DEPARTMENT OF THE ARMY
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CESPD-PDP (FRM-PCX) 8 February 2019

MEMORANDUM FOR Commander, New York District, U.S. Army Corps of Engineers (CENAN-PL-FC/Ms. Karen Baumert)

SUBJECT: Final Comment Response Record for the Independent External Peer Review (IEPR) for the Westchester County Streams, Byram River Basin, Connecticut and New York, Flood Risk Management Feasibility Study

1. References:

a. EC 1165-2-217, Review Policy for Civil Works, 20 February 2018.

b. Type I Independent External Peer Review Process Standard Operating Procedure, Version 3.0, August 2016.

c. Memorandum, CESPD-PDP (FRM-PCX), 16 October 2018, subject: Final Independent External Peer Review (IEPR) Report, Westchester County Streams, Byram River Basin, Connecticut and New York, Flood Risk Management Feasibility Study.

2. Enclosed is the Final Comment Response Record for the IEPR for the Westchester County Streams, Byram River Basin, Connecticut and New York, Flood Risk Management Feasibility Study.

3. The Flood Risk Management Planning Center of Expertise (FRM-PCX) coordinated the IEPR, which was conducted by an external panel of experts selected and managed by the Battelle Memorial Institute. The IEPR panel comments are documented in the Battelle report titled Final Independent External Peer Review Report, Westchester County Streams, Byram River Basin, Connecticut and New York, Flood Risk Management Feasibility Study, dated 9 October 2018.

4. Eleven IEPR final comments were developed by the panel, one of which was identified as having high significance. The comment response record documents the New York District responses to the panel comments and the IEPR panel backcheck of the responses. Concurrence was reached between the panel and District on all responses. The panel included an explanatory statement as part of its concurrence with the District responses to final panel comments 3 and 9.

5. Based on the comment response record, the District should prepare a written proposed response to the Final IEPR Report in accordance with reference 1a. The proposed response should be coordinated with the Major Subordinate Command

District Support Team and HQUSACE to ensure consistency with law, policy, project guidance, ongoing policy and legal compliance review, and other USACE or National considerations.

6. For further information, please contact me at (415) 503-6852 or Ms. Martha Newman, the FRM-PCX IEPR Lead for this effort, at (410) 962-4590.

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Comment Response Record for the Independent External Peer Review (IEPR) of the Westchester County Streams, Byram River Basin, Connecticut and New York, Flood Risk Management Feasibility Study

USACE Final Evaluator Responses and Final Panel BackChecks

Prepared by

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for

Department of the Army
U.S. Army Corps of Engineers
Flood Risk Management Planning Center of Expertise
Baltimore District

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February 6, 2019

Final Panel Comment 1

The hydraulic models used in the economic analysis do not fully account for the Byram River system's physical behavior, potentially increasing project risk and uncertainty.

Basis for Comment

Tidal influence in the Byram River Basin currently extends to the downstream boundary of the study area. Although the DIFR/EIS is exclusively focused on mitigating fluvial flooding, the physical processes acting at the downstream boundary of the system at the tidal interface are directly linked to the behavior of upstream fluvial flooding in the study area. Accordingly, hydraulic models will be inaccurate and fluvial flooding will be misrepresented unless the downstream boundary conditions take the actual physical behavior of the system into account. The Project Delivery Team's (PDT's) selection of the 50-percent stillwater elevation as the key downstream boundary condition for hydraulic modeling is not clearly justified with physical reasoning. Output from hydraulic modeling with boundary conditions that more accurately reflect physical processes at the downstream end of the study area would decrease risk and uncertainty of the BCR.

The PDT appears to have underestimated stage-discharge uncertainty at 0.5 feet by basing it solely on uncertainty in a single parameter as opposed to reasonable likely combinations of upper and lower bound estimates of model parameter values as stated in USACE Engineer Manual (EM) 1110-1619, section 5-7 (USACE, 1996). There is high confidence that SLR will affect downstream boundary conditions during the project planning period. As SLR occurs, interactions between tides and river flows in the study area will increase, and the joint probability of storm surge effects on fluvial flooding will increase as well. It appears that Hydrologic Engineering Center-River Analysis System (HEC-RAS) simulations of intermediate SLR were not used in quantifying uncertainty in the stage-discharge relationship. Further, the hydraulic model results were compared to field data on high water marks during previous storms, but for cases in which there is substantial disagreement between model predictions and observed high water marks, the field observations were deemed invalid without a clear rationale. This additional line of evidence suggests that the uncertainty in the stage-discharge relationship may be underestimated. The uncertainty (standard deviation) of the stage-discharge relationship directly affects the economic analysis, the BCR, and confidence intervals on the BCR.

Significance – High

Without more rigorous hydraulic modeling that incorporates effects on downstream model boundaries, project risk and uncertainty will increase, which could affect the project BCR and, ultimately, the technical basis for justifying the plan.

Recommendations for Resolution

1. Reevaluate the downstream boundary condition of the hydraulic models used in the economic analysis by incorporating future SLR and tidal influences on fluvial flooding over the planning period and justify the selected downstream boundary conditions with physical reasoning.
2. Quantify the uncertainty of the stage-discharge relationship using reasonable likely combinations of upper and lower bound estimates of model parameter values as stated in

Final Panel Comment 1

EM-1110-1619 section 5-7, as well as model testing against field observations of high water marks.

3. Perform a sensitivity analysis of the BCR to the updated boundary conditions and stage-discharge uncertainty to assess their effect on the economic viability of the project.

Literature Cited:

USACE (1996). Risk-Based Analysis for Flood Damage Reduction Studies. Department of the Army, U.S. Army Corps of Engineers, Washington, D.C. Engineer Manual (EM) No. 1110-1619. August 1, 1996.

PDT Draft/Final Evaluator Response (FPC #1)

X	**Concur**		**Non-Concur**

It is acknowledged that the physical basis for the selection of the 50%-peak annual storm surge elevation (el. 6.9 ft NAVD88) has not been sufficiently justified in the existing text. In response, the PDT will conduct an additional analysis to confirm the use of the exterior boundary condition and provide a thorough explanation for the selection of the downstream boundary condition at the mouth of the Byram River. This explanation will be added to Section 3.6 of Appendix B2 on hydraulics.

The new language will include first a description of the additional analysis and the results will determine the correlation between extreme riverine and tidal events based on a coincident record of 49 peak annual discharge events from the synthetic record developed for the Byram River and 102 peak storm surge events observed at the Stamford Hurricane Barrier. Establishing a potential lack of correlation provides a physical basis for selecting a downstream boundary condition of a peak annual recurrence interval significantly lower than the recurrence interval of the associated riverine event. The lower limit for a complete lack of correlation would be the selection of the Mean High Water (el. 3.4 ft NAVD88).

Additional explanation will be provided on how the selected downstream boundary condition relates to the findings of the Sea Level Rise (SLR) analysis presented in Section 6.2 of Appendix B2. The “intermediate” scenario is considered the median future condition and predicts with a +1.9 ft rise by the year 2100.

