



DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS
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WASHINGTON, DC 20314-1000

DEC 20 2016

CECW-LRD

MEMORANDUM THRU Commander, Great Lakes and Ohio River Division (CELRD-PD-D, ATTN: Ms. Boccieri)

FOR Commander, Chicago District (ATTN: Ms. Davis)

SUBJECT: Forest View, Illinois, Continuing Authorities Program (CAP) Section 205, Small Flood Risk Management Projects, Final U.S. Army Corps of Engineers Response to Independent External Peer Review

1. Independent, objective peer review is regarded a critical element in ensuring the reliability of scientific and engineering analyses. The Corps conducted the Independent External Peer Review (IEPR) for the subject project in accordance with Section 2034 of the Water Resources Development Act of 2007, USACE Engineer Circular (EC) 1165-2-214, and the Office of Management and Budget's Final Information Quality Bulletin for Peer Review (2004).
2. A U.S. Treasury Code 501(c)(3) non-profit science and technology organization, independent and free of conflicts of interest, established and administered the peer review panel. The IEPR panel consisted of four members with expertise in economics/planning, biological resources and environmental law compliance, hydrology and hydraulic engineering, geotechnical engineering, and civil/structural engineering.
3. The final written responses to the IEPR are hereby approved. The enclosed document contains the final written responses of the Chief of Engineers to the issues raised and the recommendations contained in the IEPR report. The IEPR report and the Corps responses have been coordinated with the vertical team and will be posted on the internet, as required in EC 1165-2-214.
4. If you have any questions regarding this matter, please contact Janet Cote, Planner, Great Lakes and Ohio River Division Regional Integration Team, at (202) 761-4589.

A handwritten signature in blue ink, appearing to read "J. Dalton", written over a horizontal line.

JAMES C. DALTON, P.E.
Director of Civil Works

Encl

Forest View, Illinois
Continuing Authorities Program (CAP) Section 205
Small Flood Risk Management Project
Detailed Project Report and Integrated Environmental Assessment

U.S. Army Corps of Engineers Response to Independent External Peer Review
October 2016

Independent External Peer Review (IEPR) was conducted for the subject project in accordance with Section 2034 of the Water Resources Development Act (WRDA) of 2007, U.S. Army Corps of Engineers (USACE) policy on Civil Works Review, EC 1165-2-214 (2012), and the Office of Management and Budget's Final Information Quality for Peer Review (2004).

The IEPR of the Draft Detailed Project Report and Integrated Environmental Assessment for the Forest View, Illinois CAP Section 205 Small Flood Risk Management Project was conducted by Battelle Memorial Institute (Battelle), a non-profit science and technology organization with experience in establishing and administering peer review panels for the USACE. The IEPR panel consisted of four members with expertise in Economics and Plan Formulation, Biological Resources and Environmental Law Compliance, Hydrology and Hydraulics, and Civil/Structural/Geotechnical Engineering. The final IEPR Report was issued in September 2016.

As a result of the review, 13 comments were documented. The comments were assigned a level of significance using the following definitions:

High: Describes a fundamental issue with the project that affects the current recommendation or justification and will affect its future success.

Medium/High: Describes a potential fundamental issue with the project which has not been evaluated at a level appropriate to this stage in the planning process.

Medium: Based on the information provided, the Panel identified an issue that would raise the risk level if the issue is not appropriately addressed.

Medium/Low: Affects the completeness of the report, but will not affect the recommendation or justification of the project.

Low: Affects the understanding or accuracy of the project as described in the report, but will not affect the recommendation or justification of the project.

Of the 13 comments, 0 were identified as having high significance, 0 were assigned medium/high significance, 2 were assigned medium significance, 5 were assigned medium/low significance, and 6 were assigned low significance. The following discussions present the USACE Final Response to the IEPR comments.

1. Medium Significance - There was a limited number of geotechnical borings collected, samples analyzed, and laboratory tests conducted, particularly in critical stability and seepage areas, which may not identify significant problematic soil conditions.

Six recommendations were made with this comment, all of which have been adopted.

