

Final Compiled Comments and Responses
on the
IEPR of the Melvin Price Wood River LRR

Final Comment-Response Record

Comment 1:

The performance metrics and alternative screening process are not presented in sufficient detail to justify the selection of the recommended plan.

Basis for Comment:

The plan formulation process did not include an appropriate diversity of alternatives to demonstrate that the least cost, environmentally acceptable and economically justified alternative was selected. The Melvin Price Wood River Underseepage Limited Reevaluation Report and Environmental Assessment on Design Deficiency Corrections (Melvin Price LRR and EA) (Section 5.6.1.1) contains a discussion of four primary alternatives including a fully-penetrating barrier wall, seepage berms, relief wells, and a single hybrid alternative seepage berm-relief wells. The LRR does not include an evaluation of other potential hybrid alternatives such as the barrier wall-seepage berm or barrier wall-relief well combinations. Therefore, based upon the information presented in the LRR, the Panel concludes that the recommended plan cannot be justified. The Panel understands that schedule constraints may require that further alternative optimizations occur during the Preconstruction, Engineering, and Design (PED) phase of the project.

In addition, the four alternatives that were developed were not all evaluated to the same level of detail. For example, the relief well alternative was not carried forward to the full cost analysis due to concerns regarding required close well spacing (Appendix A and Appendix E). The Panel agrees that a spacing of less than 50 feet for the relief well alternative may be excessive and, in fact, may result in a lesser outcome for this alternative. However, when considered in a hybridized system, relief well spacing of 50 to 100 feet may be feasible and cost effective. This projected spacing is consistent with some of the previous modeling completed by the St. Louis District for the relief well only alternative. In order to compare all alternatives side-by-side, each must have a similar level of analysis completed, including full cost estimates.

The performance metrics used to screen alternatives are not clearly defined and their use is not well documented. Metrics such as cost, exit gradient, and uplift pressures are mentioned in Appendix A (Section 1, paragraphs C, and E) but the cutoff wall alternative is not included. The Panel assumes that performance metrics were established and compared/contrasted for each alternative; however, these evaluations are not presented in the LRR nor completely detailed in Appendix A. For instance, information given in Appendix A (Sections 1 through 4) could be used to develop performance metrics to distinguish the alternatives. The Panel's understanding regarding the impetus for the recommended plan is that the barrier wall alternative is reliable and can be implemented quickly, thereby providing more efficient risk reduction for the levee system. Considerations including alternative reliability, implementation time, and risk reduction are all important metrics and the Panel agrees that these may in fact be more important than cost. Additional discussion of these metrics would provide further clarity in the LRR and provide better support for alternative selection.

Significance – High:

The selection of the recommended plan is not supported by the alternative analysis process.

Recommendations for Resolution:

1. Complete the alternative analysis with a full array of hybrid alternatives. Since hybrid alternatives may be considered part of design optimization, the Panel believes that this evaluation could be completed during PED phase if schedule constraints preclude full alternative reassessment as part of a revision to the LRR under review by the Panel. Ensure that each alternative is evaluated using the same level of detail and completeness.
2. Develop a complete set of performance metrics to differentiate the alternatives and include this in the Appendices A and E.
3. Provide further details on the performance metrics that were used for the selection of the recommended plan. If further alternative reassessment is completed, use the same performance metrics to evaluate any new hybrid alternatives.

Final USACE Evaluator Response #1

CONCUR. While the specific performance criteria may have been well defined, USACE concedes that the performance metrics and alternative screening process may not have been presented in sufficient detail.

1. **ADOPT.** The IEPR Panel made it clear that they were referring to additional hybrid alternatives among segments of the reach. The PDT does acknowledge that some additional alternatives between segments of the reach could be considered (e.g. use a cutoff wall for one segment and a relief well-berm hybrid for another segment). Every effort will be made to evaluate these alternatives and incorporate them into the final LRR.
2. **ADOPT.**
3. **ADOPT.** Recommendations 2 and 3 will be adopted. The Project Manager will consolidate the performance metrics into one complete set and include it as an additional Appendix. Included in this Appendix will be further details on the performance metrics and the rationale for their order of importance. Furthermore, the alternatives and any new hybrid alternatives will be assessed in accordance with the metrics.

Final Panel BackCheck Response #1

Concur.

Comment 2:

Improvement of the Seep/W model analysis can be achieved through application of transient calibration and through improved linkages to other models used in the study.

Basis for Comment:

The seepage modeling using the two-dimensional code Seep/W model evaluated a variety of cases (e.g., different sections, different geometries), boundary conditions, and possible remedial alternatives, but relied exclusively on steady-state flow conditions. Based upon trends that are evident in the piezometer and river pool hydrographs discussed in Appendix A, it is apparent that transient flow conditions generally prevail. Therefore, the Panel recommends that the seepage model be calibrated under transient conditions. Including transient seepage conditions would lead to an improved model capable of further optimizing the remedial alternatives and evaluation of environmental effects to adjacent wetlands/forests including changes in groundwater base flow that could affect wetland hydroperiod.

