DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS
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CECW-P 15 June 2022

MEMORANDUM FOR MAJOR SUBORDINATE COMMAND (MSC), CHIEFS, PLANNING AND POLICY

SUBJECT: Technical Guide for District Quality Control (DQC) Reviews and Agency Technical Reviews (ATR) of Planning Studies

1. References:

a. Army Regulation 702-11, Army Quality Program

b. Engineer Regulation 1100-2-8162, Incorporating Sea Level Change in Civil Works Programs

c. Engineer Regulation 1165-2-217, Civil Works Review Policy

d. Engineering and Construction Bulletin 2018-14, Rev. 1, Guidance for Incorporating Climate Change Impacts to Inland Hydrology in Civil Works Studies, Designs, and Projects

e. Planning Bulletin 2018-02, Exemption Procedures for Planning Studies Exceeding Cost and Schedule Limits

f. CENAD-PD-X Memorandum, Subject: Policy for Targeted Agency Technical Review of Flood Risk Management and Coastal Storm Risk Management Planning Studies, dated 9 July 2020

2. This memorandum supersedes the Policy for Targeted Agency Technical Review of Flood Risk Management and Coastal Storm Risk Management Planning Studies, dated 9 July 2020 (reference 1.f.).

3. The purpose of this memorandum is to provide additional guidance on the effective and efficient completion of District Quality Control review and ATR, emphasizing the Army's and the agency's review policies (references 1.a. and 1.c.), including the importance of consistent application of climate change analysis tools (references 1.b. and 1.d.).

4. DQC teams are the peer and supervisory reviewers with the necessary expertise and experience to address compliance with current USACE policies and procedures as

well as verify the accuracy of the information used in the study process. DQC should be conducted as directed within relevant District and MSC Quality Management System (QMS) processes. If the District does not have the required expertise or experience for the DQC review team, they must coordinate with the MSC to identify and consider qualified personnel from outside the District to serve on the DQC team. Team members from outside the district may require study funding to perform the DQC role. ATR includes an assessment of the effectiveness of DQC. In cases where DQC is judged to be deficient, reviewers may return products without comprehensive comments to the project delivery team (PDT). To avoid these situations, PDTs, MSCs, and RMOs should work together during the drafting of the Review Plan to ensure that adequate DQC expertise is available. DQC expertise should be maintained through the study process, even as reviewers inevitably change. MSC Quality Assurance (QA) activities should follow their QMS processes and comply with requirements in Reference 1.a., particularly Chapter 2, and Reference 1.c.

5. The engagement of the vertical team and the ATR team at critical points in a study can aid in the timely and efficient completion of studies. PDTs should coordinate early with their MSC, RMO, the Planning Centers of Expertise (PCXs), and, if needed, other technical Subject Matter Experts (SMEs), to identify and review critical work products, including modeling assumptions and model inputs, that may benefit from ATR outside of concurrent review, as discussed in 5.6.2. of Reference 1.c.

6. Early participation of specific elements of the ATR team presents an opportunity for study teams to identify, avoid, and solve study problems by providing independent review of key products to assure that they are technically correct, ensure policy compliant approaches are used, assess the adequacy of DQC to date, validate key PDT decisions, and identify any important issues, concerns, or lessons learned through the technical work performed. The outputs of ATR may inform future iterations of the study scope, including any necessary cost and schedule limit exceptions indicated in reference 1.e. However, as indicated in the Civil Works Review Policy (reference 1.c.), the ATR team does not make project decisions, and their independence must be retained. ATR team input early in a process does not assure agreement with the final product, and concurrent reviews will be required at the draft and final product stages. Early ATR reviews should occur in parallel with the study and should not pause or delay ongoing or additional analysis and may allow for technical issues to be identified before they impact major study decisions, saving project delivery teams time and money. In no case shall ATR of any kind commence until the completion of DQC on the products being reviewed.

7. The Planning Centers of Expertise for Coastal Storm Risk Management (PCX-CSRM) and Flood Risk Management (PCX-FRM), through consultation with the Hydrology, Hydraulics and Coastal Community of Practice (HH&C CoP), the Coastal

Working Group (CWG), and the Climate Preparedness and Resilience Community of Practice (CPR CoP) have developed a guide to assist in DQC and ATR. The guide is enclosed for general reference.

8. Questions related to this memorandum should be addressed to Joseph Redican, Deputy Chief, Planning and Policy Division, at joseph.h.redican@usace.army.mil or (202) 761-4523.

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DISTRICT QUALITY CONTROL AND AGENCY TECHNICAL REVIEW GUIDE

1. Districts should implement robust, life-cycle District Quality Control (DQC) and should include appropriate subject matter experts from outside the district, if necessary. DQC is an internal review process codified in a District's Quality Management System (QMS) and consists of basic science and engineering work products focused on fulfilling the project quality requirements defined in the Project Management Plan. DQC is an integrated review approach that includes a Quality Management Plan providing for seamless review, Quality Checks (first line supervisory reviews, Project Development Team (PDT) reviews), a detailed peer review/checking of the documents, computations, and graphics, etc.

2. In addition to the internal DQC process, studies can benefit from an Agency Technical Review (ATR) of interim products. The PDT should conduct ATRs at critical points during the technical analysis that supports agency decision making. ATR reviews should occur in parallel with the study and not pause or delay ongoing or additional analysis with an objective to identify and resolve any issues early. The approach of performing ATR earlier in the study process with the potential to identify issues early may reduce study costs and minimize schedule delays later in the study.

3. Identification of ATR team members and validation of appropriate credentials of reviewers is a responsibility of the Review Management Organization (RMO) (ref. ER 1165-2-217). The review teams, including the ATR team lead and the Policy and Legal Compliance Review team, should be identified early.

