



DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS
441 G STREET, NW
WASHINGTON, D.C. 20314-1000

CECW-ZB

MAY 30 2014

MEMORANDUM FOR ASSISTANT SECRETARY OF THE ARMY (CIVIL WORKS)

SUBJECT: Illinois Shoreline Erosion, Interim III, Wilmette to Illinois-Indiana State Line (Chicago Shoreline) Project - Final USACE Response to Independent External Peer Review

1. USACE conducted an Independent External Peer Review (IEPR) for the subject project in accordance with Section 2034 of the Water Resources Development Act of 2007, procedures described in Engineer Circular *Civil Works Review* (EC 1165-2-209, Change 1, 2012) and Office of Management and Budget bulletin *Final Information Quality Bulletin for Peer Review* (2004). Independent, objective peer review is regarded as a critical element in ensuring the reliability of scientific analyses.
2. Battelle Memorial Institute Battelle established and administered the IEPR panel which consisted of two members with technical expertise in civil/environmental engineering, cost engineering, and economics. The final IEPR report details the process, describes the IEPR panel members and their selection, and summarizes the final panel comments on the existing environmental, economic, and engineering analyses contained in the Chicago Shoreline project documents.
3. The final USACE response to the review panel comments is attached. I approve the final written responses to the IEPR contained in the enclosed document. The IEPR Report and USACE responses have been coordinated with the vertical team and will be posted on the Internet, as required in EC 1165-2-209.
4. If you have questions on this matter, please contact me, or have a member of your staff contact Ms. Yvonne Prettyman-Beck, Deputy Chief, Great Lakes and Ohio River Division Regional Integration Team, at 202-761-5237.

A handwritten signature in black ink, appearing to read "S. L. Stockton".

STEVEN L. STOCKTON, P.E.
Director of Civil Works

**ILLINOIS SHORELINE EROSION, INTERIM III
WILMETTE, ILLINOIS, TO ILLINOIS-INDIANA STATE LINE
(CHICAGO SHORELINE)
POST-AUTHORIZATION CHANGE REPORT**

**USACE Response to Independent External Peer Review
May 2013**

Congress authorized the project "*LAKE MICHIGAN, ILLINOIS*" in Section 101(a)(12) of the Water Resources Development Act of 1996, Public Law 104-303. The project is commonly referred to as the Illinois Shoreline Erosion, Interim III, Wilmette to Illinois-Indiana State Line (Chicago Shoreline) Project. The City of Chicago and the Chicago Park District, collectively the non-Federal Sponsors, and the Department of Army, acting by and through the Assistant Secretary of the Army for Civil Works, entered into three Project Cooperation Agreements (dated 23 April 1997, 7 August 1998, and 17 May 1999), as required by Section 221 of the Flood Control Act of 1970, Public Law 91-611, as amended, and Section 103 of the Water Resources Development Act of 1986, Public Law 99-662. The project is currently in the construction phase. As of October 2012, approximately 78 percent of the total project has been constructed. A Post-Authorization Change Report (PACR) has been drafted to notify Congress of cost increases to the Chicago Shoreline project and recommends that the project's authorization be modified in order to complete construction of the project.

The National Planning Center of Expertise for Coastal Storm Damage Reduction (PCX-CSDR) conducted a Type I Independent External Peer Review (IEPR) for the subject project in accordance with Department of the Army, USACE, guidance Civil Works Review Policy (EC 1165-2-214) dated December 15, 2012; CECW-CP memorandum dated March 30, 2007; and the Office of Management and Budget's Final Information Quality Bulletin for Peer Review released December 16, 2004.

The PCX-CSDR engaged the Battelle Memorial Institute, a nonprofit science and technology organization with experience in establishing and administering peer review panels for the U.S. Army Corps of Engineers (USACE), to coordinate the IEPR of the Chicago Shoreline Post-Authorization Change Report. The IEPR panel consisted of two individuals selected by Battelle with technical expertise in civil design/construction cost engineering and economics.

