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Via electronic mail

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RE: Comments on the New York-New Jersey Harbor and Tributaries Coastal Storm Risk Management Feasibility Study Interim Report

Dear Mr. Wisemiller:

On behalf of Riverkeeper, Inc. (“Riverkeeper”), please accept these comments on the New York-New Jersey Harbor and Tributaries Coastal Storm Risk Management Feasibility Study Interim Report (“NY-NJ HATS Feasibility Study Interim Report” or “Interim Report”). We appreciate the opportunity to submit comments that will inform the U.S. Army Corps of Engineers’ (“Corps”) Draft Feasibility Report and Tier 1 Environmental Impact Statement (“EIS”), anticipated in March 2020. Riverkeeper is a member-supported watchdog organization dedicated to defending the Hudson River and its tributaries. We also safeguard the drinking water supply of nine million New York City and Hudson Valley residents.

As an initial matter, we incorporate by reference our comments on the scope of the NY-NJ HATS Feasibility Study/Tiered EIS, submitted to the Corps on November 5, 2018 (“Scoping Comments”). In addition to our Scoping Comments, which remain relevant, we submit the comments below on the Interim Report. We continue to urge the Corps to conduct an integrated study of both storm surge (also referred to as “coastal storm risk management” or “CSRM”), and sea level rise (also referred to as “relative sea level change” or “RSLC”); to perform additional analyses necessary for informed decision-making prior to identifying a tentatively selected plan (“TSP”); to conduct a holistic cost-benefit analysis that fully values environmental impacts; and to better inform and engage the public about the study. Ultimately, the Corps should seek to address storm surge and sea level rise in a way that protects our communities and the environment while allowing our rivers to run free.

I. The Corps' study remains fatally flawed because of the failure to fully integrate sea level rise and seek comprehensive solutions for climate change mitigation and adaptation in the region.

Riverkeeper appreciates the Corps' recognition that sea level rise will present risks of more frequent flooding in the coming decades,¹ and that the storm surge barriers included in several of the alternatives “do not address ambient coastal flooding risks (e.g., due to RSLC), or flood risk from the more frequent events that may not trigger surge gate closure.”² We also acknowledge that the Corps has included “placeholders” for “complementary measures” to manage the risk of frequent flooding with each alternative.³ However, these steps taken by the Corps are not enough to address the significant public concern over sea level rise, appearing in 84% of the 4,250 comments submitted during the scoping period.⁴

In short, the study remains fatally flawed due to a principle focus on storm surge rather than a dual focus on storm surge and sea level rise.⁵ Moreover, where the Corps does consider sea level rise in the study—with regard to its potential to increase the damages caused by future storms⁶—the projections that it uses are low when compared to recent estimates for New York City.

A. A vague placeholder for yet-to-be defined measures that could mitigate flooding associated with sea level rise is an inadequate substitute for a fully integrated study.

To address impending flooding associated with climate change—caused by sea level rise as well as storm surge—our region needs an integrated study that seeks to identify comprehensive solutions to both of these critically important challenges. While the Corps is studying and formulating solutions for storm surge, it is not simultaneously studying and formulating solutions for flooding associated with everyday sea level rise. In fact, the Corps admits that “further analysis under a separate study would be needed to understand the daily impacts of high-tide

¹ U.S. Army Corps of Engineers, New York District, New York-New Jersey Harbor and Tributaries Coastal Storm Risk Management Interim Report 5 (Feb. 2019), *available at* <https://www.nan.usace.army.mil/Portals/37/docs/civilworks/projects/ny/coast/NYNJHAT/NYNJHAT%20Interim%20Report%20-%20Main%20Report%20Feb%202019.pdf?ver=2019-02-19-165223-023> [hereinafter “Interim Report”] (stating that “there is a need for measures of various scales, which are often complementary, in order to investigate the feasibility of managing frequent flooding which will worsen as sea levels rise....”).

² *Id.* at 74.

³ *See id.* at 16, 78, 82, 86, 90, 94.

⁴ *See id.* at 14, 16.

⁵ *See id.* at 5-6. As discussed in more detail in our Scoping Comments, the NY-NJ HATS Feasibility Study is authorized under Public Law 84-71, June 15, 1955 (69 Stat. 132) with the purpose of conducting an investigation into potential coastal storm risk management solutions. Letter from Riverkeeper, Inc. to U.S. Army Corps of Engineers, New York District 23 (Nov. 5, 2018) (citing 83 Fed. Reg. 6,169) [hereinafter “Scoping Comments”]. Public Law 84-71 does not mention sea level rise. Scoping Comments at 23 (citing Public Law 84-71, June 15, 1955 (69 Stat. 132)), *available at* <https://www.govinfo.gov/content/pkg/STATUTE-69/pdf/STATUTE-69-Pg132.pdf>). The Corps also identifies the study's limitations with regard to riverine flooding: “When the hydrology of flooding and potential solutions are separate, such as with riverine versus coastal flooding, the USACE uses separate authorities and studies to investigate the feasibility of managing the various flood risks. Those affected by riverine flood damages can request state and local officials to initiate a study with USACE for their flood risk problems under a separate study.” Interim Report at 6, n. 1.

⁶ *See* Interim Report at 62, 76.

inundation due to sea level rise to the region.”⁷ Unless and until that study is completed and fully integrated into the NY-NJ HATS Feasibility Study, the Corps’ assurances that placeholders for complementary measures to manage the risks of more frequent flooding “provide an integrated solution” does not hold water.⁸

Not only are the Corps’ placeholders an inadequate substitute for a comprehensive study, they also lack the detail necessary for the public to provide substantive feedback. The Corps states that each alternative concept

will include as feasible nonstructural (e.g., acquisition, relocation, and building retrofits) as well as structural measures (e.g., levee and floodwall) within the study area behind the surge gates to address residual coastal flooding impacts under ambient conditions due to increasing sea level and during more frequent, less severe coastal storms when the surge gates would not be closed. A placeholder has been assumed for such nonstructural, [natural and nature-based features], and local structural measures to address locations susceptible to this high frequency flooding.⁹

First, it is not clear what the meaning and effect of the word “placeholder” is in the context of the Interim Report or the larger Feasibility Study process. Second, the Corps fails to identify the geographic scope for the measures, other than “within the study area behind the surge gates.”¹⁰ Third, the Corps fails to identify any specific locations for any specific structures, deferring those details to a later point in the study.¹¹ Fourth, the Corps includes this placeholder for Alternative 5, despite the fact that it does not include storm surge gates, making it unclear whether the Corps is proposing any additional measures for that alternative. Finally, the Corps has provided conflicting information about whether the costs for these measures have been incorporated into the study.¹²

Moreover, in taking the approach of adding in shoreline measures for regular flooding to alternatives that were developed to deal with storm surge, the Corps misses an opportunity to approach both issues together. Short of a fully integrated study resulting in entirely new alternative concepts, one possibility that the Corps should examine is enhancing the measures that would be included to deal with regular flooding to also provide protection from storm surge.

⁷ *Id.* at 16.

⁸ *Id.*

⁹ *Id.* at 78 (regarding Alternative 2); *see also, id.* at 69 (stating that “the barriers will not be operated for all events or nuisance flooding, which is expected to increase over the period of analysis due to RSLC. Accordingly, complementary measures for high frequency events (“high frequency measures”), including nonstructural measures and natural and nature-based features (wetlands, living shorelines, etc.) are assumed for surge barrier measures.”).

¹⁰ *Id.* at 78.

¹¹ *Id.* at 111 (stating that “[t]he placeholders will be refined with respect to [actual location, action, [and] footprint in the next round of formulation.”).

¹² *See* Interim Report Cost Appendix at 16 (stating that “[f]eatures associated with high frequency risk mitigation (i.e., not covered by [storm surge barriers] with limited deployment) [are] not incorporated within this estimate.”). In contrast, at the Westchester County public meeting on March 12, 2019 and other similar meetings, Corps representatives stated that the contingency includes natural and nature-based features and structural and nonstructural measures to address frequent flooding.

Effectively, this approach would be an enhanced Alternative 5.¹³ When the Corps studies the placeholder measures in detail, it should examine this option.

