DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, SOUTH ATLANTIC DIVISION
60 FORSYTH STREET SW, ROOM 10M15
ATLANTA, GA 30303-8801

CESAD-RBT 14 September 2020

MEMORANDUM FOR Commander, Jacksonville District, 701 San Marco Boulevard, Jacksonville, Florida 32207

SUBJECT: Approval of the Review Plan for the Rio Puerto Nuevo Project, Contracts 4 and 5B, San Juan, Puerto Rico

1. References:

a. Memorandum, CESAJ-EN-Q, signed 21 August 2020, subject as above.

b. Engineering Circular (EC) 1165-2-217, Water Resources Policies and Authorities Review Policy for Civil Works, 20 February 2018.

2. The Review Plan (RP) for the Rio Puerto Nuevo Project, Contracts 4 and 5B, submitted by the Jacksonville District via reference 1.a. noted above has been reviewed by South Atlantic Division (SAD). The RP was coordinated with and endorsed by the Risk Management Center (RMC). The RP is hereby approved in accordance with reference 1.b.

3. The USACE RMC will be the Review Management Organization (RMO) for this project.

4. SAD concurs with the District's RP recommendation that outlines the requirements for District Quality Control (DQC), Agency Technical Review (ATR) and Biddability, Constructability, Operability, Environmental and Sustainability (BCOES) Review and the conclusion and recommendation that a Safety Assurance Review/Type II Independent External Peer Review is required.

5. The District should take steps to post the approved RP to its website and provide a link to CESAD-RBT. Before posting to the website, the names of Corps/Army employees should be removed. Subsequent significant changes to this RP, such as scope or level of review changes, should they become necessary, will require new written approval from this office.

6. The SAD point of contact is [redacted], CESAD-RBT, [redacted].

[redacted]

Encl

Colonel, EN
Commanding

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, JACKSONVILLE DISTRICT
701 SAN MARCO BOULEVARD
JACKSONVILLE, FLORIDA 32207-8175

CESAJ-EN-Q

MEMORANDUM FOR Commander, South Atlantic Division (CESAD-RBT), 60 Forsyth Street SW, Room 10M15, Atlanta, GA 30303

SUBJECT: Approval of Review Plan for the Rio Puerto Nuevo Project, Contracts 4 and 5B, San Juan, Puerto Rico

1. References:

   a. Engineering Circular (EC) 1165-2-217, Review Policy for Civil Works, 20 Feb 18.

   b. Flood Control Act of 1946, Public Law 79-526, 24 Jul 46.

2. I hereby request approval of the enclosed Review Plan for the Rio Puerto Nuevo Contracts 4 and 5B, San Juan, Puerto Rico and concurrence with the conclusion that a Type II Independent External Peer Review (IEPR) of the subject project is required. The recommendation to perform a Type II IEPR is based on the EC 1165-2-217 Risk Informed Decision Process as presented in the Review Plan. The Review Plan complies with applicable policy, provides for Agency Technical Review, and has been coordinated with the SAD. It is my understanding that non-substantive changes to this Review Plan, should they become necessary, are authorized by SAD.

3. The district will post the approved Review Plan to its website and provide a link to the SAD for its use. Names of Corps/Army employees will be withheld from the posted version, in accordance with guidance.

4. Point of contact is [redacted], Engineering Review Manager, [redacted] or [redacted]

[redacted]

COL, EN
Commanding

Rio Puerto Nuevo, Puerto Rico
Contracts 4 and 5B
Review Plan - Implementation

Review Plan

PREPARED BY: [redacted] 6/30/20

[redacted]
Engineering Technical Lead
USACE, Jacksonville District

DATE

APPROVAL RECOMMENDED BY: [redacted]

[redacted]
Chief, Engineering Division
USACE, Jacksonville District

DATE

ENDORSED BY: [redacted]

[redacted]
Chief, Eastern Division
USACE, Risk Management Center

DATE

MSC Approval Date: Pending

Last Revision Date: None

Introduction

1.1 Purpose

This Review Plan (RP) for the Rio Puerto Nuevo (RPN) Project, Contracts 4 and 5B will help ensure a quality engineering project is developed by the U.S. Army Corps of Engineers (USACE) in accordance with EC 1165-2-217, "Review Policy for Civil Works." As part of the Project Management Plan, this RP establishes an accountable, comprehensive, life-cycle review strategy for Civil Works products and lays out a value added process and describes the scope of review for the current phase of work. The EC outlines five general levels of review: District Quality Control/Quality Assurance (DQC), Agency Technical Review (ATR), Biddability, Constructability, Operability, Environmental and Sustainability (BCOES) Review, Independent External Peer Review (IEPR), and Policy and Legal Compliance Review. This RP will be provided to the Project Delivery Team (PDT), and the DQC, ATR, BCOES, and IEPR Teams. The technical review efforts addressed in this RP, DQC and ATR, are to augment and complement the policy review processes. The District Chief of Engineering has assessed that the life safety risk of this project is significant; therefore, a Type II IEPR/Safety Assurance Review (SAR) will be required, see Paragraph 5.1. Any levels of review not performed in accordance with EC 1165-2-217 will require documentation in the RP of the risk-informed decision not to undertake that level of review.

1.2 References

- EC 1165-2-217, Review Policy For Civil Works, 20 February 2018
- ER 1110-1-12, Quality Management, 31 March 2011
- ER 415-1-11, Biddability, Constructability, Operability, Environmental and Sustainability (BCOES) Reviews, 1 January 2013
- Interim Guidance on Streamlining Independent External Peer Review (IEPR) for Improved Civil Works Product Delivery, 5 April 2019
- 02611 – SAJ Quality Control In-House Products: Civil Works PED
- 02710 – SAJ Preparation and Submittal of Civil Works Review Plans
- Project Management Plan (PMP) for Rio Puerto Nuevo Project (P2#113454)

1.3 Review Management Organization

The USACE Risk Management Center (RMC) is the Review Management Organization (RMO) for this project. Content of this RP has been coordinated with the RMC and South Atlantic Division (SAD), the Major Subordinate Command (MSC). As RMO, the RMC is responsible for assembling the ATR Team in accordance with this RP and USACE guidance.

Section 2
Project Description

2.1 Project Description

The Rio Puerto Nuevo project was authorized for construction by the Flood Control Act of 1970 Section 204 (PL 91-611) and the Water Resources Development Act of 1986 Section 401 (PL 99-662). The project is located in San Juan, Puerto Rico. The Rio Puerto Nuevo Basin drains 24 square miles, 75 percent of which is highly developed with a population of 250,000 persons. The plan of improvement protects against the 100-year flood by the construction in the Puerto Nuevo River and its tributaries of 1.7 miles of earth lined channel, 9.5 miles of concrete lined channel (5.1 miles of which are high velocity), and two debris basins. The plan will also require the construction of five new bridges, the replacement of 17 bridges, and the modification of eight existing bridges, refer to Figure 1.