IEPR for the PACR was completed in one review; the responses presented here reflect the actions taken to address the comments from the IEPR review. The Chicago District, USACE, completed a draft PACR recommending a new authorized cost for the Chicago Shoreline Project. An IEPR of the draft PACR was initiated in February 2013, and the documents to be reviewed were provided to the IEPR panel in March 2013. The Final IEPR report and the USACE/IEPR panel comment and back-check process were completed in April 2013.

CECW-LRD

SUBJECT: Illinois Shoreline Erosion, Interim III, Wilmette, Illinois, to the Illinois-Indiana State Line (Chicago Shoreline) Post Authorization Change Report (August 2013) -- Final Agency Response to Final Independent External Peer Review Report (April 2013)

The final IEPR report contains a total of nine comments categorized by level of significance: One comment is identified as having high significance, five are identified as having medium significance, and three are identified as having low significance.

- ‘High’: Describes a fundamental problem with the project that could affect the recommendation or justification of the project.
- ‘Medium’: Affects the completeness or understanding of the reports/project
- ‘Low’: Affects the technical quality of the reports but will not affect the recommendation of the project.

The following outline summarizes USACE actions which addressed each recommendation for each of the comments provided.

The following discussions present the USACE Final Response to the nine IEPR comments.

1. IEPR Comment – High Significance: The rates of erosion, loss of infrastructure, and flooding frequency appear to be based on 1993 Feasibility Study Coastal Engineering Analysis (CEA) Report estimates, resulting in an overestimate of project benefits.

This comment included one recommendation which was not adopted as discussed below.

Recommendation 1: Update the 1993 CEA to reflect current conditions and to provide a more current estimate of project benefits as they relate to coastal flooding and shore erosion.

USACE Response: Not Adopted

An explanation of why the shoreline erosion rate used in the analysis remained unchanged from the 1993 CEA was added to section 4.1 of Appendix A of the report. This explanation cites a recent unpublished analysis conducted by the U.S. Army Corps of Engineers Engineering Research and Development Center (USACE ERDC) in February 2013 that showed little change in the wave frequencies that affect the shoreline erosion rates. The evaluation was performed using a combination of the 10 year deep wave and the 20 year lake level and vice versa. The lake level used is a design water level rather than a still water level. The design water level includes wind setup, which raises lake levels two to three feet during coastal storms. Deep water waves on the southern end of Lake Michigan can grow to nearly 20 feet and are a significant source of shoreline erosion and backshore flooding potential.

CECW-LRD

SUBJECT: Illinois Shoreline Erosion, Interim III, Wilmette, Illinois, to the Illinois-Indiana State Line (Chicago Shoreline) Post Authorization Change Report (August 2013) -- Final Agency Response to Final Independent External Peer Review Report (April 2013)

Low lake levels continue to expose timber on the existing shoreline, further contributing to degradation of the cribs and loss of the stone fill. Loss of this stone fill, coupled with wave attack, causes failure of the existing stone structure.

The lake level document referenced in the 1993 Feasibility Study is "Revised Report on Great Lakes Open-Coast Flood Levels" (USACE Detroit District, April 1988). Subsequent design reaches utilized lake levels from "Design Water Level on the Great Lakes (USACE Detroit District, September 1993). This was the latest published document with lake levels for these frequencies in this location.

The difference in the design water levels in the 10 year and 20 year frequency range is less than 0.5 feet. The recent analysis performed by ERDC in February 2013 for the southern end of Lake Michigan also showed little difference in the 10 year and 20 year frequencies. When considering the long period of record (starting in 1903), a comparison of these three frequency analyses shows only small changes. While the latest forecast and projections shows that lake levels will remain below average in the near term, it is expected that lake levels will continue to fluctuate in the future.

2. IEPR Comment – Medium Significance: No evidence for the lack of depreciation of Chicago’s infrastructure is provided, and exclusion of depreciation may result in an overstatement of the benefit-cost ratio (BCR).