In total, the new language will attempt to demonstrate the sufficiency of the newly selected downstream boundary condition to represent (1) the degree of correlation, or lack thereof, between storm surge and extreme riverine events, (2) and the expected SLR over the life of the project.

In response to the IEPR comment regarding the risk uncertainty analysis and the sufficiency of the related hydraulic uncertainty, the PDT will revisit the stage-discharge uncertainty analysis and generate a standard deviation based on “likely combinations” of hydraulic parameters based on the methodology described in Section 5.2 of EM 1110-2-1619. The parameters for consideration include coincidence of storm surge with extreme riverine events, SLR for the downstream boundary conditions, roughness coefficients, contraction and expansion coefficients, and the minimum standard deviation of error in stage described in Table 5-2 of EM 1110-2-1619.

Recommendation 1:	X	**Adopt**		**Not Adopt**

PDT Draft/Final Evaluator Response (FPC #1)				
The PDT will confirm the downstream boundary condition and conduct a risk and uncertainly analysis to include sea level change. The PDT will provide a thorough explanation for the selection of the downstream boundary condition at the mouth of the Byram River.				
Recommendation 2:	**X**	**Adopt**		**Not Adopt**
PDT will reevaluate the risk uncertainty analysis using “likely combinations” of parameter uncertainty.				
Recommendation 3:	**X**	**Adopt**		**Not Adopt**
The economic appendix and TSP section of the main report will be updated to include a range of benefits and resulting BCRs due the updating the hydraulics uncertainty.				

Panel Draft/Final BackCheck Response (FPC #1)			
X	**Concur**		**Non-Concur**

Final Panel Comment 2

The lack of adequate freeboard for the bridge design is a source of uncertainty for the TSP, especially with regard to costs and impacts from construction.

Basis for Comment

The New York State Department of Transportation (NYSDOT) Bridge Manual, Section 3.2.3.1, requires that bridge low chord elevations provide a minimum of 2 feet of freeboard over the 50-year (2-percent) flood and clear the 1-percent flood, unless an evaluation is conducted to justify less freeboard and is specifically approved (NYSDOT, 2017). However, the proposed north bridge design (and possibly the south bridge design) does not meet these criteria, and the DIFR/EIS provides no documentation of an analysis performed to justify the lower elevation(s). The Bridge Manual also requires that applicable coastal design criteria be incorporated, up to and including the intermediate SLR projection. Additionally, if the bridge is considered a critical structure, then higher freeboard requirements and SLR projections apply. For replacement bridges in Region 8 (where the project is located), the Bridge Manual states that design discharges are to be increased by 20 percent to account for future peak flows, but this requirement has not been included in the design.

It is understood that water levels upstream of the bridges are sensitive to discharge through the bridges because of the relatively limited hydraulic storage capacity of that reach. Hence, the hydraulic analyses are sensitive to variations in modeling parameters, introducing a level of uncertainty to the reported floodwater levels immediately upstream of the bridges and the corresponding freeboard. In such situations, it would generally be considered prudent to include conservatism in establishing bridge elevations, rather than setting them lower than industry design standards, especially when considering that coastal and climate change factors will likely increase water levels over the 50-year period of analysis. As a result, the costs for bridge replacement and impacts of construction on adjacent properties may be significantly underestimated by setting the bridge(s) too low.

Conversely, there may be additional benefits that have not been considered in the BCR. The DIFR/EIS describes U.S. Route 1 as the largest road in the study area, a major east-west artery, the main access to and from I-95, and often an alternate route during I-95 congestion. As stated in Section 5.10 of the DIFR/EIS, impediments to evacuation may lead to a higher potential for loss of life. Improving the reliability of the Route 1 bridges would reduce the potential for road closures during flood events so that they remain usable during emergency conditions; therefore, related socioeconomic benefits can be accounted for in the justification for the project.

Significance – Medium/High

The potential for bridge design changes that may be required to resolve the inadequate freeboard could significantly impact project costs and change the estimated BCR.

Recommendations for Resolution

1. Ascertain and document whether the U.S. Route 1 bridges are considered critical bridges, and set the bridge elevations to provide at least the minimum flood freeboard in accordance with the NYSDOT Bridge Manual. Document justification for any proposed exceptions to these criteria.

Final Panel Comment 2
2. Account for the socioeconomic benefits of improved bridge reliability during flood events when developing the value of project benefits. 3. Evaluate the potential variation of flood water level(s) for bridge elevation selection. Consider the sensitivity / confidence intervals of water levels in the upstream reach to the combinations of modeling parameters used, as well as the potential effects of storm surge, tidal fluctuations, climate change and SLR on the boundary conditions that affect fluvial flooding. 4. Estimate costs for bridge replacement and impacts of construction on adjacent properties based on setting the bridge elevation(s) in accordance with industry design standards, or document the justification for not meeting those criteria. 5. Update the BCR for the TSP using the information developed in these analyses.

Literature Cited:

NYSDOT (2017). Bridge Manual – US Customary Edition – 2017. New York State Department of Transportation. Last revised August 2017.

PDT Draft/Final Evaluator Response (FPC #2)				
X	**Concur**		**Non-Concur**	
The New York State Department of Transportation (NYSDOT) has criteria for bridge heights that the proposed project does not currently meet. NYSDOT considers the ability of each bridge to reasonably meet the NYSDOT's criteria. To meet the NYSDOT's criteria for bridge heights, roads would need to be re-graded at a higher elevation that may cause additional impacts to nearby entrances to properties; these alterations create additional costs. The NYSDOT has a waiver process that can be taken for bridges for which meeting the bridge height criteria would be unreasonably difficult or costly. Further determination of whether the bridges can be designed to meet the NYSDOT bridge height criteria will occur during Preconstruction Engineering and Design.				
Recommendation 1:	**X**	**Adopt**		**Not Adopt**
The report will be revised to state that further coordination will occur with the NYSDOT during Preconstruction Engineering and Design to ensure the project meets NYSDOT criteria or has the appropriate waiver approvals. This text will be added to the Tentatively Selected Plan chapter and the Preconstruction Engineering and Design section.				
Recommendation 2:		**Adopt**	**X**	**Not Adopt**
The type of potential benefits described, such as loss of life and maintained critical infrastructure for emergency response, are typically placed in the Other Social Effects account in USACE flood risk management studies. These are typically not quantified and included in benefit values because of their difficulty to do so. However, the socioeconomic benefits described in the comment are certainly potential benefits and discussions of these will be included in the report as Other Social Effects that support justification of the project.				
Recommendation 3:		**Adopt**	**X**	**Not Adopt**

PDT Draft/Final Evaluator Response (FPC #2)				
Preliminary sensitivity analysis with regard to the proposed bridge design for the referenced parameters is already presented in Sections 4.3, 6.1, and 6.2 of the March 27, 2018 Hydraulics Appendix B2.				
Recommendation 4:		**Adopt**	**X**	**Not Adopt**
Further determination of whether the bridges can be designed to meet the NYSDOT bridge height criteria will occur during Preconstruction Engineering and Design. All additional and appropriate costs will be accounted for at that time.				
Recommendation 5:		**Adopt**	**X**	**Not Adopt**
The information required to update the BCR, as requested, is beyond the scope of the feasibility phase. All additional and appropriate costs will be accounted for in Preconstruction Engineering and Design.				