At a minimum, prior to identifying a TSP—a milestone that the Corps has set for January 2020, 60 days prior to the release of the Draft Feasibility Report and Tier 1 EIS¹⁴—the Corps should: 1) clarify what it means by the term “placeholder;” 2) identify the geographic scope for additional measures for each alternative concept; 3) identify specific locations and specific structures for each alternative concept; 4) clarify what a placeholder for complementary measures means for Alternative 5; 5) identify specific costs for the complementary measures and clarify whether they are included in the cost estimates for the alternatives; and 6) examine whether the complementary measures could be modified to provide protection from storm surge.

B. The Corps’ sea level rise projections are low when compared to recent projections for New York City.

In the Hydrologic Engineering Center-Flood Damages Analysis (“HEC-FDA”) model, discussed *infra* at Part V.A., the Corps uses its own intermediate sea level rise projection of 1.8 feet by 2100 in an attempt to account for how sea level rise will impact coastal storm risk.¹⁵ The Corps’ identifies as a key assumption of the study that

RSLC projections will remain accurate. At present, none of the projections have assigned probabilities, so it is not possible to predict which scenario is the most likely. However, the working assumption is that rates of RSLC will not be slower than the historic/low rate or faster than the currently projected high rate.¹⁶

Intermediate sea level rise projections for New York City are higher than those used by the Corps in the study. Specifically, the New York City Panel on Climate Change (“NPCC”) projects that the City could experience a middle range of 1.83 to 4.17 feet of sea level rise by 2100.¹⁷ The

¹³ See *infra*, Part IX.

¹⁴ Interim Report at 19 (“The TSP Milestone is targeted for January 2020 when the study team, including the states of New York and New Jersey, will convene with USACE Headquarters to identify a TSP based on the analysis. The Draft Feasibility Report and Tier 1 EIS will be released within 60 days of the TSP Milestone for public and agency comment.”).

¹⁵ *Id.* at 62 (stating that “[f]or purposes of considering the potential impacts of RSLC during initial plan formulation, the study team used the intermediate rate of relative sea level change (an increase of +1.8 feet through 2100) as a rough approximate for the median, to decrease the amount of adjustment needed later for future rounds of formulation, when the low and high rates will be evaluated as well.”); *id.* at 76 (discussing the integration of the intermediate sea level rise projection into the HEC-FDA model, which “indicates that the selected comparison event (i.e., 1 percent flood) would cause approximately over 2.6 times more economic damage in the NYNJHAT study area at year 2100 than the same event would case in year 2030.”); *id.* at 111 (stating that “[b]enefits were developed on the intermediate rate of RSLC.”).

¹⁶ *Id.* at 67.

¹⁷ New York City Panel on Climate Change, *Advancing Tools and Methods for Flexible Adaptation Pathways and Science Policy Integration 16* (Cynthia Rosenzweig & William Solecki, eds., 2019), *available at* <https://www.nyas.org/annals/special-issue-advancing-tools-and-methods-for-flexible-adaptation-pathways-and-science-policy-integration-new-york-city-panel-on-climate-change-2019-report-vol-1439/> [hereinafter “NPCC 2019 Report”].

NPCC's 2019 Report also calls into question the Corps' key assumption that RSLC "will not be ... faster than the currently projected high rate."¹⁸ The Corps projects a high rate of approximately 5-6 feet by 2122,¹⁹ whereas the NPCC's high estimate for New York City is 6.25 feet by 2100.²⁰ Further, under the NPCC's new Antarctic Rapid Ice Melt Scenario ("a low-probability, upper end case for the late 21st century"),²¹ the City could experience 6.75 feet of sea level rise in the 2080s and 9.5 feet by 2100.²²

The Corps indicates that it will analyze the alternatives under each of the agency's RSLC scenarios (low, intermediate, and high) in the future.²³ However, given the study's fundamental flaw of not fully incorporating sea level rise, and the severe limitations of the study to date (discussed in detail below and in our Scoping Comments), that is simply not good enough. As the NPCC recognizes, "rising sea levels are expected to persist for centuries."²⁴ The Corps must deal with that reality; otherwise, this study could do nothing more than waste time and resources on measures that become obsolete before the end of the century, if not sooner.²⁵

II. The Corps must ensure that its decision regarding a TSP is well-informed.

The National Environmental Policy Act ("NEPA") requires that agencies make informed decisions.²⁶ Pursuant to NEPA, agencies must "utilize a systemic, interdisciplinary approach which will insure the integrated use of the natural and social sciences and the environmental design arts in planning and decision making which may have an impact on [the] environment."²⁷ In so doing, agencies must establish procedures that "insure that environmental information is available to public officials and citizens before decisions are made and before actions are taken."²⁸ Moreover, "[t]he information must be of high quality," as "[a]ccurate scientific analysis, expert agency comments, and public scrutiny are essential to implementing NEPA."²⁹ Further, environmental impacts must be identified "in adequate detail so they can be compared to economic and technical analyses."³⁰

As discussed in our Scoping Comments, the Corps' use of "tiering" has muddled the NEPA process. However, even the Corps' NEPA guidance acknowledges that a Tier 1 EIS "must present sufficient information regarding overall impacts of the proposed action so that the decision-makers can make a reasoned judgment on the merits of the action..."³¹ Unfortunately,

¹⁸ Interim Report at 67.

¹⁹ *Id.* at 76.

²⁰ NPCC 2019 Report at 16.

²¹ *Id.* at 15.

²² *Id.* at 15-16.

²³ Interim Report at 111.

²⁴ NPCC 2019 Report at 11.

²⁵ *See, e.g.,* Thomas Frank, *After a \$14-Billion Upgrade, New Orleans' Levees Are Sinking*, E&E News (Apr. 11, 2019).

²⁶ *See* 42 U.S.C. § 4332(2)(a) (Lexis 2019); 40 C.F.R. §§ 1501(a), 1507.2 (Lexis 2019).

²⁷ 42 U.S.C. § 4332(2)(a); 40 C.F.R. § 1501(a).

²⁸ 40 C.F.R. § 1500.1(b).

²⁹ *Id.*

³⁰ 40 C.F.R. § 1501.2(b).

³¹ U.S. Army Corps of Engineers, Procedures for Implementing NEPA, ER 200-2-2 para. 13.c. (Mar. 4, 1998), available at https://www.gsa.gov/cdnstatic/Department_of_Army_Procedures_for_Implementing_NEPA.pdf.

the Corps has yet to meet this bar. In fact, the Corps admits that it does not have enough information at this time to make a recommendation on a TSP.³²

The Corps is particularly falling short in its analysis of alternatives,³³ which is at the “heart” of the NEPA process.³⁴ Agencies must, *inter alia*, “[r]igorously explore and objectively evaluate all reasonable alternatives” and “[d]evote substantial treatment to each alternative considered in detail including the proposed action so that reviewers can evaluate their comparative merits.”³⁵ However, as discussed below, the cost estimates for the alternatives barely scratch the surface of environmental impacts, the benefit model disregards them—and other factors—entirely, and the resulting net benefits are unacceptably limited and uncertain. Combined, this analysis in no way constitutes a “rigorous exploration” of the alternatives, nor does it allow the Corps or the public to truly “evaluate their comparative merits.” The Corps must immediately clarify for the public the additional studies that it will undertake for all of the alternatives to bolster its analysis prior to selecting a TSP.³⁶

NEPA is intended to “help public officials make decisions that are based on understanding of environmental consequences and take actions that protect, restore, and enhance the environment.”³⁷ At this stage of the process, it is clear that the Corps simply does not have enough information, particularly with regard to environmental impacts, to make a decision on a TSP. What remains unclear is how the Corps intends to remedy this deficiency prior to the January 2020 TSP milestone.

III. The Corps’ cost estimates are incomplete and uncertain.

The cost estimates in the Interim Report, which are sometimes discussed in “rough orders of magnitude” are too incomplete and uncertain to meaningfully compare the alternatives. The Corps admits as much: at the public meetings on the Interim Report, officials have stated that the cost estimates are partial and that they do not have enough information to make a recommendation on a TSP.

In an attempt to address the “risk and uncertainty” associated with the cost estimates, the Corps added a 40% contingency to the construction costs for the alternatives.³⁸ However, using the

³² At the Westchester County public meeting and other similar meetings, Corps representatives expressly stated that they do not have enough information to make a recommendation on the TSP.

³³ At this point in the study, the alternative concepts appear largely theoretical and uncertain. For example, the Interim Report states that the locations of the proposed measures “are based only on readily available desktop information and do not yet have the benefit of site specific data, recent modeling, or specific field data collection that should be required to answer questions about the full effects of these concepts. The concepts presented in this report serve to convey cost and time, construction specifics are not conceptualized as part of the initial array of the study. The actual type of barrier, gates, and [shore based measures] (floodwall vs levee, nonstructural, or natural and nature-based features) have not yet been confirmed, nor their exact locations.” Interim Report at 68.