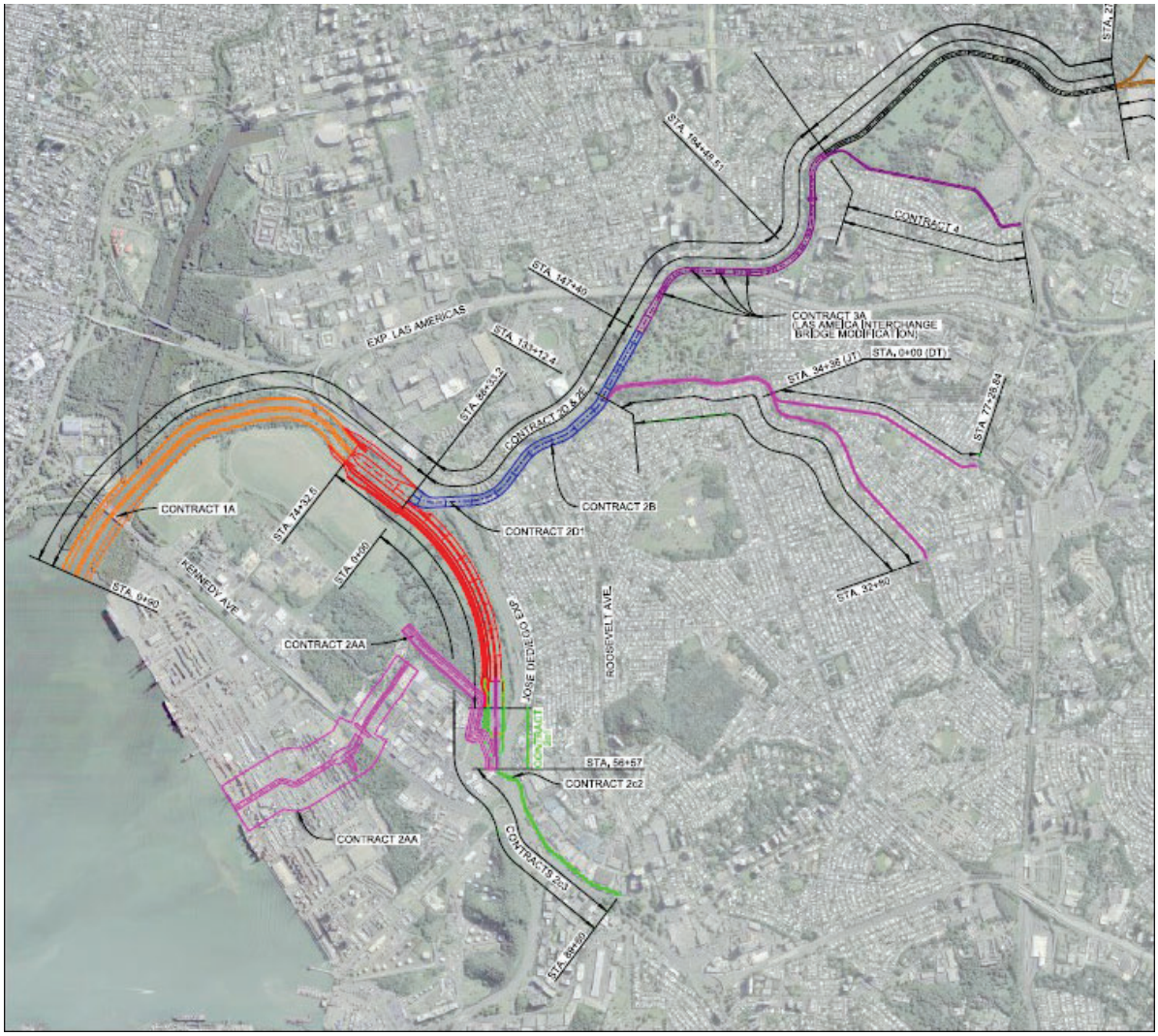

Figure 1: Rio Puerto Nuevo Contract Locations

The areas highlighted represent the project phases, which will be covered in separate review plans with their anticipated PED activities to occur in the next 5 to 10 years. This RPN RP covers projects in Contracts 4 and 5B.

RPN Contract 4 consists of the modification of Las Americas Bridges over Rio Piedras under the Rio Puerto Nuevo Project. Bridges that shall be modified under this contract are the following: (1) Las Americas Expressway (PR-18) Bridge at Station 156+65, (2) North East (NE) Access Ramp at Station 163+85, (3) Piñero Avenue (PR-17) at Station 169+22, and (4) South East (SE) Access Ramp at Station 174+50. Additionally, this project includes channel improvement of the Rio Piedras from Station 147+40 to Station 176+50, which also includes a stilling basin at the project downstream terminus and an upstream transition from improved channel to the existing channel.

RPN Contract 4 shall include demolition plans, clearing and site restoration plans, bridges modification design, channel improvements design, stilling basin, maintenance of traffic design, drainage design, utility relocation design, lighting design, construction staging drawings, construction sequencing, water diversion plan (e.g. berm, sheetpile, temporary cofferdam, etc.), right-of-way and temporary construction easements. The construction work shall be accomplished minimizing the lane closures and the impact to the current traffic. The modification of Las Americas bridges will allow widening and deepening the channel at the bridges locations and will also bring the bridges sub-structure up to current standards using AASHTO LRFD Bridge Design Specifications for HL-93 loadings and for seismic loading. Different retrofitting alternatives for the modification of the bridge substructures will be evaluated and discussed in the Bridge Evaluation Report. In addition of the substructure modifications, additional improvements shall be provided to the existing piers. Las Americas Expressway Bridge and Piñero Avenue Bridges (Eastbound and Westbound) will also have pier extensions to control the location of the hydraulic jump. This is required to pass the design flood under the bridges with needed freeboard; final design length of the extensions shall be coordinated with USACE but are anticipated to be around 40.00 feet to 50.00 feet in total length. Pier extensions height varies from top of the cap beam to the channel invert.

Rio Puerto Nuevo Channel Improvements from Station 147+40 to Station 176+50: Channel improvements, which include a downstream stilling basin, concrete lined channel and upstream temporary transition to existing channel, from Station 147+40 to Station 176+50 shall be designed. Channel walls and bottom of the channel under the Las Americas Bridges will be improved as part of this project. The proposed stilling basin will be located from approximately Station 147+40 to Station 149+75. From approximately Station 149+75 to Station 155+40, the proposed channel consists of a 98.00 feet wide 20.00 feet high concrete U-channel with a 30.00 feet wide transitioning center-pilot channel from 0.00 feet depth to 4.00 feet depth at the upstream most end. From approximately Station 155+40 to Station 176+50, the proposed rectangular composite channel of 98.00 feet width and 20.00 feet high includes a center pilot of 4.00 feet depth and 30.00 feet width. The channel may be a combination of reinforced concrete tee walls, tangent drilled shaft walls, auger cast pile walls, sheetpiles, drilled shaft or auger cast pile with panels (lagging). The wall system shall include a smooth concrete wall facing and a reinforced concrete bottom slab.