In addition to transient calibration issues, the Seep/W modeling has not been entirely integrated or linked with other numerical models used for project assessment and evaluation. The analysis of the Seep/W model does not include linkage with the Hydraulic Engineering Center River Analysis System (HEC-RAS) modeling described in the hydrologic section of Appendix A. The Panel recognizes this appears to be an oversight, as the ponding conditions modeled by HEC-RAS are actually one of the two primary boundary conditions for the Seep/W model. Similarly, there is not a clear linkage to the possible environmental effects of the various alternatives. It is clear to the Panel that seepage provides one source of water to the wetland systems present and may be an important regulator of the wetland hydroperiod. A transient Seep/W model would enable the U.S. Army Corps of Engineers (USACE) to more completely assess the possible impacts to wetlands as it relates to the recommended plan or other project alternatives. Lastly, the Seep/W water level results could be useful input to link to habitat assessment models used by USACE biologists.

Significance – Medium:

It is important to recalibrate the Seep/W model to ensure a robust analysis can be used to evaluate both engineering seepage concerns and environmental effects.

Recommendations for Resolution:

1. Recalibrate the Seep/W model using abundant transient data available.
2. When evaluating alternatives, ensure that boundary conditions related to landside ponding is consistent with results shown for HEC-RAS.
3. Export water levels from Seep/W model for input into habitat assessment models or for further consideration by USACE biologists in regard to wetland evaluations.

Final USACE Evaluator Response #2

CONCUR . The PDT agrees that the Seep/W model analysis would improve through the application of transient calibration and through improved linkages to other models used in the study.

1. **NOT ADOPT.** The piezometric data indicates that changes in Mississippi River level or changes in the landside ponding elevation immediately impact the piezometric levels in the confined aquifer. Additionally, calibration analyses to date have been done during those times when the Melvin Price Pool and the landside ponding have remained constant. This is appropriate for this design. Adding transient data, while improving the Seep/W model, will not add significant value to justify the additional cost (relative to the limited budget available for the LRR) and the time required (relative to the milestone date for report submission).
2. **ADOPT.** This has been accomplished manually. The assumptions made by the Geotechnical engineer about the landside ponding elevations were manually/verbally coordinated with the project hydraulics engineer. The project Geotechnical engineer also provided the computed underseepage flow rates and relief well flow rates to the project hydraulic engineer.
3. **ADOPT in FUTURE.** Exported water levels from Seep/W models will be incorporated into a revised Environmental Assessment (EA) to be submitted on behalf of the LRR. The current report reflects manual/verbal coordination between the project's Geotechnical engineer and environmentalist on the seepage flow rates expected to occur for each of the considered alternatives. The team will take advantage of opportunities to digitally link the various numeric models as that capability becomes available. ("ADOPT in FUTURE" indicates that the PDT agrees with the recommendation, but is not confident that the task can be completed in time for incorporation into the final LRR. "ADOPT", on the other hand, indicates that the PDT agrees with the recommendation and will make a strong effort to incorporate the recommendation into the Final LRR before submission to higher authority.)

Final Panel BackCheck Response #2

Concur.

Comment 3:

The risk analysis is inconsistent with USACE guidance addressing Risk-Based Analysis for Flood Damage Reduction Studies and with observed levee seepage conditions and analyses.

Basis for Comment:

The risk analysis presented in Appendix B (Section 5, Analysis of the Underseepage Project) relates surface water level in the river to probability of levee failure. The section presents Probability of Unsatisfactory Performance (PUP); however, the specific details of this analysis are not described. The risk analysis results do not correlate with observed seepage conditions at various river stages, nor are they supported by a discussion of the seepage analyses and specific seepage gradient and levee/seepage blanket uplift pressure criteria. It appears that the PUP analyses may have been adapted from the general assessment of the overall Wood River Levee system and it is not clear if these PUPs are meant to be specific to the Mel Price Wood River project area.

EM 1110-2-1619, Risk-Based Analysis for Flood Damage Reduction Studies, defines risk outputs in terms of Annual Exceedance Probability (AEP) and Condition Annual Non-exceedance Probability (CNP). The PUP terminology is not defined in this guidance document; however, this terminology is used in other USACE guidelines including the Expert-Opinion Elicitation of Probabilities and Consequences for Corps Facilities (January 2001). It is the Panel's opinion that the AEPs and CNPs should be computed for the without project condition and the alternatives considering the design flood elevation, as well as lesser exterior stage water levels in accordance with the guidance provided in EM 1110-2-1619. Furthermore, the risk analysis and calculation of PUPs and CNPs are engineering-based analyses, and as such would be more appropriate in the Engineering Appendix instead of the Economics Appendix where they currently are presented.

The LRR also assumes that all the alternatives will provide the same or similar probabilities of satisfactory performance, yet does not provide discussion, rationale or evidence to support the assumption. The Panel suggests that the evaluation of AEPs and CNPs be applied to all the alternatives.