³⁴ 40 C.F.R. § 1502.14.

³⁵ 40 C.F.R. § 1502.14(a), (b).

³⁶ See 40 C.F.R. § 1502.22(a). (“If the incomplete information relevant to reasonably foreseeable significant adverse impacts is essential to a reasoned choice among alternatives and the overall costs of obtaining it are not exorbitant, the agency shall include the information in the environmental impact statement.”); see also, *infra* at Part VII.

³⁷ 40 C.F.R. § 1500.1(c)

³⁸ Interim Report at 109.

same percentage across the board fails to account for the increased uncertainty associated with the costs of storm surge barriers.³⁹ The Corps admits that “[s]ince storm surge barriers are relatively rare infrastructure in the U.S. . . . there is less data and impact analysis associated with them.”⁴⁰ The Corps should revise the contingencies to take into account the increased uncertainty associated with the costs of storm surge barriers as opposed to shoreline-based measures.

Adding in contingencies alone does not solve the problems of uncertainty. Where the costs are large with a large uncertainty and the benefits are similarly large with a large uncertainty and a narrow scope, subtracting the two numbers to derive an even more uncertain net benefit could give a false impression that small differences in net benefits are meaningful.⁴¹ To address this issue, the Corps should at least undertake a sensitivity analysis to show how uncertainties in inputs can affect the output. For example, a higher discount rate would strongly disfavor options with long construction timeframes, like the Sandy Hook – Breezy Point barrier included in Alternative 2, which the Corps estimates will take 25 years to construct.⁴² Moreover, the lack of experience in constructing large barriers means that the estimates for their cost are inherently more uncertain. Once the Corps has a handle on the range of uncertainty for the net benefits, it will be able to see which alternatives are significantly different and which score similarly in terms of economics and therefore need to be differentiated in other ways.

Even with the Corps’ limited information, it is clear that the costs associated with storm surge barriers drastically exceed the costs of shoreline-based measures. For example, the estimated cost of construction for Alternative 2, which includes the Sandy Hook – Breezy Point barrier, comes in at nearly \$58 billion with the contingency.⁴³ In addition to construction costs for each alternative, the Corps includes estimates for operation, maintenance, repair, and rehabilitation costs over a 50-year period⁴⁴ (\$11.6 billion for Alternative 2⁴⁵), “preliminary” estimates for real estate and environmental and cultural mitigation⁴⁶ (\$0.03 billion and \$0.27 billion for Alternative 2, respectively⁴⁷), and a combined estimate for interest during construction, preconstruction engineering and design, and construction management⁴⁸ (\$49 billion for Alternative 2⁴⁹). Notably, the Corps does not estimate replacement or demolition costs at this time.

³⁹ See *id.* at 101-02 (“For this study, the large size of—and the design uncertainties associated with—the SSB’s under consideration drive the cost engineering approach.”).

⁴⁰ *Id.* at 109.

⁴¹ See *infra* at Part V.I.

⁴² Interim Report at 106. It appears that the benefits calculations have not been discounted to take account of the longer durations necessary to implement the barrier alternatives. *Id.* at 105 (“It should be noted at this point while construction durations have been parametrically estimated for the barriers and inform the parametric cost estimate, these construction durations have not been factored into the calculations of benefits. The flows of benefits and costs through time will be reconciled for the upcoming Draft Feasibility Report.”). Once this is corrected, alternatives with long construction durations will appear less favorable.

⁴³ *Id.* at 110. Without the contingency, the cost of the Sandy Hook – Breezy Point barrier is over \$36 billion. *Id.* 106. That is more than 15 other storm surge barriers combined. *Id.*

⁴⁴ *Id.* at 106-07.

⁴⁵ *Id.* at 110.

⁴⁶ *Id.* at 108.

⁴⁷ *Id.* at 110.

⁴⁸ *Id.* at 109.

⁴⁹ *Id.* at 110.

The resulting cost estimate for Alternative 2 is a whopping \$118.8 billion—eight times the estimated cost of Alternative 5, which includes only shoreline-based measures and comes in at \$14.8 billion.⁵⁰ While the remaining storm surge barrier alternatives are estimated to cost less than Alternative 2, ranging from \$47.1 billion to \$32.0 billion, they remain over two to three times more expensive than Alternative 5.⁵¹

IV. The Corps’ environmental and cultural mitigation estimates fail to include system-wide environmental impacts.

The Corps recognizes that public concern surrounding the environmental impacts of the proposed alternatives is “ubiquitous,” appearing in 91% of the 4,250 comments submitted during the scoping period.⁵² The Corps also recognizes that the potential for negative environmental impacts “especially to the Hudson River and its estuaries” was identified as a “major concern” at agency workshops involving more than 100 representatives from agencies and local governments.⁵³ Yet, the Corps limits the environmental and cultural mitigation estimates to the footprint of each measure,⁵⁴ resulting in wholly inadequate figures that favor the storm surge barrier alternatives. The environmental and cultural mitigation estimates in the Interim Report are as follows:⁵⁵

Table 16. Preliminary Estimates for Other Cost Considerations (FY 19 P.L.)

Alternative	Real Estate	Environmental and Cultural Resources Mitigation
2	\$30,000,000	\$270,000,000
3A	\$110,000,000	\$240,000,000
3B	\$270,000,000	\$1,270,000,000
4	\$270,000,000	\$1,270,000,000
5	\$150,000,000	\$1,380,000,000

According to the Corps, Alternatives 2 and 3A—the options with the largest storm surge barriers—have the lowest environmental mitigations costs, while Alternative 5—the only option limited to shoreline-based measures—has the highest environmental mitigation cost. This counterintuitive result highlights the Corps’ failure to consider system-wide environmental impacts.

The Corps must expand its environmental and cultural mitigation estimates to include impacts that are likely to occur throughout all of the waterways that may be affected by storm surge barriers. There is simply no way that a monetary mitigation estimate based on the footprint of a structure can address the wide-ranging and potentially catastrophic impacts to fish migration,

⁵⁰ *Id.*

⁵¹ *Id.*

⁵² *Id.* at 14, 17.

⁵³ *Id.* at 12.

⁵⁴ *Id.* at 108 (stating that “[e]nvironmental and cultural mitigation estimates are based on potential impacts on land and within water from the footprint of each measure.”).

⁵⁵ *Id.*

tidal exchange, sediment transport and the upstream food web and ecology of the affected waterways that could result from storm surge barriers.

The Corps even recognizes that the environmental impacts are not limited to the footprint of the measures, yet it fails to value those broader impacts in the mitigation estimates. For example, the mitigation estimates for Alternatives 2 and 3A fail to account for what the Corps characterizes as the “main environmental concerns” of “[t]idal exchange in the Hudson River Estuary [and] migration of estuary resources through [the New York] Bight and Long Island Sound.”⁵⁶

It is unclear if and when the Corps plans expand the mitigation estimates to account for the true scope of potentially significant environmental impacts. Although the Corps recognizes that the estimates may change as it gathers site-specific information, it does not specifically state what the scope of any additional investigations will be:

Environmental and Cultural Resources Mitigation: The environmental and cultural resources mitigation estimates were based on existing information from other completed studies and construction projects. More site-specific investigation may yield additional potential environmental and cultural resources impacts for resources that are: 1) currently unknown; 2) not known to be in either the study area or within areas affected by induced flooding from the various measures; and/or 3) so significant that they cannot be addressed through mitigation and may be declared environmentally unacceptable.⁵⁷

This issue is further complicated by the Corps admission that its investigation of potential impacts “is in its nascent stage, incomplete, and still under development.”⁵⁸ However, even at this early stage, the Corps has identified numerous environmental impacts of the alternatives that extend beyond the footprint of the measures.⁵⁹ Those impacts, and others that the Corps identifies as it moves forward with its impact analysis, must be incorporated into the environmental and cultural resources mitigation estimates. Further, the Corps must make enough progress in its impact analysis to identify and value system-wide environmental impacts for each alternative before selecting a TSP.

V. The Corps’ benefit modeling is unacceptably limited and does not take into account environmental impacts.

A. HEC-FDA Benefit Model

The Corps’ HEC-FDA benefit model, based largely on a desktop inventory of structures,⁶⁰ provides an unacceptably narrow analysis of the benefits that could be associated with each

⁵⁶ *Id.* at 115.