4. ATR can focus on the overall technical approach, including the supporting documentation of critical assumptions and data sources that will be used to evaluate the final array of alternatives and the assessment of the future without project (FWOP) condition, the foundation of a study and decision making. The purpose of such an ATR is to confirm that the technical approach is sound before a significant amount of time and money is spent to complete analysis. The following is a partial list of items that could benefit from early ATR:

- Approach to coastal hazard and hydrologic frequency analysis (and reservoir system analysis, if applicable).

- Approach to hydraulic or coastal modeling, including model domains, boundary condition assumptions, and major inputs.

- Approach to economic analysis including selection of index points, damage reaches, and damage areas.

- Approach to evaluating incremental life risk analysis, including life loss modeling.

- Approach to probable failure modes analysis (aka fragility curves).

- Selection and analysis of coastal forcing data.

- Approach to climate change analysis and adaptation (sea level change and inland).

- Selection of depth-damage functions.

- Reasonableness of the future without project assumptions and consistency with the technical analysis.

- Cost estimate and risk analysis development consistent with the technical design and project modeling resulting from the ATR.

5. The following paragraphs are offered as examples of how ATR could be implemented, including examples of critical items that could be reviewed.

a) Selection and Application of Depth-Damage Functions (FRM and CSRM): Flood and Coastal Storm Risk Management feasibility studies employ depth-damage functions to generate estimates of damages avoided by specific interventions. While the library of depth-damage functions continues to grow, it is still relatively limited. Study teams must make decisions about which curves will be used in specific situations from the catalogue of available choices, and the available curves may not perfectly represent the specific study context. This is a technical decision that impacts the results of the analysis, and curve reconsideration after model runs would require significant rework. Therefore, it is recommended that study teams undertake a concentrated depth-damage curve discussion, document the results from the discussion, and subject the supporting documentation to review early in the feasibility study process. Decisions should be documented in the decision log and risk register before proceeding with economic model runs.

b) Coastal Forcing Data Selection and Application (CSRM): The Planning Centers of Expertise for Coastal Storm Risk Management (PCX-CSRM), Hydrology, Hydraulics and Coastal Community of Practice (HH&C CoP), and the Coastal Working Group (CWG) have seen a number of situations in which the selection of coastal forcing data and its application for use within a feasibility study, including the associated models, has not been accomplished appropriately. The primary problems are associated with user error related to both the use of Coastal Hazards System (CHS) data and other data sources where CHS data are not available. To that end, districts should review their DQC process early and seek to engage appropriate vertical team members to supplement the DQC team. In an ATR, the PDT should document its methodology and engage the coastal engineering ATR reviewer early in the study process to present the method, data, and its application within the study before significant analysis and modeling occurs.

c) FWOP Conditions (CSRM and FRM)**:** Development of the FWOP should consider climate change early. ATR of the FWOP condition is highly recommended, especially when using planning models like G2CRM, Beach-Fx, and HEC-LifeSim. The purpose of the ATR is to affirm that assumptions are correct, the model is accepting inputs and producing outputs as expected, and to determine any input issues that might otherwise lead to a less credible measurement of damages or life loss. These issues could ultimately lead to the selection of a less optimal plan.

d) Sea Level Change Scenarios (CSRM and FRM): Early ATR may also be appropriate on the application of sea level change (SLC) scenarios, including whether the future without project condition or the array of alternatives are sensitive to SLC, and hence total water levels as impacted by changing sea level. It is understood this may not be known until the Alternatives Milestone Meeting (AMM), when a screened array of alternatives has been identified that will be further refined between the AMM and Tentatively Selected Plan (TSP). An early decision on whether plans will be evaluated against one SLC scenario with a sensitivity performed for the other two SLC scenarios or evaluated against all three SLC scenarios is also recommended to ensure that the uncertainty in SLC rates are accounted for in alternative selection. This also applies to flood risk management studies where the downstream boundary conditions of riverine flood profiles are influenced by sea level change and associated changes in total water levels. This is important when downstream water level controls impact riverine conveyance and hence upstream water levels.

e) Hydrologic Frequency Analysis (FRM): Hydrologic frequency analysis is the foundation for flood risk analysis because the results serve as inputs to hydraulic models, which then serve as inputs to economic risk and life risk analysis. There are many different methods to conduct hydrologic analysis, and there are many critical assumptions that are specific to the study area and alternatives being considered. For example, evaluation of a proposed reservoir project may require a different technical approach than a levee improvement project. Locations with statistically significant hydrologic nonstationarities may require a different approach than those where no statistically significant nonstationarities have been detected.

f) Hydraulic Analysis and Assumptions (FRM): Hydraulic analysis and assumptions serve as inputs to economic and life safety analysis. There are many different methods to conduct hydraulic analysis, including different model types, hand calculations, or nomographs. There are also many critical assumptions that are specific to a study area and the alternatives being considered. For example, one dimensional modeling might be more suitable for one portion of a study area than a two-dimensional model. However, two-dimensional modeling might be more appropriate in some regions of the study

area to facilitate life loss simulation modeling.

g) Economic Analysis (CSRM and FRM): Economic analysis requires the determination of appropriate index points, damage reaches, and model areas. The selection of these variables is highly dependent on the specific study area and alternatives selected. Incorrect selection can result in significant overestimates or underestimates of project performance and benefits and lead to selection of less efficient plans.

h) Life Risk Analysis (CSRM and FRM): Many of the inputs to life risk analysis are similar to economic analysis. However, there are additional considerations, including population at risk, evacuation plan implementation, evacuation times, human behavior, and water velocity. Errors in the modeling approach or the input assumptions can lead to under- or over-estimates of life risk. Efficiencies can be gained if the economic and life risk modeling assumptions are consistent with each other.