1. Perform additional soil borings sited halfway between the existing boring locations; the boring spacing should be open to modification based on conditions encountered in the field.

USACE Response: Adopted

Actions Taken/Actions to be Taken: In addition to the borings completed in 2011, eleven borings were completed in 2014, as documented in Appendix F (Geotechnical Analysis) in the "Local Geology" section and Attachment 1. Nine additional borings will be completed in 2016, focusing on areas where the design would benefit from a better understanding of the subsurface conditions.

2. Determine the borrow location and sample the borrow material for identification, material properties, and strength and permeability values for remolded samples.

USACE Response: Adopted

Actions to be Taken: Although the borrow site will not be determined by USACE, the contract specifications will include minimum material property requirements, and the recommended testing will be conducted to verify the material quality.

3. Obtain relatively undisturbed 3-inch diameter Shelby Tube samples for triaxial shear Strength and permeability testing of each of the critical soil strata encountered. All triaxial tests used to determine drained shear strength parameters should have a minimum of three reliable circles to determine the phi angle and cohesion intercept.

USACE Response: Adopted

Actions Taken/Actions to be Taken: Undisturbed tube sampling was completed in 2014 to complete two consolidation tests, two unconfined-undrained triaxial tests, and two hydraulic conductivity tests. Additional tests will be conducted as part of the 2016 investigation to obtain additional strength information. Temporary monitoring wells and slug testing will also be completed onsite to collect permeability data on soil and bedrock.

4. Sample the ends of the Shelby Tubes for moisture content, strength (Torvane or Hand Penetrometer), and classification and use that combined data along with previous test data to determine which samples should be tested for strength and permeability.

USACE Response: Adopted

Actions Taken/Actions to be Taken: The recommended testing will be completed for the borings to be conducted in 2016. Previously collected data from 2011 and 2014 has been used to identify the specific areas where additional data, including strength and permeability data, would be beneficial.

5. Use the new test data along with previously obtained test data to select design shear strengths for the critical materials in the seepage and stability analyses and re-evaluate the factors of safety using the updated information.

USACE Response: Adopted

Actions to be Taken: The additional data to be collected in 2016 will be used during the design phase to ensure that appropriate factors of safety are considered.

6. Adjust the levee design as needed to incorporate the results of the updated analyses.

USACE Response: Adopted

Actions to be Taken: The additional borings to be collected in 2016 will be used for the final design of the seepage mitigation around the buried spillway and confirm assumptions made from past investigations along the levee alignment.

2. Medium Significance - An analysis has not been conducted on the possible increase in the likelihood of overtopping of the levee on the west bank of the Des Plaines River during floods larger than the design event.

The comment includes two recommendations for resolution, both of which have been adopted.

1. Determine what flows could overtop the levee on the west bank of the river for both existing and with-project conditions.

USACE Response: Adopted

Actions Taken: There is a very low chance of overtopping at the west levee (stages would be higher than the 0.2% ACE (annual chance of exceedance) flood event) in both without- and with-project conditions. The proposed project design ensures that overtopping occurs on the east bank prior to overtopping the west bank. The east bank overtopping would occur at an event larger than the 0.5% ACE flood event. The west levee would overtop at an event larger than the 0.2% ACE flood event. When considering overtopping only, the risk of west levee overtopping will be increased in the with-project condition; however, it should be noted that higher flood levels will also increase the probability of overtopping for the east levee for both with- and without-project conditions. In the case of an overtopping event in both with- and without-project conditions, the increased flood risk on the west bank is expected to be minimal. Section 3.5.2.4 of the main report and the "Superiority" and "Project Impacts" sections of Appendix E (Hydrology and Hydraulics) have been updated to add detail to the discussion of overtopping risk for the west levee.

2. Evaluate and describe the risk to areas protected by the levee on the west bank of the river due to increased likelihood of overtopping during events larger than the one percent annual exceedance flow for with-project conditions.