The exterior stage river water levels presented in Tables 3 and 4 of Appendix B are not consistent with the water levels described in the LRR in Section 5.1.3.2, Underseepage and Sand Boils, or Section 5.1.4.4, Hydrologic and Hydraulic Conditions. These inconsistencies are also present in Appendix A regarding the discussion and analyses in Section A5, Discovery of Uncontrolled Seepage and Sand Boils, as well as the maximum pool elevations used in the geotechnical seepage analyses described in Sections B5 and B6, Geotechnical Seepage Analyses and Model Calibration, respectively.

The LRR and Appendix A indicate that heavy seepage with sand movement was observed at the normal pool elevation of 419 feet and landside ponding at 402.9 feet. Additionally, active sand boils were observed when the river elevation was at 421.93 feet and landside ponding at 409 feet. These observations, as evidenced by sand boils, suggest levee failure due to internal erosion is dependent on the landside ponding and will be initiated at a river level somewhere between elevation 419 feet and 422 feet.

Accordingly, the PUP should then be approximately 1.0 for this range of river levels. However, Table 2 presents PUP values for “Exterior Stage” river water levels that vary from 0.0 (at elevation 432.0 feet) to 1.0 (at elevation 443.8 feet). Table 3 suggests that underseepage will not cause levee failure until the water levels reach the maximum design flood profile of about elevation 443 feet. This elevation is 23 feet higher than observed water levels, indicating levee distress, and significantly understating the probability of unsatisfactory performance.

Significance – Medium:

The river water levels used in the risk analysis are not consistent with observed seepage conditions and the terms used to describe risk are not consistent with USACE guidelines. These inconsistencies affects the completeness of the report in describing the without project condition, and in addressing the benefits of the various alternatives.

Recommendations for Resolution:

1. Evaluate the probable levee performance for the existing condition, and all alternatives in terms of AEPs and CNPs associated with levee underseepage for the appropriate range of river water level as described in EM 1110-2-1619, Risk-Based Analysis for Flood Damage Reduction Studies.
2. Relate the computed AEPs and CNPs to observed seepage conditions at various river water levels.
3. Provide seepage analysis results that corroborate performance consistent with USACE Engineer Technical Letter (ETL) 1110-2-556 for Risk-Based Analysis in Geotechnical Engineering for Support of Planning Studies.
4. Provide justification for the assumptions that risk levels for all three alternatives will be virtually the same.

Final USACE Evaluator Response #3

CONCUR. The PDT believes the risk analysis was consistent with USACE guidance and addressed Risk-Based Analysis for Flood Damage Reduction Studies; but agrees to confirm the language and guidance are consistent throughout the LRR.

1. **ADOPT.** Although the PDT is confident that the risk analysis was consistent with its interpretation of USACE guidance, the PDT will confer with division experts and ensure the LRR is evaluating the probable levee performance for the existing condition using the terms and the appropriate range of river water levels as described in EM 1110-2-1619.
2. **ADOPT.** The PDT will review the LRR to ensure the observed seepage conditions at various river water levels are properly related to the AEP and CNP calculations.
3. **ADOPT in FUTURE.**
4. **ADOPT.** Per USACE guidance, properly designed and maintained levee system alternatives provide the same degree of safety. It's on this basis that the PDT assumed that the risk levels for all alternatives will be virtually the same. Regardless, a definition of PUP as it is used within the LRR as well as how the risk is communicated will be included in the final LRR.

Final Panel BackCheck Response #3

Concur.

Comment 4:
The project purpose and objectives are not defined clearly and have not been integrated consistently into the plan formulation process.
Basis for Comment:
<p>The LRR states that the project purpose is to correct an underseepage design deficiency and that the main objective is to restore operational functionality of the levee (Section 5.4). However, the supporting objectives, both stated and implied, are not consistently presented and measurements of their success are not defined. For example:</p> <ul style="list-style-type: none"> • An objective of urgency is stated in Section 5.4, but the timeline is not defined. • An objective of high reliability is implied in Section 5.4.1; however, an acceptable level of risk of failure is not defined. • Appendix C, Section 1.4 states that Federal Emergency Management Agency (FEMA) certification is a project objective; however, this is not presented as an objective in the main report. <p>In order to attain the main objective, the LRR defines and evaluates four alternative plans. The Panel has found that criteria used to compare the alternatives are described inconsistently within the LRR.</p> <ul style="list-style-type: none"> • Section 5.4 cites the criteria as least cost, environmentally acceptable, and economically justified; • Section 5.6 cites the criteria as reasonableness, efficiency, and effectiveness; and • Section 5.6.1.1 presents engineering experience, cost effectiveness, and efficiency as the stated criteria. <p>It is the Panels' opinion that consolidating the objectives and their corresponding measurements of success and the alternatives and their criteria for comparison would strengthen the selection of the recommended plan.</p>
Significance – Medium:
By defining success measurements for the project objectives and by using consistent criteria for alternative comparison, the alternative analysis will be more complete.
Recommendations for Resolution:
<ol style="list-style-type: none"> 1. State the criteria used to measure the success of the objectives in Section 5.4 of the LRR. 2. Summarize the results in Section 5.6 of the LRR to distinguish the alternatives. 3. Edit the LRR to provide consistent terminology when comparing the alternatives.
Final USACE Evaluator Response #4

CONCUR. USACE will review the LRR and ensure the project purpose and its supporting objectives, stated and implied, are better defined and consistently presented.