This comment included one recommendation which was adopted as discussed below.

Recommendation 1: Provide data from the City of Chicago and an outside group such as ASCE to support the assumption that the facilities listed in Table 4-8 of Appendix A, paragraph 27 have not depreciated in value. If it is not possible to substantiate the assumption, use data on depreciation of infrastructure and recalculate the replacement value to include depreciation.

USACE Response: Adopted

Action Taken: Values for infrastructure were revised by using RS Means to calculate the depreciation rates and adjusting the replacement values of Chicago’s infrastructure. A discussion of the depreciation rates and replacement values can be found in Section 4.4 of Appendix A. The use of depreciated replacement values had a minimal impact on the BCR.

3. IEPR Comment – Medium Significance: Large increases in replacement costs for city infrastructure from 1993 to 2012 are not supported by sufficient data and may result in an overstatement of the benefit-cost ratio (BCR).

This comment included three recommendations which were adopted as discussed below.

CECW-LRD

SUBJECT: Illinois Shoreline Erosion, Interim III, Wilmette, Illinois, to the Illinois-Indiana State Line (Chicago Shoreline) Post Authorization Change Report (August 2013) -- Final Agency Response to Final Independent External Peer Review Report (April 2013)

Recommendation 1: Obtain estimates for the replacement cost of a facility of similar type and capacity as the South Shore Filtration Plant.

USACE Response: Adopted

Action Taken: The approach used to estimate the replacement costs for the city infrastructure was altered to use Engineering News Record Construction Cost Indexes (ENR CCI). Discussion was added to Section 5.3 of Appendix A that describes how the values of city infrastructure were updated from the original Feasibility Study.

In particular, ENR CCI was used to update replacement costs for the South Shore Filtration Plant as shown in Table 4-8. Since protection of the South Shore Filtration Plant was accomplished as a separable element to the project and is complete, there is no additional need for project justification and the analysis is merely provided to Congress as additional information.

Recommendation 2: Document the process used to familiarize International Planetarium Society members with the Alder Planetarium and explain how replacement cost estimates were developed.

USACE Response: Adopted

Action Taken: Adler Planetarium is protected by the 1998 Solidarity Drive project. The original replacement cost of the planetarium in the 1993 Feasibility Report was approximately \$50 million. Development of a replacement cost of this historic structure (a National Landmark) and its contents was difficult since designing and building such a structure is a niche field. In order to determine a reasonable estimate of the replacement value of this unique structure, the International Planetarium Society (IPS) was consulted on this issue. The Society provided a range of \$150 to \$200 million based on their expertise and knowledge of recent planning and design costs for similar structures. In order to provide a conservative estimate of damages, the values provided by the IPS were replaced with the original replacement cost for the facility indexed from 1992 price levels with a discount of 8 percent to account for depreciation. This resulted in a depreciated replacement value of \$41.9 million for the planetarium.

Recommendation 3: Describe how the new replacement value for the Lincoln Park Zoo was estimated.

USACE Response: Adopted

Action Taken: The approach used to estimate the replacement costs for the city infrastructure was altered to use Engineering News Record Construction Cost Indexes (ENR CCI). Discussion

CECW-LRD

SUBJECT: Illinois Shoreline Erosion, Interim III, Wilmette, Illinois, to the Illinois-Indiana State Line (Chicago Shoreline) Post Authorization Change Report (August 2013) -- Final Agency Response to Final Independent External Peer Review Report (April 2013)

was added to Section 5.3 of Appendix A that describes how the values of city infrastructure were updated from the original Feasibility Study.

In particular, ENR CCI was used to update replacement costs for the Lincoln Park Zoo as shown in Table 4-8.

4. IEPR Comment – Medium Significance: There is insufficient documentation to ascertain whether the economic reevaluation utilized historic project data to validate cost models and assumptions.

This comment included four recommendations, all of which were adopted as described below.