Panel Draft/Final BackCheck Response (FPC #2)			
X	**Concur**		**Non-Concur**

Final Panel Comment 3

It is not clear why an alternative that included channel improvements in addition to replacement of Route 1 bridges was not considered.

Basis for Comment

Appendix D of the DIFR/EIS states that expected annual flood reduction benefits under the TSP would be about $0.77 million, but there are $1.3 million of residual expected annual damages (Table 13 of Appendix D). Table 2 of Appendix B3 states that 128 structures remain in the 1% Annual Exceedance Probability floodplain with the TSP in place. The substantial residual damages under the TSP indicate that additional measures that might increase the project benefits should be considered.

The DIFR/EIS indicates that a dredging-only scenario based on the river bed profile proposed in the 1977 Feasibility Report (USACE, 1977) was considered. This scenario resulted in a 2.2-foot reduction in water levels upstream of the southbound Route 1 bridge, but flood damages were not significantly reduced and the measure was dropped. Channel improvements, if combined with the Route 1 bridge replacements, could be an effective and relatively low-cost measure compared to levees, floodwalls, pumps, etc. Additionally, several of the public comments are related to observations of fallen trees, other vegetation, and sediment that could continue to exacerbate flooding despite the bridge replacements.

The TSP includes minor channel improvements adjacent to the bridges, but there is no explanation why additional upstream channel improvements were not considered to increase benefits. A sensitivity analysis with HEC-RAS could be used to estimate changes to water surface elevations and impacts to the project BCR resulting from additional channel improvements in critical locations. One factor to consider under this type of analysis would be the longevity of dredging / channel improvement benefits given longitudinal changes in sediment transport capacity and future potential for re-accumulation of sediment / debris between stations 10000-12000, despite replacement of the Route 1 bridges. Future maintenance dredging may need to be a project component in order to maintain benefits.

Significance – Medium/High

Without an evaluation of channel improvements combined with bridge replacements, it is possible that an alternative exists that would provide greater net National Economic Development (NED) benefits.

Recommendations for Resolution

1. Formulate and evaluate an alternative that includes upstream channel improvements in addition to replacement of the Route 1 bridges to determine whether the net NED benefits would increase relative to the current TSP.
2. Consider the longevity of dredging / channel improvement benefits given longitudinal changes in sediment transport capacity and future potential for re-accumulation of sediment / debris, and determine whether maintenance dredging would be needed in order to maintain benefits.

Literature Cited:

USACE (1977). Feasibility Report for Flood Control, Mamaroneck and Sheldrake Rivers Basin, New York and Byram River Basin, Connecticut, Volumes 1 and 2. U.S. Army Corps of Engineers, October 1977.

PDT Draft/Final Evaluator Response (FPC #3)				
	Concur	**X**	**Non-Concur**	

Non-concur. Channel improvements were considered as part of Alternatives 3 and 4 in the initial array of alternatives. The real constricting hydrologic factor is the bridge, not the channel. Therefore, for channel modifications be able to reduce the water surface elevations enough to benefit the community, levees/floodwalls would also need to be constructed with it.

The analysis of mitigation measures analyzed considered the hydraulic impact of two different channel modifications: (1) 700 feet of dredging as described in the 1977 Feasibility Report and in the immediate vicinity of the Route 1 Bridges, and (2) channel widening between the Route 1 Bridges and Comly Ave Bridge including Caroline Pond.

The “dredging only” scenario (with no modifications to the bridge) was analyzed resulting in the reduction of the 1% peak-annual flood of as much as 2.2 feet immediately upstream of the Route 1 Bridges. It was understood that the majority of the reduction in flooding was due to the extent that dredging around the Route 1 bridges increased conveyance under the bridges. The replacement of the Route 1 bridges overlaps nearly all of the increased conveyance as the dredging alone. In other words, the 1977 dredging in addition to the replacement (or removal) of the Route 1 bridge does not impact the upstream flood profile.

As stated in the submitted report, the analysis shows that channel widening alone would not significantly improve the upstream flooding. With the replacement of the Route 1 bridges, as shown in Figure 4 in Appendix B2, the hydraulic grade is lowered significantly so as to be basically parallel with the channel slope. Channel widening in addition to the bridge replacement requires extreme dimensions that would provide only very modest incremental reductions for a significant increase in real estate costs. For this reason, widening was not considered.

Recommendation 1:		**Adopt**	**X**	**Not Adopt**

Analysis conducted as part of the evaluation of the initial array of alternatives indicated that there would be little to no benefit of channel dredging nor widening and would require major acquisitions of riparian properties; this would increase costs significantly and the project may become economically unjustified. Additionally, acquisition would not be readily accepted by the local community.

The analyses conducted and their conclusions were not explicitly communicated in the report. The Plan Formulation section of the report will be modified to discuss the findings of conducted analyses for the 1977 Feasibility Study. The Plan Formulation section and the Hydrology and Hydraulics appendices will also better explain the conclusions made from evaluations of the initial array of alternatives and why additional combinations of measures, such as bridge modifications and dredging, were not considered as alternatives. The discussion above will be added to the report in addition to, but not limited to, the following:

- The 1977 Feasibility Study evaluated an alternative consisting of bridge replacements, channel modifications, floodwalls, and levees (Plan 6) and it was found to not be economically justified
- Current analyses found the U.S. Route 1 bridges are the major constricting factor

Recommendation 2:		**Adopt**	**X**	**Not Adopt**

PDT Draft/Final Evaluator Response (FPC #3)
Dredging is not part of TSP and so its longevity does not need to be evaluated. The report will better explain why dredging is not recommended.

Panel Draft/Final BackCheck Response (FPC #3)			
X	**Concur**		**Non-Concur**
Explanation: Adding a more thorough explanation of the 1977 plan formulation conclusions regarding the viability of channel improvements in addition to bridge replacements will satisfy the panel's concern.			

Final Panel Comment 4

Incomplete analysis of potential benefits could jeopardize the implementation of the TSP.

Basis for Comment

The TSP's BCR of 1.13 is not likely to satisfy USACE budget guidelines, which are published yearly in USACE Engineer Circular (EC) 11-2-208 (USACE, 2015). Because funding is limited, only those projects that will produce the greatest benefits are included in the budget. The budget criteria require a better BCR based on a higher discount rate. As a result, unless greater benefits are identified in the DIFR/EIS, it is likely the project would not receive funding for preconstruction engineering and design (PED) and would not be implemented.