⁵⁷ *Id.* at 114.

⁵⁸ *Id.*

⁵⁹ *See id.* at 114-26.

⁶⁰ *Id.* at 99.

alternative. When analyzing alternatives for water-related projects, the Corps should consider the four accounts described in the *Economic and Environmental Principles and Guidelines for Water Related Land Resources Implementation Studies* (“Principles & Guidelines”).⁶¹ However, the HEC-FDA model fails to do so.⁶²

The Principles & Guidelines accounts are as follows:

- (a) The national economic development (NED) account displays changes in the economic value of the national output of goods and services.
- (b) The environmental quality (EQ) account displays non monetary effects on significant natural and cultural resources.
- (c) The regional economic development (RED) account registers changes in the distribution of regional economic activity that result from each alternative plan. Evaluations of regional effects are to be carried out using nationally consistent projections of income, employment, output, and population.
- (d) The other social effects (OSE) account registers plan effects from perspectives that are relevant to the planning projects but are not reflected in the other three accounts.⁶³

The HEC-FDA model—the only approved benefit model that the Corps is using in the study as of now—is limited to just one account, NED, and does not consider the remaining three accounts.⁶⁴ In addition to being limited to NED, the HEC-FDA model focuses solely on the “structure and contents” subset of NED and disregards other considerations.⁶⁵ The HEC-FDA model is further constrained due to its inability to capture “secondary or tertiary effects (lost productivity, etc.)”⁶⁶

The remaining Principles & Guidelines accounts must be fully analyzed for each alternative concept before the Corps selects a TSP. For example, the EQ account refers to “beneficial and adverse effects” on the “ecological, cultural, and aesthetic properties of natural and cultural

⁶¹ *Id.* at 98; *see generally*, U.S. Water Resources Council, *Economic and Environmental Principles and Guidelines for Water Related Land Resources Implementation Studies* (1983), *available at* https://planning.erdc.dren.mil/toolbox/library/Guidance/Principles_Guidelines.pdf [hereinafter, “Principles & Guidelines”].

⁶² Interim Report at 98.

⁶³ Principles & Guidelines at v.

⁶⁴ Interim Report at 98-99.

⁶⁵ *Id.* at 100 (“HEC-FDA is designed to measure NED benefits – more specifically, the subset of NED benefits that consists of damages prevented to structures and their contents.”); U.S. Army Corps of Engineers, New York District, New York-New Jersey Harbor and Tributaries Coastal Storm Risk Management Feasibility Study, Public Meeting on Interim Report PowerPoint Presentation 29 (2019), *available at* <https://www.nan.usace.army.mil/Portals/37/Final%20Public%20Meetings%20Pres%20on%20Interim%20Report%2014%20Mar%202019.pdf> (identifying transportation, clean up, and emergency as other NED considerations).

⁶⁶ Interim Report at 100.

resources that sustain and enrich human life.”⁶⁷ Among the considerations in the EQ account are functional aspects of the environment such as “production, nutrient cycling, succession, assimilative capacity, erosion, and other dynamic, interactive processes and systems” and structural aspects of the environment such as “plant and animal species, populations and communities; habitats; and the chemical and physical properties of air, water (surface and ground), and soil and other geophysical resources.”⁶⁸ It is clear that the alternatives may impact functional and structural aspects of the environment,⁶⁹ and those impacts should be taken into consideration.

The Corps acknowledges that the HEC-FDA model has analytical limitations.⁷⁰ However, it also states that it will continue to focus on NED benefits for the TSP:

Our current milestone requirements include benefits developed through an approved or certified model for the TSP. For CRSM studies, the models that have been approved are for NED benefits. Accordingly, for the upcoming milestone, the study team will identify, on the broadest terms, the NED benefits for NYNJHATS alternatives to meet this requirement, while acknowledging that such an analysis still needs the remaining three accounts to be complete.⁷¹

Given the threats posed by the storm surge barrier alternatives, the Corps’ failure to have a mechanism that considers all four Principles & Guidelines accounts for each alternative prior to the selection of a TSP is unacceptable. As discussed at length in our Scoping Comments, and further detailed *infra* at Part VIII, the alternatives may have many significant environmental impacts that must be considered including, *inter alia*, impacts on water quality, tidal exchange, sediment movement, aquatic life, and habitat.⁷² The HEC-FDA model, with its focus on NED and its disregard for the remaining Principles & Guidance accounts, including EQ, cannot possibly capture the full scope of beneficial and adverse effects necessary to inform the Corps’ selection of a TSP.

B. GIS Composite Risk Index

In an attempt to compensate for the limitations of the HEC-FDA model, the Corps undertook a GIS analysis.⁷³ Unfortunately, the GIS analysis is also flawed. Although the Corps maintains that the GIS analysis is an effort to “capture the four Principles and Guidelines accounts,”⁷⁴ the agency did not weigh environmental and habitat resources.⁷⁵ This decision is a departure from the North Atlantic Comprehensive Coastal Study (“NACCS”), where “cultural and

⁶⁷ Principles & Guidelines at 103.

⁶⁸ *Id.*

⁶⁹ *See, e.g.*, Interim Report at 114-26; Scoping Comments, Part II.

⁷⁰ Interim Report at 98-100.

⁷¹ *Id.* at 99.

⁷² *See generally*, Scoping Comments, Part II.

⁷³ Interim Report at 100.

⁷⁴ *Id.*

⁷⁵ *See id.* at 51.

environmental resources” were weighted at 10%.⁷⁶ It is also a departure from the default exposure weights for NY-NJ HATS Feasibility Study of 4% for cultural resources, 3% for environmental resources, and 3% for habitat resources.⁷⁷

As discussed in the Addendum to the GIS Appendix, the NY-NJ HATS Feasibility Study “sponsors and partners” decided to weigh cultural resources at 5% and zero out the weights for both environmental and habitat resources.⁷⁸ The Corps offers the following explanation for devaluing these critically important resources:

During discussions as to the development of the composite exposure indices and the weights that would be applied to each of the indices, representatives from the State of New York expressed concern the weighing of environmental and habitat indices could result in structural coastal storm risk management features (barriers or seawalls) isolating natural habitats from rivers, bays, and oceans, thereby negatively impacting those resources (ex. restricted sediment movement during storms).⁷⁹

This rationale appears contradictory. If state partners are concerned that barriers or seawalls would harm, rather than protect, ecological resources, that would appear to be an argument for giving environmental factors greater weight rather than zero weight. If these resources are highly weighted then the least damaging alternatives would be more favored. The Corps must explain further why it took this approach to the GIS analysis.

Intentionally undervaluing environmental and habitat resources to somehow spare them from proposed “solutions” to storm surge provides yet another indication of how fundamentally flawed the NY-NJ HATS Feasibility Study is. The vast amount of diverse resources that exist in the study area must be appropriately valued, and, in the context of environmental and habitat resources, doing so should not raise concerns about harming, rather than protecting, those resources. As such, the GIS analysis is not an adequate tool to compensate for the analytical limitations of the HEC-FDA model, particularly with regard to environmental impacts. Further, even if the GIS analysis were adequate, it is not an approved model.⁸⁰

C. The Corps has no clear path forward to ensure that a holistic benefit model is available for the remainder of the NY-NJ HATS Feasibility Study.

The Corps recognizes that the HEC-FDA model is limited⁸¹ and that the GIS analysis is both limited and not an approved model.⁸² Moving forward, the Corps identifies the following options:

⁷⁶ *Id.*

⁷⁷ Interim Report GIS Appendix, GIS Report Addendum at 3.

⁷⁸ *Id.*

⁷⁹ *Id.*

⁸⁰ Interim Report at 113.

⁸¹ *Id.* (stating that “HEC-FDA is best used for structures and their contents, and does not adequately capture critical infrastructure, let alone benefits from the other three P&G accounts (EQ, OSE, and RED).”).

- 1) Continue to use HEC-FDA, as it adjusts to account for wave action and can be adjusted over time to accommodate RSLC assumptions;
- 2) Adapt HEC-FDA based on expert advice to capture more types of benefits;
- or 3) Develop GIS outputs and pursue model certification.⁸³

As discussed *supra*, neither the HEC-FDA model nor the GIS analysis provides a holistic assessment of the alternatives. Therefore, only option two—adapting the HEC-FDA model to capture additional accounts—could potentially offer a more comprehensive assessment of the alternatives. The Corps would have to ensure that the adapted model not only captures “more types of benefits,” but that it fully incorporates all four Principles & Guidance accounts, including EQ. However, it is unclear how long adapting the model could take, whether the Corps would then have to get the adapted model certified, and how those tasks could affect the project timeline.