Recommendation 1: Provide additional documentation and description of specific historical information and methods used to incorporate previously completed project cost information into the current cost estimates, including a description of calibration of the original model for current use.

USACE Response: Adopted

Action Taken: Additional documentation was added to the cost appendix (Appendix C) explaining how the current cost estimates and contingencies were developed. In particular, this included an explanation of how the Cost Schedule Risk Analysis (CSRA) was completed for each of the remaining reaches. One of the factors considered within the Cost Schedule Risk Analysis was the amount of past contract changes. Using the USACE's Resident Management System (RMS), the amount of the final contract compared to the award amount was evaluated. The dollar amount of contract changes varied from -10% to as high as 25% of the original contact value with an average difference of 3.3%. This range was used in the development of the cost risk models.

Recommendation 2: Ensure the data and lessons learned from completed projects are brought forward into the current project cost estimates.

USACE Response: Adopted

Action Taken: As discussed in the response to the first recommendation, one of the factors considered within the Cost Schedule Risk Analysis was the amount of past contract changes. Using the USACE's Resident Management System (RMS), the amount of the final contract compared to the award amount was evaluated. The dollar amount of contract changes varied from -10% to as high as 25% of the original contact value with an average difference of 3.3%. Using this range in the cost risk models incorporated the lessons learned from the completed projects into the current project cost estimates.

CECW-LRD

SUBJECT: Illinois Shoreline Erosion, Interim III, Wilmette, Illinois, to the Illinois-Indiana State Line (Chicago Shoreline) Post Authorization Change Report (August 2013) -- Final Agency Response to Final Independent External Peer Review Report (April 2013)

Recommendation 3: Supply additional documentation regarding costs for stone. Include quotations acquired from stone sources that meet the project quality requirements and determine whether those sources have a sufficient quantity of material available to complete the project.

USACE Response: Adopted

Action Taken: Stone quotes were added to Appendix C as was documentation of an email conversation verifying sufficient stone availability. This documentation is included in Section 8 of Appendix C.

Recommendation 4: Provide additional discussion in the PACR to aid the reader in understanding how all the numbers relate

USACE Response: Adopted

Action Taken: Additional discussion was added Section 6.6 of the PACR to help distinguish the relationships between different cost figures presented in Section 6 of the report. This included a discussion in Section 6.8 as to the differences in the project construction costs shown in Table 6 and the total cost presented in Table 11.

5. IEPR Comment – Medium Significance: Significant cost changes, such as Planning, Engineering and Design (PED) and Breakwaters & Seawalls, are not supported by data and may impact the benefit-cost ratio (BCR).

This comment included one recommendation which was adopted as discussed below.

Recommendation 1: Add an appendix that provides detailed explanations for all large increases in costs and for all elements listed in Section 6.0 of the PACR.

USACE Response: Adopted

Action Taken: Additional discussion detailing the cost changes was added to Section 6.6 of the PACR. An example from the discussion of PED cost increases reads: *“Of the \$64,183,000 cost change, \$37,652,000 of that cost is in the four remaining project segments that have yet to be constructed, leaving an increase of \$26,531,000 in sunk costs from the original authorized cost. The \$26,531,000 in sunk PED costs is mainly due to several construction segments that have required substantial design changes from the original decision document to comply with changed conditions, unforeseen regulatory compliance requirements, and local opposition. For example, on Belmont to Diversey – South, the original design did not include incorporating existing art stones into the reconstruction of the revetment. There was local opposition to the*

CECW-LRD

SUBJECT: Illinois Shoreline Erosion, Interim III, Wilmette, Illinois, to the Illinois-Indiana State Line (Chicago Shoreline) Post Authorization Change Report (August 2013) -- Final Agency Response to Final Independent External Peer Review Report (April 2013)

removal of the art stones and thus, there was a significant redesign efforts required to include the art stones in the project. There have been several reaches where similar issues have been raised.”