Contract 5B covers The Piñero Avenue Bridge is located in the municipality of San Juan, at Piñero Avenue (PR-17) crossing the Josefina Creek, approximately 2.5 miles upstream from San Juan Harbor. The Contract 5B site is approximately 5.0 miles from the Luis Muñoz International Airport located in the eastern part of San Juan, Puerto Rico.

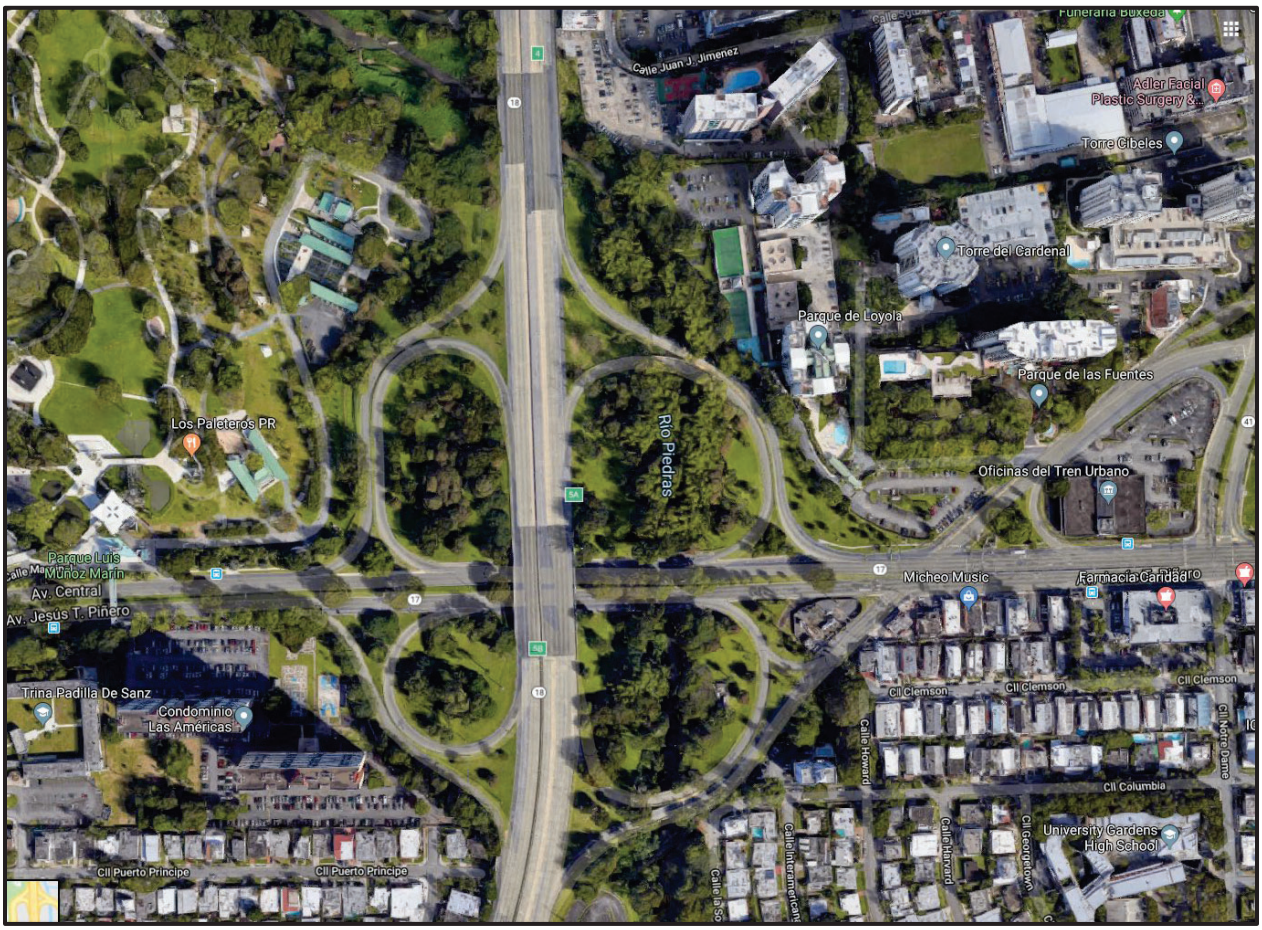

Figure 2: Aerial view of Roosevelt Bridge

The existing Piñero Avenue Bridge consists of a dual two-span continuous cast-in-place reinforced concrete bridge 65.00 feet long. The bridge spans are 32.50 feet each. The eastbound bridge has three traffic lanes (total roadway width is 31.17 feet wide), and a sidewalk 13.12 feet wide. The westbound bridge has three traffic lanes and one decelerating lane (total roadway width is 43.14 feet wide), and a sidewalk 13.12 feet wide. The total bridge width (out to out) is: eastbound bridge 45.60 feet and westbound bridge is 57.58 feet. The twin bridges are separated by a median which is 7.60 feet wide. The exterior barriers consist of concrete posts and rails. Utility conduits are spanning the river and are supported on brackets throughout the exterior barriers.

Piñero Avenue Bridge Replacement: The new bridge, located at approximately Station 24+25, shall be a single-span of approximately 65 feet long (from centerline bearing to centerline bearing) with no skew. The final span arrangement will be dictated by the required hydraulic opening and the proposed channel configurations.