In short, as the Corps admits, the benefits analysis presented in the Interim Report is very limited and much more needs to be done in order to make an informed decision.

VI. The net benefits of the alternatives are uncertain and unacceptably limited.

The net benefits of the alternatives presented in the Interim Report are a product of the cost estimates and HEC-FDA model, both discussed *supra*. As such, they are also uncertain and unacceptably limited. According to the Interim Report, the net benefits are as follows:⁸⁴

Table 19. Net Benefits for Alternatives 2-5 (in billions)

Alternative	Project Benefits in Present Value	Alternative Costs	Net Benefits
1- No Action	--	--	--
2 – SH-BP barrier	\$175.1	\$118.8	\$57.0
3A- Regional barriers	\$171.1	\$47.1	\$124.0
3B – Mid size barriers	\$160.8	\$43.0	\$117.8
4 – Small Barriers	\$148.6	\$32.0	\$116.6
5- Perimeter only	\$48.6	\$14.8	\$33.8

Under the Corps’ analysis, Alternative 3A has the highest net benefits, followed closely by Alternatives 3B and 4.⁸⁵ Alternatives 2 and 5 lag behind.⁸⁶ However, the uncertainty associated

⁸² *Id.* (stating that “[t]he GIS analysis ... is not a certified model, does not provide outputs in monetary units, and would require a time function to be able to estimate benefits over a period of analysis.”).

⁸³ *Id.*; *see also, id.* at 99 (“For each alternative, the concentration of NED benefits by location will be compared to the GIS characterization of areas and resources at risk to assess how the results correlate, and what refinements are needed to best meet our requirements. Potential outcomes could include refinements to HEC-FDA if the correlations are strong, or adding more rigor and resources to the GIS method to support an application for model certification.”).

⁸⁴ *Id.* at 110.

with the cost estimates—particularly the estimates for storm surge barriers and the 40% contingency—and the limitations of the HEC-FDA model call into question whether the net benefits in the Interim Report provide any justification for advancing any one of the alternative concepts over the others. The only conclusion that the Corps can draw from its limited analysis to date is that all of the alternatives are cost-effective under this framework.⁸⁷ As such, and as the Corps admits, none of the alternatives can be screened out on cost alone.⁸⁸

In addition to the comments presented *supra*, a full and fair cost-benefit analysis of the alternatives must take into account the following:

- Measures that protect against flooding from everyday sea level rise;
- System-wide environmental impacts, including impacts to ecosystem services and endangered species;
- Comparison events in addition to the 1% flood;⁸⁹
- Frequencies of gate closure in addition to the 50% flood;⁹⁰
- Spans of time beyond the 50-year study period;⁹¹
- Beginning the study period at different times, from now into the future;
- Design conditions for storm surge barriers that allow for less than the maximum flow;⁹²
- Modifications to storm surge barriers that may be necessary under different sea level rise scenarios;
- Removal or replacement of storm surge barriers under different sea level rise scenarios; and
- Risk of mechanical failure of storm surge barriers.

The Corps should not select a TSP based solely on extremely limited and uncertain net benefits developed under the framework presented in the Interim Report. Rather, the Corps should focus on developing a more holistic cost-benefit analysis and conducting additional studies.

⁸⁵ *Id.* We note that the net benefits of Alternatives 3A, 3B, and 4 may be virtually the same, given the contingencies added to the cost estimates and the uncertainty and limitations inherent in the Corps' analysis. While the net benefits may not be a distinguishing factor for these alternatives, the difference in scope and scale of environmental impacts from the most detrimental of the group—Alternative 3A—to the least detrimental—Alternative 4—must be considered.

⁸⁶ *Id.*

⁸⁷ *Id.*

⁸⁸ Representatives from the Corps made statements to this effect at the Westchester County public meeting and other similar meetings. *See also*, Interim Report at 110 (stating that all of the alternatives "...have net benefits and could be pursued for further investigation in the next round of formulation.").

⁸⁹ The 1% flood is also referred to as the 100-year flood. Interim Report at 70. It is a flood level "that has a 1 in 100, or 1 percent chance of being equaled or exceeded in any year." *Id.*

⁹⁰ The 50% flood has a 50% chance of being equaled or exceeded in any year. *See id.*

⁹¹ Representatives from the Corps have stated at the Westchester County public meeting and other similar meetings that the agency will need a waiver to extend the 50-year study period. *See also*, Interim Report at 111-12. We urge the Corps to pursue this waiver.

⁹² Interim Report at 101. Assuming "maximum flow" and "minimum interruption" presents a best-case scenario despite the fact that the storm surge gate designs are entirely theoretical and uncertain at this point. *See id.* at 72.

VII. The Corps must conduct additional studies before selecting a TSP.

The Interim Report states that “[t]he identification of the plan with the highest net benefits is contingent, however, upon investigation of the assumptions made throughout this study to date, *and analyses needed to confirm or corroborate the assumptions.*”⁹³ Additional studies are also necessary to uncover any information currently unknown that would affect the Corps’ selection of a TSP. Therefore, it is essential that the Corps complete the additional analyses identified in the Interim Report, as well as additional analyses identified by interested stakeholders and members of the public, prior to selecting a TSP.

The additional analyses that could impact plan selection, as identified by the Corps in the Interim Report include, *inter alia*:

- “additional hydrodynamic modeling along with engineering gate structure designs for both navigation as well as environmental effects”;⁹⁴
- “a detailed investigation [into] how the alternatives perform under each of the RSLC scenarios”;⁹⁵
- an analysis of the “optimal trigger event per gate”;⁹⁶
- site-specific environmental investigations;⁹⁷
- interior drainage refinements;⁹⁸
- port operations requirements;⁹⁹ and
- “field investigations for economics, environmental, engineering purposes (geotechnical and bathymetric).”¹⁰⁰

The Corps also identified additional analyses at the public meetings on the Interim Report. For example, in Westchester County, the Corps stated that using the 50% flood as a trigger for surge gate closure would “absolutely” have environmental impacts that the agency has not yet studied. The Corps also stated that induced flooding had not been analyzed for Alternative 4.

We urge the Corps to complete these additional analyses, as well as the analyses identified in our Scoping Comments and *infra* at Part VIII, prior to selecting TSP.¹⁰¹ Furthermore, absent more accurate cost estimates and a holistic benefit model, the Corps must provide assurances that qualitative analyses are actually taken into consideration, rather than simply relying on net benefits.¹⁰² Failure to do so risks making an arbitrary decision and expending limited time and

⁹³ *Id.* at 111 (emphasis added).

⁹⁴ *Id.*

⁹⁵ *Id.*

⁹⁶ *Id.* at 112.

⁹⁷ *Id.* at 114.

⁹⁸ *Id.*

⁹⁹ *Id.*

¹⁰⁰ *Id.*

¹⁰¹ *See generally*, Scoping Comments, Part II.

¹⁰² *See* Interim Report at 110-11.

resources on a plan that turns out to be technically infeasible, economically unjustified, or environmentally unacceptable.¹⁰³

VIII. The alternatives that include storm surge barriers continue to raise significant environmental concerns.

The Corps is continuing to examine alternatives that include massive storm surge barriers, including those that span across New York Harbor (Alternative 2) and the Verrazzano Narrows (Alternative 3A). In addition, the Corps is now providing some entirely theoretical conceptual designs of the structures under consideration.¹⁰⁴ The potential for massive storm surge barriers—and some of the features in the Corps’ renderings—continue to raise environmental concerns.

A. Storm surge barriers could have permanent ecological consequences for the region.

The Corps rightly recognizes that tidal exchange and migration of estuary resources are “main environmental concerns” for several of the alternatives that include storm surge barriers.¹⁰⁵ For Alternatives 2 and 3A, the waterways impacted span the Hudson River estuary, the New York Bight, and the Long Island Sound. Potential changes in tidal energy, circulation patterns, sediment deposition, fish passage, and other processes that could be affected by storm surge barriers threaten to fundamentally alter the entire ecosystem.