6. IEPR Comment – Medium Significance: The method used to calculate the estimated 1992 and 2012 monetary value of travel time saved is not explained in sufficient detail to substantiate the benefits of reducing traffic delays caused by road closures from erosion and flooding.

This comment included three recommendations, all of which were adopted as described below.

Recommendation 1: Explain why the dollar values of travel time, in Appendix A, page 24, are higher on weekends than during the work week

USACE Response: Adopted

Action Taken: Additional description of the method used to calculate the monetary value of travel time saved was added to Section 5.1 of Appendix A. The data used in the 1993 Feasibility Report was developed using a 1975 American Association of State Highway Officials manual. The method used in the current study weighs the values based on a percentage of trips based on purpose (work, social, other). The hour value for work trips was adjusted for the occupancy of the vehicle based on data from the 2001 National Household Travel Survey published by the Federal Highway Administration.

The value of time saved is displayed in Table 5.3. In this table, the average hourly rate (\$/Hour column) is determined by the multiplying the “% of Hrly. Family Income” from Table D-4 of ER 1105-2-100 times the average hourly rate for the Chicago Metropolitan Area (\$29) and, in the case of work trips, adjusting it for the occupancy rate (1.14). Table D4 of ER 1105-2-100 was developed based on a study conducted by American Association of State Highway Officials (AASJO) which utilized survey data to determine how the value of time saved varied depending on the purpose of the trip and the amount of time saved on each trip. This study indicated that as the time saved increased, the value of time saved as a percentage of wages also increased. For trips less than 15 minutes, work trips were valued more highly than social or recreational trips. However, for trips greater than 15 minutes social and recreational trips were more highly valued. When applied to the current study, this resulted in weekend trips being more highly valued than weekday trips, as shown in equation 4-6.

Recommendation 2: Provide the source numbers in Table 5-3 as an appendix to the PACR (or include Appendix D-4 from ER 1105-2-100) as an appendix to the PACR.

USACE Response: Adopted

CECW-LRD

SUBJECT: Illinois Shoreline Erosion, Interim III, Wilmette, Illinois, to the Illinois-Indiana State Line (Chicago Shoreline) Post Authorization Change Report (August 2013) -- Final Agency Response to Final Independent External Peer Review Report (April 2013)

Action Taken: Table D-4 of ER 1105-2-100 has been incorporated into Table 5-3 in Appendix A. However, the "\$/hr" column has been adjusted from the values shown in ER 1105-2-100 based on the average hourly wage rate for the Chicago Metropolitan Area (\$29). The "% of Hourly Family Income" column has been adapted directly from Table D-4 of ER 1105-2-100.

Recommendation 3: Identify which numbers in Table 5-3 are used to calculate the \$17.57 updated value of travel time in Table 5-3.

USACE Response: Adopted

Action Taken: The value of time saved (\$/Hr) was weighted for each trip type based on information provided by the Chicago Metropolitan Agency for Planning. These weightings represent the percentage of daily trips for each purpose. The weight categories allow for a single adjusted rate per category for each time grouping. For the ">15" minute grouping, the \$17.57 value is the sum of the following: $\$17.61 * .85 + \$17.22 * .13 + \$18.51 * 0.02$. The 0-5 and 6-15 minute groupings were also calculated using this procedure.

7. IEPR Comment – Low Significance: The assumption that 73.7% of the operations and maintenance (O&M) costs have been sunk because specific project segments are complete is not correct.

This comment included one recommendation which was adopted as described below.

Recommendation1: Reclassify the 73.7% of O&M costs as Total Annual Remaining Costs in Table 8.1 of Appendix A, and recalculate the RBRCR.

USACE Response: Adopted

Action Taken: As suggested, O&M costs were reclassified as remaining costs rather than sunk costs in Table 8.1 of Appendix A. This resulted in a negligible impact on the RBRCR calculations.

8. IEPR Comment – Low Significance: Appendix A does not describe the deductive reasoning-based method that was used to address the lack of specificity on transportation flooding damages in the Feasibility Report.