There are benefit categories that could potentially improve the BCR and the net benefits of the project, but these categories are not evaluated. Appendix D (p. D-27) identifies these categories as:

- Emergency cost reduction
- Traffic delays and diversions – with bridge replacements, traffic would not be interrupted as frequently due to water levels rising to the low chord of the bridge
- Damage to outside property and landscaping
- Cleanup cost reduction
- Reduced damages to roads, bridges, and utilities
- Reduced damages to other infrastructure

Additionally, Table 21 of the DIFR/EIS includes $25,000 of Annual Operations and Maintenance Costs in the annual total costs. The DIFR/EIS states (p. 62) that the operations and maintenance (O&M) costs of the new bridges would be less than the cost for the existing bridges, which should be a benefit similar to the benefits associated with extending the life of the bridges.

Significance – Medium/High

By not evaluating all benefit categories, the BCR will not be great enough to meet the USACE budget criteria.

Recommendations for Resolution

1. Evaluate the benefit categories listed in the Basis for Comment.
2. Assess potential benefits associated with reduced O&M costs, or eliminate O&M costs from the total project cost.

Literature Cited:

USACE (2015). Corps of Engineers Civil Works Direct Program Development Policy Guidance Fiscal Year 2017. Department of the Army, U.S. Army Corps of Engineers, Washington, D.C. Engineer Circular (EC) No. 11-2-208. March 31, 2015 (updated annually).

PDT Draft/Final Evaluator Response (FPC #4)			
X	**Concur**		**Non-Concur**
Concur. Not all possible benefit categories were included in the economic analysis; this is in part due to the time-requirements, complexity of calculations, and lack of practical evaluation methodology for some categories. The North Atlantic Coast Comprehensive Study (NACCS), conducted as a result of Hurricane Sandy, provides methodologies for estimating most of the additional benefit categories listed. As noted, current O&M costs for the existing bridges were assumed to continue with replaced bridges.			
Recommendation 1:	**X**	**Adopt**	**Not Adopt**
The NACCS methodologies will be applied to evaluate additional benefit categories in the Byram River study where reasonably possible. Reductions in traffic delay and diversion costs will also be included.			
Recommendation 2:	**X**	**Adopt**	**Not Adopt**
The O&M cost used in the report was based off of NYSDOT's estimate of the O&M cost of the current bridges. The team acknowledges the O&M cost is conservative. The team is currently coordinating with NYSDOT to determine if the O&M cost used is appropriate for the TSP.			

Panel Draft/Final BackCheck Response (FPC #4)		
X	**Concur**	**Non-Concur**

Final Panel Comment 5

The sediment transport analysis, and the documentation of how and under what conditions the sediment data were collected, are inadequate and increase uncertainty.

Basis for Comment

The Byram River watershed contains several dams and impoundments that alter sediment transport and supply throughout its drainage network (DIFR/EIS; Appendix B2, p. B2-17). Despite these features, substantial sediment and debris have accumulated between river stations 9000-13000 below an abrupt reduction in bed slope and directly upstream of the Route 1 bridges. This accumulation of sediment and debris and the resulting reduction in channel capacity are well known, as evidenced by the 1977 Feasibility Report (USACE, 1977), public comments, and the development of large gravel bars around the Route 1 bridges. Further, it appears that the bed profile resulting from deposition of sediment and debris in this river segment creates a backwater effect (Appendix B2, Figure 7). This river bed aggradation suggests that, at least historically, there has been appreciable sediment supply to the river segment upstream of the Route 1 bridges despite the numerous upstream dams.

The sediment transport analysis in Appendix B2, Section 7, primarily consists of a brief description of six sediment samples collected in a previous study, and a modeling analysis of pre- and post-project flow velocities in the immediate vicinity of the Route 1 bridges. The methods used to collect the suspended sediment samples and the extent to which these samples may be representative of washload versus bed material load are not discussed. Based on the six samples and small velocity changes anticipated at the Route 1 bridges, the PDT concludes that the sediment supply is limited and of no consequence to the TSP. The DIFR/EIS does not discuss the sediment sources and processes that have resulted in aggradation between river stations 9000-13000 to an extent that potentially warrants dredging. Further, there is no meaningful discussion of the effects of deposited sediment and debris on water surface profiles in the vicinity of river station 12000 and how conditions might change after the bridges are replaced.

Significance – Medium/Low

The lack of sediment transport analysis and data related to the observed accumulation of sediment and its impact on water surface profiles affects the clarity and completeness of the report, and adds to uncertainty regarding the potential benefits of channel improvements combined with bridge replacement.

Recommendations for Resolution

1. Clarify in the DIFR/EIS how sediment accumulation has occurred between river stations 9000-12000 despite supply being limited by upstream impoundments.
2. Discuss the effects of sediment and debris accumulation on water surface profiles between river stations 9000-12000 under current conditions and after implementation of the TSP in the project documentation.
3. Use the HEC-RAS model to examine the effect of combining the Route 1 bridge replacements with the bed profile from the 1977 Feasibility Report and interpret the results in the DIFR/EIS.

Literature Cited:

USACE (1977). Feasibility Report for Flood Control, Mamaroneck and Sheldrake Rivers Basin, New York and Byram River Basin, Connecticut, Volumes 1 and 2. U.S. Army Corps of Engineers, October 1977.

PDT Draft/Final Evaluator Response (FPC #5)			
	Concur	**X**	**Non-Concur**
The sediment study focused on the area within proximity of the Route 1 bridges. The existing stream channel has a weir at station 11200 to control waster surface elevations within Caroline Pond (station 11200 – 13000). This impoundment controls Caroline Pond and allows the pond to significantly reduce velocities and sediment transport from the upper parts of the watershed. Based on stream characteristics downstream of Caroline Pond, sediment accumulation is limited downstream of Station 10600 due to the tidal influence which decreases the velocities within the channel. With both the tidal influence (up to station 10600) and the outlet weir at Carolyn Pond (station 11200) velocities within the stream channel are limited and channel erosion minimized. Due to the channel characteristics and constraints, a sediment transport model of the entire Byram River is not warranted. The existing channel protection upstream of Caroline Pond from approximately station 12500 to the Bailiwick Bridge and the upstream Pemberwick Dam significantly minimizes erosion and sediment sources upstream of the project area. The 1977 stream channel profile is in MSL datum and the current profiles are in NAVD88 datum. With the correct datum shift (1.1 feet) the stream channel elevations in the 1977 profiles are similar to the stream channel elevations in the current HEC-RAS model.			
Recommendation 1:	**X**	**Adopt**	**Not Adopt**
Report text will be modified to explain the weir at station 11200 at the outlet to Caroline Pond that prevents sediment transport downstream of the pond outlet; to include a discussion of upstream channel conditions and the lack of potential for sediment transport due to channel and watershed characteristics; and to explain the 1977 streambed profiles and the current profiles with the datum conversion.			
Recommendation 2:	**X**	**Adopt**	**Not Adopt**
Report text will be modified to explain why sediment accumulation is not occurring between 9000 and 12000. This is due to both the weir at 11200 and tidal influence downstream of Station 10600. The text will also be modified to clarify that sediment accumulation and deposition within the project area will not change based on the proposed project due to the minimal changes in velocities within proximity of the Route 1 bridges. Sediment delivery to the area and settling of that sediment will occur in the same way it has in the past.			
Recommendation 3:		**Adopt**	**X** **Not Adopt**
Due to the minimal changes from 1977 to now, a HEC-RAS comparison analysis is not warranted. The report text will be edited to include a discussion on the comparison of stream bed elevations over time and to clarify the differences in datums with respect to the 1977 and current profiles. A graphic will be added showing the comparison of the two profiles (in the same datum) and the lack of sediment accumulation from 1977 to current.			