1. **ADOPT.** Section 5 will be rewritten to include criteria to measure the success of the objectives.
2. **ADOPT.** Section 5.6 will be rewritten to include a summary of the results to distinguish the alternatives.
3. **ADOPT.** The entire LRR will be edited by the Project Manager to ensure terminology is consistent, particularly when comparing alternatives.

Final Panel BackCheck Response #4

Concur.

Comment 5:

The potential direct and indirect impacts on aquatic resources, water quality, subsurface soil, and groundwater cannot be determined using the data provided in the Environmental Assessment.

Basis for Comment:

The Environmental Assessment (EA) presented in Appendix C does not provide a detailed description of potential impacts to aquatic resources, including emergent wetlands, wet bottomland forest, scrub-shrub wetland habitat and shallow ponded water. The Panel believes that the acreages of these areas should be provided in order to assess the magnitude/severity of potential environmental effects of implementation of the recommended plan. Since the current conditions are only minimally described, it is difficult to predict the project impacts on these resources. For example, a formal wetland delineation report, a listed species report, Phase I and Phase II Environmental Site Assessments, and a general biological assessment of the project area were not provided. In turn, without understanding the scope and extent of impacts to aquatic resources, it is difficult to determine appropriate mitigation.

The EA discusses documented impacts to the environment that have resulted from preliminary work along the levee system, including 0.5-acre of non-woody wetlands that have been adversely affected. In addition, the EA states that approximately 20-30 acres of wet bottomland forest are currently showing symptoms of a hydroperiod change and will be adversely affected within 4-5 years. Scrub-shrub habitat is currently stressed by prolonged inundation, and may be adversely affected in the near future. These impacts have not been addressed in a mitigation plan nor are mitigation costs addressed in the project budget.

The EA discusses the potential for subsurface soil and groundwater contamination in the project area, but does not map the locations of these potential contaminants. Therefore, it is difficult for the Panel to determine the distance of these known contaminated areas from the project site. The EA does not discuss a plan for mitigating subsurface soil and groundwater contamination should it be encountered during construction activities nor does it discuss a plan for determining the level and extent of contamination.

Significance – Medium:

Addressing both known and potential environmental impacts of the project will enable the calculation of an accurate budget and schedule for mitigating direct and indirect losses.

Recommendations for Resolution:

1. Provide a wetland mitigation plan, budget estimate and schedule for compensation of foreseeable wetland losses.
2. Provide a plan for determining the level and extent of potential contamination, including a contingency plan in the event contaminants are encountered during the construction process.

Final USACE Evaluator Response #5

CONCUR. Due to time constraints, the EA data available for the IEPR panel was less than desired and agreeably weak in some areas. Consequently, the impacts may not have been well enough defined, but the EA did contain sufficient information to identify potential direct and indirect impacts. Additional information (which we believe will be sufficient) will be included in the revised EA.

1. **ADOPT.** The PDT will revise the EA prior to public review. A wetland mitigation plan, budget estimate, and schedule for compensation will be included in the revised EA.
2. **PARTIAL ADOPT.** A plan will not be provided for determining the level and extent of potential contamination. The potential exists that contaminants could be found during any construction project; however, the PDT believes the potential is low on the assumption that IF there were contaminants, they would be located in the upper regions of the impacted area and there's little potential for them to migrate to distance to the river. Nonetheless, it's MVS' standard operating procedure to include a contingency plan in the event contaminants are encountered during the construction process.

Final Panel BackCheck Response #5

Concur.

Comment 6:

The socioeconomic conditions are not adequately addressed to understand the impacts associated with this project.

Basis for Comment:

The Panel believes that the discussion and analysis of the socioeconomic conditions should be expanded to include the following:

