

Final Independent External Peer Review Report Olmsted Locks and Dam 52 and 53 Replacement Project Updated Cost Estimate Peer Review

Prepared by
Battelle Memorial Institute

Prepared for
Department of the Army
U.S. Army Corps of Engineers
Inland Navigation Planning Center of Expertise
Louisville District

Contract No. W912HQ-10-D-0002
Task Order: 0020

November 4, 2011



**Final Independent External Peer Review Report
Olmsted Locks and Dam 52 and 53 Replacement Project
Updated Cost Estimate Peer Review**

by

**Battelle
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for

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FINAL
INDEPENDENT EXTERNAL PEER REVIEW REPORT
for the
Olmsted Locks and Dam 52 and 53 Replacement Project
Updated Cost Estimate Peer Review

EXECUTIVE SUMMARY

Project Background and Purpose

The U.S. Army Corps of Engineers' (USACE) Olmsted Locks and Dam project provides for a structure near Ohio River Mile 964.4 that would replace the existing Locks and Dam 52 and 53. The structure will consist of twin 110-foot by 1,200-foot locks adjacent to the Illinois bank, 5 tainter gates, a 1,400-foot navigable pass, and a fixed weir extending to the Kentucky bank. The first construction contract was awarded on November 19, 1992, to construct the access road and resident engineer's office. Since then, several contracts have been awarded. The major contracts that have been awarded and completed include the locks cofferdam, the locks, the approach walls, and the operations and maintenance bulkheads contracts. The contract (cost reimbursable) for the construction of the dam was awarded January 28, 2004, and work is ongoing. Other contracts to be awarded in the future include the buildings and grounds (including site restoration), demolition of Locks and Dam 52 and 53, river dikes, upstream mooring cells, paving, and equipment contracts.

The Olmsted Locks and Dam Project had an original authorized cost of \$775 million (no escalation) in the Water Resources Development Act (WRDA) of 1988. Recent design changes, contract modifications, and other unanticipated increases in project costs have led USACE to seek a Post Authorization Change Report (PACR) to increase the project's authorized amount to a level necessary for successful project completion.

In support of the PACR, Battelle was engaged to perform an Independent External Peer Review (IEPR) and submitted the Olmsted Locks and Dam 52 and 53 Replacement Project PACR (Olmsted Locks and Dam PACR) Final IEPR Report on November 15, 2010 (Battelle, 2010). The Olmsted Locks and Dam PACR Final IEPR Report identified Final Panel Comments related to concerns/issues pertaining to cost, schedule, and risk (hereinafter: original Final Panel Comments). Since that period, USACE further addressed/updated the cost estimate in an effort to improve confidence of a Total Project Cost (TPC) prior to the 2013 budget submission.

Based on the original Final Panel Comments and feedback from USACE Headquarters, USACE has further developed project cost, schedule, and risks that will then undergo a quality control (QC) review. The resulting product, the *Olmsted Locks and Dam Baseline Cost Estimate for the Post-Authorization Change Report* (Olmsted Baseline Cost Report), was subject to a cost Agency Technical Review (ATR) managed by the Cost Engineering Directory of Expertise for Civil Works and the cost estimate was certified at the conclusion of the ATR process.

Independent External Peer Review Process

USACE is conducting an IEPR of the Olmsted Locks and Dam 52 and 53 Replacement Project Updated Cost Estimate Peer Review (hereinafter: Olmsted Cost Update). As a 501(c)(3) non-profit science and technology organization, Battelle is independent, is free from conflicts of interest (COIs), and meets the requirements for an Outside Eligible Organization (OEO) per guidance described in USACE (2010). Battelle has experience in establishing and administering peer review panels for USACE and was engaged to coordinate the IEPR of the Olmsted Cost Update. Independent, objective peer review is regarded as a critical element in ensuring the reliability of scientific analyses. The IEPR was external to the agency and conducted following USACE and Office of Management and Budget (OMB) guidance described in USACE (2010), USACE (2007), and OMB (2004). This final report describes the IEPR process, describes the panel members and their selection, and summarizes the Final Panel Comments of the IEPR Panel (the Panel).

The Olmsted Cost Update IEPR required the use of the two cost engineering panel members from the Olmsted Locks and Dam PACR IEPR (i.e., original IEPR) to complete the review of the Olmsted Baseline Cost Report. The cost engineering panel members for the Olmsted Cost Update IEPR were rescreened to ensure that no COIs had arisen since the original IEPR. Although the Panel was disclosed to USACE, Battelle made the final decision on selecting the Panel.

The Panel received electronic versions of the Olmsted Baseline Cost Report documents, totaling more than 6,500 pages, along with a charge that solicited comments on specific sections of the documents to be reviewed. The charge was prepared by USACE according to guidance provided in USACE (2010) and OMB (2004). Charge questions were provided by USACE and included in the draft and final Work Plans.

The USACE Project Delivery Team briefed the Panel and Battelle at an in-person briefing held at the Huntington District Office on October 19, 2011. In addition to this meeting, a teleconference with USACE, the Panel, and Battelle was held halfway through the review period to provide the Panel an opportunity to ask questions of USACE and clarify uncertainties. The Panel produced approximately 22 individual comments and 6 preliminary Final Panel Comments in response to the 11 charge questions.

IEPR panel members reviewed the Olmsted Baseline Cost Report documents individually. The panel members then met via teleconference with Battelle to review key technical comments, discuss charge questions for which there were conflicting responses, and reach agreement on the Final Panel Comments to be provided to USACE. Each Final Panel Comment was documented using a four-part format consisting of: (1) a comment statement; (2) the basis for the comment; (3) the significance of the comment (high, medium, or low); and (4) recommendations on how to resolve the comment. Overall, six Final Panel Comments were identified and documented. Of these, four were identified as having high significance, one had medium significance, and one had low significance.

IEPR Results and Panel's Understanding of Project Changes since Original IEPR

The panel members agreed among one another on their assessment of the adequacy and acceptability of the cost engineering methods, models, and analyses used (USACE, 2010; p. D-4) in the Olmsted Baseline Cost Report documents. Table ES-1 lists the Final Panel Comment statements by level of significance. The full text of the Final Panel Comments is presented in Appendix A of this report. The following summary presents the IEPR results and the Panel's understanding of the Olmsted project changes since the original IEPR was conducted in 2010.

The Panel found the Olmsted Baseline Cost Report to be a comprehensive analysis and summary of the costs incurred to date and the anticipated future costs for the project. The high level of effort put forth by USACE to develop the Olmsted Baseline Cost Report and PACR is evident in the quality of the final deliverables. As indicated by USACE during the in-person meeting, USACE has employed its best technical experts as well as the latest technology and cost estimating methodologies to develop the updated Total Project Cost Summary (TPCS). This effort has resulted in a TPCS that is up to date, reasonable, and technically defensible.

During the October 19, 2011 in-person briefing, USACE indicated that they spent considerable time and resources in studying the ongoing dam construction, as this component is the single most expensive item of the project. A joint USACE-consultant team validated the incurred project costs and productivity levels from the completed portion of the Dam Contract. URS, the dam construction contractor, provided a detailed rebaseline cost estimate for the remaining Dam Contract completion effort. A detailed analysis of URS's estimate to complete the Dam Contract construction was conducted by Hill International, a consultant under contract to USACE. Hill International concluded that the URS estimate was within an acceptable range by estimating standards. The Cost and Schedule Risk Analysis (CSRA) for the Dam Contract was revisited and revised using the previous construction experience as a guide for future progress. In addition to the Dam Contract, USACE completed a bottom-up cost estimate for all other remaining project components to be constructed in future "out-years". The out-year contracts include a range of smaller project components such as the resident office construction, demolition of existing unused locks, and access road repaving.

The Panel understands that for typical USACE projects, all project elements would include independent government estimates (IGE); however, this project is atypical. The Dam Contract was awarded as a cost-reimbursable contract due to the unique nature of the "in-the-wet" construction methodology. As the project has progressed, the original 1986 cost estimate was superseded. As part of the updated cost estimate, USACE chose to validate URS costs for the dam rather than prepare an updated independent cost estimate for the dam. The Panel understands that the uniqueness of the project generally precluded preparation of a bottom-up cost estimate on the remaining Dam Contract costs. Overall, the Panel believes that the TPCS does adequately account for the costs to complete the project. However, the Panel does have concerns regarding elements of the TPCS. The three primary concerns outlined by the Panel are detailed herein.

USACE compiled a detailed CSRA contingency analysis for Dam Contract and out-year contracts. The Dam Contract contingency was estimated to be about 18% of the remaining base construction cost. The current contingency of 18% for the dam would be very reasonable for most projects at this stage of construction, but the Panel does not feel this is sufficient, given the overall project history and the fact that cost projections have repeatedly failed to capture the real cost of the dam construction. Consideration should be given to employing a higher contingency for the dam for the final TPCS.

The baseline cost estimate assumes \$150 million per year of program funding for the majority of the upcoming contract years. Based upon the history of funding for this project and the potential for real funding limitations in the future given the current economic and political climate, this level of funding may be overestimated. A reduction in the actual funding stream in the future would result in further project schedule delays and additional cost growth. USACE should consider that less program funding may be available in the future.

The Civil Works Construction Cost Index System (CWCCIS) to estimate cost escalation through the completion of construction activities may not adequately account for future inflation. Future inflation was assumed to be 1.8% per year per OMB policy; however, this project is projected to continue through 2024. During that time, it is likely that the inflation rate will be higher than 1.8%, perhaps approaching the long-term mean of about 3% per year. USACE should consider using a higher inflation rate over the remaining life of the project for determination of the TPCS.

Table ES-1. Overview of Six Final Panel Comments Identified by the Olmsted Cost Update IEPR Panel

No.	Final Panel Comment
Significance – High	
1	The use of the Civil Works Construction Cost Index System (CWCCIS) to estimate cost escalation through the completion of construction activities may not adequately account for future inflation.
2	The project funding assumptions were not developed using a worst-case scenario and therefore may overestimate available funding.
3	The estimated contingency for the remaining dam construction costs is low, and may not account for possible delays associated with the construction of a uniquely engineered structure.
4	The Planning, Engineering and Design (PED)/Engineering During Construction (EDC)/Supervision and Administration (S&A) costs for the remaining dam construction contract and out-year construction contracts are inconsistent, and TPCs cannot be accurately determined.

Table ES-1. Overview of Six Final Panel Comments Identified by the Olmsted Cost Update IEPR Panel, continued.

No.	Final Panel Comment
Significance – Medium	
5	The cost adjustments made to the URS rebaseline estimate shown in Table 6 of the main Olmsted Final Baseline Cost Estimate (FY12) for the Post-Authorization Change Report, Olmsted Locks and Dam, October 2011 report are not thoroughly discussed, and do not provide complete documentation of the cost validation process.
Significance – Low	
6	The use of a calendar year (CY) format in the Primavera P6 schedule may have resulted in minor discrepancies among the selected mid-points used for cost escalation.

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LIST OF ACRONYMS

ATR	Agency Technical Review
C&D	Chesapeake and Delaware
COI	Conflict of Interest
CSRA	Cost and Schedule Risk Analysis
CWCCIS	Civil Works Construction Cost Index System
CWWBS	Civil Works Work Breakdown Structure
CY	Calendar Year
DrChecks	Design Review and Checking System
EDC	Engineering During Construction
EIA	Energy Information Administration
ENR	Engineering News Record
ERDC	Engineer Research and Development Center
FY	Fiscal Year
IEPR	Independent External Peer Review
IGE	Independent Government Estimate
IMTS	Inland Marine Transportation Systems
IWTF	Inland Waterways Trust Fund
MCACES	Microcomputer Aided Cost Engineering System
MII	MCACES, 2 nd Generation
OEO	Outside Eligible Organization
OMB	Office of Management and Budget
PACR	Post Authorization Change Report
PED	Planning, Engineering and Design
POP	Period of Performance
QC	Quality Control
RLB	Rider Levett Bucknall
S&A	Supervision and Administration
TPC	Total Project Cost
TPCS	Total Project Cost Summary
USACE	United States Army Corps of Engineers
WRDA	Water Resources Development Act

1. INTRODUCTION

The U.S. Army Corps of Engineers' (USACE) Olmsted Locks and Dam project provides for a structure near Ohio River Mile 964.4 that would replace the existing Locks and Dam 52 and 53. The structure will consist of twin 110-foot by 1,200-foot locks adjacent to the Illinois bank, 5 tainter gates, a 1,400-foot navigable pass, and a fixed weir extending to the Kentucky bank. The first construction contract was awarded on November 19, 1992, to construct the access road and resident engineer's office. Since then, several contracts have been awarded. The major contracts that have been awarded and completed include the locks cofferdam, the locks, the approach walls, and the operations and maintenance bulkheads contracts. The contract (cost reimbursable) for the construction of the dam was awarded January 28, 2004, and work is ongoing. Other contracts to be awarded in the future include the buildings and grounds (including site restoration), demolition of Locks & Dam 52 and 53, river dikes, upstream mooring cells, paving, and equipment contracts.