Due to the potentially catastrophic ecological consequences of storm surge barriers, the Corps must answer the following questions related to tidal exchange and migration of estuary resources prior to selecting a TSP:

- How will restricted tidal energy or altered circulation patterns caused by the barriers (open and closed) impact the entire larval invertebrate community e.g., blue crab larvae, oyster spat, mussel trochophore larvae, barnacle nauplius and the myriad of other planktonic larvae that rely on circulation patterns for distribution of their offspring or recruitment within the estuary?
- How will restricted tidal energy or altered circulation patterns caused by the barriers (open and closed) impact the larval fish community? What will be the impact to the billions of juvenile fish that are produced in the Hudson River estuary and New York Harbor each year?
- How will the slowing of tidal currents caused by barrier structures or during gate closures affect the semi-buoyant eggs of fish e.g., striped bass, river herring, and shad? These

¹⁰³ See *id.* at 68 (stating “[i]t is possible that the barriers, gates, and [shore-based measures] shown in this report could be removed from consideration as more site specific investigations indicate that the certain measures may not be technically feasible, or economically justified, or environmentally acceptable – measures must meet all three criteria to proceed.”); see also, *id.* at 17 (discussing the analysis of environmental impacts for the TSP only; stating that “[i]f the environmental impacts of the TSP are unacceptable, the plan will not move forward.”).

¹⁰⁴ *Id.* at 72 (stating that “[t]he objective at this stage of the study is to provide a description and first conceptual design which outline the basis for key geometric characteristics (e.g., height, width, and depth of openings) for each storm surge barrier” and that “[s]ignificant additional study is required to substantiate the conceptual design of the storm surge barriers.”); see also, *id.* at 47. Representatives from the Corps have indicated at the Westchester County public meeting and other similar meetings that the storm surge barrier designs are entirely theoretical.

¹⁰⁵ Interim Report at 115.

fishes require a near constant tidal current to keep their eggs from sinking into the sediments and suffocating.

- How will lateral circulation patterns as mentioned by Ralston et al. be impacted with reduced tidal energy?¹⁰⁶ How will the countless intricate abiotic and biotic relationships be altered?
- Will sediment deposition patterns in the entire Hudson River estuary change as a result of slowing of water velocities due to gates both open and closed? According to Wall et al., concentration differences associated with daily resuspension due to tides and seasonal flow rates was discernible.¹⁰⁷ What is the ecosystem impact to altered tidal and flow regimes? How would this impact the most isolated reaches of the system?
- Significant changes in current velocities in the vicinities of the gates opening would be expected. High velocities in the vicinity of the structures would make passage for fish and slow swimming nekton challenging. How likely is it that entry and exit into the Harbor would be available for all creatures throughout the entire tidal cycle, especially for creatures with limited swimming ability?
- By their nature, gate openings increase water velocity in the vicinity of the structure. The swimming ability of a fish is generally represented by empirical curves showing the distance which fish of a given species and length can travel in a flow with a given velocity. Will barrier designs cause higher velocities at their gates that could discriminate against slow swimming fishes? Will individual fish species be studied for their swimming performance to assure complete passage while the gates are open?
- When the gates are opened after a period of closure, the attendant velocities in and around the gates may be higher proportionate to the height of storm surge and the amount of rainfall during the closure event. So, in addition to the gate closures, will nektonic creatures with poor swimming ability or those in immature stages of development be required to await passage through the barriers until conditions are stabilized? If not, will they be transported to unsustainable locations? Will they be lost to the estuary?
 - Could certain species, including but not limited to, glass eels or blue crab zoeae approaching the gates be denied entry to the estuary while the gates are closed, which, as smaller storms trigger additional closures due to RSLC, could be for a week or more? Even when the gates are open, how much longer will these same glass eels or other slow swimming forms of nekton be denied entry due to periodic turbulence and high velocities?
 - How will turbulence around barriers and altered tidal exchange impact the movement of passively transported planktonic larvae? Will the changes in flow regimes alter their normal settlement and distribution patterns?
- It is conceivable that the storm surge barriers will not only create direct physical barriers to fish passage but also impose indirect obstacles to fish in the form of elevated water velocities and turbulence. How will storm surge barriers impact the rheotaxis of fish such as lined seahorses, pipefish, juvenile fishes, glass eels, larval fishes, etc., as well as the entire assemblage of invertebrate larvae? Will the extraordinary diversity of lifeforms at

¹⁰⁶ See David K. Ralston et al., *Bathymetric controls on sediment transport in the Hudson River estuary: Lateral asymmetry and frontal trapping*, 117 *J. Geophysical Res.*, 1-21 (2012).

¹⁰⁷ G.R. Wall et al., *Suspended Sediment Transport in the Freshwater Reach of the Hudson River Estuary in Eastern New York*, 31 *Estuaries and Coasts* 542-53 (2008).

all different levels in the various food-webs (marine, estuarine, freshwater and riparian), that transit the Hudson River estuary all be impacted by altered flow regimes, especially during their most vulnerable stages?

- Turbulence and the associated bubbling of air in water cause vibration and noise that, depending on their magnitude, may present obstacles to fish movement. Will these physical conditions act as barriers to the vast number of migratory fishes, especially the clupeids that are extremely sensitive to sound and vibration as they enter the Hudson River estuary? Changes in water velocity, turbidity, and light associated with in-water infrastructure may elicit avoidance behavior or act as behavior barriers to certain species. Can we guarantee that all species that currently transit to and from the Hudson and the Harbor will have free mobility and will not be inhibited from passing during the construction of barriers or through the barrier openings, once constructed?
- Will large-scale construction operations, including the requisite support equipment, e.g., extensive number of barges, scows, tugs, support boats, cranes, pile drivers, extensive dredge and fill operations, etc., act as behavior barriers or cause mortality to many of our most sensitive or imperiled creatures? Will construction vessel traffic cause potentially unsustainable mortality of endangered Atlantic sturgeon due to propeller strikes? How will the transmission of sound energy during construction impact the aquatic fauna? Will these creatures flee from the transmission of increased frequencies of high energy sound or shock waves? Will this cacophony of sounds occurring within the construction zones inhibit intra and interspecies communication patterns that are important for species survival?
- When determining the size and type of gates at each location, will tests be conducted to determine criteria to ensure passage of fish and invertebrates as well as their larvae? Will tests be conducted to determine criteria to ensure passage of fish and larvae with the weakest swimming ability? If the criteria for fish passage cannot be met, will other solutions be considered?
- Will decreased tidal exchange and closed gates lead to decreased flushing of affected waterways? If so, can we expect more frequent macroalgal blooms including red tides, rust tides, brown tides, and green tides?
 - Will increased macroalgal blooms negatively impact species that use planktonic larval recruitment?
 - Will increased macroalgal blooms impact the shellfish such as oysters, mussels and clams throughout the estuary?
- *Ulva spp.* already occur in extremely high densities in Jamaica Bay. Will macroalgal blooms of *Ulva spp.* increase due to reduced flushing and impairment of Jamaica Bay and New York Harbor, causing even more disturbance of the regional ecosystem?
 - What is the impact to winter flounder and other creatures from increased macroalgal blooms of *Ulva spp.*?
 - Due to increased eutrophication, will mats of *Ulva spp.* that typically form on intertidal sandflats increase? Where these mats are found, will they decrease the macrofaunal diversity?
 - Will increased macroalgal blooms negatively impact species that use planktonic larval recruitment?

- Could increases in *Ulva spp.* production as a result of increased eutrophication be proportionately more harmful to the ecosystem? According to Lamb et al., *Ulva* have ecosystem consequences such as *Zostera spp.* degradation, fish and shellfish declines.¹⁰⁸
- Estuaries function like nutrient traps, which allows the development of very complex food webs that include a great diversity of algae, invertebrates, fish, birds, and mammals. The deposition of some of the suspended nutrients and organic matter, in turn, maintains a diverse bottom community. How will this all change with the implementation of storm surge barriers with gates both open and closed?
- How will the barriers affect the shellfish beds of Raritan Bay?
- When winter nor'easters or coastal storms occur in conjunction with spring and king tides, we can expect the gates to close for five days or more. This will become ever more likely due to RSLC as smaller and smaller storms will trigger closure. How will back flooding impact upstream communities after prolonged periods of closure?
 - What is the impact to migratory fish during these periods?
 - Will they seek other estuaries?
 - What is the impact to glass eels, which are incapable of prolonged periods of rheotaxis, or are dependent upon tidal currents for upstream transport?
 - What is the impact to sea lampreys during gate closures? How will they be able home towards their ammocoetes?
- Freshwater tidal marshes are globally rare. How will reduced tidal energy impact accretion of these rare marshes?
- Marshes in general were vital in protecting communities such as Piermont. What is the impact to other communities if marshes are lost or damaged?
- What is the impact to the ecosystem if both freshwater and salt marshes are lost or damaged?