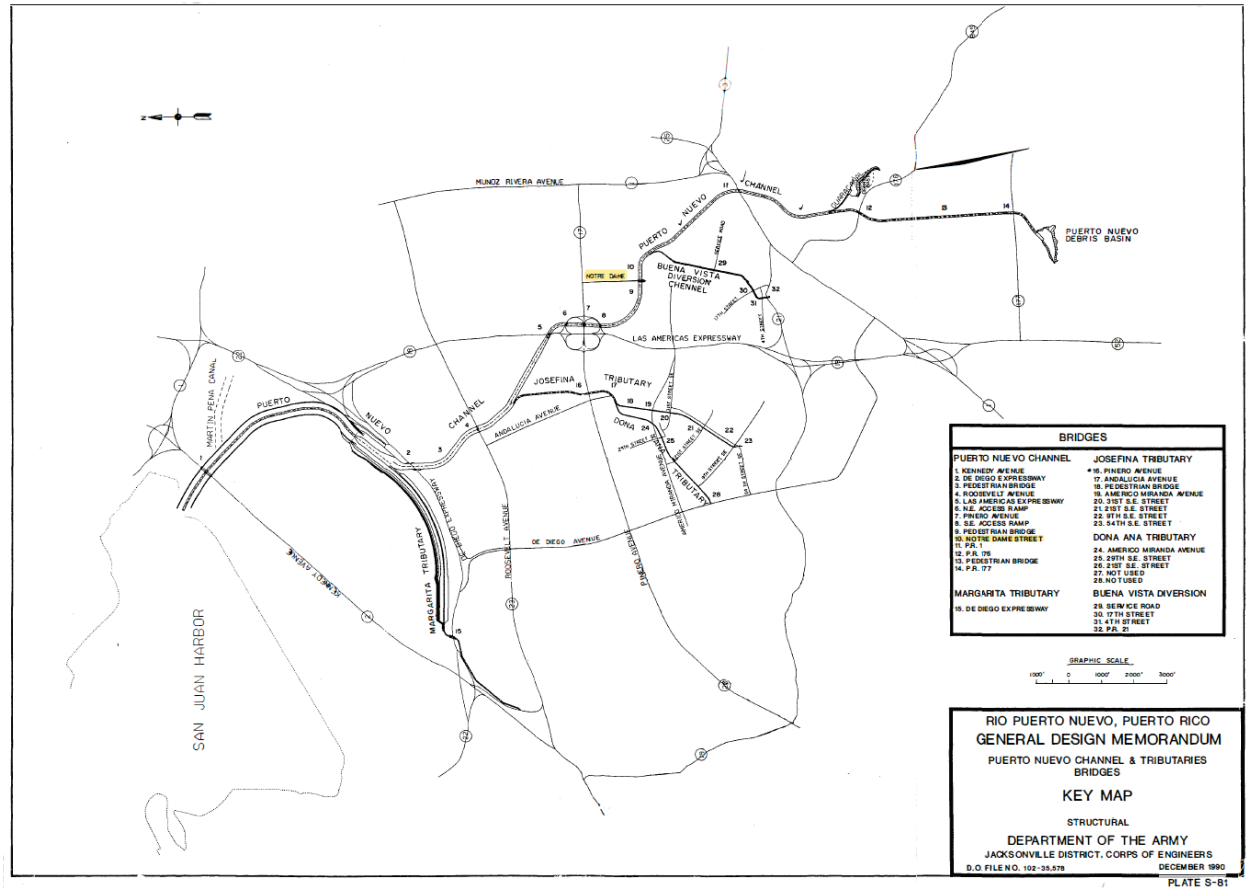

Figure 3: Rio Puerto Nuevo Channel and Tributaries – Bridges Key Plan (Plate S-81 taken from the GDM dated 1991)

Contract 5B will cover the geotechnical investigations, traffic study, value engineering study, demolition plans of the existing bridge, clearing and site restoration plans, boundary maps, proposed bridge replacement design, temporary bridge design and/or detour route plan, channel improvements design, transitions to the existing channel, maintenance of traffic design, roadways and drainage design, utility relocation design, lighting design, tree inventory, reforestation and landscaping design, construction staging drawings, construction sequencing, water diversion plan (e.g. berm, sheetpile, temporary cofferdam, etc.), signing and pavement marking plans, cross sections, right-of-way and temporary construction easements. In order to maintain the current traffic level of service, a detour using a temporary bridge is required for the construction of the permanent bridge. Currently, the permanent bridge is proposed to be constructed in phases to accommodate traffic. Preliminary configuration of the new bridge shall be as follows: three lanes of traffic, one for each direction plus a left lane to make a left turn on the westbound bridge. Lane width and sidewalk width shall be determine in accordance with the PRHTA's Highway Design Manual (HDM). Roadway barriers shall be provided on each side of the bridge. The superstructure shall consist of a concrete deck slab supported on prestressed concrete beams. The height of the bridge is designed to accommodate a 100-year storm event with a minimum vertical clearance of 2 feet to the low member of the permanent bridge. The permanent bridge is going to be designed for seismic loadings in accordance with applicable AASHTO Standards and Specifications. In addition to the AASHTO standards, the bridge design shall conform to the Puerto Rico Highway and Transportation Authority (PRHTA) Highway Design Manual (HDM) and other PRHTA design documents. The bridge structure shall be designed for HL-93 loadings and for PRHTA requirements.

The temporary bridge shall be located either upstream of the existing bridge, outside the limits of the replacement bridge construction area. The recommended configuration is a two-lane temporary bridge. To maintain the current level of traffic, the permanent bridge shall be constructed in phases. The temporary bridge superstructure shall be a modular steel, pre-fabricated panel bridge (Acrow or similar). The low member of the temporary bridge shall be set at approximately the same elevation of low member of the existing bridge. Temporary bridge shall be designed to the same standards as the permanent bridge, as described above.

Josefina Creek Channel Improvements: Channel improvements adjacent and under the bridge from Station 22+25 to Station 24+50 shall consist of a wall system with a smooth concrete facing, and a reinforced concrete bottom slab or a reinforced concrete U-frame. Wall system under the bridge can be part of the structural system of the bridge abutments or independent. Government suggested options for the channel wall system include: a combination of reinforced concrete tee walls, tangent drilled shaft walls, auger cast pile walls, drilled shaft with lagging panels, or auger cast pile with lagging panels.

2.2 Project Sponsor

Products and analyses provided by non-Federal sponsors as in-kind services are subject to DQC, ATR, policy and legal compliance, BCOES and IEPR reviews. However, there will not be in-kind contributions for this effort. The non-federal sponsor is the Puerto Rico Department of Natural and Environmental Resources (DNER).

Section 3
District Quality Control

3.1 Requirements

All implementation documents (plans and specifications; including supporting data, analyses, reports, environmental compliance documents, water control manuals, etc.) shall undergo DQC in accordance EC 1165-2-217. The A-E will be required to submit a Design Quality Control Plan (DQCP) in accordance with ER-110-1-12, which includes a design delivery schedule and the quality control (QC) review team, see Attachment 3. SAJ shall perform a Quality Assurance Review (QAR) in accordance with District Quality Control (DQC) activities for engineering products stipulated in ER 1110-1-12, Engineering & Design Quality Management, EC 1165-2-217, Review Policy for Civil Works, and SAJ EN QMS 02611.

See Attachment 1, Table 9 for the QA Team, reviewers, and reviewer's disciplines.

3.2 Documentation

Documentation of DQC activities is required and will be implemented by the process described in paragraph 3.1.

3.3 DQC Schedule and Estimated Cost

Although DQC is always seamless, the following milestone reviews for the A-E Contract and SAJ QA are scheduled in Table 1. The cost for the DQC is approximately $50,000.00.