The Olmsted Locks and Dam Project had an original authorized cost of \$775 million (without escalation) in the Water Resources Development Act (WRDA) of 1988. Recent design changes, contract modifications, and other unanticipated increases in project costs have led USACE to seek a Post Authorization Change Report (PACR) to increase the project's authorized amount to a level necessary for successful project completion.

In support of the PACR, Battelle was engaged to perform an Independent External Peer Review (IEPR) and submitted the Olmsted Locks and Dam 52 and 53 Replacement Project PACR (i.e., original IEPR) Final IEPR Report on November 15, 2010. This Final IEPR Report identified Final Panel Comments related to concerns/issues pertaining to cost, schedule, and risk (hereinafter: original Final Panel Comments). Since that period, USACE has elected to further address/update the cost estimate in an effort to improve confidence of a Total Project Cost (TPC) prior to the 2013 budget submission.

Based on the original Final Panel Comments and feedback from USACE Headquarters, USACE has further developed project cost, schedule, and risks that will then undergo a quality control (QC) review. The resulting product, the *Olmsted Locks and Dam Baseline Cost Estimate for the Post-Authorization Change Report* (Olmsted Baseline Cost Report), was subject to a cost Agency Technical Review (ATR) managed by the Cost Engineering Directory of Expertise for Civil Works and the cost estimate was certified at the conclusion of the ATR process.

The objective of the work described herein was to conduct an IEPR of the Olmsted Cost Update in accordance with procedures described in the Department of the Army, USACE Engineer Circular *Civil Works Review Policy* (EC No. 1165-2-209) (USACE, 2010), USACE CECW-CP memorandum *Peer Review Process* (USACE, 2007), and Office of Management and Budget (OMB) bulletin *Final Information Quality Bulletin for Peer Review* (OMB, 2004). Independent, objective peer review is regarded as a critical element in ensuring the reliability of scientific analyses.

This final report details the IEPR process, describes the IEPR panel members and their selection, and summarizes the Final Panel Comments of the IEPR Panel on the cost engineering analyses contained in the Olmsted Baseline Cost Report. The full text of the Final Panel Comments is presented in Appendix A.

2. PURPOSE OF THE IEPR

To ensure that USACE documents are supported by the best scientific and technical information, USACE has implemented a peer review process that uses IEPR to complement the ATR, as described in USACE (2010) and USACE (2007).

In general, the purpose of peer review is to strengthen the quality and credibility of the USACE decision documents in support of its Civil Works program. IEPR provides an independent assessment of the economic, engineering, and environmental analysis of the project study. In particular, the IEPR addresses the technical soundness of the project study's assumptions, methods, analyses, and calculations and identifies the need for additional data or analyses to make a good decision regarding implementation of alternatives and recommendations.

In this case, the IEPR of the Olmsted Cost Update was conducted and managed using contract support from Battelle, which is an Outside Eligible Organization (OEO) (as defined by EC No. 1165-2-209) under Section 501(c)(3) of the U.S. Internal Revenue Code with experience conducting IEPRs for USACE.

3. METHODS

This section describes the method followed in selecting the members for the IEPR Panel (the Panel) and in planning and conducting the IEPR. The IEPR was conducted following procedures described by USACE (2010) and in accordance with USACE (2007) and OMB (2004) guidance. Supplemental guidance on evaluation for conflicts of interest (COIs) was obtained from the *Policy on Committee Composition and Balance and Conflicts of Interest for Committees Used in the Development of Reports* (The National Academies, 2003).

3.1 Planning and Schedule

At the beginning of the Period of Performance (POP), Battelle held a kick-off meeting with USACE to review the preliminary/suggested schedule, discuss the IEPR process, and address any questions regarding the scope (e.g., clarify expertise areas needed for panel members). Any revisions to the schedule were submitted as part of the final Work Plan. A revised final Work Plan was subsequently submitted to reflect additional changes to the overall project schedule (Table 1) and the list of review and reference documents (Table 2).

Table 1 defines the schedule followed in executing the IEPR. Due dates for milestones and deliverables are based on the award/effective date of September 22, 2011, and a draft document receipt date of October 24, 2011. Note that the work items listed in Task 6 occur after the submission of this report. Battelle will enter the six Final Panel Comments developed by the Panel into USACE's Design Review and Checking System (DrChecks), a Web-based software

system for documenting and sharing comments on reports and design documents, so that USACE can review and respond to them. USACE will provide responses (Evaluator Responses) to the Final Panel Comments, and the Panel will respond (BackCheck Responses) to the Evaluator Responses. All USACE and Panel responses will be documented by Battelle.

Table 1. Olmsted Cost Update IEPR Schedule

Task	Action	Due Date
1	Award/Effective Date	9/22/2011
	Battelle submits draft Work Plan ^a	9/30/2011
	USACE provides comments on draft Work Plan	10/4/2011
	Battelle submits final Work Plan ^a	10/7/2011
	Battelle submits revised final Work Plan	11/3/2011
2	Battelle requests input from USACE on the COI questionnaire	9/27/2011
	USACE provides comments on COI questionnaire	9/28/2011
	Battelle submits list of selected panel members	9/30/2011
	USACE provides comments on selected panel members' COI	10/3/2011
	Battelle completes subcontracts for panel members	10/11/2011
3	USACE/Battelle hold kick-off meeting	10/3/2011
	Battelle/Panel hold kick-off meeting	10/14/2011
	Battelle/Panel attend on-site project briefing (Huntington District)	10/19/2011
4	USACE supplies draft cost documentation/files	10/19/2011
	USACE supplies draft Baseline Cost Estimate Report	10/24/2011
	Battelle convenes mid-review teleconference for Panel to ask clarifying questions of USACE	10/26/2011
	USACE supplies Final Baseline Cost Estimate Report	10/28/2011
	Panel members complete their individual reviews	10/31/2011
	Battelle provides Panel merged individual comments and talking points for Panel Review Teleconference	10/31/2011
	Panel members provide preliminary Final Panel Comments to Battelle	11/1/2011
	Battelle supplies working draft Final Panel Comments to USACE	11/4/2011
5	Battelle submits Final IEPR Report to USACE ^a	11/4/2011
6 ^b	Battelle convenes teleconference with USACE to review the Comment Response Process	TBD
	USACE provides draft Evaluator Responses to Battelle	11/7/2011
	Battelle convenes teleconference with Panel and USACE to discuss Final Panel Comments and draft responses	11/8/2011
	USACE inputs final Evaluator Responses in DrChecks	11/9/2011
	Battelle inputs the Panel's BackCheck Responses in DrChecks	11/11/2011
	Battelle submits pdf printout of DrChecks project file ^a	11/11/2011
	Project Closeout: includes time to close out subcontracts with panel members ^c .	11/23/2011

^a Deliverable.

^b Task 6 occurs after the submission of this report.

^c A no-cost extension to modify the POP will be necessary to extend the POP 52 days (i.e., through January 31, 2012) after the last deliverable is submitted in order to conduct project closeout activities.

3.2 Identification and Selection of IEPR Panel Members

The Olmsted Cost Update IEPR required the participation of the two cost engineering panel members from the original IEPR to complete the review of the updated cost review documents. No other primary or back-up panel members were identified for the Olmsted Cost Update IEPR project. Information about the candidate panel members, including brief biographical information, highest level of education attained, and years of experience, was provided to USACE for feedback. Battelle made the final selection of panel members according to the selection criteria described in the Work Plan.

The cost engineering panel members for the Olmsted Cost Update IEPR were rescreened to ensure that no COIs had arisen since the original IEPR for the following potential exclusion criteria or COIs.¹ These COI questions were intended to serve as a means of disclosure and to better characterize a candidate's employment history and background. Providing a positive response to a COI screening question did not automatically preclude a candidate from serving on the Panel. For example, participation in previous USACE technical peer review committees and other technical review panel experience was included as a COI screening question. A positive response to this question could be considered a benefit.

- Involvement by you or your firm² in the Olmsted Locks and Dam 52 and 53 Replacement Project Updated Cost Estimate Peer Review and technical appendices.
- Involvement by you or your firm² in any work on the Olmsted Locks and Dam 52 and 53 Replacement Project Post Authorization Change Report (Olmsted Locks and Dam PACR), or related projects.
- Involvement by you or your firm² in flood control, navigation, or ecosystem restoration projects in Ballard County (KY), Pulaski County (IL), or in the vicinity of Ohio River Mile 964, including:
 - Smithland Locks and Dam
 - Olmsted Dam Design & Construction
 - Olmsted Locks and Dam Project- Locks Cofferdam
 - Olmsted Locks and Dam Project - Locks
 - Olmsted Locks and Dam Project - Approach Walls
 - Olmsted Locks and Dam Project - Operating & Maintenance Bulkheads.
- Involvement with paid or unpaid expert testimony related to the Olmsted Locks and Dam PACR.

¹ Battelle evaluated whether scientists in universities and consulting firms that are receiving USACE-funding have sufficient independence from USACE to be appropriate peer reviewers. See OMB (2004, p. 18), "...when a scientist is awarded a government research grant through an investigator-initiated, peer-reviewed competition, there generally should be no question as to that scientist's ability to offer independent scientific advice to the agency on other projects. This contrasts, for example, to a situation in which a scientist has a consulting or contractual arrangement with the agency or office sponsoring a peer review. Likewise, when the agency and a researcher work together (e.g., through a cooperative agreement) to design or implement a study, there is less independence from the agency. Furthermore, if a scientist has repeatedly served as a reviewer for the same agency, some may question whether that scientist is sufficiently independent from the agency to be employed as a peer reviewer on agency-sponsored projects."

² Includes any joint ventures in which your firm is involved and if your firm serves as a prime or as a subcontractor to a prime. Please clarify which relationship exists.

- Current or previous employment or affiliation with members of the cooperating agencies or local sponsors (for pay or *pro bono*), including:
 - Kentucky Department of Fish and Wildlife Resources
 - City of Olmsted, IL
 - City of Paducah, KY
 - City of Cairo, IL
 - Illinois State Historic Preservation Agency
 - Kentucky State Historic Preservation Office
 - Inland Waterways Trust Fund.
- Past, current, or future interests or involvements (financial or otherwise) by you, your spouse, or your children related to Ballard County (KY), Pulaski County (IL), or in the Ohio River System in the vicinity of River Mile 964.
- Participation in relevant prior Federal studies relevant to this project and/or Locks and Dam 52 and 53 Replacement Project (Olmsted Lock and Dam) PACR, including the project cost estimating performed by Hill International.
- Current personal involvement in other USACE projects, including whether involvement was to author any manuals or guidance documents for USACE. If yes, provide titles of documents or description of project, dates, and location (USACE district, division, Headquarters, Engineer Research and Development Center [ERDC], etc.), and position/role. Please highlight and discuss in detail any projects that are specifically with the Louisville District.
- Current firm² involvement in other USACE projects, specifically those projects/contracts that are with the Louisville District. If yes, provide title/description, dates, and location (USACE district, division, Headquarters, ERDC, etc.), and position/role.
- Previous employment by the USACE as a direct employee or contractor (either as an individual or through your firm²) within the last 10 years, notably if those projects/contracts are with the Louisville District. If yes, provide title/description, dates employed, and place of employment (district, division, Headquarters, ERDC, etc.), and position/role.
- Other USACE affiliation (e.g., scientist employed by USACE).
- Previous experience conducting technical peer reviews. If yes, please highlight and discuss any technical reviews concerning coastal protection projects, and include the client/agency and duration of review (approximate dates).
- Pending, current, or future financial interests in the Olmsted Locks and Dam PACR, or related contracts/awards from USACE, including:
 - Smithland Locks and Dam
 - Olmsted Dam Design & Construction
 - Olmsted Locks and Dam Project- Locks Cofferdam
 - Olmsted Locks and Dam Project - Locks
 - Olmsted Locks and Dam Project - Approach Walls
 - Olmsted Locks and Dam Project - Operating & Maintenance Bulkheads

- A significant portion (i.e., greater than 50%) of personal or firm² revenues within the last 3 years came from USACE contracts.
- Any publicly documented statement, affidavit, or opinion on USACE coastal projects.
- Any publicly documented statement (including, for example, advocating for or discouraging against) related to related to Olmsted Locks and Dam PACR.
- Participation in relevant prior Federal studies relevant to this project and/or Olmsted Locks and Dam PACR, including:
 - The Lower Ohio River Feasibility Study
 - Smithland Locks and Dam
 - Olmsted Dam Design & Construction
- Participation in prior non-Federal studies relevant to this project and/or Olmsted Locks and Dam PACR.
- Is there any past, present, or future activity, relationship or interest (financial or otherwise) that could make it appear that you would be unable to provide unbiased services on this project? If so, please describe.