Panel Draft/Final BackCheck Response (FPC #5)		
X	**Concur**	**Non-Concur**

Final Panel Comment 6

The H&H analysis does not adequately consider the effects of climate change, resulting in increased uncertainty.

Basis for Comment

USACE policy (Engineer Regulation [ER] No. 1100-2-8162) requires consideration of the potential effects of climate change on proposed projects (USACE, 2013). To this end, the DIFR/EIS includes an analysis of peak flow trends at the nearby Norwalk River at the South Wilton, Connecticut, streamflow gage. Regression analysis was used to assess whether peak flows have increased or shifted as a result of potential changes in precipitation. The conclusion is that there is no trend in peak flows; however, it appears that approximately four out of the six highest flows since 1963 have occurred in the last eight years of the record used in the analysis. More robust statistical tests would include a Mann-Kendall test (possibly for unequal variance) and a Pettitt test for shifts. The present trend analysis of peak flow data is highly susceptible to a Type II error (concluding there is no trend or shift when there really is one) due to low statistical power.

The study also includes HEC-RAS modeling of three SLR scenarios in accordance with ER 1100-2-8162; however, it is unclear how these analyses were utilized to assess the potential effects of SLR on project performance. This is a fluvial flooding study, but the physical processes that control fluvial flooding in the study area will be directly affected by SLR during the planning period. Therefore, the project and report would benefit from a more thorough consideration of uncertainty and risk associated with SLR.

Significance – Medium/Low

The present analysis and discussion of the potential effects of climate change leads to uncertainty with regard to whether this lack of information will affect the justification of the TSP.

Recommendations for Resolution

1. Acknowledge the limitations of the current regression analysis in assessing the potential for future increases in peak flows as a result of climate change.
2. Use the HEC-RAS simulations of SLR that were performed to evaluate and explain the potential impacts of SLR on the freeboard and potential overtopping of the Route 1 bridges during the 1-percent and 2-percent floods.
3. Consider and further discuss the potential ramifications of an upward shift in peak flows and SLR on the benefits of the TSP in the DIFR/EIS.

Literature Cited:

USACE (2013). Incorporating Sea Level Change in Civil Works Programs. Department of the Army, U.S. Army Corps of Engineers, Washington, D.C. Engineer Regulation (ER) No. 1100-2-8162. December 31, 2013.

PDT Draft/Final Evaluator Response (FPC #6)			
	Concur	**X**	**Non-Concur**

Non-concur. The climate trend analysis presented in Section 6.1 of the March 27, 2018 Hydraulics Appendix B2 concludes that there is no statistically significant trend. This trend is supported by the USACE literature review of climate trends for the Mid-Atlantic region (USACE, 2015). Given these supporting findings, the team maintains that the discharge-probability uncertainty analysis performed in accordance with USACE EM 1110-2-1619 sufficiently represents the uncertainty in extreme event discharge.

Section 6.2 of the March 27, 2018 Hydraulics Appendix B2 describes the potential impact to the proposed Route 1 bridges, which are impacted by the tidal boundary condition. The freeboard is reduced under each increasing scenario. Even under the "High Scenario" SLR tailwater, the 1% storm does not overtop the bridge as shown in Figure 18. Because the bridge was already not designed for the 100-year flood event, the profile associated with no SLR is already above the low chord of the southbound (upstream) span.

Economic analysis with the historic, intermediate, and high sea level change scenarios is typically conducted during optimization and is presented in the final integrated report. The team plans on being in accordance with ER 1100-2-8162 and will conduct these analyses after the Agency Decision Milestone meeting.

Recommendation 1:		**Adopt**	**X**	**Not Adopt**

The team maintains that the climate change for peak flows described in Section 6.1 present a sufficient case for the discharge probability relationship developed from historic data and there are no limitations.

Recommendation 2:	**X**	**Adopt**		**Not Adopt**

HEC-RAS simulations presented in Section 6.2 of the March 27, 2018 Hydraulics Appendix B2 already describe the potential impact to the proposed U.S. Route 1 bridges, which are impacted by the tidal boundary condition. The risk and uncertainty analysis will be updated to incorporate sea level change. Text explaining the results, including impacts to freeboard and how risks change with different sea level change scenarios, will be presented in the Hydraulics Appendix and in Section 4.4 Risk and Uncertainty Analysis of the main report.

Recommendation 3:	**X**	**Adopt**		**Not Adopt**

The team will conduct an economic analysis with the historic, intermediate, and high sea level change scenarios to discuss potential changes in performance over the lifetime of the project.

Additional language will be added to the physical justification for the selection of the downstream boundary condition which includes a conservative degree of uncertainty with respect to both SLR and the coincidence of extreme storm surge and riverine flooding.

Panel Draft/Final BackCheck Response (FPC #6)			
X	**Concur**		**Non-Concur**

Final Panel Comment 7

Foundation and cofferdam designs are insufficiently developed to provide confidence in costs and construction schedules and are therefore a source of uncertainty in the evaluation of the TSP.

Basis for Comment

Details and assumptions supporting the estimated cost of the TSP are not clear in the DIFR/EIS. Site-specific geotechnical data are insufficient to develop detailed designs, especially with regard to depth to bedrock and existing bridge foundations. It appears that a number of design aspects which could have a significant effect on project costs have not been taken into account, including the following:

- The cost estimates on the last two pages of the DIFR/EIS Appendix B4 indicate pile-supported bridge abutments, but these structures are not described in the report and the bridge profiles in Appendix B4 show T-wall construction.
- Excavation requirements for removal of the existing structures and construction of new abutments have not been defined. The site is confined, with the bridges in close proximity to adjacent businesses. There is a gas station within about 30 feet of both east bridge abutments, and existing buildings that very nearly adjoin the north bridge at its west abutment. Because the proposed bridges are approximately equal in width to the existing bridges, it is likely that shoring will be needed to protect the adjacent properties. Furthermore, it would not be uncommon for existing stone structures of that era to be founded on timber mats over timber piles. Such wood foundations may extend well beyond the structure limits and may well cross the stream channel, influencing design and construction of the cofferdams and new substructures. However, estimates have not been prepared for site-specific conditions, and potential unforeseen costs may not be adequately covered by the general contingency.
- The construction schedule assumes that both abutments for each bridge will be constructed concurrently. However, the DIFR/EIS provides no details concerning the cofferdams that will be needed to remove the existing foundations and construct the new bridge abutments. As described above, existing bridge foundations may require partial removal for cofferdam installation. Furthermore, cofferdams are commonly designed for 10-percent floods in order to mitigate contractors' risks during construction and may impede the passage of floods. The Panel sees no evidence of an analysis to assess whether the potential for flooding will be exacerbated during construction or whether abutment demolition and reconstruction at each end will need to be staggered to mitigate flood impacts.