USACE Response: Adopted

Actions Taken: Hydraulic modeling shows a 0.5 foot increase for the 0.2% ACE flood event with project, which does not overtop the west levee. Despite the low likelihood, a

discussion of flood risk on the west bank of the levee has been added to the report. The west levee protects a few residential homes mostly along one city block. The first floor elevations are approximately at the 100-year flood level per the current modeling. The crest of the west levee is approximately one and a half feet above the first floor elevations. Breaching or overtopping failure of the west levee would result in shallow ponding depths and negligible velocities at the structures as compared to the catastrophic consequences and potential loss of life that would be involved with breaching or overtopping of the east levee. Section 3.5.2.4 of the main report and the "Superiority" and "Project Impacts" sections of Appendix E (Hydrology and Hydraulics) have been updated to include a discussion of flood risk on the west bank of the river.

3. Medium/Low Significance - There was not enough detail provided to understand how the costs for the on-site wetland mitigation project were determined, or why the off-site mitigation bank was chosen over on-site in-kind mitigation.

The comment includes four recommendations for resolution; all of which have been adopted.

1. Provide a detailed description in Appendix C of how the \$200,000 engineering and design cost for on-site mitigation was determined.

USACE Response: Adopted

Actions Taken: For initial planning level analyses, USACE typically uses available data to characterize key parameters to be used in decision making. The \$200,000 estimate for Engineering and Design was based on costs for several recently completed small restoration projects. Engineering and Design activities include: ecological assessments and planning; hydrology and environmental engineering analyses; preparing plans and specifications; preparing real estate appraisals and agreements; developing an independent government estimate for project implementation costs; and activities associated with soliciting bids and awarding the final construction contract. This detail on the activities required for Engineering and Design and the associated costs has been added to Section 4.8.4 of Appendix C (Mitigation Planning).

2. Provide a detailed cost estimate for long-term monitoring of the on-site mitigation alternative.

USACE Response: Adopted

Actions Taken: Discussion of long-term monitoring requirements was added to Section 4.8.4 of Appendix C (Mitigation Planning). The discussion clarifies that annual monitoring is included in the Operation and Maintenance activities that are estimated to have an annual cost of approximately \$2,500 per acre.

3. Provide detail for contingency funding in the event of failure of the on-site mitigation implementation.

USACE Response: Adopted

Actions Taken: Discussion has been added to Section 4.8.4 of Appendix

C (Mitigation Planning) to explain the expected activities that would be required if an on-site mitigation project were to fail.

4. Provide more detail on the rationale for the selection of the mitigation bank alternative.

USACE Response: Adopted

Actions Taken: Additional discussion of the rationale for eliminating on-site mitigation alternatives has been added to Section 4.8.5 of Appendix C (Mitigation Planning). The added text includes discussion of the increased risk of failure when a small 1.5 acre restoration project is implemented in a large area (approximately 140 acres) with low-quality habitat, along with reference to Section 3.e where this risk is discussed in more detail.

4. Medium/Low Significance - The cost for utility work may be underestimated given the construction requirements for work under active rail lines and the location of the natural gas pipeline.

The comment includes two recommendations for resolution. One was adopted and one was not adopted.

1. Contact the railroad operating on the lines in question and determine what their Requirements are for work within their ROW and how it impacts the natural gas pipeline.

USACE Response: Adopted

Action Taken: The non-Federal sponsor has initiated coordination with the owners of the railroad owners to minimize impacts to the project associated with this activity. During the design phase, USACE and the non-Federal sponsor will continue coordination with the railroad owners to determine what their requirements are for work within their right of way. The natural gas pipeline is located north of the CN Railroad tracks, but is not in the railroad right-of-way and utility coordination conducted to date has not identified any potential impacts to this utility, as documented in Section 5 of Appendix A (Civil Design).

2. Re-evaluate the cost of the utility work, accounting for the cost of railroad manpower (flagmen, signalmen, etc.) that will be required during the construction activities.