Other considerations:

- Participation in previous USACE technical review panels
- Other technical review panel experience

The two final reviewers were affiliated with either academic institutions or consulting companies. Battelle established subcontracts with the panel members when they indicated their willingness to participate and confirmed the absence of COIs through a signed COI form. USACE was given the list of candidate panel members, but Battelle made the final selections of the Panel. Section 4 of this report provides names and biographical information on the panel members.

Prior to beginning their review and within 3 days of their subcontracts being finalized, all members of the Panel attended a kick-off meeting via teleconference planned and facilitated by Battelle in order to review the IEPR process, the schedule, communication procedures, and other pertinent information for the Panel.

3.3 Preparation of the Charge and Conduct of the IEPR

Charge questions were provided by USACE and included in the draft and final Work Plans. In addition to a list of 11 charge questions/discussion points, the final charge included general guidance for the Panel on the conduct of the peer review (provided in Appendix B of this final report).

Battelle held a kick-off meeting via teleconference where the details of the IEPR process and project schedule were presented to the Panel. Before the meeting, the IEPR Panel received an electronic version of the final charge. In addition, USACE conducted an in-person briefing to discuss the Olmsted Cost Update IEPR at the Huntington District Office on October 19, 2011.

The documents and files in Table 2 were provided for review October 24, 2011 through October 28, 2011; the other documents were provided for reference or supplemental information only.

- USACE guidance *Civil Works Review Policy* (EC 1165-2-209) dated January 31, 2010
- CECW-CP Memorandum dated March 30, 2007
- OMB’s *Final Information Quality Bulletin for Peer Review* released December 16, 2004

Table 2. Olmsted Cost Update IEPR Review Documents

Document Title ¹	Review (R) or Reference (RF)	Page Count
Final Baseline Cost Estimate (FY12) for the Post-Authorization Change Report	R	70
Appendix A - Total Project Cost Summary	R	20
Appendix B - MII Reports	R	11
Appendix C - Dam Base Cost Estimate Adjustments	R	98
Appendix D - Primavera P6® Schedule	R	23
Appendix E - Agency Technical Review Documentation	R	60
Appendix F - Quality Control Documentation	RF	118
Appendix G - Prior Expenditures	R	10
Appendix H - Team Resumes	RF	91
Appendix I - Cost & Schedule Risk Analysis	R	191
Appendix J - Out-Year Contract Back Up	R and RF	60
Appendix K - Hill Olmsted Cost and Schedule Review Report with Backup	R and RF	2268
Appendix L - URS Corporation 2011 Rebaseline Estimate Summary& Details	R and RF	2271
Appendix M - Backup to URS 2011 Rebaseline Estimate	RF	777
Construction schedule and supporting docs	R and RF	22

¹ Draft versions of these documents were received on October 24, 2011. The final versions were received on October 28, 2011.

About halfway through the review of the Olmsted Baseline Cost Report documents, a teleconference was held with USACE, the Panel, and Battelle so that USACE could answer any questions the Panel had concerning either the review documents or the project.

3.4 Review of Individual Comments

The Panel was instructed to address the charge questions/discussion points within a comment-response form provided by Battelle. At the end of the review period, the Panel produced approximately 22 individual comments and 6 preliminary Final Panel Comments in response to the charge questions/discussion points. Battelle reviewed the comments to identify overall recurring themes, areas of potential conflict, and other overall impressions. As a result of the review, Battelle summarized the 22 comments into a preliminary list of 11 overall comments and discussion points. Each panel member’s individual comments were shared with the full Panel in a merged individual comments table.

3.5 IEPR Panel Teleconference

Battelle facilitated a 2-hour teleconference with the Panel so that the panel members could exchange technical information. The main goal of the teleconference was to identify which issues and preliminary Final Panel Comments should be carried forward as Final Panel Comments in the Final IEPR Report and decide which panel member would serve as the lead author for the development of each Final Panel Comment. This information exchange ensured that the Final IEPR Report would accurately represent the Panel's assessment of the project, including any conflicting opinions. The Panel engaged in a thorough discussion of the overall positive and negative comments, added any missing issues of high-level importance to the findings, and merged any related individual comments. In addition, Battelle confirmed each Final Panel Comment's level of significance to the Panel.

The Panel also discussed responses to five charge questions where there appeared to be disagreement among panel members. The conflicting comments were resolved based on the professional judgment of the Panel, and all sets of comments were determined not to be conflicting. Each comment was either incorporated into a Final Panel Comment, determined to be consistent with other Final Panel Comments already developed, or determined to be a non-significant issue.

At the end of these discussions, the Panel identified six comments and discussion points that should be brought forward as Final Panel Comments.

3.6 Preparation of Final Panel Comments

Following the teleconference, Battelle prepared a summary memorandum for the Panel documenting each Final Panel Comment (organized by level of significance). The memorandum provided the following detailed guidance on the approach and format to be used to develop the Final Panel Comments for the Olmsted Cost Update:

- **Lead Responsibility:** For each Final Panel Comment, one Panel member was identified as the lead author responsible for coordinating the development of the Final Panel Comment and submitting it to Battelle. Battelle modified lead assignments at the direction of the Panel. To assist each lead in the development of the Final Panel Comments, Battelle distributed the merged individual comments table, a summary detailing each draft final comment statement, an example Final Panel Comment following the four-part structure described below, and templates for the preparation of each Final Panel Comment.
- **Directive to the Lead:** Each lead was encouraged to communicate directly with other IEPR panel member as needed and to contribute to a particular Final Panel Comment. If a significant comment was identified that was not covered by one of the original Final Panel Comments, the appropriate lead was instructed to draft a new Final Panel Comment.
- **Format for Final Panel Comments:** Each Final Panel Comment was presented as part of a four-part structure:
 1. Comment Statement (succinct summary statement of concern)
 2. Basis for Comment (details regarding the concern)

3. Significance (high, medium, low; see description below)
 4. Recommendation(s) for Resolution (see description below).
- Criteria for Significance: The following were used as criteria for assigning a significance level to each Final Panel Comment:
 1. High: Describes a fundamental problem with the project that could affect the recommendation, success, or justification of the project. Comments rated as high indicate that the Panel analyzed or assessed the methods, models, and/or analyses and determined that there is a “showstopper” issue.
 2. Medium: Affects the completeness of the report in describing the project, but will not affect the recommendation or justification of the project. Comments rated as medium indicate that the Panel does not have sufficient information to analyze or assess the methods, models, or analyses.
 3. 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. Comments rated as low indicate that the Panel identified information (tables, figures, equations, discussions) that was mislabeled or incorrect or data or report sections that were not clearly described or presented.
 - Guidance for Developing Recommendations: The recommendation section was to include specific actions that USACE should consider to resolve the Final Panel Comment (e.g., suggestions on how and where to incorporate data into the analysis, how and where to address insufficiencies, areas where additional documentation is needed).

At the end of this process, six Final Panel Comments were prepared and assembled. Battelle reviewed and edited the Final Panel Comments for clarity, consistency with the comment statement, and adherence to guidance on the Panel’s overall charge, which included ensuring that there were no comments regarding either the appropriateness of the selected alternative or USACE policy. There was no direct communication between the Panel and USACE during the preparation of the Final Panel Comments. The Final Panel Comments are presented in Appendix A of this report.

4. PANEL DESCRIPTION

The Olmsted Cost Update IEPR utilized the two cost engineering panel members from the original IEPR to complete the review of the updated cost review documents. No other primary or back-up panel members were identified for the Olmsted Cost Update IEPR project. Battelle prepared a presentation with the primary cost engineering panel members (who were rescreened for availability and COIs), and provided it to USACE for feedback. Battelle made the final selection of panel members.

An overview of the credentials of the final two primary members of the Panel and their qualifications in relation to the technical evaluation criteria is presented in Table 3. More detailed biographical information regarding each panel member and his area of technical expertise is presented in the text that follows the table.

Table 3. Olmsted Cost Update IEPR Panel: Technical Criteria and Areas of Expertise

Technical Criteria	Brown	Schlebusch
Cost Engineering		
10 years of experience	X	X
Registered professional engineer, certified cost consultant/certified cost engineer, or certified estimating professional	X	X
Demonstrated experience in reviewing Federal water resource economic documents justifying construction efforts	X	X
Demonstrated experience in developing estimated construction costs and construction methods related to large Civil Works navigation projects	X	X
Familiarity with applicable USACE regulations, including knowledge of the Microcomputer Aided Cost Engineering System (MCACES) 2nd Generation (MII) estimating software package, the Civil Works Work Breakdown Structure (CWWBS), and critical path project scheduling.	X	X
M.S. or higher in cost engineering	X	X

Christopher Brown, P.E., Ph.D.

Role: This panel member was chosen primarily for his cost engineering experience and expertise.

Affiliation: University of North Florida

Dr. Christopher Brown is a professor at the University of North Florida teaching civil engineering, fluid mechanics, hydraulics, and engineering geology. He earned his Ph.D. in civil engineering in 2005 from the University of Florida and is a licensed professional engineer in Florida and Pennsylvania. He has over 20 years of experience working on public works projects for USACE (1991-2006) and as a private consultant focusing on geotechnical engineering, water resources planning, and civil engineering projects. He is experienced in developing estimated construction costs and construction methods related to large Civil Works navigation projects involving canals, ocean harbors, inland navigation, dredged material disposal, waterborne construction, and subsurface barrier walls. Large Civil Works projects supported include the Chesapeake and Delaware (C&D) Canal Deepening Project in Maryland and Delaware and the Delaware Main Channel Deepening Project in Pennsylvania and New Jersey. Dr. Brown is familiar with all applicable USACE regulations that require an extensive knowledge of cost engineering applications. He is familiar with Microcomputer Aided Cost Engineering System (MCACES I) model estimates and understands the assumptions and outputs associated with it. He has worked on a team developing the replacement of bridge sections along the Tamiami Trail in south Florida, a complex project costing over \$100 million and involving multiple contracts over a 3-year period. He is familiar with the basic Civil Works Work Breakdown Structure (CWWBS) and has utilized it on studies such as the Liquid Natural Gas tank foundation improvement in Martin County in 2009 as a part of a five-part feasibility-level cost study. He has also utilized the CWWBS to develop feasibility-level cost estimates for the rehabilitation of embankments, outlet structures, and structures for the Iluka Mine, Green Cove, Florida. Dr. Brown is familiar with Critical Path Method (CPM) scheduling, utilizing various software tools including Microsoft Project, Timeline, and self-programming inside Microsoft Excel. He developed PERT charts for the Iluka Mine project and has used Gantt charts for numerous

projects, including the New Jersey Coast Guard helicopter landing facility rehabilitation and replacement project.

Marc Schlebusch, P.E.

Role: This panel member was chosen primarily for his cost engineering experience and expertise.

Affiliation: CDM, Inc.

Marc Schlebusch is a cost engineer for CDM, Inc., specializing in cost estimates, construction schedules, and project controls for complex projects. He earned his M.S. in environmental engineering from the University of Iowa in 1997, has received formal training in MCACES, 2nd generation (MII), and is a licensed professional engineer in Kansas and Missouri. He has more than 10 years of demonstrated experience in civil cost engineering analysis, design, cost estimation, construction, and operations and maintenance. He is familiar with large, high-visibility, complex, Civil Works projects, having provided cost estimating support for such projects as the Louisiana Coastal Area Ecosystem Restoration and the Covent/Blind River Diversion Project, Louisiana, and the Central City Project in Ft. Worth, Texas. Mr. Schlebusch is experienced with the development of estimated construction costs and construction methods related to large Civil Works navigation projects, including the Baptiste Collette Bayou Navigation Channel Deepening, Plaquemines Parish, Louisiana, an 8-mile channel enlargement project (estimated cost of \$123 million); and the Central City Project in Ft. Worth, Texas, involving the relocation of a channel and installation of new dam structures (estimated cost of \$681 million). He is familiar with all applicable USACE regulations that require an extensive knowledge of cost engineering applications. He has extensive experience preparing MCACES MII cost estimates for USACE projects with values from \$1 million to more than \$100 million, including feasibility-, design-, and construction-level estimates for bypass channel/flood control, ecosystem restoration, floodwall demolition and construction, and hazardous site remediation. He is experienced in the CWWBS and has completed cost estimates requiring its use. Specific projects utilizing both MII and CWWBS include the Ft. Worth Central City Project and the St. James Parish Covent/Blind River Diversion Project mentioned above. Mr. Schlebusch is experienced in the use of CPP, and has prepared preliminary construction schedules for numerous projects including the Central City Project and Hurricane Protection Projects, Jefferson Parish, Louisiana.