The area of contact and partial mix between freshwater and saltwater is known as a front. Fronts are mobile zones with increased levels of biological productivity, which is high because the water mixing and circulation patterns keep a large amount of organic detritus and nutrients, of both river and marine origin, in suspension. These fronts are significant in the selection of spawning sites of important fishes in the Hudson River estuary. Therefore, the Corps should answer the following questions prior to selecting a TSP:

- How will salt intrusion into the estuary change with the construction of barriers? How will these changes impact aquatic life and vegetation in the lower estuary?
- How will front patterns and salt wedges be altered as a result of decreased tidal exchange and flow rates associated with gates?
 - Are fish hardwired to spawn in certain locations or is there plasticity in their selection of spawning sites? Are fish dependent upon precise environmental conditions at specific locations? How will historic spawning sites be altered due to changes in flow rate, salinity or a myriad of other conditions? Will spawning

¹⁰⁸ Annesia L. Lamb et al., *Identification of the Bloom Forming Ulva and Macroalgal Assemblage in Jamaica Bay, New York, USA*, 120 *Rhodora* 269-99 (2018).

seasons be suspended until new locations become imprinted or will they simply move on to new sites?

- Will fish spawn in areas that have been determined through eons of natural selection or are spawning locations selected because of inherent environmental conditions such as type of sediment, salinity levels, and/or flow? If these patterns are altered in any way, how might recruitment efforts of a wide variety of fishes be impacted? Eggs and larvae are the most conservative life-stage and the life-stage that is the least capable of evolutionary plasticity or adaptability.
- Will fish recruitment be lost for years until fish adapt to new conditions or will they learn to spawn elsewhere? What is the time frame for these evolutionary patterns to become hardwired into their DNA?
- If spawning sites are hardwired into the fishes' DNA and those same locations are negatively impacted, it is conceivable we could lose recruitment of fishes in the future. For how long? Which species would this specifically affect?
- Will changes in the tidal flow and energy or sudden changes in salinity levels from closed gates cause hypoxia and anoxia and thus massive kills of fishes and invertebrates? These occurrences have already happened to river herring in places where tidal gates were employed.
- Will the changes in tidal flow and energy cause attendant changes in salinity levels throughout the lower estuary? These impacts need to be modeled because they can be extremely detrimental to diadromous fishes. For example, juveniles and even adult diadromous fishes need a gradual change in salinity as they undergo the physiological changes needed to transition from freshwater to saltwater. If these fishes are suddenly transferred from one environment to the other, they can die from osmotic shock.
 - If gates are closed, could freshwater build up on the inland side, potentially causing a more distinct saline barrier?
 - Will there be any changes in salinity levels in the estuary as a result of reduced tidal exchange or because of closed barrier gates?
 - How might various fish species be affected by changes in salinity?

Functioning estuarine wetlands provide large influxes of carbon and nutrients to the estuarine system, benefiting even those species and individuals not directly residing in the marshes. Therefore, the Corps should answer the following questions prior to selecting a TSP:

- How will the processes provided by estuarine wetlands be impacted by muted tidal regimes caused by both open and closed barrier gates?
- Typically, wetlands also serve as carbon sinks, absorbing carbon dioxide from the atmosphere and emitting carbon dioxide. When wetlands flood and sewage effluence increases, the carbon storage capacity decreases. Accordingly, when the gates are closed or tidal flushing is decreased, will the sequestration capacity of wetlands be reduced and will greenhouse gases such as methane and carbon dioxide be released at much higher levels, thus contributing to climate change?

The Corps recognizes that storm surge barriers will have permanent impacts to benthic communities.¹⁰⁹ As such, the Corps should answer the following questions prior to selecting a TSP:

- What is the impact to benthic communities from the gate structures, fixed barrier sections, gate sills, etc., in the conceptual designs?
- Will the structures fragment benthic communities?
- More specifically, how will the sills and structures impact imperiled horseshoe crabs and red knots in Lower New York Harbor and Jamaica Bay? Red knots are federally protected and gorge themselves on horseshoe crab eggs to sustain their vernal migrations.

Climate change and sea level rise must be taken into account when analyzing the environmental impacts of storm surge barriers. As such, the Corps should answer the following questions prior to selecting a TSP:

- The Hudson River has already experienced a four-degree temperature increase since the 1960s, with greater increases expected and higher summertime extremes. How will climate change, dissolved oxygen levels and acidification all be influenced by changes to the hydrodynamics of the system and increasing effects from climate change? Future impacts must be considered or we risk losing the entire ecosystem as we know it.
- With increasing sea level rise, we can presume that the gates will close more often, triggered by smaller and smaller storms. What is the impact to the entire ecosystem due to increased frequency and duration of closure with increasing time?

According to Swanson et al., the construction of large storm surge barriers and/or tidal gates will cause significant environmental and ecological impacts to New York Harbor and the Hudson River.¹¹⁰ The authors state that the salinity regime of the Harbor will be altered as will sediment dynamics and distribution, which will in turn impact fish and shellfish distributions. The cumulative ecological damage could be catastrophic. Can we quantify or qualify these impacts for all species and their ecosystem function? Can we account for them financially if they are extirpated or driven to extinction?

Estimating, evaluating, attenuating, and compensating for the myriad of possible ecological and evolutionary impacts that would occur if storm surge barriers were to be built, for example, at the mouth of the second largest estuary on the east coast of the United States, is an enormous task. However, the Corps must develop a much fuller understanding of the ecological consequences of taking such drastic action prior to selecting a TSP. Again, failure to do so risks expending limited time and resources on a plan that is ultimately environmentally unacceptable.¹¹¹

¹⁰⁹ See e.g., Interim Report at 116.

¹¹⁰ R. L. Swanson et al., *Storm Surge Barriers: Ecological and Special Concerns* (2012).

¹¹¹ See Interim Report at 17.

B. The Corps should recognize wetland impacts as a main environmental concern for the storm surge barrier alternatives.

The *Summary Table of Alternatives* in the Interim Report identifies wetland impacts as a “main environmental concern” only for Alternative 5.¹¹² However, the Corps identifies direct, permanent impacts to wetland resources for the storm surge barrier alternatives as well:

- **Alternative #2:** direct, permanent impacts to estuarine wetlands on the Sandy Hook, Rockaway and Throgs Neck peninsulas; direct, permanent impacts to estuarine and freshwater forested/shrub wetlands in Pelham Bay Park;
- **Alternative #3A:** direct, permanent impacts to estuarine wetlands on the Rockaway and Throgs Neck peninsulas, and around Gerritsen Creek; direct, permanent impacts to estuarine and freshwater forested/shrub wetlands in Pelham Bay Park;
- **Alternative #3B:** direct, permanent impacts to estuarine wetlands on the Rockaway peninsula, along Flushing Bay, around Gerritsen Creek and a small riverine section in Pierson Park; direct, permanent or temporary impacts to freshwater emergent wetlands in Jersey City and freshwater forested/shrub wetlands in Pelham Bay Park;
- **Alternative #4:** direct, permanent impacts to estuarine wetlands on the Rockaway peninsula, in Pelham Bay Park, Stony Point, along Flushing Bay, along the Hackensack River in Secaucus and Kearny, around Gerritsen Creek and a small riverine section in Pierson Park in Tarrytown; direct, permanent or temporary impacts to freshwater emergent wetlands in Jersey City and near the Hackensack River in Kearny, and freshwater forested/shrub wetlands in Pelham Bay Park.¹¹³

Given these direct, permanent impacts, the Corps should consider wetland impacts as a main concern for the storm surge barrier alternatives moving forward.

In doing so, the Corps should also fix its deficient approach to assessing wetlands impacts. Absent in the Corps’ impact discussion are two elements critical to evaluating impacts to wetlands for each of the alternatives: (1) estimates of the size of wetland habitat the proposed alternatives will temporarily and/or permanently impact; and (2) evaluation of the ecosystem services of the existing wetlands before, during and after disturbance by the proposed action.