USACE Response: Not Adopted

Expected work in the railroad right of way involves sealing potential seepage pathways through the railroad ballast where the railroad crosses the levee. The seepage control will be in areas where the existing railroad ballast extends below the proposed levee crest. Because the detailed design for work in the railroad embankment has not been developed, the cost estimate was developed as a percentage of construction costs. This percentage was based on actual construction costs associated with work in railroad right-of-ways for a USACE levee project constructed in northwest Indiana. The labor required to manage traffic and avoid impacts to rail traffic are included in the traffic management cost estimate. As noted in the panel's comment, this activity was further identified as a high-

risk item in the Abbreviated Risk Analysis. This ensures that the cost contingency assigned to the project accounts for potential increases in cost resulting from this activity.

5. Medium/Low Significance - The design flow may be lower than the actual one percent exceedance flow, which would have an effect on the level of protection that can be expected from the project.

The comment includes one recommendation for resolution, which was not adopted.

1. Provide a statement indicating that although the design flows are considered to be the best available estimate, there is a significant possibility that the actual one percent flow will exceed the design flow and that the actual level of protection provided will be less than indicated in the DPR.

USACE Response: Not Adopted

Communicating uncertainties in future condition assumptions, including potential changes in precipitation that could lead to increased flood frequency, is an important part of the report documentation. Given the available information, it is appropriate to advise public about the uncertainties, but we do not have enough information to say that the probability of change is significant. Although a frequency analysis using events from 1974 to 2013 estimates higher flows for the 1% ACE flood event, these higher flows are within the 95% confidence limits for Riverside gage when evaluating the full gage record. Based on this analysis, this shift does not appear to be significant.

The potential impacts of changes in future storm frequency distribution on the level of protection is discussed in the report. As noted in the main report (see discussion of Climate Change in Section 5.1), increased flood frequency would not affect project justification – more frequent flooding would increase benefits, resulting in higher net benefits for the project – but shifts in the storm frequency distribution could ultimately change the level of protection provided by the project. The statistical uncertainties were also incorporated in the HEC-FDA model that computes the economic damages as well as the expected residual risk for the project.

6. Medium/Low Significance - The sensitivity of project performance to small differences in hydraulic model output is not described as a risk to the project.

The comment includes one recommendation for resolution, which was adopted.

1. Provide a statement acknowledging the sensitivity of level of protection provided to the hydraulic modeling results and the potential for change over time.

USACE Response: Adopted

Action Taken: Uncertainty in stages is incorporated in the HEC-FDA model and is used in the calculation of residual risk for the project. There is a high level of confidence in the model built for this study. The prior model was developed as a regional model, estimating flood stages over a large portion of the Des Plaines River (more than 48

miles), and was calibrated to gage and high water data available at the time. The study model is calibrated to six recent flood events and incorporates additional gage and flood stage data. Flood stages from April 2013 and July 2014 events were used in the calibration. The study model also includes updated channel geometry based on new surveys, replacing interpolated cross-sections used in the prior model. The prior model was calibrated in this area to flows only and did not have the benefit of stage data in the project area. The remaining uncertainty and how it is incorporated into the residual risk has been noted in the description of the recommended plan in Section 5.1 of the main report.

7. Medium/Low Significance - The analysis and discussion of residual risk does not seem to include the possibility that the levee could fail before overtopping occurs.

The comment includes two recommendations for resolution. One was adopted and one was not adopted.

1. Determine whether the values in Table 19 incorporate consideration of levee failure prior to overtopping. If they do not, revise the analysis to incorporate the possibility of this residual risk and revise the table accordingly.

USACE Response: Not Adopted

The values in Table 19 do not incorporate the risk of levee failure prior to overtopping because the model precision does not allow for display of this very low risk. For a project that meets USACE design criteria, this risk is very low. The average risk of failure for USACE levees is 0.0003. The Long Term and Residual Risk discussion in Section 5.1 of the main report has been revised to include a qualitative discussion of this risk.

2. Expand the discussion on page 32 to clarify that there is a potential for levee failure without overtopping and describing the level (qualitative is acceptable) of the risk this poses.

USACE Response: Adopted

Actions Taken: Communicating this risk is important and the report was revised to include a qualitative discussion of this risk. The discussion of benefits in Section 3.5.21 of the main report has been revised to include discussion of the possibility that a breach could occur, noting that although the risk is low, this is a residual flood risk for the community.