5. SUMMARY OF FINAL PANEL COMMENTS

The following summary presents the IEPR results and the Panel's understanding of the Olmsted project changes since the original IEPR was conducted in 2010. The panel members agreed among one another on their assessment of the adequacy and acceptability of the cost engineering methods, models, and analyses used (USACE, 2010; p. D-4) in the Olmsted Baseline Cost Report IEPR document. Table 4 lists the six Final Panel Comment statements by level of significance. The full text of the Final Panel Comments is presented in Appendix A of this report.

The Panel found the Olmsted Baseline Cost Report to be a comprehensive analysis and summary of the costs incurred to date and the anticipated future costs for the project. The high level of

effort put forth by USACE to develop the Olmsted Baseline Cost Report and PACR is evident in the quality of the final deliverables. As indicated by USACE during the in-person meeting, USACE has employed its best technical experts as well as the latest technology and cost estimating methodologies to develop the updated Total Project Cost Summary (TPCS). This effort has resulted in a TPCS that is up to date, reasonable, and technically defensible.

During the October 19, 2011 in-person briefing, USACE indicated that they spent considerable time and resources in studying the ongoing dam construction, as this component is the single most expensive item of the project. A joint USACE-consultant team validated the incurred project costs and productivity levels from the completed portion of the Dam Contract. URS, the dam construction contractor, provided a detailed rebaseline cost estimate for the remaining Dam Contract completion effort. A detailed analysis of URS's estimate to complete the Dam Contract construction was conducted by Hill International, a consultant under contract to USACE. Hill International concluded that the URS estimate was within an acceptable range by estimating standards. The Cost and Schedule Risk Analysis (CSRA) for the Dam Contract was revisited and revised using the previous construction experience as a guide for future progress. In addition to the Dam Contract, USACE completed a bottom-up cost estimate for all other remaining project components to be constructed in future "out-years". The out-year contracts include a range of smaller project components such as the resident office construction, demolition of existing unused locks, and access road repaving.

The Panel understands that for typical USACE projects, all project elements would include independent government estimates (IGE); however, this project is atypical. The Dam Contract was awarded as a cost-reimbursable contract due to the unique nature of the "in-the-wet" construction methodology. As the project has progressed, the original 1986 cost estimate was superseded. As part of the updated cost estimate, USACE chose to validate URS costs for the dam rather than prepare an updated independent cost estimate for the dam. The Panel understands that the uniqueness of the project generally precluded preparation of a bottom-up cost estimate on the remaining Dam Contract costs. Overall, the Panel believes that the TPCS does adequately account for the costs to complete the project. However, the Panel does have concerns regarding elements of the TPCS. The three primary concerns outlined by the Panel are detailed herein.

USACE compiled a detailed CSRA contingency analysis for Dam Contract and out-year contracts. The Dam Contract contingency was estimated to be about 18% of the remaining base construction cost. The current contingency of 18% for the dam would be very reasonable for most projects at this stage of construction, but the Panel does not feel this is sufficient, given the overall project history and the fact that cost projections have repeatedly failed to capture the real cost of the dam construction. Consideration should be given to employing a higher contingency for the dam for the final TPCS.

The baseline cost estimate assumes \$150 million per year of program funding for the majority of the upcoming contract years. Based upon the history of funding for this project and the potential for real funding limitations in the future given the current economic and political climate, this level of funding may be overestimated. A reduction in the actual funding stream in the future

would result in further project schedule delays and additional cost growth. USACE should consider that less program funding may be available in the future.

The Civil Works Construction Cost Index System (CWCCIS) to estimate cost escalation through the completion of construction activities may not adequately account for future inflation. Future inflation was assumed to be 1.8% per year per OMB policy; however, this project is projected to continue through 2024. During that time, it is likely that the inflation rate will be higher than 1.8%, perhaps approaching the long-term mean of about 3% per year. USACE should consider using a higher inflation rate over the remaining life of the project for determination of the TPCS.

Table 4. Overview of Six Final Panel Comments Identified by the Olmsted Cost Update IEPR Panel

No.	Final Panel Comment
Significance – High	
1	The use of the Civil Works Construction Cost Index System (CWCCIS) to estimate cost escalation through the completion of construction activities may not adequately account for future inflation.
2	The project funding assumptions were not developed using a worst-case scenario and therefore may overestimate available funding.
3	The estimated contingency for the remaining dam construction costs is low, and may not account for possible delays associated with the construction of a uniquely engineered structure.
4	The Planning, Engineering and Design (PED)/Engineering During Construction (EDC)/Supervision and Administration (S&A) costs for the remaining dam construction contract and out-year construction contracts are inconsistent, and TPCs cannot be accurately determined.
Significance – Medium	
5	The cost adjustments made to the URS rebaseline estimate shown in Table 6 of the main Olmsted Final Baseline Cost Estimate (FY12) for the Post-Authorization Change Report, Olmsted Locks and Dam, October 2011 report are not thoroughly discussed, and do not provide complete documentation of the cost validation process.
Significance – Low	
6	The use of a calendar year (CY) format in the Primavera P6 schedule may have resulted in minor discrepancies among the selected mid-points used for cost escalation.

6. REFERENCES

Battelle (2010). Final Independent External Peer Review Report Olmsted Locks and Dam 52 and 53 Replacement Project Post Authorization Change Report. November 15.

EIA (2011). International Energy Outlook 2011, Energy Information Administration, U.S. Department of Energy, DOE/EIA Report # 0484 (2011).
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ENR (2011). Historical Indices. Engineering News Record.
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IMTS (2010). Inland Marine Transportation Systems Capital Projects Business Model, Final Report. Inland Marine Transportation Systems (IMTS) Capital Investment Strategy Team. April 13.

IWTF (2011). Inland Waterways Trust Fund Status Report. Inland Waterways Trust (IWTF). April 1.

OMB (2004). Final Information Quality Bulletin for Peer Review. Executive Office of the President, Office of Management and Budget, Washington, D.C. Memorandum M-05-03. December 16.

RLB (2011). Quarterly Construction Cost Report – USA Report. Rider Levett Bucknall. July.

The National Academies (2003). Policy on Committee Composition and Balance and Conflicts of Interest for Committees Used in the Development of Reports. The National Academies (National Academy of Science, National Academy of Engineering, Institute of Medicine, National Research Council). May 12.

Turner (2011). Turner Building Cost Index – 2011 Third Quarter Forecast. Turner Construction. 2011

USACE (2007). Peer Review Process. Department of the Army, U.S. Army Corps of Engineers, Washington, D.C. CECW-CP Memorandum. March 30.

USACE (2009). Corps of Engineers Civil Works Direct Program, Program Development Guidance – Fiscal Year 2011, Table 1. EC 11-2-194. April 1.

USACE (2010). Water Resources Policies and Authorities: Civil Works Review Policy. Department of the Army, US Army Corps of Engineers, Washington, D.C. Engineer Circular (EC) No. 1165-2-209. January 31.

USACE (2011). Civil Works Construction Cost Index System. EM 1110-2-1304. September 30.

APPENDIX A

Final Panel Comments

on the

Olmsted Cost Update IEPR

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Final Panel Comment 1

The use of the Civil Works Construction Cost Index System (CWCCIS) to estimate cost escalation through the completion of construction activities may not adequately account for future inflation.

Basis for Comment:

The CWCCIS uses Office of Management and Budget (OMB) inflation factors to forecast escalation for years in which no data are available. The CWCCIS currently is forecasting approximately 1.8% escalation year to year after fiscal year (FY) 2012. Escalation was considered in the Cost and Schedule Risk Analysis (CSRA), Appendix I - Risk Register under risk number DAM-036.

Under current economic conditions, this escalation rate may be adequate for immediate future escalation. However, when compared to historical averages, this is relatively low. The recent economic downturn has resulted in negative or comparably low inflation indices, and there is variation depending on which cost index is reviewed, but looking at inflation rate over 20 years, the average annual inflation rate is approximately 3%. Some indices, like those from the Engineering News Record (ENR), have shown recent inflation rates close to this (ENR, 2011). For example: ENR Construction Cost Index from calendar year (CY) 2009 to CY2010 showed an increase of 2.7% and from CY2010 to CY2011 showed an increase of 2.8%. The CWCCIS over the same time frame has increases of 3% and 4.1%, respectively. The Rider Levett Bucknall (RLB) National Construction Cost Index had smaller gains of 0.9% and 1.4%, respectively (RLB, 2011); however, the RLB index considers primarily bid price inflation. And the Turner Building Cost Index over the same period showed a decrease of -4% and then an increase of 1.9%, respectively (Turner, 2011).

Based on the ENR Skilled Labor Index History, labor costs have increased on average approximately 3.4% per year. Through the recent economic downturn, labor cost increases have remained higher than material cost increases. The ENR Skilled Labor Index from CY2009 to CY2010 showed an increase of 3.5% and from 2010 to 2011 showed an increase of 2.5%. In addition, in the CSRA, risk number DAM-036 suggests a 4% per year labor agreement cost increase.

Generally, material prices have been very volatile and are dependent on global economic demand. Concrete and steel prices may currently be stable or decreasing because global demand is depressed as a result of the economic downturn. For example, fuel costs could grow at significantly higher rates than 1.8%. The Energy Information Administration 2011 Energy Outlook includes a high oil price scenario that has the price of a barrel of oil at \$146 in 2015 and at \$169 in 2020 (EIA, 2011). If this scenario were realized, the cost of diesel fuel for the Olmsted project would be much higher than estimated.

Should economic conditions improve, which is possible considering the time frame until completion, it is likely that inflation could be higher than the current CWCCIS approximation. Current USACE guidance mandates the use of Table 1 of the Program Development Guidance for Fiscal Year 2011 (USACE, 2009); however, the CWCCIS (USACE, 2011) also states on page 2-1 that “while the historic projections are reliable to update project costs, forecasting beyond two years may be unreliable.”

Significance – High

Actual costs due to inflation could be significantly higher than those currently projected.

Recommendations for Resolution:

1. Review inflation rates assumed in the CWCCIS with respect to historic construction cost indices and inflation on similar projects. Revise inflation rates based on review.
2. Consider the assumptions made by URS for escalation in the Dam Contract and apply a similar methodology/rate to the Total Project Cost Summary (TPCS) for the remainder of the Dam Contract.

Literature Cited:

EIA (2011). International Energy Outlook 2011, Energy Information Administration, U.S. Department of Energy, DOE/EIA Report # 0484 (2011).
<http://205.254.135.24/forecasts/ieo/index.cfm>.

ENR (2011). Historical Indices. Engineering News Record.
http://enr.construction.com/economics/historical_indices/. October 2011.

RLB (2011). Quarterly Construction Cost Report – USA Report. Rider Levett Bucknall. July.

Turner (2011). Turner Building Cost Index – 2011 Third Quarter Forecast. Turner Construction. 2011.

USACE (2011). Civil Works Construction Cost Index System. EM 1110-2-1304. September 30.

USACE (2009). Corps of Engineers Civil Works Direct Program, Program Development Guidance – Fiscal Year 2011, Table 1. EC 11-2-194. April 1.

Final Panel Comment 2

The project funding assumptions were not developed using a worst-case scenario and therefore may overestimate available funding.

Basis for Comment:

The Olmsted Final Baseline Cost Estimate (FY12) for the Post-Authorization Change Report (PACR), Olmsted Locks and Dam, October 2011 report (main report) states on page 35 that "... it was apparent that the dam construction duration is cost driven rather than activity driven." The funding stream scenario used in the analysis is \$150 million per year through FY2021, then a \$100 million per year for FY2022 to FY2024. The CSRA risk register number DAM-021 has a worst case scenario of \$150 million per year for FY2012 and FY2013 which is then reduced to \$130 million per year for the remainder of the dam contract and \$75 million per year for out-year contracts.

Final Panel Comment number 1 from the Final Independent External Peer Review Report Olmsted Locks and Dam 52 and 53 Replacement Project Post Authorization Change Report related to the adequacy of funding from the Inland Waterways Trust Fund (IWTF) in meeting future project needs. Even if all available funds from the IWTF are made available solely to the Olmsted Locks and Dam project, the assumption of \$150 million a year in funding may not be realistic. The FY2010 ending balance of the IWTF was \$58.5 million (IWTF, 2011). The FY2010 revenues were \$73.9 million, down from \$76 million in FY2009. There has generally been a decreasing trend in revenue for the IWTF (IMTS, 2010). In addition, because the total IWTF has been severely reduced, the interest on remaining funds generated year to year has decreased more substantially. Depending on economic conditions, the IWTF may be depleted to the point where it cannot maintain the 50% cost share for funding of \$150 million per year through FY2021.