1. The LRR does not focus on the floodplain being protected by the upper portion of the Wood River Levee system. There is information presented concerning the relative economic conditions of the residents currently protected by both portions of the levee system, yet there are no residential structures extant behind this portion of the levee system. The LRR alludes to future growth potential for oil refining and other manufacturing and/or service industry activity, but does not provide any location information to verify that this growth would actually occur behind this portion of the levee system.
2. The depth versus percent damage relationships for commercial properties were extracted from information used in the analyses from recent damage in the New Orleans area. The Panel agrees that the mix of commercial properties may be similar to that of the New Orleans area; however, these relationships may also contain consideration of items which are unique to the New Orleans area and not to this project, such as consideration for biological and/or chemical contamination (mold, mildew, oil/gas/grease), or the length of time before any clean-up can commence.
3. The Panel agrees that the types of data used in the HEC-FDA model are appropriate; however, the discussion of these data do not include information relative to the stage versus frequency data, specifically how that data were adjusted for geography or topography. Additionally, the report does not define the three reaches into which the study area was divided, and the Panel is unable to verify that the LRR is concerned with only the upper portion of the levee system.
4. The LRR indicates that the failure of the upper portion of the levee system would constitute significant potential for the failure of lower portion of the levee system as well as other levee systems downstream, but does not provide any evidence that such would actually occur. The LRR speculates that failure could impact commercial navigation without providing any rationale that this would or could occur, or any information concerning the sequence of events that must occur prior to such impacts becoming a reality.
5. The computations of interest during construction are generally correct, but a monthly convention seems to indicate a degree of certainty of construction expenditures which may not be achievable.

Significance – Medium:

It cannot be verified that the reduction in damages from the implementation of the recommended plan, the impacts that may result from levee failure, or the description of the economic activity forecasts are specific to the project floodplain.

Recommendations for Resolution:

1. Focus solely on the floodplain for this project area. Information extracted from prior reports should be specific to this project.
2. Confirm that the depth versus damage relationships for commercial property are completely appropriate for this floodplain and do not contain considerations for the extent of potential damages from conditions that do not exist in this floodplain.
3. Document that the extent of potential future economic activity is that which may occur in this floodplain and not in neighboring areas.
4. Provide the rationale and physical evidence that catastrophic impacts could occur as a direct result of levee failure.
5. Compute interest during construction based on realistic assumptions with respect to the uncertainties inherent in the construction schedule as determined in the MCACES cost estimate.

Final USACE Evaluator Response #6

CONCUR. The PDT believes the socioeconomic conditions were adequately addressed; however, the PDT may not have made it clear that actual damages/benefits were for the upper portion of the Wood River levee system only. As a result, the entire LRR, particularly the portions pertinent to the socioeconomic conditions, will be reviewed and rewritten to ensure that it is the upper portion of the Wood River levee that is the obvious focus of the report.

1. **ADOPT.** See above.
2. **ADOPT.** The PDT will look into this and correct the LRR where necessary.
3. **ADOPT.** The PDT is confident that this has already been done in the LRR.
4. **ADOPT.** The Project Manager, in collaboration with Hydrologic & Hydraulics Branch, will include in the LRR information additional information regarding a potential for failure of a lower portion of the levee system. Additionally, information concerning the impact on commercial navigation will be included.
5. **ADOPT.** The PDT's economics and cost estimate personnel will collaborate to ensure the computed interest during construction is in line with the MCACES cost estimate.

Final Panel BackCheck Response #6

Concur.

Comment 7:

The LRR does not include a compensation plan or budget for potential environmental impacts that cannot be avoided or minimized.

Basis for Comment:

Compensation for environmental effects is an integral part of the National Environmental Policy Act (NEPA) process. NEPA, as well as other state and federal regulations, requires that the issues of avoidance, minimization and mitigation of effects on natural resources be addressed for all foreseeable impacts. In addition to discussing the specific environmental effects that will or may occur as a result of implementation of the recommended plan, a detailed discussion describing how, when, and where compensatory mitigation for these effects will be undertaken. Mitigation has a cost. The cost should be included in the project budget. For example, Page C-62, last sentence of third paragraph of the EA (Appendix C) indicates that tree seedlings will be planted throughout a 20-30 acre wet bottomland forest that is currently expected to be adversely affected in the next 4 to 5 years. This only addresses one area that is currently being adversely affected by construction activities in the project area.

Once the recommended plan is implemented, there will be additional environmental effects on natural resources on the land side of the levee system. These potential deleterious effects have been mentioned but not described fully. Compensation for any losses that are likely to occur should be determined and described, in terms of both a mitigation plan and a budget.

On Page C-59 of the EA (Appendix C) states that 42 trees were cleared in April 2010, including one large, hollow cottonwood. There is no mention of compensation for the loss of trees or adhering to conditions of the Migratory Bird Act. In addition, there is no compensation plan or budget line item for such adverse effects.

Page C-60 of the EA (Appendix C) states that as early as October 2010, effects on vegetation have been noted in scrub-shrub and wet bottomland forest wetlands. It appears that these stress conditions will continue for approximately 4-5 years and during that time it is reasonable to assume that these vegetation communities will be adversely affected. A mitigation plan and budget were not included as part of the discussion of these likely losses.

Significance – Medium:

A more complete discussion of likely adverse environmental effects on aquatic resources and forested areas will more fully address the requirements of NEPA. In addition, compensatory mitigation, including cost estimates, would add strength to the analysis.

Recommendations for Resolution:

1. Include a qualitative discussion of aquatic and forested areas that have been and are likely to be adversely affected to the LRR and the EA.
2. Include line item cost estimates in the budget for compensatory mitigation.