Rio Puerto Nuevo Contract 4		
Project Phase/Submittal	**Review Start Date**	**Review End Date**
DQC 30% P&S and DDR - AE	January 11, 2021	February 22, 2021
DQC 30% - SAJ QA	January 2021	February 2021
DQC 60% P&S and DDR Review - AE	June 2021	August 2021
DQC 60% P&S and DDR Review – SAJ QA	June 2021	October 2021
DQC Final P&S and DDR Review - AE	December 2021	February 2022
DQC Final P&S and DDR Review – SAJ QA	December 2021	February 2022

Table 1 DQC Schedule for Contract 4

Rio Puerto Nuevo Contract 5B		
Project Phase/Submittal	**Review Start Date**	**Review End Date**
DQC 30% P&S and DDR - AE	NTP+100	NTP+150
DQC 30% - SAJ QA	NTP+150	TBD
DQC 60% P&S and DDR Review – SAJ QA	NTP+208	NTP+302
DQC Final P&S and DDR Review	NTP+499	NTP+535
DQC Final P&S and DDR Review – SAJ QA	NTP+499	NTP+535

Table 3 DQC Schedule for Contract 5B

Section 4
Agency Technical Review

4.1 Requirements

All implementation documents (including supporting data, analyses, reports, environmental compliance documents, water control manuals, etc.) shall undergo ATR in accordance EC 1165-2-217. ATR reviews will occur seamlessly, including early involvement of the ATR team for validation of key design decisions, and at the scheduled milestones as shown in Section 4.6. A site visit will be scheduled for the ATR Team.

4.2 Documentation of ATR

Documentation of ATR will occur using the requirements of EC 1165-2-217. This includes the four part comment structure and the use of DrChecks^{SM}.

4.3 Products to Undergo ATR

The ATR Team will review the Intermediate (60%) and Final (100%) Plans & Specs along with the Intermediate (60%) and Final (100%) DDR for Contract 4 – Modification of the Four Las Americas Bridges over Rio Piedras and Rio Puerto Nuevo Channel Improvements, to include those products designed by A-E Firm(s). The ATR Team will review the Intermediate (60%) and Final (100%) Plans & Specs along with the Intermediate (60%) and Final (100%) DDR for Contract 5B – Modification of The Piñero Avenue Bridge. All ATR reviews and tentative time frames are outlined in Table 4 and 5.

4.4 Required Team Expertise and Requirements

ATR teams will be established in accordance with EC 1165-2-217. The following disciplines will be required for ATR of this project:

ATR Lead. The ATR lead shall be a senior professional with experience in flood risk management projects and conducting ATR. ATR lead shall also have the necessary skills and experience to lead a virtual team through the ATR process. A minimum of 10 years of related project design/construction experience is required. ATR lead shall have experience with risk assessments for life safety disciplines. ATR Team Leader may be a co-duty to one of the review disciplines.

Civil Engineer. The team member shall be a registered professional engineer with experience in civil/site work on flood control projects that includes earthwork operations, site drainage, embankments and utilities relocation. A minimum of 10 years of related project design/construction experience is required.

Construction Management. The team member shall have 10 years of construction management experience with bridges in heavy highway construction.

Electrical Engineering. The team member shall have a minimum of 10 years of specialized experience in the electrical engineering field and shall be a registered professional electrical engineer. The Electrical

Engineering panel member expertise shall include bridge, traffic electrical and lighting systems design and a minimum of 5 projects of similar scope.

Geotechnical Engineer. The team member shall be a registered professional engineer with experience in seismic design (Seismic Zone 3 or higher) of structures, design and analysis of flood walls, channel slope stability evaluations, erosion protection, sheet pile retaining structures, bridge foundations, and earthwork construction to support the development of the Plans and Specifications. A minimum 10 of years of related project design/construction experience is required.

Hydraulic Engineer. The team member shall be a registered professional with experience in earth and concrete channel designs, HEC-RAS modeling of the channels and through transitions (subcritical and supercritical flows), and hydraulic control structures such as grade control structures, drop structures, and culverts (with flap gates) as part of the engineering multi-disciplinary project. A minimum of 10 years of related project design/construction experience is required.

Structural Engineer. The team member shall be a registered professional engineer with experience in seismic design (Seismic Zone 3 or higher) of hydraulic concrete structures such as channels, stilling basin, wall systems composed of drilled shafts, auger cast piles, retaining walls, sheet pile type structures and seismic design (Seismic Zone 3 or higher) and seismic retrofitting (Seismic Zone 3 or higher) of bridges. A minimum of 10 years of related project design/construction experience is required.

4.5 Statement of Technical Review Report

At the conclusion of each ATR effort, the ATR team will prepare a review report with a completion and certification memo. The report will be prepared in accordance with EC 1165-2-217.

4.6 ATR Schedule and Estimated Cost

The preliminary ATR milestone schedule is listed in Table 4 for Rio Puerto Nuevo Contract 4 and Table 5 for Rio Puerto Nuevo Contract 5. The cost for the ATR is approximately $45,000 - $55,000.

Rio Puerto Nuevo Contract 4			
Project Phase/Submittal	**Review Start Date**	**Review End Date**	**Site Visit**
ATR 60% P&S and DDR Review	8/16/2021	10/5/2021	NTP+30
ATR Pre-Final P&S and DDR Review	2/10/2022	3/15/2022	

Table 4: ATR Schedule for Contract 4

Rio Puerto Nuevo Contract 5B			
Project Phase/Submittal	**Review Start Date**	**Review End Date**	**Site Visit**
ATR 60% P&S and DDR Review	NTP+354	NTP+307	NTP+21
ATR Pre-Final P&S and DDR Review	NTP+499	NTP+535	

Table 5: ATR Schedule for Contract 5B

Section 5
Safety Assurance Review

5.1 Requirements

A SAR, also known as a Type II Independent External Peer Review (IEPR), may be required for implementation documents and construction activities for hurricane, storm, and flood risk management projects or other projects where existing and potential hazards pose a significant threat to human life. A risk-informed decision, as described in EC 1165-2-217, is made as to whether a SAR is appropriate. SARs are managed outside the USACE and shall consider the adequacy, appropriateness, and acceptability of the design and construction activities, assuring public health safety and welfare.

5.2 Decision on SAR

The District Chief of Engineering has made a risk-informed decision that this project poses a significant threat to human life (public safety); therefore, a SAR will be performed. This decision is due to the high volume of traffic that makes daily use of the bridge and would be subject to earthquake loading and frequent flooding, which pose a threat to human life and cause significant economic damage of the surrounding area.

The SAR team will be required to perform an initial site visit and a follow-up site visit just prior to their review of the construction documents at the Intermediate Phase of design. SAR reviewers are required to review construction activities as well. A site visit will be performed by Geotechnical Engineer and Structural Engineer reviewer at the midpoint construction as described below in Table 6.