The use of a \$150 million per year funding stream for the majority of the upcoming contract years may not be realistic, based on the history of funding for this project and the potential for real funding limitations in the future given the current economic and political climate. Contingency for the remaining dam contract and out-year contracts may increase under the worst-case funding scenario.

The main report, page 47, states that fixed site overhead costs are approximately \$50 million per year. These costs are incurred regardless of how much construction is accomplished in a given year. Program funding at levels less than expected would have a real impact on project schedule because less construction would then be accomplished. Less construction accomplished delays the project schedule and increases costs.

The report does cite an estimation of project savings under a better-than-expected funding scenario. However, the report would benefit from additional text describing the funding streams in more detail and the implications of lower-than-ideal funding, including number of additional years and costs potentially incurred based on the worst-case scenario.

Significance – High
If program funding is less than assumed, the overall project schedule will be delayed, resulting in increased costs.
Recommendations for Resolution:
<ol style="list-style-type: none">1. Base schedule and cost estimate on an expected funding limit of \$130 million per year through FY2021 and \$75 million for the out-year contracts (worst-case scenario under CSRA risk register number DAM-021).2. Include additional text in the report regarding the implications of lower-than-ideal funding, including number of additional years and costs potentially incurred based on the worst-case scenario.3. Include a discussion of the two funding streams, IWTF and Treasury, for the Olmsted project and their possible limitations.

Literature Cited:

Battelle (2010). Final Independent External Peer Review Report Olmsted Locks and Dam 52 and 53 Replacement Project Post Authorization Change Report. November 15.

IMTS (2010). Inland Marine Transportation Systems Capital Projects Business Model, Final Report. Inland Marine Transportation Systems (IMTS) Capital Investment Strategy Team. April 13.

IWTF (2011). Inland Waterways Trust Fund Status Report. Inland Waterways Trust (IWTF). April 1.

Final Panel Comment 3

The estimated contingency for the remaining dam construction costs is low, and may not account for possible delays associated with the construction of a uniquely engineered structure.

Basis for Comment:

The “Rebaseline Estimate and Schedule Review” (hereinafter called the Hill International Report) performed by Hill International for USACE and described in Appendix K contains great detail regarding their evaluation of the dam construction issues and cost growth. The Hill International Report recommendations are then included in the risk analysis study. One task that has not been completed to date, though, is a comparison of URS annual budget estimate updates. These have increased continually during construction, including a most recent estimate increase of 31% from February 2009 to July 2011 as referenced in the main report and in Appendix L. This indicates that there still is considerable risk of further cost growth in the dam portion of the project.

The current contingency of 18% would be very reasonable for most projects at this stage of construction, but it is not sufficient for this project given the overall project history and the fact that cost projections have repeatedly failed to capture the real cost of the dam construction. A key reason that the cost projections have not been accurate to date is that the work is so unique for the dam that the overall “worst-case” conditions are not described adequately due to lack of experience and knowledge with construction techniques being used. Perhaps what is assumed to be the worst case in the risk analysis is really the expected value, making it difficult to foresee further costs that could be incurred.

The risk analysis also portends possible future issues. Figure 18 in the main report depicts the S-curve or cumulative probability plot detailing the expected contingency cost levels for the dam construction. The 80% confidence level provides an estimate of \$200 million, whereas the 100% confidence level is about \$400 million. This difference may indicate that the top-end risks are not adequately understood yet due to the unique nature of the dam construction methodology.

Although the 80% confidence interval is used by USACE for most project risk studies, a higher contingency confidence interval may be warranted for this project due to the non-standard project issues highlighted here. In addition, using a higher confidence interval, say 90% rather than 80%, may provide a more expedient way to incorporate further cost estimate buffers to account for a number of other project uncertainties (e.g., inflation rate, actual funding stream, construction challenges) under one umbrella. Using a higher confidence interval also may address the observed tendency to underestimate overall dam construction costs for the project.

Significance –High

The TPC may be underestimated, potentially leading to future project delays and further PACR updates.

Recommendations for Resolution:

1. Use a higher confidence interval for the dam construction contingency rather than the standard 80% value.
2. Consider the use of the 90% confidence interval to increase the contingency costs by about \$40 million; this could be justified given the past project history.

Final Panel Comment 4

The Planning, Engineering and Design (PED)/Engineering During Construction (EDC)/Supervision and Administration (S&A) costs for the remaining dam construction contract and out-year construction contracts are inconsistent, and TPCs cannot be accurately determined.

Basis for Comment:

The EDC for the dam is estimated at \$1.75 million per year which is approximately 2% of the dam construction estimate. EDC for out-year contracts is assumed to be 5% of construction estimates. Given that the dam is a much more complex and expensive cost item, it seems reasonable that the EDC percentage could be higher while out-year values are lower. Similarly, the S&A estimate for the dam is about 5 to 5.5% of construction cost while the out-year value is assumed to be 7.5%. USACE might consider investing higher S&A in the dam and less in the out-year contracts given that the dam is a large majority of the future project costs. This approach would also be consistent with higher oversight for Civil Works “mega-projects” as recommended by USACE Headquarters.

For comparison purposes, total PED, EDC, and S&A for the prior project expenditures accounted for approximately 14.5% of the construction cost, according to Table 4. Table 9 lists PED/EDC/S&A proposed values for out-year contracts that range from 27.5% to 37.5% of the construction cost for each listed element of work. Overall, the sum of these items appears to be unreasonably high. The S&A costs are estimated at 7.5% of the construction costs. This cost may be reasonable, but the other costs, including PED and EDC, appear overestimated. For example, for military construction, rates for sum of PED/EDC/S&A are usually capped at 12% to 15% of the construction cost; similar rates for private-sector projects are usually even lower.

USACE has employed a large and diverse team of estimators to compile the various updated cost estimates. Engineering judgment is used when assigning values for PED, EDC, and S&A; with such a large number of estimators, the “judgments” may all be entirely different.

Significance – High

The TPC estimate may be underestimated or overestimated due to inconsistencies in design and construction oversight costs.

Recommendations for Resolution:

1. Re-evaluate the PED, EDC, and S&A costs for the remaining dam construction contract and the out-year contracts.
2. Convene a panel of the top three most experienced cost estimators to adjust the final PED/EDC/S&A percentages assigned to all contracts, keeping in mind the actual past expense as a guide.

Final Panel Comment 5

The cost adjustments made to the URS rebaseline estimate shown in Table 6 of the main Olmsted Final Baseline Cost Estimate (FY12) for the Post-Authorization Change Report, Olmsted Locks and Dam, October 2011 report are not thoroughly discussed, and do not provide complete documentation of the cost validation process.

Basis for Comment:

Table 6 of the main report lists the various adjustments, additions, and deletions included in the USACE analysis, but there is very little explanation for most of these items. Some of this information is contained in the Hill International Report in Appendix K, but it would be better if it were also in the main report. A short narrative describing each table item would be useful.

The narrative could include the following:

- An explanation of the work item in terms of construction activities involved or assumptions made.
- An explanation of the difference identified by Hill and how it was uncovered.
- An explanation of the significance of the item.
- A discussion of how the adjustment was applied to the cost estimate.

This methodology appears to be very useful in validating URS costs. It may also prove useful in the future as part of enhanced project controls.

Significance – Medium

It is important to fully document the government cost validation process for the dam construction contract since a bottom-up independent government estimate has not been prepared.

Recommendation for Resolution:

1. Include more detailed narrative discussions of each item listed in Table 6 and provide further explanation on how each was applied in the final TPC estimate.

Final Panel Comment 6

The use of a calendar year (CY) format in the Primavera P6 schedule may have resulted in minor discrepancies among the selected mid-points used for cost escalation.

Basis for Comment:

Based on a review of the detailed P6 schedule, it appears that there are minor discrepancies in the selected mid-points. Some of these changes may have a beneficial impact on the overall cost, meaning that the amount of escalation would decrease.

The discrepancy in the mid-points for escalation may be attributed to the Primavera P6 schedule provided for the draft schedule in Appendix D of the baseline cost estimate report being in calendar year format and not government fiscal year (FY) format (Figure 1; line below the year is represented by a “Q” indicating calendar year quarter). The final schedule had a change in the date line replacing the line represented by “Q” with that of the government FY start (Figure 2); however, a review of the midpoints assumed for escalation in the TPCS did not change between the draft and final reports provided. An example of the difference in date format between the two versions is included below.

Figure 1. Draft Primavera P6 Schedule (Appendix D)

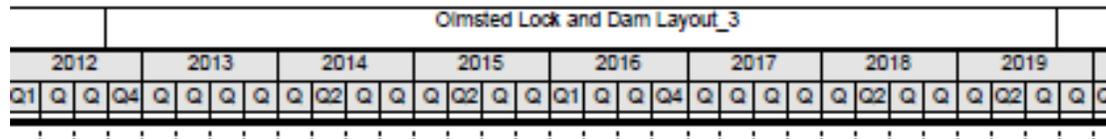
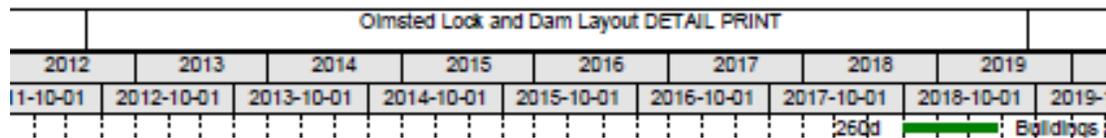


Figure 2. Final Primavera P6 Schedule (Appendix D)



Significance – Low

Changes in the midpoint of construction assumptions will have minor impacts to the TPC.

Recommendation for Resolution:

1. Review midpoints of construction with respect to the project schedule and revise the midpoints in the TPCS.

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APPENDIX B

Final Charge to the Independent External Peer Review Panel

as

Submitted to USACE on October 7, 2011

on the

Olmsted Cost Update IEPR

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APPENDIX B
Charge Questions and Guidance to the Peer Reviewers
for the
Independent External Peer Review of the Olmsted Locks and Dams 52 and 53 Replacement
Project Updated Cost Estimate Peer Review

BACKGROUND

The U.S. Army Corps of Engineers' (USACE) Olmsted Locks and Dam (L&D) Project provides for a structure near Ohio River Mile 964.4 that would replace the existing Locks and Dams 52 and 53. The structure will consist of twin 110 foot by 1200 foot locks adjacent to the Illinois bank, five tainter gates, a 1400 foot navigable pass, and a fixed weir extending to the Kentucky bank. The first construction contract was awarded on 19 November 1992 to construct the Access road and Residents Engineer's Office. Since then, several contracts have been awarded. The major contracts that have been awarded and completed include the Locks Cofferdam, the Locks, the Approach Walls, and the Operations and Maintenance Bulkheads contracts. The contract (cost reimbursable) for the construction of the Dam was awarded 28 January 2004 and work is ongoing. Other contracts to be awarded in the future include the Buildings and Grounds (including Site Restoration), Demolition of Locks & Dams 52 and 53, River Dikes, Upstream Mooring Cells, Paving, and Equipment contracts.

The Olmsted Locks and Dam Project had an original authorized cost of \$775M (no escalation) in WRDA 1988. Recent design changes, contract modifications, and other unanticipated increases in project costs have led USACE to seek a PACR to increase the project's authorized amount to a level necessary for successful project completion.

In support of the PACR, Battelle was previously engaged in performing an Independent External Peer Review (IEPR), which was submitted in a November 15, 2010 report, "Final Independent External Peer Review Report." That report offered several comments from the peer reviewers that raised cost, schedule, and risk concerns/issues. Since that period, USACE has elected to further address/update the cost estimate in an effort to improve confidence of a Total Project Cost (TPC) prior to the 2013 budget submission.

Based on the previous comments, USACE has elected to further develop project cost, schedule, and risks that will then undergo a quality control (QC) review. The resulting product will also undergo a cost Agency Technical Review (ATR) managed by the Cost Engineering Directory of Expertise for Civil Work. The goal is to have the certified cost estimate at the conclusion of this process, anticipated no later than October 28, 2011.

OBJECTIVES

The objective of this work is to conduct an IEPR of the Olmsted Locks and Dams 52 and 53 Replacement Project Updated Cost Estimate Peer Review (hereinafter: Olmsted Cost Update IEPR) in accordance with the Department of the Army, USACE, Water Resources Policies and Authorities' *Civil Works Review Policy* (EC 1165-2-209) dated January 31, 2010, and the Office

of Management and Budget's *Final Information Quality Bulletin for Peer Review* released December 16, 2004.

Peer review is one of the important procedures used to ensure that the quality of published information meets the standards of the scientific and technical community. Peer review typically evaluates the clarity of hypotheses, validity of the research design, quality of data collection procedures, robustness of the methods employed, appropriateness of the methods for the hypotheses being tested, extent to which the conclusions follow from the analysis, and strengths and limitations of the overall product.