Without delineating all wetland area that barrier infrastructure and the shift in tidal flow resulting from gate closures will temporarily and/or permanently disturb, it will not be possible to assess the net impact to tidal wetlands with any accuracy. Storm surge barriers, both open and closed, reduce the tidal flow and tidal energy throughout the entire estuary. Reduction in the daily tidal range (rise and fall) and reductions in idle current velocity will deprive estuarine and freshwater wetlands in the Hudson and other rivers of the cyclic tidal inundation upon which their ecosystem services depend. To properly assess impacts to wetlands caused by the proposed

¹¹² *Id.* at 115.

¹¹³ *Id.* at 116-24.

alternatives, the Corps must adopt a comprehensive approach that includes future RSLC projections and quantifies the total wetland area that barrier siting/design and altered flow regimes will impact in the study area.

Also critical to assessing wetland impacts are the ecosystem services that wetlands perform and that storm surge barriers will temporarily and/or permanently disturb. The Corps acknowledges some of the many functions that wetlands perform “such as water filtration, by absorbing chemicals, filtering pollutants, helping turbid sediments to settle out of the water column and filtering phosphorous, heavy metals and toxins from sediments, and breaking down suspended solids and bacteria.”¹¹⁴ These ecosystem services vary in level of function depending on the type of wetland and whether it is subject to degradation from environmental or anthropogenic factors. To properly assess impacts to wetlands from the proposed alternatives, the Corps must identify the ecosystem services provided by all impacted wetlands and evaluate their functions before, during and after construction of the storm surge barriers.

Additionally, the natural and nature-based features component of the complementary measures for more frequent flooding includes wetlands.¹¹⁵ Where the Corps proposes creating, enhancing or restoring wetlands, those sites will also require a comprehensive assessment of the wetlands’ existing and future ecosystem services, baseline level of function and delineated geographic area. Functions of any such wetlands must be sustainable in the long term as the frequency and intensity of storm events and RSLC continue to increase.

IX. Alternative 5, the only alternative that does not involve storm surge barriers, should be expanded.

Addressing storm surge and sea level rise while allowing our rivers to run free will require a combination of shoreline-based structural measures, natural and nature-based features, and nonstructural measures, including managed strategic retreat. To that end, the Corps should expand Alternative 5—the only scenario that the Corps has presented to date that includes only shoreline-based measures—to cover a greater portion of the study area.

As it stands, Alternative 5 includes only fourteen features across the 2,150-plus square mile study area.¹¹⁶ Eight of the features are in the New York City area while the remaining six are in communities along the Hudson River.¹¹⁷ The Corps states that it is “not feasible” to study shoreline-based measures for “100% of at-risk shoreline” at this time and that it will only do so if Alternative 5 is selected as the TSP.¹¹⁸ By failing to expand Alternative 5 now, the Corps is reducing the chances of it being selected as the TSP. However, if Alternative 5 were selected as the TSP, it could be expanded. Making the expansion of Alternative 5 contingent upon its selection as the TSP is an arbitrary and short-sighted decision that creates a catch-22 and could foreclose any further exploration of this option.

¹¹⁴ *Id.* at 116.

¹¹⁵ *Id.* at 69.

¹¹⁶ *Id.* at 93.

¹¹⁷ *Id.*

¹¹⁸ *Id.*

Alternative 5 is already at a disadvantage due to the limitations of the Corps' cost-benefit analysis discussed *supra*. If the Corps insists on retaining the current scope of Alternative 5, it risks eliminating the only option that could address storm surge and sea level rise without harming our waterways.¹¹⁹ While Alternative 5 would not be without significant environmental impacts, the Corps recognizes that shoreline-based measures do not pose the same threats as storm surge barriers to tidal exchange and fish migrations.¹²⁰ In addition, Alternative 5 would avoid the permanent impacts to benthic communities and the water column that the Corps identifies for all of the alternatives that involve storm surge barriers.¹²¹

X. The Corps must continue to improve public outreach and ensure public participation

While we appreciate that the Corps responded to the public appeals for more time and information, the agency must still do more to foster robust public participation. The Corps received 4,250 comments during the scoping period and more than 700 people attended the scoping meetings, indicating that the study is of significant interest to the public, municipalities, and elected officials.¹²² However, the public meetings on the Interim Report have generally not been well attended. For example, in Poughkeepsie, NY, there were approximately 50 people in attendance, as compared to 158 people at the scoping meeting.¹²³ Furthermore, Riverkeeper is unaware of any virtual web-based meetings on the Interim Report, despite the Corps' stated intent to convene such meetings.¹²⁴

We continue to urge the Corps to develop a comprehensive outreach plan in order to expand and sustain public engagement, taking into account the significant percentage of environmental justice communities in the study area.¹²⁵ This plan must include, *inter alia*, both direct outreach to community-based and not-for-profit organizations across the study area and a media campaign that includes more than press releases. Further, there must be a budget allocated for the community outreach and engagement component of the NY-NJ HATS Feasibility Study. The failure to allocate resources for outreach negatively affects the Corps' efforts to conduct a study that is informed by, and responsive to, the public.

In addition to inadequate outreach, the Corps is not fostering an open dialogue at the public meetings. The use of comments cards and posters is not an adequate substitute for a question and answer period that allows for back and forth between community members and agency officials in an open forum. It also forecloses the development of new questions and comments that naturally occur while observing and engaging in a conversation with other participants. Moreover, due to time limitations, the Corps was often unable to respond to all of the comment

¹¹⁹ The Corps admits that shore-based measures "generally address coastal storm risks from both frequent and infrequent events." *Id.* at 73.

¹²⁰ *See id.* at 115.

¹²¹ *Compare id.* at 116-24 with *id.* at 124-25.

¹²² Interim Report Public Engagement Appendix at 6.

¹²³ *Id.*

¹²⁴ Interim Report at 128.

¹²⁵ *Id.* at 42. ("Fifty-seven percent of the census block groups of the study area as a whole qualify as environmental justice communities.")

cards in real time at the majority of the public meetings on the Interim Report. As such, many of the public's questions continue to go unanswered.

We urge the Corps to keep the public informed about the study as it progresses towards the Draft Feasibility Report/Draft Tier 1 EIS. Specifically, the Corps should disclose the additional analyses that it plans to do prior to selecting a TSP and clarify whether those analyses will be completed for each alternative. The Corps should also inform the public of the TSP when it reaches the milestone date of January 2020. If a TSP has not been selected by then, the Corps should provide the public with an update on the status of the study. When the Draft Feasibility Report/Draft Tier 1 EIS is issued, we expect that the Corps will more widely publicize its release and do a better job of informing interested community members and stakeholders about the comment period and the public meetings. The Corps must hold those public meeting in more locations, particularly in areas without any meetings thus far, including many Hudson Valley communities, the Albany area, and Queens (particularly on the Rockaway peninsula). If meetings are added after the initial release, the Corps must make additional focused announcements to ensure that communities are informed about their opportunities to participate in the process.¹²⁶

We also urge the Corps to uphold its promise for the study team to brief partners, elected officials, and agencies in advance of public releases and milestones as discussed in the Public Engagement Appendix to the Interim Report.¹²⁷ Additionally, while we appreciate the desire of the Corps to provide elected community leaders with the information they need to answer constituents' questions,¹²⁸ the Corps has not done so yet. Further, ensuring that elected officials are informed does not relieve the Corps of its obligation to effectively communicate information about the study to the general public.

In addition to public outreach, the Interim Report cites efforts in partnership with non-federal sponsors to convene an independent technical working group made up of interested experts and non-governmental organizations to provide more structured input to the study and to facilitate good communication between these groups and their members.¹²⁹ Different goals for the working group have been articulated in written information and at public meetings. The Corps and the non-federal sponsors must clarify the goals and expectations of this group. Given that participation in the working group could be burdensome to smaller organizations, the Corps should consider providing financial assistance to those groups for their participation. The Corps and the non-federal sponsors should take steps to convene the working group as soon as possible, to make participation in the group open to a diverse set of stakeholders from across the study area, and to ensure participation from environmental justice organizations and smaller community-based groups.

¹²⁶ Both the scoping meeting and the Interim Report meeting in Brooklyn were announced late, with little notice or promotion, and were not well attended as a result.

¹²⁷ Interim Report Public Engagement Appendix at 39, 41 (Response to Comments 196, 213).

¹²⁸ *Id.*

¹²⁹ *Id.*

Thank you for the opportunity to submit comments on the NY-NJ HATS Feasibility Study Interim Report. We look forward to continued engagement from the Corps as we approach the TSP milestone date and the release of the Draft Feasibility Report/Draft Tier 1 EIS.

Sincerely,

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