8. Low Significance - The structure elevation cost estimates do not appear to be consistent with the size of the structure being elevated.

The comment includes one recommendation for resolution, which has been adopted.

1. Review the data underlying the cost estimates for raising masonry residential structures and determine why the results conflict with the expected relationship between structure size and cost of raising.

USACE Response: Adopted

Action Taken: The identified discrepancy was a result of an error in the calculations conducted to estimate elevation costs for the 850 SF single story masonry structure. This error was corrected. The non-structural plan was reanalyzed with this corrected data. The cost only applies to a small number of structures and resulted in a change of less than \$1,000,000 in the total plan cost (over \$50,000,000). The updated results did not affect plan selection or justification.

9. Low Significance: - The Economic Appendix does not clearly explain whether the Fair Market Value (FMV) for commercial and industrial properties includes the land on which the facility sits, and whether the FMV accounts for depreciation.

The comment includes two recommendations for resolution, both of which have been adopted.

1. Add text to Appendix D explaining whether the FMV of commercial and industrial properties includes land values.

USACE Response: Adopted

Actions Taken: For all categories of structures, the Cook County Assessor provides a data table that includes a column for each the land value, improvement or structure value, and the total value (summation of land and structure). The statement noting that Cook County Assessor data used in the analysis excludes land values in Section 2.2 of Appendix D (Economic Analysis) was clarified to note that this applies to commercial and industrial as well as residential structures.

2. Clarify in Appendix D whether the FMV reflects the depreciation of commercial and industrial structures.

USACE Response: Adopted

Actions Taken: The county assessor uses structure valuation methods that are similar to those used by USACE to estimate depreciated replacement values. The residential values from the assessor seemed to be overstating the depreciation (based on recent USACE Marshall and Swift estimates), while there was not a similar relationship for the commercial and industrial structures. For this reason, it was determined that the county provided depreciated replacement value for commercial and industrial structures was the best available data. Language was added to Section 2.2 of Appendix D (Economic Analysis) to explain that commercial and industrial structure values provided by the Assessor's Office reflect the depreciated value.

10. Low Significance - The benefits of the project may be underestimated because the continued degradation of the levee over time does not appear to have been reflected in Plan 0 - No Action.

The comment includes one recommendation for resolution, which was not adopted.

1. Account for the continued deterioration of the levee as part of Plan 0 - No Action and recalculate without project average annual damages accordingly.

USACE Response: Not Adopted

Because the study recommendation is not likely to change as a result of the updated analysis, the additional data collection and analysis required to characterize future fragility is not warranted. It is most likely that further deterioration of the levee would result from periodic floods interacting with the levee and changes in the vegetation and other encroachments on the levee. The estimated levee fragility is based on existing condition data, collected since 2011. Although the frequency of flooding can be predicted, no data has been collected to support quantifying the impact of each flood event on seepage. For encroachments, it is likely that trees could die and subsequently fall, removing a portion of the levee with the root ball. However, the condition of the trees and the likelihood of this occurrence is unknown. Sections 3.3.1 and 3.5.2.1 of the report were updated to clarify that further degradation of the levee was not quantified.

11. Low Significance - Several potential benefits do not appear to have been considered during the alternatives analysis, specifically, indirect riverine/riparian ecosystem restoration, off-site flood stage reduction, increased property values, and recreational benefits.

The comment includes four recommendations for resolution. Three have been adopted and one was not adopted.

1. Qualitatively describe auxiliary ecosystem restoration benefits that might be expected from the various alternatives, specifically Plan 2.

USACE Response: Not Adopted

Although some of the alternative plans may provide some ecological benefits once the existing levee fails at some point in the future, the study objectives are focused on flood risk rather than degraded ecosystems. The ecological impacts of the recommended plan have been evaluated as part of the environmental assessment. Additional evaluation of ecological impacts is beyond the scope of the study.

2. Evaluate and present the expected flood stage reductions upstream, downstream, and across the river for Plans 2 and 3.