The purpose of the IEPR is to assess the "adequacy and acceptability of the economic, engineering, and environmental methods, models, and analyses used" (EC 1165-2-209; p. D-4) for the Olmsted Cost Update documents. The IEPR will be limited to technical review and will not involve policy review. The IEPR will be conducted by subject matter experts (i.e., IEPR panel members) with extensive experience in cost engineering as well as experience applying their subject matter expertise to flood risk management.

The Panel will be "charged" with responding to specific technical questions as well as providing a broad technical evaluation of the overall project. Per EC 1165-2-209, Appendix D, review panels should identify, recommend, and comment upon assumptions that underlie the analyses as well as evaluate the soundness of any models used in preparing this estimate. The reviewers should be able to evaluate whether the interpretations of analyses and conclusions are technically sound and reasonable, provide effective review in terms of both usefulness of results and of credibility, and have the flexibility to bring important issues to the attention of decision makers. The reviewers may offer opinions as to whether there are sufficient technical analyses upon which to base the ability to implement the project. The independent reviewers will address factual inputs, data, the use cost models, analyses, assumptions, and other scientific and engineering tools/methodologies to inform decision-making.

DOCUMENTS PROVIDED

The following is a list of documents and reference materials that will be provided for the review.

- The Locks and Dams 52 and 53 Replacement Project (Olmsted Lock and Dam) Revised Baseline Cost Report, which will include: MII, Risk Report, TPC Report and supporting information.

Documents for Reference

- USACE guidance Civil Works Review Policy (EC 1165-2-209) dated January 31, 2010
- CECW-CP Memorandum dated March 31, 2007
- Office of Management and Budget's *Final Information Quality Bulletin for Peer Review* released December 16, 2004.

SCHEDULE

This draft schedule is based on the October 21, 2011 receipt of the final review documents. The schedule will be revised upon receipt of final review documents. Dates that are important to the panel members are shown in **bold**. Asterisk denotes Battelle deliverable to USACE.

Task	Action	Due Date
Conduct Peer Review	Battelle/Panel hold kick-off meeting	10/14/2011
	USACE/Battelle/Panel hold kick-off meeting	10/14/2011
	Battelle sends review documents to IEPR Panel	10/21/2011
	Battelle/Panel Conduct Site Visit	10/18/2011-10/19/2011
	Battelle convenes mid-review teleconference for Panel to ask clarifying questions of USACE	10/25/2011
	Panel members complete their individual reviews and provide response to charge questions and Preliminary Final Panel Comments	10/27/2011
Prepare Final Panel Comments and Final IEPR Report	Battelle provides Panel merged individual comments, talking points, and comments on Preliminary FPCs for Panel Review Teleconference	10/28/2011
	Battelle convenes Panel Review Teleconference	10/28/2011
	Panel members submit Final Panel Comments in final format to Battelle	11/1/2011
	Battelle submits Final Panel Comments in word format to USACE	11/1/2011
	Battelle provides Final IEPR Report to Panel for review	11/2/2011
	Panel provides comments on Final IEPR Report	11/2/2011
	*Battelle submits Final IEPR Report to USACE	11/3/2011
Comment/Response Process	Battelle convenes teleconference with Panel to review the Comment Response Process (if necessary)	11/1/2011
	USACE provides draft Evaluator Responses to Battelle	11/7/2011
	Battelle provides the Panel the draft Evaluator Responses	11/7/2011
	Panel members provide Battelle with draft comments on draft Evaluator Responses (i.e., draft BackCheck Responses)	11/8/2011
	Battelle convenes teleconference with Panel to discuss draft BackCheck Responses	11/8/2011
	Battelle convenes teleconference with Panel and USACE to discuss Final Panel Comments, and draft responses	11/8/2011
	USACE inputs final Evaluator Responses in DrChecks	11/9/2011
	Battelle provides Evaluator Responses to Panel	11/9/2011
	Panel members provide Battelle with final BackCheck Responses	11/10/2011
	Battelle inputs the Panel's BackCheck Responses in DrChecks	11/11/2011
	*Battelle submits pdf printout of DrChecks project file	11/11/2011

CHARGE FOR PEER REVIEW

Members of this IEPR Panel are asked to determine whether the technical approach and scientific rationale presented in the Olmsted Locks and Dam 2011 updated cost estimate are credible and whether the conclusions are valid. The reviewers are asked to determine whether the technical work is adequate, competently performed, properly documented, satisfies established quality requirements, and yields scientifically credible conclusions. The panel is being asked to provide feedback on the cost-engineering analyses. The reviewers are not being asked whether they would have conducted the work in a similar manner.

GENERAL CHARGE GUIDANCE

Please answer the scientific and technical questions listed below and conduct a broad overview of the Olmsted Locks and Dam revised baseline cost report. Please focus on your areas of expertise and technical knowledge. In addition, please note the following guidance. Note that the panel will be asked to provide an overall statement related to 1 and 2 below per USACE guidance (EC 1165-2-209; Appendix D).

1. Your response to the charge questions should not be limited to a “yes” or “no.” Please provide complete answers to fully explain your response.
2. Assess the adequacy and acceptability of the cost-engineering methods, models, and analysis used.
3. If appropriate, offer opinions as to whether there are sufficient analyses upon which to base a recommendation for re-authorization.
4. Identify, explain, and comment on assumptions that underlie cost-engineering analyses.
5. Evaluate whether the interpretations of analysis and conclusions are reasonable.

Please **do not** make recommendations on whether a particular alternative should be implemented, or whether you would have conducted the work in a similar manner. Also please **do not** comment on or make recommendations on policy issues and decision making. Comments should be provided based on your professional judgment, **not** the legality of the document.

1. If desired, panel members can contact one another. However, panel members **should not** contact anyone who is or was involved in the project, prepared the subject documents, or was part of the USACE Independent Technical Review.
2. Please contact the Battelle Project Manager (Project Manager, bakerhartl@battelle.org) or Program Manager (Karen Johnson-Young (johnsonyoungk@battelle.org)) for requests or additional information.
3. In case of media contact, notify the Battelle Program Manager, Karen Johnson-Young (johnsonyoungk@battelle.org) immediately.
4. Your name will appear as one of the panel members in the peer review. Your comments will be included in the Final IEPR Report, but will remain anonymous.

Please submit your comments in electronic form to Project Manager, bakerhartl@battelle.org, no later than October 27, 2011, COB ET.

**Independent External Peer Review
of the
Olmsted Locks and Dams 52 and 53 Replacement Project
Updated Cost Estimate Peer Review**

Charge Questions As Supplied By USACE

1. Are the assumptions that underlie the 2011 cost-engineering analyses sound?
2. Please comment on the adequacy and acceptability of the cost models and analyses used, as well as any assumptions made.
3. Are the interpretations of analysis and conclusions based on the analysis reasonable?
4. Are the contingency cost expanded to existing line items to account for cash flow issues that may arise over the next 5 years?
5. Do cost risk analysis and contingency determinations include remaining work or consider experience with the dam construction methods or changes in dam construction assumptions?
6. In your opinion, considering the complexity of the project and the remaining schedule, are the proposed contingencies adequate or overstated?
7. Please comment on the adequacy of the risk assessment in determining the dam construction contingencies.
8. Please discuss the extent to which the Total Project Construction Cost Contingency Analysis is adequately described and justified.
9. Please discuss the extent to which the Total Project Cost Estimate adequately addresses all the cost and is sufficient to complete the project.
10. Please comment on the increases due to inflation. Does the CWCCIS adequately address the cost increase due to inflation?
11. Does the estimate include sufficient contingencies for the future construction contracts?

**Final Compiled Comments and Responses
on the
Olmsted Locks and Dam 52 and 53
Replacement Project
Updated Cost Estimate IEPR**

Final Comment-Response Record

Final Comment-Response Record

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Final Panel Comment 1

The use of the Civil Works Construction Cost Index System (CWCCIS) to estimate cost escalation through the completion of construction activities may not adequately account for future inflation.

Basis for Comment:

The CWCCIS uses Office of Management and Budget (OMB) inflation factors to forecast escalation for years in which no data are available. The CWCCIS currently is forecasting approximately 1.8% escalation year to year after fiscal year (FY) 2012. Escalation was considered in the Cost and Schedule Risk Analysis (CSRA), Appendix I - Risk Register under risk number DAM-036.jj

Under current economic conditions, this escalation rate may be adequate for immediate future escalation. However, when compared to historical averages, this is relatively low. The recent economic downturn has resulted in negative or comparably low inflation indices, and there is variation depending on which cost index is reviewed, but looking at inflation rate over 20 years, the average annual inflation rate is approximately 3%. Some indices, like those from the Engineering News Record (ENR), have shown recent inflation rates close to this (ENR, 2011). For example: ENR Construction Cost Index from calendar year (CY) 2009 to CY2010 showed an increase of 2.7% and from CY2010 to CY2011 showed an increase of 2.8%. The CWCCIS over the same time frame has increases of 3% and 4.1%, respectively. The Rider Levett Bucknall (RLB) National Construction Cost Index had smaller gains of 0.9% and 1.4%, respectively (RLB, 2011); however, the RLB index considers primarily bid price inflation. And the Turner Building Cost Index over the same period showed a decrease of -4% and then an increase of 1.9%, respectively (Turner, 2011).

Based on the ENR Skilled Labor Index History, labor costs have increased on average approximately 3.4% per year. Through the recent economic downturn, labor cost increases have remained higher than material cost increases. The ENR Skilled Labor Index from CY2009 to CY2010 showed an increase of 3.5% and from 2010 to 2011 showed an increase of 2.5%. In addition, in the CSRA, risk number DAM-036 suggests a 4% per year labor agreement cost increase.

Generally, material prices have been very volatile and are dependent on global economic demand. Concrete and steel prices may currently be stable or decreasing because global demand is depressed as a result of the economic downturn. For example, fuel costs could grow at significantly higher rates than 1.8%. The Energy Information Administration 2011 Energy Outlook includes a high oil price scenario that has the price of a barrel of oil at \$146 in 2015 and at \$169 in 2020 (EIA, 2011). If this scenario were realized, the cost of diesel fuel for the Olmsted project would be much higher than estimated.

Should economic conditions improve, which is possible considering the time frame until completion, it is likely that inflation could be higher than the current CWCCIS approximation. Current USACE guidance mandates the use of Table 1 of the Program Development Guidance for Fiscal Year 2011 (USACE, 2009); however, the CWCCIS (USACE, 2011) also states on page 2-1 that “while the historic projections are reliable to

update project costs, forecasting beyond two years may be unreliable.”

Significance – High

Actual costs due to inflation could be significantly higher than those currently projected.

Recommendations for Resolution:

1. Review inflation rates assumed in the CWCCIS with respect to historic construction cost indices and inflation on similar projects. Revise inflation rates based on review.
2. Consider the assumptions made by URS for escalation in the Dam Contract and apply a similar methodology/rate to the Total Project Cost Summary (TPCS) for the remainder of the Dam Contract.

USACE Final Evaluator Response to FPC 1

Non-concur

1. Adopt-in-Part - Inflation is captured and presented in accordance to current policy and regulations. USACE will not revise the inflation rates but per discussion with IEPR team on 11/8/11, will update the report to further explain methodology used and how escalation risks were accounted for in the CSRA and contingencies added to the base cost. The future rates in the CWCCIS table are not accurate models for predicating future inflation and fully funded costs. The CWCCIS table is actually a composite table with prior to publication date rates being actual computed inflation values and future rates as set by OMB. These rates are mandated for use and generally are low for future years. (The future rates for CWCCIS should match the annual program EC Table 1 and Table 2 rates for future years.) Current USACE cost engineering guidance and direction requires utilization of CWCCIS escalation factors for estimating future escalation per ER 1110-2-1302 and ETL 1110-2-573. Under WRDA 1986 and the provisions of section 902, this project if reauthorized will receive the ACTUAL inflation allowance as captured by CWCCIS past rates. These past rates are considered to be accurate. In the examination of risk with regards to inflation, the potential for CWCCIS to not capture the actual local inflation is what is studied and added to the contingency value. From studying past inflation rates we think that there most likely will be 3-4% average inflation over the remainder of this contract and that it will be captured by the updates to the CWCCIS Tables as the project progresses subsequently raising the 902 limit of the project each year.

2. Adopt-in-Part - Methodology utilized to capture inflation is in accordance with current policy and regulation. USACE will not revise the inflation rates using the recommended methodology per discussion with IEPR team on 11/8/11, but will update report to further explain methodology used.

Final Panel BackCheck Response FPC1

Concur with Comment.

1. and 2. The Panel notes that verbiage regarding a sensitivity analysis on escalation was included in the revised report in the executive summary. The Panel requests that the discussion from the bullet for Dam-036 and OYC-001 on Page ix regarding the sensitivity analysis conducted on escalation also be included in similar bullets on Page 49, Page 50, and Page 52.