This comment includes two recommendations, both of which were adopted as described below.

Recommendation 1: Describe the deductive reasoning-based method employed to address the lack of specificity in the Feasibility Report on transportation flooding damages.

CECW-LRD

SUBJECT: Illinois Shoreline Erosion, Interim III, Wilmette, Illinois, to the Illinois-Indiana State Line (Chicago Shoreline) Post Authorization Change Report (August 2013) -- Final Agency Response to Final Independent External Peer Review Report (April 2013)

USACE Response: Adopted

Action Taken: Additional description of the deductive-reasoning method used to address the lack of specificity on transportation flooding damages was added to Section 4.3 in Appendix A. Table 4-6 and Table 4-7 show the computations using data from the Feasibility Report and Table 5-3. In order to produce the data in Table 5.3 in Appendix A, the Feasibility Report “value of time saved” was weighted based on trip purpose. Equation 4-5 establishes the probability between flooding occurring during the week or weekend. Equation 4-6 shows how the peak weekday trips, non-peak, and weekend trips were weighted relative to probability of occurrence. The peak traffic during a typical work week was assumed to be 17 percent of a total day. The actual monetary value of those periods could be “low, medium, or high time savings”. In the case of Reach 2, the increase in delay was greater than 15 minutes and the high time savings were used. The apportionment of the trip purposes were then adjusted to the time increments to provide an adjusted rate per category per time grouping. This is shown in Table 5-3 and described in Section 4.3 of Appendix A.

Recommendation 2: Provide details on how the deductive reasoning developed was used to calculate the updated transportation flooding damages in Table 5-13 in Appendix A.

USACE Response: Adopted

Action Taken: The values in Table 5-3 of Appendix A were broken down by time increments and purpose. Equation 4-5 and Equation 4-6 were created to establish a single time increment (0-5, 5-15, >15) that sufficiently accounted for the apportionment of the monetary value for the week and weekend trips. Table 5-3 then adjusts the apportionment of the trip purposes to the time increments ($\$17.61 \cdot .85 + \$17.22 \cdot .13 + \$18.51 \cdot 0.02 = \17.57).

For Reach 2, it is assumed that all eight lanes of Lake Shore Drive would be closed for a period of one day. The annual exceedance probability that these conditions would be met or exceeded was 1/15. In order to determine the total transportation costs, the incremental time delay (4,799 seconds) was multiplied by the number of vehicles per hour (6,250), the hours of delay in a year (48), the value of time per hour (\$17.57 since the increase in delay is greater than 15 minutes) and the annual exceedance probability to provide total annual damages of \$495,155. This value is reflected in Table 5.13 of Appendix A. A similar methodology was employed for Reach 5. This method is reasonable, conservative relative to the original estimate, and provides an idea of the magnitude of transportation damages relative to current input parameters.

9. IEPR Comment – Low Significance: The application of Unit Day Values (UDVs) for valuing project visitor use is inconsistent with U.S. Water Resources Council Principles and Guidelines.

CECW-LRD

SUBJECT: Illinois Shoreline Erosion, Interim III, Wilmette, Illinois, to the Illinois-Indiana State Line (Chicago Shoreline) Post Authorization Change Report (August 2013) -- Final Agency Response to Final Independent External Peer Review Report (April 2013)

This comment included one recommendation which was adopted as described below.

Recommendation 1: Explain why the UDVs in Appendix A, Section 4.5 were chosen to value recreation use for this project instead of the Travel Cost Method or Contingent Valuation Method.

USACE Response: Adopted

Action Taken: While Unit Day Values are not typically used if visitor use is greater than 750,000 visitor days, in this case it is appropriate as these recreational benefits are used only in the justification of the locally preferred plan (LPP), not the NED Plan. Recreation benefits of the project were considered incidental to the justification of the project. Since the NED plan was forgone for the LPP, recreation benefits above and beyond the NED plan were identified as separable. This discussion was added to Section 5.4 of Appendix A.