Despite a relatively detailed evaluation of the applicable bridge type and arrangement considerations, a preliminary-phase approach was used to estimate bridge costs by merely applying square-foot unit prices to shoulder break areas. The cost estimate was not developed by preparing quantity estimates or assigning allowances for the various components and certain site-specific features that may significantly influence construction cost and schedule.

Significance – Medium/Low

The lack of site-specific detail in development of construction activities, features, and schedule related to foundations and cofferdams reduces confidence in the estimated costs for the TSP.

Final Panel Comment 7

Recommendations for Resolution

1. Document assumptions and identify risks, including potential foundation and cofferdam issues that must be resolved and investigations that must be performed during the next phase of design in order to move the design forward and improve the accuracy of the cost estimate.

2. Evaluate the potential for flooding impacts resulting from installing cofferdams at both abutments simultaneously to determine whether schedule and costs may be underestimated.

3. Update the cost estimate for the TSP using estimated quantities and realistic allowances where appropriate for the various elements of construction, based on rational assumptions for the work required at the project site.

PDT Draft/Final Evaluator Response (FPC #7)

	Concur	**X**	**Non-Concur**

Non-concur. The site-specific detail requested in this comment does not align with USACE SMART Planning principles. The site-specific detail requested will be obtained during Preconstruction Engineering and Design. The team acknowledges that the costs may change during this phase. The cost of the Tentatively Selected Plan includes a construction contingency of 17.18% because of those risks.

Recommendation 1:	**X**	**Adopt**		**Not Adopt**

Adopt. The cost appendix will be updated to include a statement about why the construction contingency is 17.18%.

Recommendation 2:		**Adopt**	**X**	**Not Adopt**

Not Adopt. This request is beyond the scope of the feasibility phase. Schedule and cost impacts of risks are included as contingency and will be documented in the Risk and Uncertainty Analysis section of the main report.

Recommendation 3:		**Adopt**	**X**	**Not Adopt**

Not Adopt. The team accepts the risk of not using site-specific information and quantities. The risk of the implementation cost being higher than estimated, and the schedule being longer, has been communicated to the vertical team and included in the risk register. The risk register is the team's primary risk management tool and allows the team to consider study and implementation risks in one location.

Panel Draft/Final BackCheck Response (FPC #7)

X	**Concur**		**Non-Concur**

Final Panel Comment 8

It is unclear whether the evaluation of the TSP has fully accounted for potential impacts to local businesses.

Basis for Comment

Substantial grade increases have been identified in the road alignments for the TSP:

- South bridge - up to 3.0 feet east of the bridge and up to 6.0 feet west of the bridge.
- North bridge – less than 3 feet each side of the bridge; however, this grade increase is based on a bridge elevation that is not in conformance with NYSDOT standards and may therefore increase.

The south entrance to the Putnam Village Center (plaza) parking lot east of the river is shown to be raised approximately 5.5 feet in the proposed road profile (DIFR/EIS, Appendix B4, Figure 7). The entrance is adjacent to an auto detailer and gas station (602 Main St.), which both rely on at-grade entrance across the sidewalk (as can be seen on Google Street View ®). The gas station is configured for eastbound through-traffic only. Building first floors are also at or near grade. The following structural mitigation measures are identified in DIFR/EIS Appendix B4, Table 6:

- Resetting or relocating gas pumps
- Reconfiguring or reconstructing the driveway(s)
- Improving drainage

However, raising the south Putnam Village Center parking lot entrance ramp enough to provide a safe grade change and lines of sight for exiting traffic to merge onto eastbound Route 1 may effectively leave the businesses at 602 Main St. inaccessible. It therefore appears likely that mitigation would also need to include elevating those buildings to a level equal to the road grade change. Those businesses would also be inaccessible throughout road and/or facility reconstruction, and it does not appear that lost business and building relocations have been included in the assessment of project costs.

Similar issues may occur near the north entrance if it is determined that the north bridge elevation must change.

With the change in traffic patterns and temporary loss of entrances during construction, access to and from businesses in and adjacent to the traffic circle will be impeded. In addition, there is a bus stop on the far side of Hillside Avenue across from the plaza. However, there has not been any discussion of pedestrian access to the plaza. Maintenance and protection of traffic (MPT), including pedestrian traffic, during construction will be critical to the continued operation of those businesses and to public safety.

Significance –Medium/Low

Because potential impacts to local businesses do not appear to have been considered in the analysis, project costs may have been underestimated.

Final Panel Comment 8

Recommendations for Resolution

1. Develop details for Putnam Village Center parking lot entrance changes and reconstruction requirements for businesses within and adjacent to the traffic circle after confirming the bridge elevations.
2. Develop MPT plans for the TSP that consider access to the local businesses and pedestrian safety during construction.
3. Account for all direct and indirect impacts in developing project costs.

PDT Draft/Final Evaluator Response (FPC #8)

X	**Concur**		**Non-Concur**

Concur. The TSP includes significant grade increases in the road alignments; impacts due to these changes will be analyzed during optimization before the final feasibility report.

Recommendation 1:	X	**Adopt**		**Not Adopt**

During optimization, the details for changes to property entrances and reconstruction requirements for businesses impacted by grade changes will be determined. At that time, the team will look further into the possibility of relocating (raising, modification, etc.) buildings and structures. Any additional relocation costs identified will be considered a Land, Easements, Rights-Of-Way, Relocation, and Disposal Areas cost.

Recommendation 2:		**Adopt**	X	**Not Adopt**

Not adopt. A more detailed pedestrian and traffic plan will be developed during the Preconstruction Engineering and Design Phase. There are currently costs included in the estimate for traffic control, which includes pedestrian safety. Section 5.20, Transportation, will be revised to include direct and indirect impacts to pedestrian traffic and measures that may potentially be employed to maintain pedestrian access.

Recommendation 3:	X	**Adopt**		**Not Adopt**

Adopt. USACE flood risk management studies are conducted with a national perspective, with a Federal objective of improving national economic development. Income loss to business may be included as non-physical benefits for evaluated alternatives only to the extent that business income cannot be either postponed or transferred to other establishments (ER 1105-2-100). As such, these impacts are best described qualitatively. The socioeconomic impact section and Other Social Effects section of the report will be updated to include qualitative discussion of the impacts to local businesses and public transportation.