Final Panel Comment 2

The project funding assumptions were not developed using a worst-case scenario and therefore may overestimate available funding.

Basis for Comment:

The Olmsted Final Baseline Cost Estimate (FY12) for the Post-Authorization Change Report (PACR), Olmsted Locks and Dam, October 2011 report (main report) states on page 35 that "... it was apparent that the dam construction duration is cost driven rather than activity driven." The funding stream scenario used in the analysis is \$150 million per year through FY2021, then a \$100 million per year for FY2022 to FY2024. The CSRA risk register number DAM-021 has a worst case scenario of \$150 million per year for FY2012 and FY2013 which is then reduced to \$130 million per year for the remainder of the dam contract and \$75 million per year for out-year contracts.

Final Panel Comment number 1 from the Final Independent External Peer Review Report Olmsted Locks and Dam 52 and 53 Replacement Project Post Authorization Change Report related to the adequacy of funding from the Inland Waterways Trust Fund (IWTF) in meeting future project needs. Even if all available funds from the IWTF are made available solely to the Olmsted Locks and Dam project, the assumption of \$150 million a year in funding may not be realistic. The FY2010 ending balance of the IWTF was \$58.5 million (IWTF, 2011). The FY2010 revenues were \$73.9 million, down from \$76 million in FY2009. There has generally been a decreasing trend in revenue for the IWTF (IMTS, 2010). In addition, because the total IWTF has been severely reduced, the interest on remaining funds generated year to year has decreased more substantially. Depending on economic conditions, the IWTF may be depleted to the point where it cannot maintain the 50% cost share for funding of \$150 million per year through FY2021.

The use of a \$150 million per year funding stream for the majority of the upcoming contract years may not be realistic, based on the history of funding for this project and the potential for real funding limitations in the future given the current economic and political climate. Contingency for the remaining dam contract and out-year contracts may increase under the worst-case funding scenario.

The main report, page 47, states that fixed site overhead costs are approximately \$50 million per year. These costs are incurred regardless of how much construction is accomplished in a given year. Program funding at levels less than expected would have a real impact on project schedule because less construction would then be accomplished. Less construction accomplished delays the project schedule and increases costs.

The report does cite an estimation of project savings under a better-than-expected funding scenario. However, the report would benefit from additional text describing the funding streams in more detail and the implications of lower-than-ideal funding, including number of additional years and costs potentially incurred based on the worst-case scenario.

Significance – High

If program funding is less than assumed, the overall project schedule will be delayed, resulting in increased costs.

Recommendations for Resolution:

1. Base schedule and cost estimate on an expected funding limit of \$130 million per year through FY2021 and \$75 million for the out-year contracts (worst-case scenario under CSRA risk register number DAM-021).
2. Include additional text in the report regarding the implications of lower-than-ideal funding, including number of additional years and costs potentially incurred based on the worst-case scenario.
3. Include a discussion of the two funding streams, IWTF and Treasury, for the Olmsted project and their possible limitations.

USACE Final Evaluator Response to FPC 2**Non-concurred**

Olmsted is already due to receive \$150M for FY12 and FY13. Through discussions with USACE-HQ, LRL Program Office, and the IWTR User's Board, the assumed most-likely scenario was that the \$150M per year funding stream could be maintained for the dam contract. A funding stream of \$130 per year was assumed to be worst-case to account for the potential for some funding to go to other navigation projects in the latter years. USACE cost engineering guidance and best practices require the most-likely cost to complete the project to be developed. In this case, the most-likely funding stream is \$150M per year. The funding stream impacts are discussed in Risk Item # DAM-021 in the executive summary as well as other sections of the report; further details are included in Appendix I – Cost and Schedule Risk Analysis. This risk item is categorized as high for both cost and schedule. The best case scenario assumes a 1-year reduction in schedule and overhead costs (-\$48M) if additional funding did become available; adversely, the worst-case scenario assumes an additional 2-years for construction and overhead costs (+\$175M). Verbiage has been added to report to account for the order-of-magnitude related to costs associated with this risk item for both an unconstrained funding stream and the \$130M per year funding stream as stated below: DAM-021 - Funding differs from \$150M per year: The current estimate and schedule are based on a \$150M per year construction cap. Uncertainty exists actual funding levels may vary up or down. Increased funding, sooner in the project schedule would result in reduced escalation over time and potential reduction to contractor's onsite duration and associated extended site overheads. On the other hand, less funding would tend to increase escalation and add contractor's onsite duration and extended site overheads. An unconstrained funding scenario could cut up to three years from the project schedule resulting in significant cost savings of approximately \$250M (~\$170M first-cost plus ~\$80 escalation); approximately \$215M per year would be needed for this scenario. Conversely, a reduced funding stream down to \$130M per year would result in additional schedule impacts and adversely affect overall project costs (~\$175M cost increase including additional overheads and escalation).

Response to Recommendations:

1. Adopt in Part – USACE will not adopt the specific recommendation of basing the cost estimate on the worst case funding scenarios for the project, per discussion with IEPR team on 11/8/11. USACE will update the report to include verbiage explaining why the \$150M/year most-likely funding stream was used and how we accounted for the risk of a lower funding stream in the CSRA and associated contingency dollars.
2. Adopt – USACE will update the report to include verbiage explaining why the \$150M/year most-likely funding stream was used and how we accounted for the risk of a lower funding stream in the CSRA and associated contingency dollars.
3. Adopt in Part – USACE will update the report to include a discussion of the two funding streams and their limitations.

Final Panel BackCheck Response FPC2

Concur with Comment.

1. and 2. Panel notes that verbiage has been included in the final report discussing the cost and schedule impacts under the worst-case funding stream.
3. Please include the discussion regarding the development of the most-likely funding scenario from Page vii on Page 37. While this discussion does provide a general origin for the \$150 million per year funding assumption for the remaining dam contract, the Panel requests that the report discuss the two funding sources in more detail. It should be noted in the report the assumption that all the funds in the IWTF be diverted to the Olmsted project to meet the 50% cost share for the majority of the remaining project; this appears to be a fundamental assumption in the funding forecasts.

Final Panel Comment 3

The estimated contingency for the remaining dam construction costs is low, and may not account for possible delays associated with the construction of a uniquely engineered structure.

Basis for Comment:

The “Rebaseline Estimate and Schedule Review” (hereinafter called the Hill International Report) performed by Hill International for USACE and described in Appendix K contains great detail regarding their evaluation of the dam construction issues and cost growth. The Hill International Report recommendations are then included in the risk analysis study. One task that has not been completed to date, though, is a comparison of URS annual budget estimate updates. These have increased continually during construction, including a most recent estimate increase of 31% from February 2009 to July 2011 as referenced in the main report and in Appendix L. This indicates that there still is considerable risk of further cost growth in the dam portion of the project.

The current contingency of 18% would be very reasonable for most projects at this stage of construction, but it is not sufficient for this project given the overall project history and the fact that cost projections have repeatedly failed to capture the real cost of the dam construction. A key reason that the cost projections have not been accurate to date is that the work is so unique for the dam that the overall “worst-case” conditions are not described adequately due to lack of experience and knowledge with construction techniques being used. Perhaps what is assumed to be the worst case in the risk analysis is really the expected value, making it difficult to foresee further costs that could be incurred.

The risk analysis also portends possible future issues. Figure 18 in the main report depicts the S-curve or cumulative probability plot detailing the expected contingency cost levels for the dam construction. The 80% confidence level provides an estimate of \$200 million, whereas the 100% confidence level is about \$400 million. This difference may indicate that the top-end risks are not adequately understood yet due to the unique nature of the dam construction methodology.

Although the 80% confidence interval is used by USACE for most project risk studies, a higher contingency confidence interval may be warranted for this project due to the non-standard project issues highlighted here. In addition, using a higher confidence interval, say 90% rather than 80%, may provide a more expedient way to incorporate further cost estimate buffers to account for a number of other project uncertainties (e.g., inflation rate, actual funding stream, construction challenges) under one umbrella. Using a higher confidence interval also may address the observed tendency to underestimate overall dam construction costs for the project.

Significance –High

The TPC may be underestimated, potentially leading to future project delays and further PACR updates.

Recommendations for Resolution:

1. Use a higher confidence interval for the dam construction contingency rather than the standard 80% value.
2. Consider the use of the 90% confidence interval to increase the contingency costs by about \$40 million; this could be justified given the past project history.

USACE Final Evaluator Response to FPC 3

Non-concur

The 80% confidence contingency amount presented for the dam contract is \$200M (18%). The IEPR recommendation of 90% confidence contingency amount would be \$240M (22%).

The USACE business model recommends standard 80% confidence levels for budgetary requests. This level of confidence reflects the organization's management approach to acceptable risk exposure. Per USACE Cost And Schedule Risk Analysis Guidance dated 17 May 2009 published by the Directory of Expertise for Civil Works Cost Engineering:

“The PM and management are left to decide what confidence level they prefer to present to Congress for authorization. Historically, Congress and the Assistant Secretary of the Army are accustomed to a contingency value with an 80 percent confidence of successful execution and completion.”

Further, Section 902 of the Water Resources Development Act (WRDA) of 1986 defines the maximum amount that a project may cost (often referred to as the 902 Limit). ER 1105-2-100 Appendix G states:

“The maximum project cost limit imposed by Section 902 is a numerical value specified by law which must be computed in a legal manner (ER 1105-2-100 Appendix G).”

“The maximum project cost includes the authorized cost (adjusted for inflation), the current cost of any studies, modifications, and action authorized by WRDA '86 or any later law, and 20 percent of the authorized cost (without adjustment for inflation). The cost of modifications required by law is to be kept separate and added to other allowable costs. These three components equal the maximum project cost allowed by section 902.”

Note: Appendix G also prescribes the calculation for allowed inflation based on the CWCCIS method, the same method applied in the TPCS. This greatly reduces the future escalation risk to the budget management, however some risk remains that the CWCCIS method does not adequately address the actual inflation (see Risk Item # DAM-036).

It is important to note some of the basis for the historical cost growth to date. Also to be considered is the learning curve that has been realized since the early estimates. Prior items of uncertainty and “unknowns” are now functioning elements such as the precast yard, lifting systems, and the track experience of nearly two construction seasons of precast shell placements. At this stage of the project the means and methods of construction have been demonstrated, invoiced, and set to be refined. Much of this cost

growth from the February 2009 to July 2011 estimates were due to the incorporation of known production rates (further variation of production rates is in Risk Item# DAM-001). Another key revision was the project estimate taking ownership of some of the key risk items into the base estimate. In other words, buying into risks/uncertainties and making the base estimate more conservative, and therefore warranting a lesser contingency to achieve the same confidence level.

For the FY12 PACR Cost Estimate, the dam contingency amount was developed utilizing a risk-based approach to identify root cause events and conditions that could impact the project cost and schedule. This process involved soliciting feedback from the entire project management, design, and construction management team who do have a great deal of experience and knowledge of the existing construction techniques at the Olmsted Project. These key areas of "known" uncertainty in design and constructability are included in the base estimate and/or as specific risk items. Further, the team recognizes that there is still "unknown" uncertainty in the remaining construction that is quantified in Risk Item# DAM-035.

Further, contingency amount resulting from the 18% applied to the dam equates to \$200M. This contingency amount in itself encompasses the Total Project Cost of "most" large USACE civil works projects. The recommendation for a 90% confidence is too risk averse and is inconsistent with budget requests for other projects that the USACE has presented to the Congress and the Assistant Secretary of the Army.

Response to Recommendations

1. Not Adopt - USACE will not incorporate this IEPR recommendation to use the 90% confidence level and associated contingencies per discussion on 11/8/11. The 80% confidence contingency amount presented for the dam contract is \$200M (18%). The IEPR recommendation of 90% confidence contingency amount would be \$240M (22%). The USACE business model recommends standard 80% confidence levels for budgetary requests. This level of confidence reflects the organization's management approach to acceptable risk exposure. Per USACE Cost And Schedule Risk Analysis Guidance dated 17 May 2009 published by the Directory of Expertise for Civil Works Cost Engineering: "The PM and management are left to decide what confidence level they prefer to present to Congress for authorization. Historically, Congress and the Assistant Secretary of the Army are accustomed to a contingency value with an 80 percent confidence of successful execution and completion."

2. Not Adopt - Same response for recommendation #1

Final Panel BackCheck Response FPC3

Concur with comment.

The USACE may opt to use a higher confidence interval rather than 80% as noted by USACE Cost And Schedule Risk Analysis Guidance dated 17 May 2009 published by the Directory of Expertise for Civil Works Cost Engineering:

"The PM and management are left to decide what confidence level they prefer to present to

Congress for authorization.” Given, the past problems estimating the actual costs for the dam component of the project, the use of 90% confidence interval should be seriously considered. This value would increase the dam contingency by 20%. With the appropriate explanation, the Congress and the Assistant Secretary of the Army for Civil Works would understand why such a confidence interval was necessary for this project.