5.3 Products to Undergo SAR

The SAR Panel will review the Intermediate (60%) Plans, Specifications, and DDR relevant to the Contract 4 – Modification of the Four Las Americas Bridges over Rio Piedras and Rio Puerto Nuevo Channel Improvements, as well as construction at the mid-point of construction.
The SAR Panel will review the Intermediate (60%) Plans, Specifications, and DDR relevant to the Contract 5B – Modification of the Pinero Avenue Bridge, as well as construction at the mid-point of construction.

5.4 Required SAR Panel Expertise

SAR panels will be established in accordance with EC 1165-2-217. Panels will consist of independent, recognized experts from outside the USACE in the appropriate disciplines, representing a balance of areas of expertise suitable for the review being conducted. The selection of SAR review panel members will be conducted using the National Academy of Science (NAS) Policy, which sets the standard for “independence” in the review process.

The following disciplines will be required for SAR of this project:

Civil/Traffic/Transportation Engineer. Panel member shall have a minimum of 10 years of specialized experience in civil, traffic and transportation engineering; and shall be a registered professional engineer. The panel member expertise shall include civil, bridge, traffic, and transportation systems design; and a minimum of 5 projects of similar scope. The member shall also have experience designing bridges in

Puerto Rico and be familiar with the "PRHTA Highway Design Manual" and Puerto Rico Aqueduct and Sewer Authority (PRASA) technical requirements.

Geotechnical Engineer. Panel member shall have a minimum of 15 years of specialized experience in the geotechnical engineering field and shall be a registered professional engineer. The distinguished Geotechnical panel member shall be a recognized expert in earthquake engineering for critical flood risk management infrastructure and expert in the seismic evaluation (Seismic Zone 3 or higher), analysis, design, and construction of bridge foundations and retaining walls, subsurface investigations, soils mechanics, including a minimum of 3 projects of similar scope. The experience shall include designing bridges in Seismic Zone 3 as defined in the AASHTO LRFD Bridge Design specifications. The member shall be familiar with the "PRHTA Highway Design Manual". Design experience in PR is desirable.

Hydrology and Hydraulics. Panel member shall have a minimum of 15 years of specialized experience in the Hydrologic and Hydraulics (H&H) engineering field and shall be a registered professional engineer. The H&H panel member shall have experience in river hydraulics (subcritical and supercritical flows), storm water systems, flood analysis, hydraulic analysis and design of flood control projects, bridges, and hydraulic structures, and bridge scour and stream instability analysis and countermeasures design. The H&H panel member must have experience with USACE's hydrologic and hydraulic computer numerical models (HEC and ERDC software), the application of data from physical model testing (journals, research, etc.), and the ability to coordinate, interpret, and explain computed results with other engineering disciplines, particularly structural engineers, geotechnical engineers, and civil engineers. The H&H panel member shall be familiar with USACE Engineer Manuals for hydraulic design and preferably be familiar with FHWA and PRHTA design guidance.

Structural Engineer. Panel member shall have a minimum of 15 years of specialized experience in the structural engineering field and shall be a registered professional engineer. Active participation in related profession societies is encouraged. The Structural Engineering panel member shall be proficient in seismic design of hydraulic concrete structures (channels, stilling basin, etc), performing stability analysis and design of reinforced concrete structures and walls systems; such as sheet piles, retaining walls, tangent drilled shaft walls, auger cast piles and cofferdam/water diversion system. The Structural Engineering panel member shall have performed work in bridge demolition, seismic design and seismic retrofitting of bridges, deep foundation design subjected to several type of loadings such as live loadings (HL 93, construction equipment, etc), wind loadings, seismic loadings, hydraulic and soil loadings. The experience shall include designing hydraulic concrete structures, wall systems and bridges in Seismic Zone 3 (or higher) as defined in the AASHTO LRFD Bridge Design specifications as well as designing prestressed concrete bridges. Preferably be familiar with the "PRHTA Highway Design Manual," PRHTA's Design Standards, and have experience designing bridges in Puerto Rico (but not mandatory).

5.5 Documentation of SAR

Documentation of SAR (Type II IEPR) will be managed by an organization that meets the criteria set forth in EC 1165-2-217. DrChecks^{sm} review software should be used to document the SAR comments and aid in the preparation of the Review Report.

The SAR panel will prepare a Review Report that will accompany the publication of the final report for the project and shall:

- Disclose the names of the reviewers, their organizational affiliations, and include a short paragraph on both the credentials and relevant experiences of each reviewer;
- Include the charge to the reviewers;
- Describe the nature of their review and their findings and conclusions; and
- Include a verbatim copy of each reviewer's comments (either with or without specific attributions), or represent the views of the group as a whole, including any disparate and dissenting views;

- Milestone Review Summary report(s) will be provided to the District following each milestone review along with the submission of a single document following the final milestone, which will include all previous milestone SAR reviews and summary documents;
- The District Chief of Engineering will submit the panel's report and the District's responses to the RMC and MSC Chief of Business Technical Division for final review and concurrence.

Written responses to the SAR Review Report will be prepared to explain the agreement or disagreement with the views expressed in the report, the actions undertaken or to be undertaken in response to the report, and the reasons those actions are believed to satisfy the key concerns stated in the report (if applicable). These comment responses will be provided to the RMO for concurrence. The revised submittal will be provided to the RMO with the USACE response and all other materials related to the review.

5.6 Scope, Schedule, and Estimated Cost of SAR's

The SARs will be performed in accordance with EC 1165-2-217 and as shown in Table 6 and 7. The estimated cost for the SARs of each contract for this project are in the range of $120,000 to $150,000. This estimate will be refined when the Scope of Work for the SAR contract is completed.

Milestone Reviews	Geotech	H&H	Structural	Civil/Traffic/ Transportation	Site Visit Duration (days)	Review Start Date	Review End Date
Intermediate (60%) P&S and DDR	X	X	X	X	1	8/16/2021	10/5/2021
Midpoint of Construction	X		X		1	TBD	TBD

Table 6: SAR Schedule with Required Reviewers and Site Visit Duration for Contract 4

Milestone Reviews	Geotech	H&H	Structural	Civil/Traffic/ Transportation	Site Visit Duration (days)	Review Start Date	Review End Date
Intermediate (60%) P&S and DDR	X	X	X	X	1	NTP+307	NTP+354
Midpoint of Construction	X		X		1	TBD	TBD

Table 7: SAR Schedule with Required Reviewers and Site Visit Duration for Contract 5B

Section 6

Public Posting of Review Plan

As required by EC 1165-2-217, the approved RP will be posted on the District public website (https://www.saj.usace.army.mil/Missions/Civil-Works/Review-Plans/). This is not a formal comment period and there is no set timeframe for the opportunity for public comment. If and when comments are received, the PDT will consider them and decide if revisions to the RP are necessary.