Panel Draft/Final BackCheck Response (FPC #8)

X	**Concur**		**Non-Concur**

Final Panel Comment 9

Increasing the flow area through the existing Route 1 bridges is not presented as an alternative to increase conveyance.

Basis for Comment

The TSP demonstrates that an increased flow area will reduce fluvial-related water elevations upstream of the bridges. However, the cross-sectional flow area through the existing bridges and through bridge replacement under the TSP are not defined and compared in the DIFR/EIS, so it is not clear how much channel deepening would be required to have a hydraulic impact comparable to bridge replacement.

Depending on the relative increase(s) and on the foundation conditions of the existing Route 1 bridges (e.g., foundation depth, materials and possible timber cribbing), there may be alternative means to increase flow area and reduce flow constrictions at the bridges. If structurally practicable, such means could include deepening the channel, hardening it with concrete lining, and/or improving the approach and exit configurations in order to mitigate losses at changes in cross-section and reduce the potential for debris accumulation. This option could cost less than bridge replacement while minimizing traffic disturbance and yielding a higher BCR.

However, alternative means of improving hydraulics have not been compared with the TSP or eliminated from consideration as being impracticable.

Significance – Medium/Low

Increasing the flow area through the existing bridges by implementing local channel improvements may provide greater net NED benefits.

Recommendations for Resolution

1. Determine the needed increases in channel cross-section and other factors affecting conveyance, such as roughness and transitions that would provide water level reductions comparable to the TSP.
2. Formulate an alternative that includes channel improvements at bridge locations in lieu of Route 1 bridge replacements, and evaluate whether such improvements are structurally feasible.
3. If feasible, prepare benefit and cost analyses to determine whether the net NED benefits would be increased through channel improvements.

PDT Draft/Final Evaluator Response (FPC #9)

	Concur	**X**	**Non-Concur**

PDT Draft/Final Evaluator Response (FPC #9)				
Non-concur. Improvements to increasing conveyance through the existing bridge structures were considered as part of Alternatives 3 and 4 in the initial array of alternatives. The analysis of mitigation measures considered the hydraulic impact of channel modifications in the immediate vicinity of the U.S. Route 1 bridges including within the bridge opening as described in the 1977 Feasibility Report. The channel-modifications-only scenario (with no modifications to the bridge embankments or superstructures) was analyzed resulting in the reduction of the 1% peak-annual flood of as much as 2.2 feet immediately upstream of the Route 1 Bridges. Such a reduction would require levees and flood walls to provide any significantly reduced impacts to flooding. For this reason further detailed analysis was not pursued.				
Recommendation 1:		**Adopt**	**X**	**Not Adopt**
Such an analysis was already performed, and these modifications were demonstrated to be insufficient for improving upstream flooding. The analyses conducted and their conclusions were not explicitly communicated in the report. Further explanation as to why increasing the flow area under the bridges through channel modifications was not evaluated will be added to the Hydrology and Hydraulics appendices and the Plan Formulation section of the main report. The discussion above will be added to the report in addition to, but not limited to, the following: • The 1977 Feasibility Study evaluated an alternative consisting of bridge replacements, channel modifications, floodwalls, and levees (Plan 6) and it was found to not be economically justified • Current analyses found the U.S. Route 1 bridges are the major constricting factor				
Recommendation 2:		**Adopt**	**X**	**Not Adopt**
Such an analysis was already performed and these modifications were demonstrated to be insufficient for improving upstream flooding. Channel modifications were determined to be not structurally feasible. The analyses conducted and their conclusions were not explicitly communicated in the report. Further explanation as to why increasing the flow area under the bridges through channel modifications was not evaluated will be added to the Hydrology and Hydraulics appendices and the Plan Formulation section of the main report. The discussion above will be added to the report in addition to, but not limited to, the following: • The 1977 Feasibility Study evaluated an alternative consisting of bridge replacements, channel modifications, floodwalls, and levees (Plan 6) and it was found to not be economically justified • Current analyses found the U.S. Route 1 bridges are the major constricting factor				
Recommendation 3:		**Adopt**	**X**	**Not Adopt**
It is not recommended that complete cost-benefit analysis be performed for these scenarios that did not produce meaningful changes to the flood profile.				

Panel Draft/Final BackCheck Response (FPC #9)			
X	**Concur**		**Non-Concur**
Explanation: Based on the explanation above it is understood that modeling was completed as part of the 1977 Feasibility Report. Having this report provide an explanation of the 1977 results and why they were not reevaluated addresses the concerns of the panel.			

Final Panel Comment 10

The Federal/non-Federal cost-share splits are listed differently in different parts of the DIFR/EIS.

Basis for Comment

The Executive Summary of the DIFR/EIS presents a 65% Federal/35% non-Federal share. It also states that replacement of the bridges would be a relocation, which is a real estate cost that is a 100% non-Federal responsibility. This description is not complete. The model Project Partnership Agreement for structural flood risk management projects states that the non-Federal share is a minimum of 35% with a maximum of 50%. The non-Federal sponsor must contribute cash equal to 5% of construction costs. Additionally, the non-Federal sponsor must pay 100% of the real property interests, placement area improvement, and relocations. If the cost of these items exceeds 45% of construction costs, at its sole discretion, the Federal Government may perform any of the remaining relocations with the cost of such work included as a part of the Federal Government's cost of construction. Table 35 details the project cost, resulting in a 50% Federal / 50% non-Federal project cost sharing. There is no clear explanation in the Executive Summary or in Section 8.5, Cost Sharing and Non-Federal Partner Responsibilities, of why the non-Federal share was not 35%.

Significance – Low

Inconsistent presentation of Federal and non-Federal cost sharing responsibilities affects the clarity and understanding of the DIFR/EIS.

Recommendations for Resolution

1. Revise the Executive Summary and Section 8.5 to be consistent with Table 35 of the DIFR/EIS, which results in a 50% Federal/50% non-Federal project sharing.

PDT Draft/Final Evaluator Response (FPC #10)

X	**Concur**		**Non-Concur**

Concur. The cost sharing presented in the report follows the guidance from ER 1105-2 100. The New York District is in discussions with North Atlantic Division and Headquarters to confirm the cost sharing approach for implementation of the proposed project. The discussion provided in the draft report is limited and, upon confirmation with the vertical team, the discussion will be updated to be more explicit and comprehensive in the Executive Summary and Cost Sharing sections of the report.

ER 1105-2 100 reads:

"The requirements for structural projects are essentially as follows:

(1) Provide a cash contribution equal to 5 percent of structural flood control features costs.