Final Comment-Response Record

Final Panel Comment 4

The Planning, Engineering and Design (PED)/Engineering During Construction (EDC)/Supervision and Administration (S&A) costs for the remaining dam construction contract and out-year construction contracts are inconsistent, and TPCs cannot be accurately determined.

Basis for Comment:

The EDC for the dam is estimated at \$1.75 million per year which is approximately 2% of the dam construction estimate. EDC for out-year contracts is assumed to be 5% of construction estimates. Given that the dam is a much more complex and expensive cost item, it seems reasonable that the EDC percentage could be higher while out-year values are lower. Similarly, the S&A estimate for the dam is about 5 to 5.5% of construction cost while the out-year value is assumed to be 7.5%. USACE might consider investing higher S&A in the dam and less in the out-year contracts given that the dam is a large majority of the future project costs. This approach would also be consistent with higher oversight for Civil Works “mega-projects” as recommended by USACE Headquarters.

For comparison purposes, total PED, EDC, and S&A for the prior project expenditures accounted for approximately 14.5% of the construction cost, according to Table 4. Table 9 lists PED/EDC/S&A proposed values for out-year contracts that range from 27.5% to 37.5% of the construction cost for each listed element of work. Overall, the sum of these items appears to be unreasonably high. The S&A costs are estimated at 7.5% of the construction costs. This cost may be reasonable, but the other costs, including PED and EDC, appear overestimated. For example, for military construction, rates for sum of PED/EDC/S&A are usually capped at 12% to 15% of the construction cost; similar rates for private-sector projects are usually even lower.

USACE has employed a large and diverse team of estimators to compile the various updated cost estimates. Engineering judgment is used when assigning values for PED, EDC, and S&A; with such a large number of estimators, the “judgments” may all be entirely different.

Significance – High

The TPC estimate may be underestimated or overestimated due to inconsistencies in design and construction oversight costs.

Recommendations for Resolution:

1. Re-evaluate the PED, EDC, and S&A costs for the remaining dam construction contract and the out-year contracts.
2. Convene a panel of the top three most experienced cost estimators to adjust the final PED/EDC/S&A percentages assigned to all contracts, keeping in mind the actual past expense as a guide.

USACE Final Evaluator Response to FPC 4

Non-concur.

EDC and S&A for the remaining dam contract were based on the historical average expended over the last five years. The E&D for the dam contract is conservative since 90% of the design has been completed. The S&A is based on the historical average over the last five years.

Total E&D for Out-Year Contracts is \$14.44M which is approximately 13.3% of construction costs. Total S&A for OYCs is \$8.04M which is approximately 6.7% of construction costs. Although these costs appear to be high, it is not unreasonably high. When factoring in the percent of design development, duration of activities, and yearly costs for each OYC, these costs could be incurred especially if there is earlier design involvement to prepare for this future work.

PED costs vary for each OYC based on the amount of design completed and are also dependent on the size of the job and duration of each activity. EDC was assumed to be a 5% of construction costs regardless of size. S&A was assumed to be 7.5% of construction costs and is the historical percentage that USACE adheres to and is measured against.

Response to Recommendations:

1. Adopt in Part – USACE will not re-evaluate PED, EDC, and S&A costs per discussion with IEPR team on 11/8/11. USACE will update the report to add explanation justifying the use of actual historical rates for these costs.
2. Adopt in Part – USACE will not convene a panel to adjust PED/EDC/S&A percentages per discussion with IEPR team on 11/8/11. USACE will update the report to add explanation justifying the use of actual historical rates for these costs.

Out-Year Contract	Design Development
Buildings & Grounds	90%
Dredging	10%
Final County Road Paving	100%
Lock & Dam 52 - Land Demolition	10%
Lock & Dam 52 - Marine Demolition	10%
Lock & Dam 53 - Land Demolition & Historic Restoration	10%
Lock & Dam 53 - Marine Demolition	10%
Lock Rehab/O&M Startup	5%
Operations Equipment and Machinery	90%
Project Closeout & Site Restoration	5%
RE Office Conversion to Ops Building	10%
River Dikes	25%
Salvage/Excess of Government Owned Equipment	5%
U/S Mooring Cells	95%
Wicket Lifter Barge	90%

Feature Account	Project First Cost FY12 Price Level	Total Project Cost (Fully Funded)
▣ Dam Contract	1,291.89 M	1,406.14 M
▣ Remaining	1,291.89 M	1,406.14 M
▣ Construction	1,209.02 M	1,307.68 M
04 - DAMS	1,209.02 M	1,307.68 M
▣ Non-Construction	82.88 M	98.46 M
01 - LANDS & DAMAGES	0.03 M	0.03 M
30 - PLANNING, ENGINEERING & DESIGN	20.71 M	24.61 M
31 - CONSTRUCTION MANAGEMENT	62.13 M	73.82 M
▣ Out-Year Contracts	268.18 M	329.33 M
▣ Remaining	268.18 M	329.33 M
▣ Construction	216.78 M	259.90 M
04 - DAMS	35.95 M	43.72 M
05 - LOCKS	70.98 M	84.45 M
06 - FISH & WILDLIFE FACILITIES	5.25 M	5.75 M
08 - ROADS, RAILROADS, & BRIDGES	1.01 M	1.26 M
09 - CHANNELS & CANALS	60.31 M	73.61 M
18 - CULTURAL RESOURCE PRESERVATION	3.61 M	4.41 M
19 - BUILDINGS, GROUNDS, & UTILITIES	14.94 M	17.12 M
20 - PERMANENT OPERATING EQUIPMENT	24.71 M	29.59 M
▣ Non-Construction	51.41 M	69.43 M
30 - PLANNING, ENGINEERING & DESIGN	28.92 M	39.70 M
31 - CONSTRUCTION MANAGEMENT	14.44 M	21.04 M
50 - CONSTRUCTION FACILITIES	8.04 M	8.70 M
▣ PRIOR	1,358.10 M	1,358.10 M
▣ Spent	1,358.10 M	1,358.10 M
Grand Total	2,918.18 M	3,093.57 M

Final Panel BackCheck Response FPC4

Concur with comment.

Costs for PED and EDC for the out-year contracts are substantially inconsistent. For the River Dikes project, the PED and EDC costs are the same (\$2,520,109). For Marine Demolition project, the PED cost is twice the EDC cost. For RE Office conversion to Ops Building project, the PED cost is five times the EDC cost. From the Panel's experience, EDC costs are usually some percentage of the original PED total unless USACE is expecting to complete 100% redesign during EDC. A reasonable EDC value would likely be 20% to 40% of PED costs. The Panel understands that the PED and EDC costs were developed using assumed percentages of construction costs, however, the proposed dollar value to complete each effort should be reasonable and consistent. In those instances where the EDC value is the same or nearly the same as the corresponding PED cost, the implication is that the same or about the same level of engineering is required during construction as was required to develop the contract documents in the first place.

Final Panel Comment 5

The cost adjustments made to the URS rebaseline estimate shown in Table 6 of the main Olmsted Final Baseline Cost Estimate (FY12) for the Post-Authorization Change Report, Olmsted Locks and Dam, October 2011 report are not thoroughly discussed, and do not provide complete documentation of the cost validation process.

Basis for Comment:

Table 6 of the main report lists the various adjustments, additions, and deletions included in the USACE analysis, but there is very little explanation for most of these items. Some of this information is contained in the Hill International Report in Appendix K, but it would be better if it were also in the main report. A short narrative describing each table item would be useful. The narrative could include the following:

- An explanation of the work item in terms of construction activities involved or assumptions made.
- An explanation of the difference identified by Hill and how it was uncovered.
- An explanation of the significance of the item.
- A discussion of how the adjustment was applied to the cost estimate.

This methodology appears to be very useful in validating URS costs. It may also prove useful in the future as part of enhanced project controls.

Significance – Medium

It is important to fully document the government cost validation process for the dam construction contract since a bottom-up independent government estimate has not been prepared.

Recommendation for Resolution:

1. Include more detailed narrative discussions of each item listed in Table 6 and provide further explanation on how each was applied in the final TPC estimate.

USACE Final Evaluator Response to FPC 5

Concur

Response to Recommendation:

1. Adopt - A bulleted list of the major cost adjustments have been added to the report. A more detailed version of Table 6 will be added in the Appendix as well providing further explanation of adjustments.

- Extended FOOH Due to Longer Construction Schedule. Added \$206,356,956 to account for extended FOOH from 1-DEC-15 until the end of the existing dam contract (approximately 6 years). Total cost added: \$206.4M.
- Spent Dollars from 28-FEB-11 to 30-SEP-11 by Work Package. The 2011 URS Corporation Rebaseline Estimate included costs from 28-FEB-11 to 30-NOV-15

while the spent dollars for the project were up to 30-SEP-11. This amount was deducted from the estimate to avoid double-counting these costs. Total cost deduction: \$66.8M.

- Escalation. Escalation was removed from the estimate since it will be accounted for in the TPCS (Total Project Cost Summary) sheet which will capture escalation. Total cost deduction: \$56.4M. • Home Office G&A. Due to the addition/deletion of costs, HOOH had to be adjusted to account for these adjustments (7.37% of select items). Total cost added: \$18.5M.
- Management Reserve. Management reserve (contingency) was removed from the estimate since it will be accounted for in the CSRA (Cost and Schedule Risk Analysis). Total cost deduction: \$15M.
- Standby tug for river operations. Per the contract requirements (Document 00800 page 49, Spec 1.62), a tug is needed 24-7 to assist river traffic for safe passage through the NAV pass section of the dam during construction. Total cost added: \$14.8M.
- Variation of pile length on uncompleted sections. This was an adjustment made for revising pile lengths for the navigable pass from 42' to 54'. The 2011 URS Corporation Rebaseline Estimate assumes navigable pass piles are equal length to the tainter gate piles. USACE believes that once test piles are driven, the "most likely" case is that the navigable pass piles will be 33% longer than tainter gate piles. Total cost added: \$11.3M.

Final Panel BackCheck Response FPC 5

Concur.

Final Panel Comment 6

The use of a calendar year (CY) format in the Primavera P6 schedule may have resulted in minor discrepancies among the selected mid-points used for cost escalation.

Basis for Comment:

Based on a review of the detailed P6 schedule, it appears that there are minor discrepancies in the selected mid-points. Some of these changes may have a beneficial impact on the overall cost, meaning that the amount of escalation would decrease.

The discrepancy in the mid-points for escalation may be attributed to the Primavera P6 schedule provided for the draft schedule in Appendix D of the baseline cost estimate report being in calendar year format and not government fiscal year (FY) format (Figure 1; line below the year is represented by a “Q” indicating calendar year quarter). The final schedule had a change in the date line replacing the line represented by “Q” with that of the government FY start (Figure 2); however, a review of the midpoints assumed for escalation in the TPCS did not change between the draft and final reports provided. An example of the difference in date format between the two versions is included below.

Figure 1. Draft Primavera P6 Schedule (Appendix D)

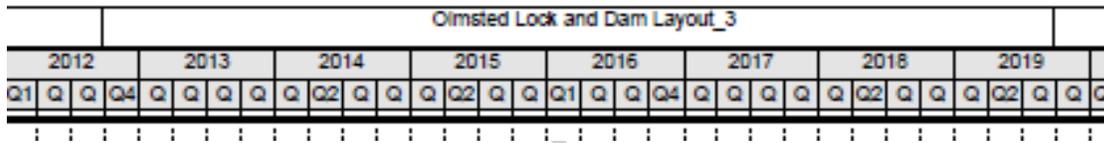
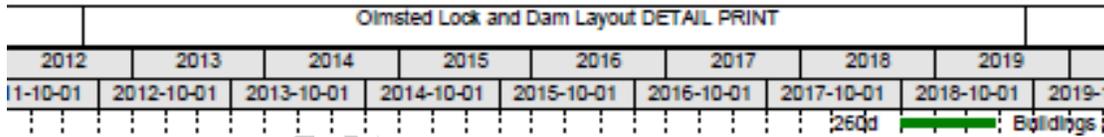


Figure 2. Final Primavera P6 Schedule (Appendix D)



Significance – Low

Changes in the midpoint of construction assumptions will have minor impacts to the TPC.

Recommendation for Resolution:

1. Review midpoints of construction with respect to the project schedule and revise the midpoints in the TPCS.

USACE Final Evaluator Response to FPC 6

Concur

Response to Recommendation:

1. Adopt - The mid-points of select Out-Year Contracts will be reviewed by USACE and adjusted as necessary

Final Panel BackCheck Response FPC 6

Concur.

Final Comment-Response Record