Final USACE Evaluator Response #7

CONCUR. As discussed in Comment #5, the EA portion of the LRR will be revised prior to public review.

1. **ADOPT.** The revised EA will include a qualitative discussion of aquatic and forested areas that have been and are likely to be adversely affected.
2. **ADOPT.** The revised project cost estimate will include line item cost estimates for compensatory mitigation.

Final Panel BackCheck Response #7

Concur.

Comment 8:

The long-term performance of the alternatives considered is not discussed in sufficient detail to determine the risk reduction.

Basis for Comment:

In the Economics Appendix, a note is provided stating that the alternatives are designed to provide the same level of protection. However, the evidence is not provided to support this statement or the idea that the design factors that contribute to the success of each alternative have been adequately considered in order to achieve identical results.

There is no discussion of the risks associated with the construction of a deep slurry cutoff wall, only a listing on the detailed risk register. It is probable that difficulties with the construction will impact the length of the construction schedule and/or contractor claims.

For an urban levee that approaches a standard project flood (SPF) level of protection (approximately 700-year level of protection), residual damages on the order of 20% seem very large. The LRR does not provide any inundation mapping or an explanation to support this percentage.

The LRR states that the probability of unsatisfactory performance of the levee would increase over time in the absence of a design deficiency correction. The Panel agrees that this is most probably the case, but no explanation is provided for the lack of analysis of this condition.

In the Economics Appendix, there is a general discussion of the derivation of the probabilities of unsatisfactory performance, without and with project, as well as the conditional probability of design non-exceedance. Tables 3, 4, and 5 present these data in an inconsistent manner using pool elevation in the first two instances and frequency in the last instance. There is no consistent correlation provided for pool elevation and frequency recurrence to verify the accuracy of the data presented. There is no explanation of the differences between the probability of unsatisfactory performance of the with project condition and the conditional probability of design non-exceedance.

Significance – Medium:

Without a complete discussion of the risks and uncertainties associated with the long-term performance of the alternatives considered, it is not possible to verify the technical adequacy of the analyses nor to confirm that the recommended plan is the most economical and/or least costly alternative.

Recommendations for Resolution:

1. Provide evidence that the level of protection and/or the performance of each alternative is identical or, if not, provide the appropriate analyses of the different degrees of success.
2. Provide adequate and appropriate consideration of the construction risks related to the slurry wall depth in both the construction schedule and cost estimate.
3. Present the rationale and analyses to support the estimate of residual damages.
4. Provide the assumptions, methodology, and calculations utilized to estimate the probability of unsatisfactory performance of the levee with respect to time or provide an explanation as to why the calculations are not performed.
5. Provide a consistent presentation of the data relative to the performance statistics.

Final USACE Evaluator Response #8

CONCUR. The LRR will incorporate the recommendations.

1. **ADOPT.** Per USACE guidance, the level of protection of each alternative is assumed equal on the assumption that the designs are proper and systems are properly maintained. Nonetheless, the final LRR will include an explanation clarifying why Level of Performance and Performance Standard are considered equal among our choices.
2. **ADOPT.** This recommendation is believed to have already been completed in the new CSRA report that was provided.
3. **ADOPT.** Information will be included in the LRR to support the estimate of residual damages relative to the industry affected.
4. **ADOPT.** In conjunction with Recommendation #3, the additional information regarding the probability of unsatisfactory performance of the levee with respect to time will be included in the LRR.
5. **ADOPT.** Tables 3, 4, and 5 will be updated to provide a consistent presentation of the data relative to the performance statistics; however, the data will be within pool elevations.

Final Panel BackCheck Response #8

Concur.

The Panel understands that the level of protection is equal for each alternative. The Panel believes that the probability for satisfactory performance is not equal for each alternative. Since the cutoff wall alternative has the greatest net benefits, however reducing the average annual benefits for the other two alternatives by reducing their probabilities of satisfactory performance would not alter the selection of the NED plan.

While reporting on residual damages/risks has become somewhat more important than in the past, great care must be exercised to not report any proprietary information that was obtained in confidence.

Comment 9:

The recommended plan does not include instrumentation and wetland mitigation costs and the LRR does not include a project schedule to support the Total Project Cost Summary.

Basis for Comment:

The Panel believes the report and appendices will benefit from describing the construction methods, estimate assumptions, and project schedule as guided by USACE ER 1110-2-1302 and ETL 1110-2-573 for feasibility phase level estimates. More detail is provided in the Micro-Computer Aided Cost Estimating System (MCACES) regarding production rates, construction methods, and design data than is evident in the LRR and appendices. By including information from MCACES, questions that arise from the current incompleteness of the report and appendices will be clarified.