Section 7

Review Plan Approval and Updates

The MSC Commander, or delegated official, is responsible for approving this RP. The Commander's approval reflects vertical team input (involving the District, MSC, and RMC) as to the appropriate scope, level of review, and endorsement by the RMC. The RP is a living document and should be updated in accordance with 1165-2-217. All changes made to the approved RP will be documented in Attachment 2, Table 13 RP Revisions. The latest version of the RP, along with the Commander's approval memorandum, will be posted on the District's webpage and linked to the HQUSACE webpage. The approved RP should be provided to the RMO.

Section 8

Engineering Models

The use of certified, validated, or agency approved engineering models is required for all activities to ensure the models are technically and theoretically sound, compliant with USACE policy, computationally accurate, and based on reasonable assumptions. The responsible use of well-known and proven USACE developed and commercial engineering software will continue and the professional practice of documenting the application of the software and modeling results will be followed. The selection and application of the model and the input and output data is still the responsibility of the users and is subject to DQC, ATR, BCOES, policy and legal review, and SAR (if required). Where such approvals have not been completed, appropriate independent checks of critical calculations will be performed and documented. The following engineering models, software, and tools are anticipated to be used:

Model Name	Version	Validation Date
Conspan by Leap Software	Latest version	
Geomath by Leap Software	Latest version	
STAAD.Pro V8i by Bentley	Latest version	
FB-Multiplier, Bridge Software Institute (BSI)	v2018 or later	
Seisab by Imbsen & Associates	Latest version	
LPILE	v2018 or later	

GROUP	v2018 or later	
PYWall	v2015 or later version	
SHAFT	v2017 or later version	
CWALSHT, COM624G and CWALSSI	Latest version	
GRLWEAP 2010	v2010	
SPT94 Department of Civil Engineering	Latest version	
Sap 2000 and/ or CSI Bridge by Computers & Structures Inc.	Latest version	
RAM Element 13, RAM Concrete, RAM Steel, RAM Connection by Bentley	Latest version	
HEC-RAS	Latest version	

Table 8 Models and Status

Section 9

Review Plan Points of Contact

Title	Organization	Phone
Senior Reviewer	CEIWR-RMC	[redacted]
Quality Manager	CESAD-RBT	[redacted]
Review Manager	CESAJ-EN-Q	[redacted]
Project Manager	CESAJ-PM-WN	[redacted]
Engineer Technical Lead	CESAJ-EN-DL	[redacted]

Table 9 RP POC's

ATTACHMENT 1

[redacted]

[redacted]

[redacted]

ATTACHMENT 2

Review Plan Revisions

Revision Date	Description of Change	Page/Paragraph Number

Table 13 RP Revisions

ATTACHMENT 3

Design Quality Control Plan

Modification of the Four Las Americas Bridges over Rio Piedras, and Rio Puerto Nuevo Channel Improvements from Station 147+40 to Station 176+50 San Juan, Puerto Rico

Design Quality Control Plan

Contract W912EP-19-D-0015
Task Order W912EP-20-F-0021

CDM Smith

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Design Quality Control Plan

Modification of the Four Las Americas Bridges over Rio Piedras, and Rio Puerto Nuevo Channel Improvements from Station 147+40 to Station 176+50

Contract No. W912EP-19-D-0015
Task Order No. W912EP-20-F-0021

[redacted] 4/1/2020
Date

CDM Smith
Project Manager

[redacted] 4/1/2020
Date

CDM Smith
Design Quality Control Manager

CDM Smith

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List of Acronyms

AE	Architectural/Engineering
CDM Smith	CDM Federal Programs Corporation
CO	Contracting Officer
COR	Contracting Officer's Representative
CSA	CSA Architects and Engineers
CSF	critical success factor
CVS	Certified Value Specialist
CWE	current working estimate
DDR	Design document report
ER	Engineering Regulation
ETL	Engineering Technical Lead
MFS	MFS Construction LLC
MII	USACE Micro-Computer Aided Cost Engineering System software
PAT	process, activity, and task
PDT	project delivery team
P.E.	Professional Engineer
PM	project manager
PMP	Project Management Professional
P&S	plans and specifications
PQM	project quality management
PT&C	project time and cost
PTL	project technical leader
QA	quality assurance
QAS	quality assurance specialist
QC	quality control
QCM	quality control manager
QCP	quality control plan
QCT	quality control team
SOW	statement of work
SVS	Strategic Value Solutions
TO	task order
TOM	task order manager
TRC	technical review committee
USACE	U.S. Army Corps of Engineers
VAGTEC	VAG Transportation Engineering Consultants, PSC
VCI	Vali Cooper International

Section 1

Introduction

Under the U.S. Army Corps of Engineers (USACE), Contract Number W912EP-19-D-0015, CDM Federal Programs Corporation (CDM Smith) will provide architectural engineering (AE) services to the USACE Jacksonville District. Task Order (TO) W912EP19D0020 is to prepare construction plans and specifications, design document report, design calculations, and other supporting documentation for modification of the four Las Americas Bridges of Rio Piedras under the Rio Puerto Nuevo Project in San Juan, Puerto Rico.

This TO-specific design quality control plan (QCP) was developed to describe the management structure and general quality assurance (QA) and quality control (QC) procedures to be implemented by CDM Smith for this assignment. Use of the QCP will help ensure that this project is completed according to project-specific objectives and applicable requirements and standards.

We intend to provide a professional product that is understandable, reliable, technically complete, and in compliance with regulatory constraints, while adhering to our profession's standard of care.

This QCP has been developed according to: USACE Engineering Regulation (ER) 1110-1-12, *Engineering and Design Quality Management*; ER 1110-2-1150, Engineering and Design for Civil Works Projects; *and the CDM Smith Quality Program.*

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Section 2

Project Description

2.1 Project Scope

The execution of the Modification of the four Las Americas Bridges over Rio Piedras, and Rio Puerto Nuevo Channel Improvements from Station 147+40 to Station 176+50 is in San Juan, Puerto Rico. This project includes the preparation of the construction plans and specifications (P&S), design document report (DDR), design calculations, and other supporting documentation for modification of the four Las Americas Bridges over Rio Piedras (Contract 4) under the Rio Puerto Nuevo Project. Bridges that shall be modified as part of Rio Puerto Nuevo Contract 4 are the following: (1) Las Americas Expressway (PR-18) Bridge at Station 156+65, (2) North East (NE) Access Ramp at Station 163+85, (3) Piñero Avenue (PR17) East Bridges (Eastbound and Westbound) at Station 169+22, and (4) South East (SE) Access Ramp at Station 174+50. Additionally, this task order includes improvements of the Rio Puerto Nuevo Channel from Station 147+40 to Station 176+50; including a stilling basin at the project downstream terminus and an upstream transition from the improved channel to the existing channel. The project number is task order no. W912EP-20-F-0021, under contract no. W912EP-19-D-0015.