(2) Provide all lands, easements, rights-of-way, relocations (except existing railroad bridges and approaches thereto) and suitable borrow and dredged material disposal areas (referred to as

PDT Draft/Final Evaluator Response (FPC #10)				
LERRD). (3) If the sum of the above two items is less than 35 percent of the costs assigned to flood control, non-Federal sponsors will pay the difference in cash. If it is greater than 35 percent, total non-Federal costs shall not exceed 50 percent of total project costs assigned to flood control. Contributions in excess of 50 percent will be reimbursed by the Federal Government to the non- Federal sponsor. Total contributions in excess of 30 percent may be reimbursed to the Federal government over a period not to exceed 15 years."				
Recommendation 1:	**X**	**Adopt**		**Not Adopt**
Upon agreement on the cost sharing-approach with the vertical team, the discussion in the Executive Summary and Cost Sharing sections will be updated to be more explicit and consistent. Text similar to the following will be added to the Executive Summary and Cost Sharing sections: "In accordance with the cost share provisions in Section 103 of the WRDA of 1986, as amended (33 U.S.C. § 2213), project design and implementation are cost shared 65 percent Federal and 35 percent non-Federal. The set-up of the bridge removal (i.e., mobilization, demobilization, site preparations, traffic control, excavation and disposal, cofferdams, etc.) and the bridge removal itself are project costs that are cost shared 65 percent Federal and 35 percent non-Federal. It is standard that the non-Federal sponsors are required to provide a cash contribution equal to 5 percent of structural flood control feature costs. The construction of the new bridges is considered a relocation and 100 percent of the cost is the non-Federal sponsors' responsibility. Following ER 1105-2-100, the Federal government will reimburse the non-Federal sponsors' costs in excess of the 50 percent. The cost-share breakdown is 50-50 once the Federal government reimburses the non-Federal sponsor the amount over 50 percent."				
Panel Draft/Final BackCheck Response (FPC #10)				
X	**Concur**		**Non-Concur**	

Final Panel Comment 11

Many of the existing conditions descriptions and impacts analyses regarding natural resources and other disciplines sound generic.

Basis for Comment

The DIFR/EIS does not consistently describe actual specific potential impacts to specific taxa/species groups or specific elements of a resource area under consideration. There are several examples where the DIFR/EIS can provide more detail to support the impacts analysis and conclusions.

Sections 2.8 and 2.9: If no site-specific survey was conducted, local sources would likely be able to provide lists of potentially affected species. For example, the National Audubon Society nature center in Greenwich maintains lists of birds and mammals that can be cited to describe the presence of such species regionally.
http://greenwich.audubon.org/sites/g/files/amh711/f/birdchecklist4audubongreenwich_0.pdf

Section 2.14, second paragraph, indicates that there are essentially no wetlands in the project area. This contradicts Section 2.2.3 (second paragraph under "Connecticut regulated wetlands"), which indicates that there are 16 wetlands (each less than 0.1 acre) within the project area.

Several subsections of Section 5 that discuss natural resources impacts warrant further detail in support of the conclusions that project impacts would be negligible. For example:

- Section 5.2.2 discusses "minor short-term impacts to aquatic habitats" but does not provide acreage or square feet of extent to justify use of the word "minor."

- Section 5.5 discusses negligible impacts to aquatic macroinvertebrates, but again does not cite the acreage of the project footprint that would be impacted in support of this conclusion.

- Section 5.6 concludes that impacts to reptiles and amphibians would be negligible but should also cite the fact that wetlands would not be impacted, and that project impacts would be limited to open-water areas that are not as commonly frequented by these species.

- Section 5.7 describes short-term minor impacts to migratory bird species but does not specify which species. Bridges, even in populated areas, often provide nesting locations for swallows and other species (e.g., Eastern phoebe); therefore, the text should explain why taxa might be impacted and why project impacts would not affect local populations.

- Section 5.8 describes impacts to mammals as short-term adverse impacts associated with removal of vegetation and trees but ignores the issue of bridges. Bridges may be used as roosting sites by some species of bats.

Section 2.3.2 also contains a discussion on mitigation and monitoring which sounds like a generic treatment of replanting techniques. This discussion is not warranted under this section because there are no project impacts to wetlands.

Final Panel Comment 11

Finally, Section 6.4 of the DIFR/EIS concludes: "*The TSP and any current and future actions taken by others will result in negligible short-term and moderate long-term adverse impacts to riparian vegetation within the project area. Short-term impacts include removal of vegetation within construction workspaces. These impacts will have minor cumulative impacts due to the restoration of impacted areas. The loss of mature trees in a watershed with high density development may have moderate cumulative impacts*." Supporting details in terms of number of acres impacted or number of mature trees to be removed are not provided in support of the conclusion. It is acknowledged that the overall conclusions of the impact analysis are not likely to change significantly due to the highly developed nature of the watershed and limited areas to be impacted by the project.

Significance – Low

Detailed descriptions of conditions and analysis results in the DIFR/EIS would better inform the public and agencies and would support the overall conclusions regarding impacts to natural resources.

Recommendations for Resolution

1. Add further details as suggested to the sections cited to support the conclusions of the DIFR/EIS and the findings of no significant impact to natural resources.

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X	**Concur**		**Non-Concur**

Section 2.14 of the FR/EIS will be revised to be more consistent with Section 2.2.3 as it relates to the location of wetland resources. Section 5 of the FR/EIS will be revised to clarify and/or provide further detail of areas and resources impacted to support the conclusions of the level of impact presented in the report.

Recommendation 1:	**X**	**Adopt**		**Not Adopt**

The last sentence within section 2.14 will either be removed or revised to correct the language regarding presence of wetlands within the project area.

The third paragraph in the introductory text of Chapter 5 notes the acreages of impacts for each resources. The paragraph will be revised to include acreages of vegetation impacted as well. Acreages to open water resource are re-stated in section 5.2.1 Surface Water. The report will be revised to reiterate those impacts in Section 5.2.2 Water Quality and Habitat and 5.5 Aquatic Macroinvertebrates.

Section 5.6 Reptiles and Amphibians will be revised to include language that cites the fact that wetlands will not be impacted and that project impacts would be limited to open-water areas that are not as commonly frequented by these species.

Section 5.7 Birds will be revised to clarify the type of species (such as those noted in the Basis for Comment) that could potentially be most impacted by the TSP and to better explain why the long term impact will be negligible.

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Section 5.8 Mammals will be revised to include potential impacts to bats as a result of the bridge removal/replacement. Section 6.4 Vegetation will be revised to include acreage amounts. It should be noted that Regarding the statement made in the Basis for Comment about Sections 2.8 and 2.9, it should be noted that the comment appears to relate more to Section 2.7 Birds given that the link provided was specific to bird species. After assessing the report, the information presented in Sections 2.7 and 2.8 Mammals has been deemed sufficient. This assessment is based on a lack of comments received from agencies and the public on these resources during the NEPA Scoping period and comment period for the draft FR/EIS. In addition, species noted in both Section 2.7 Birds and 2.8 Mammals were those observed during site visits with language in Section 2.7 specifically referring the reader to the full list of bird species observed during site visits. In addition, applicable state databases were consulted and did not identify any unique, rare or significant ecological communities within the project area that would warrant a more detailed description of such resources. The mitigation and monitoring discussion in Section 5.3 will be moved to directly below 5.3.1 Upland and references regarding wetlands will be removed.

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X	**Concur**		**Non-Concur**