Appendix E lacks discussion of the assumptions used to backup the Government Estimate Work Sheets and MCACES estimate. Furthermore, a representative construction schedule that supports the Total Project Cost Summary (TPCS) and the Cost and Schedule Risk Analysis (CSRA) is missing. The following were also noted by the Panel:

- In review of the benefit and cost analysis in Appendix B, paragraph 06 and the Government Estimate Work Sheets and TPCS of Appendix E, it was unclear how the operation and maintenance (O&M) costs were developed.
- The adaptive management of wetlands and instrumentation costs associated with the selected alternative should be part of the comparative costs.

Section 8 of the LRR report contains blank tables (8-1 and 8-2) and text to be added once the Cost Engineering Appendix E is complete. It is difficult to determine what has been considered and appropriately accounted for without narratives describing the assumptions of needs for additional technical/design data, uncertainty of construction methods, and costs beyond construction completion.

For example, it was noted by the Panel in review of the Seep/W groundwater model in Appendix A, that additional piezometers at varying elevations would benefit the robustness of the model by improving accuracy of calibration and understanding of boundary conditions as well providing additional surveillance capability to monitor the performance of the slurry wall after construction. Although the MCACES estimate in Appendix E includes costs for 11 new relief wells, it does not provide narrative regarding costs of monitoring or maintenance after construction.

In review of the LRR Section 8, the Panel recognizes that the implementation schedule is tentative at best. However in consideration of schedule, the Panel noted that descriptions of construction methods in Appendix A, Section 2, Section E were general in nature. The descriptions provided in Section E6 alluding to deep wall depths and global stability concerns are not commensurate with the CSRA where the detailed risk register categorizes technical risk TL-1 at marginal and low and construction risk CON-1 at negligible and low for impact and risk level, respectively. The general descriptions in Appendix A suggest uncertainty and the

low risk levels in the detailed risk register suggest certainty.

Significance – Medium:

Satisfying the requirements of ER 1110-2-1302 and ETL 1110-2-573 will improve the understanding and completeness of the comparative cost estimates, TPCS, MCACES, and CSRA.

Recommendations for Resolution:

1. Include information in the text placeholders and Tables 8.1 and 8.2 of Section 8 in the LRR.
2. Include a project schedule in Appendix E.
3. Include further narrative discussion regarding the method of construction and estimate assumptions described in Appendix E.
4. In Appendix B paragraph 06, elaborate on the O&M computations used in the referenced LRR.
5. Provide agreement between the discussion in Appendix A, Section 2, paragraph E, p. A-47 regarding construction methods and concerns and the Detailed Risk Register in Appendix E for risk events TL-1 and CON-1.

Final USACE Evaluator Response #9

CONCUR. The PDT agreed that Appendices A, E, and section 8 could be rewritten by the Project Manager to include an improved project schedule to better support the Total Project Cost Summary.

1. **ADOPT.** Tables 8.1 and 8.2 will be updated in the LRR.
2. **ADOPT.** An improved project schedule will be included in Appendix E of the LRR.
3. **ADOPT.** Appendix E will be improved to include additional information regarding the method of construction.
4. **ADOPT.** Appendix B paragraph 06 will be expanded in the LRR.
5. **NOT ADOPT.** There does not appear to be a direct conflict between Appendix A and the Risk Register items TL-1 and CON-1. TL-1 is unlikely to affect cost or schedule. Existing borings indicate that there is no glacial till in the area. Although CON-1 is likely to affect cost and schedule it is considered to be negligible based on the size of the project.

Final Panel BackCheck Response #9

Concur.

Comment 10:

It is unclear how the project will be integrated with the overall levee system and the project objectives.

Basis for Comment:

The LRR indicates that the levee affected by the Melvin Price Locks and Dam Project is a portion of the overall Wood River Levee system. Appendix C indicates that the USACE has also identified underseepage design deficiencies at other locations within the Wood River Levee system and that another LRR and Supplemental Environmental Assessment for the additional locations will likely be completed in 2011. In addition, Appendix C, Section 1.4 - Public Concerns, indicates that the top priority of local interests is to maintain 100-year flood protection certification so that FEMA will not revise the Flood Insurance Rate Maps and change the designation of the areas behind the levees from protected area to flood hazard area. The LRR is unclear if this is an objective of the project or a subsequent issue that will be addressed by the local levee district.

It is also unclear what additional levee improvement measures, if any, will be required within the subject levee reach or to adjacent reaches. These measures could be associated with deficiencies identified in the LRR set for completion by 2011 or by the 100-year FEMA certification process. In addition, the LRR does not address what measures will be necessary at the transitions between the proposed cutoff walls and existing levee conditions. The installation of the cutoff walls may alter seepage conditions at the transitions and typically additional features, such as supplemental relief wells are included at the transitions. USACE discussed the incorporation of additional relief wells at the transitions during a conference call on March 18, 2011 with the Panel and Battelle. However, these measures are not discussed in the report or shown on the drawing.