USACE Response: Adopted

Action Taken: A qualitative discussion of the potential impacts of reduced flood stages from Alternatives 2 and 3 has been added to Appendix D, Section 7.4 and referenced in the main report. Alternative 2, the set-back levee would provide additional floodplain storage, but only after the existing levee project eventually breaches. This future storage would provide some benefit, but would not have optimized inflow or outflow, providing only a small amount of stage reductions. Alternative 3, the by-pass spillway, would only be activated during extreme flood events (approximately 0.2% ACE). Modeling completed for Alternative 3 showed that the flood stage for this extreme flood event would be reduced by approximately 0.3 feet in the project area. The benefits associated with this stage reduction would be highest in the immediate project area, with smaller

stage reductions outside the project area. These benefits are also included in the economic analysis presented in Section 3.5.2.1.

3. Reconsider the assumption that property values remain unchanged; consider whether regional property values would be expected to benefit from the reduced incidence of flooding.

USACE Response: Adopted

Action to be Taken: A qualitative discussion about potential property value impacts will be added to the environmental assessment. Note that, while the property values may increase due to a more reliable levee, this effect is categorized as a Regional Economic Development (RED) impact. USACE policy requires that project justification calculations use National Economic Development (NED) benefits such as the Depreciated Replacement Values (DRVs). DRVs minimize the effect of market fluctuations over time by focusing on the cost of replacing the home in its current condition.

4. Describe whether increased recreational use is expected from any or all of the alternatives.

USACE Response: Adopted

Action Taken: A qualitative discussion of likely impacts of the recommended plan on recreation resources in the area has been added to the environmental assessment. The recommended plan would have minimal impacts on recreation resources as the project avoids the existing picnic groves and shelters and an existing trail runs parallel to the proposed project along the west bank of the Des Plaines.

12. Low Significance - The data forms in the wetland delineation reports in Appendix C are missing information, and there are inconsistencies in the evaluation of the raw data.

The comment includes two recommendations for resolution. One was adopted and one was not adopted.

1. Review, complete, and revise the wetland delineation data forms.

USACE Response: Not Adopted

The wetland delineation was conducted by a consultant prior to the start of a Feasibility Study, but the site was visited by Chicago District staff to verify the conclusions and establish the existing conditions documented in the environmental assessment. Although there is some missing information and inconsistencies in the wetland delineation reports, the data provided is sufficient to draw conclusions about the status of the delineated areas and the habitat quality. This level of detail is sufficient for evaluating wetland impacts and mitigation alternatives.

2. Ensure future field data recording and wetland delineation data forms document the

sampling locations in case field notes and raw data have to be revisited.

USACE Response: Adopted

Action to be Taken: Identifying the data collection gaps provides an opportunity to evaluate the quality assurance procedures and prevent similar omissions in the future, improving the quality of future delineation efforts.

13.. Low Significance - The process by which mitigation alternative B3 was selected is not clearly described.

The comment includes one recommendation for resolution, which was adopted.

1. In Appendix C, Section 4.8.5, provide more information on the rationale for selecting mitigation alternative B3 even though it is less cost effective than B1.

USACE Response: Adopted

Action Taken: Additional discussion has been added to Section 4.8.5 of Appendix C to describe the CE/ICA procedure and definitions as outlined in ER 1105-2-100 Paragraph E-36 and the plan selection process. Both plans B1 and B3 are “cost-effective” (no other identified alternative provides the same or greater outputs for less cost) and the incremental cost analysis used to select B3 over B1 looked at the increment in output provided by the increment in cost. This analysis evaluates each incremental unit cost in the identified “best buy” plans (a sub-set of cost-effective plans that provide the greatest increase in output for the lowest increase in cost). As shown in Figure 2 of Appendix C, Plan B1 provides 1.8 Average Annual Habitat Units (AAHU) at an annualized cost of approximately \$1,100 per habitat unit. Plan B3 provides 3.5 additional AAHU at an annualized cost of approximately \$1,400 per habitat unit. The benefits provided by Plan B3 are justified because the additional cost per habitat unit provides a significant increase in benefits and because the proposed mitigation would be aligned with mitigation recommendations by the Chicago District Regulatory Branch for out-of-kind substituted habitat.