The geotechnical evaluation of the levees has focused primarily on underseepage as the potential mode of failure based on visual levee inspection. USACE has identified underseepage as a known deficiency in the levee section under consideration for this LRR; however this does not preclude the existence of other potential failure modes. It does not appear that sufficient investigation has been conducted to address all potential levee failure mechanisms that need to be addressed for FEMA certification. Little is known about the characteristics of the levee itself, specifically the adequacy of the riverside clay blanket to mitigate through-seepage. It is the Panel's opinion that other potential failure modes, including through-seepage and associated steady-state seepage stability, have not been considered. EM 1110-2-1913 Design and Construction of Levees is used as the basis of levee assessment and states that levees need to be analyzed for these failure modes.

Ultimately consideration of through-seepage and its impacts on internal erosion, as well as the effect of steady state seepage on embankment stability, will need to be considered in the geotechnical evaluation for FEMA certification. Since the proposed cutoff trench will be at the riverside toe, it will have little effect on the mitigation of through-seepage, if the clay blanket is not sufficient. These further assessments could result in additional mitigation measures, such as modification of the clay blanket, which would need to be integrated with the

recommended plan to correct underseepage.

Ultimately, the overall Wood River Levee needs to be considered as a complete system that integrates measures implemented as part of the Melvin Price Locks and Dam Project Wood River Levee LRR (the subject of this IEPR), The LRR for the Wood River Levee system (scheduled to be completed in 2011), and any additional measures identified by the professional engineer retained by the Wood River Drainage and Levee District to address FEMA certification issues. The LRR could be improved by discussing this integration and conceptually describing how the recommended plan would be integrated with existing or future levee conditions.

Significance – Medium:

The details regarding how the project will be integrated with other existing and future levee conditions affects the understanding of the project as it relates to a systems approach to Risk-based Flood Damage Reduction Studies.

Recommendations for Resolution:

1. Incorporate discussion of on-going or planned studies (LRR for the Wood River Levee system and FEMA certification) that may result in additional modifications to the levee system.
2. Address the need for and details of additional project element, such as a relief well, at the project transitions.
3. Clarify if one of the project objectives is FEMA certification of the levee or if that is the responsibility of the local levee district.

Final USACE Evaluator Response #10

CONCUR. Improvements will be made to the LRR to clarify USACE's position with respect to the Mel Price project and its relationship to other Wood River Levee System work.

1. **ADOPT.** The LRR will incorporate relevant information of on-going work related to the overall Wood River Levee System and FEMA certification as it relates to the Mel Price project.
2. **ADOPT.** Relief wells at project transitions are already planned (and some are being installed); however, the PDT will ensure the LRR includes this information.
3. **ADOPT.** In conjunction with recommendation #1, the LRR will include a clarification of the project objectives and responsibilities of the local levee district.

Final Panel BackCheck Response #10

Concur.

Comment 11:

The potential economic and environmental effects of a levee failure under the future without project conditions are not clearly described.

Basis for Comment:

The LRR and appendices do not clearly describe the potential economic and environmental effects of a levee failure under the future without project conditions. The economic damages to the specific project area are not clear and the Panel understands the focus of the analysis to be from a much broader area including the Upper and Lower Wood River Levee and vicinity. Also in the LRR, some of the listed environmental effects refer to unsubstantiated environmental damage in the “billions of dollars” and cleanup costs of “\$125,000 per acre.” These numbers are not supported by references nor are they thoroughly documented in the Economics Appendix.

Similarly, it is not clear to the Panel if direct environmental effects and environmental justice issues reference broader community issues for the entire Wood River Project, or just the specific 11,500 feet long area under consideration by this LRR. For example, the Environmental Assessment information refers to environmental justice issues in general; however, specific areas of the community where these issues are pertinent to the LRR under review are not presented.

Significance – Low:

The economic and environmental conditions under the future without project scenario require further clarity to enhance the understanding of the report.

Recommendations for Resolution:

1. Add further narrative discussion in Appendix B (Economic Appendix) and Appendix C (EA) that describes the possible effects of levee failure, focusing solely on the specific project area under consideration. Adopt key portions of this new narrative as new text for the main report.
2. Add narrative to support the estimated per acre cleanup costs and potential widespread economic damages from flooding or loss of navigation infrastructure.
3. Either delete references to regional environmental justice issues or provide further clarification regarding environmental justice issues specifically related to the 11,500 feet of levee recommended for repair in the LRR.

Final USACE Evaluator Response #11

NON-CONCUR. The PDT is of the opinion that the potential economic and environmental effects of a levee failure under the future without project conditions were clearly described, but may not have made it clear which areas (upper or lower Wood River) that the information applied to; thus, some clarification is in order.

1. **ADOPT.** Appendices B and C will be re-written to clarify that the described possible effects focus solely on the specific project area under consideration.
2. **PARTIAL ADOPT.** An additional narrative to support the estimated per acre cleanup costs, etc. is not necessary. The information is not included in the economic calculations. A narrative detailing the loss of navigation infrastructure will be added.
3. **ADOPT.** The "domino" affect will be better described in the LRR; however, the PDT agreed that referenced to regional environmental justice issues could be deleted

Final Panel BackCheck Response #11

Concur.