The scope of work includes activities necessary to prepare the construction plans and specifications, design document report, design calculations, and other supporting documentation for modification of the four Las Americas Bridges over Rio Piedras (Contract 4) under the Rio Puerto Nuevo Project.

This scope of work includes:

- Design QCP
- Site visit
- Reviews and conferences
- Status reports
- Cost estimates
- Construction schedules
- Boundary Map Drawings
- Geotechnical and subsurface investigations
- Bridge Evaluation Report
- Preliminary 30%, Intermediate 60%, Pre-Final 100%, and Corrected Final design DDR and plans and specifications (P&S)

- Value Engineering Study Report
- Traffic Study
- Engineering Considerations and Instructions Report

2.1.1 Work Plan Tasks

To facilitate coordination with USACE, CDM Smith's designated task managers will work with the project manager (PM) to prepare for and attend a pre-work conference, develop a project work plan, hold internal and external technical review meetings, and prepare for and attend regular meetings and workshops. Proper project planning and meetings will help ensure the project proceeds on schedule and on budget. A kick-off meeting will be conducted in San Juan, Puerto Rico on January 28, 2020 followed by a 2-day site visit on January 29 and January 30, 2020, and a project quality management (PQM) workshop on January 31, 2020.

A kick-off report will be prepared summarizing the kick-off meeting and site visit. Development of this design QCP and the project schedule are included in the work plan tasks.

2.1.1.1 Preliminary 30% Design

The purpose of this phase is to collect, compile, and evaluate necessary data to develop the Preliminary 30% design level documents for two bridge alternatives: preliminary 30% plans, specifications outline, pricing (bid) schedule, MII construction cost estimate, and DDR. The submittal for this phase will be followed by a review conference with USACE.

The preliminary 30% plans and specifications outline shall include: cover/title sheet, general notes, existing bridges plans and elevations, modified bridges plans and elevations, typical sections, drainage plans, modification of the bridge substructures (including abutment details, pier details, foundation details, piles or drilled shaft, shear transfer details such as shear key or shear block), channel excavation plan, channel plan and profile, channel transitions, channel improvement alternatives (including proposed wall systems and bottom of the channel), stilling basin plan and details, utilities (existing and relocation) plans, lighting plans, geotechnical recommendations, geotechnical investigations, boring location plans, access road plan and profile, acquisition limits, R-O-W plans, maintenance of traffic plans, construction sequencing, and water diversion plan.

The Current Working Estimates (CWE) shall meet ER 1110-2-1302. Construction cost items shall be prepared at the detail level which shall include unit costs for labor, equipment and materials. Lump sum pricing use shall be minimized, and where used shall be backed up with historic data escalated to current prices using USACE approved methods or quotations.

The Proposed Construction Schedule shall be prepared utilizing Scheduling software which is consistent with the project construction cost estimate. During development of this schedule, consideration shall be given to standard construction practices, duration of tasks, the sequence of construction, procurement of materials, mobilization and demobilization operations, etc. The Proposed Construction Schedule shall utilize MS Project.

2.1.1.2 Intermediate 60% Design

The purpose of this phase is to collect, compile, and evaluate necessary data to develop to the Intermediate 60% design level documents of the selected alternative: intermediate 60% plans, specifications, pricing (bid) schedule, MII construction cost estimate, and DDR. The submittal for this phase will be followed by a review conference with USACE.

The intermediate 60% plans and specifications shall include VE proposals accepted by the Government (per Section 6.8 of the SOW) and shall include: engineering analyses, cover/title sheet, general notes, demolition plans, existing bridges plans and elevations, modified bridges plans and elevations, typical sections, drainage plans and profiles, drainage details, erosion control plans and details, modification of the bridge substructures (including abutment details, pier details, foundation details, piles or drilled shaft, shear transfer details such as shear key or shear block), piers debris mitigation measures details, pier extensions details, pier encapsulated concrete wall details, channel excavation plan, channel plan and profile, channel cross sections, channel transitions, channel wall system details, bottom of the channel details, stilling basin plan and details, stilling basin cross sections, utilities (existing and relocation) plans, lighting plans, geotechnical recommendations, boring location plans, access road plan and control tables, access road profile, access road grading plans, access road cross sections, acquisition limits, R-O-W plans and tables, maintenance of traffic plans, construction signs and pavement markings, construction staging plans, construction sequencing, and water diversion plan.

The Project Time and Cost (PT&C) 60% and Proposed Construction Schedule will be prepared for the features requested in the intermediate 60% submittal. The Proposed Construction Schedule shall be prepared utilizing Scheduling software, which is consistent with the project construction cost estimate. During development of this schedule, consideration will be given to standard construction practices, duration of tasks, the sequence of construction, procurement of materials, mobilization and demobilization operations, etc. The Proposed Construction Schedule will utilize MS Project.

2.1.1.3 Pre-Final 100% Design

The purpose of this phase is to collect, compile, and evaluate necessary data to develop to the Pre-Final 100% design level documents of the selected alternative: pre-final 100% plans, specifications, pricing (bid) schedule, MII construction cost estimate, and DDR. The submittal for this phase will be followed by a review conference with USACE.

The pre-final 100% plans and specifications shall include 100% design of those work products described above in the Intermediate 60% design submittal (and Section 6.1.2 of the SOW) in addition to Engineering Considerations and Instructions Report (ECIR). Utilities and lighting plans shall be approved/endorsed by Commonwealth of Puerto Rico utility agencies (per Section 6.1.3 of the SOW).

The PT&C 100% and Proposed Construction Schedule will be prepared for the features requested in the Pre-Final 100% submittal.

2.1.1.4 Final Submittal

This phase accounts for submitting the final design to USACE including final plans, specifications, pricing (bid) schedule, MII construction cost estimate, and DDR. The submittal is subject to a Verification Review.

The Revised PT&C and Revised Proposed Construction Schedule will be prepared for the features requested in the Final submittal.

2.1.1.5 Corrected Final Submittal

The corrected final is submitted after completion of the Verification Review by USACE. The corrected final plans, specifications, pricing (bid) schedule, MII construction cost estimate, and DDR are submitted.

2.1.1.6 Surveys and Studies

As outlined in the TO statement of work (SOW), this task includes the boundary map drawings, geotechnical test and investigations, bridge evaluation report, traffic study, value engineering study workshop, ECIR, and the DDR.

2.1.1.7 Construction Contract Bidding Period and Amendments Submittal

As outlined in the SOW 7.6, this phase allows for CDM Smith to provide services during construction contract solicitation (bidding), including, response to inquiries in ProjNet from prospective bidders, and development of contract amendments as required.

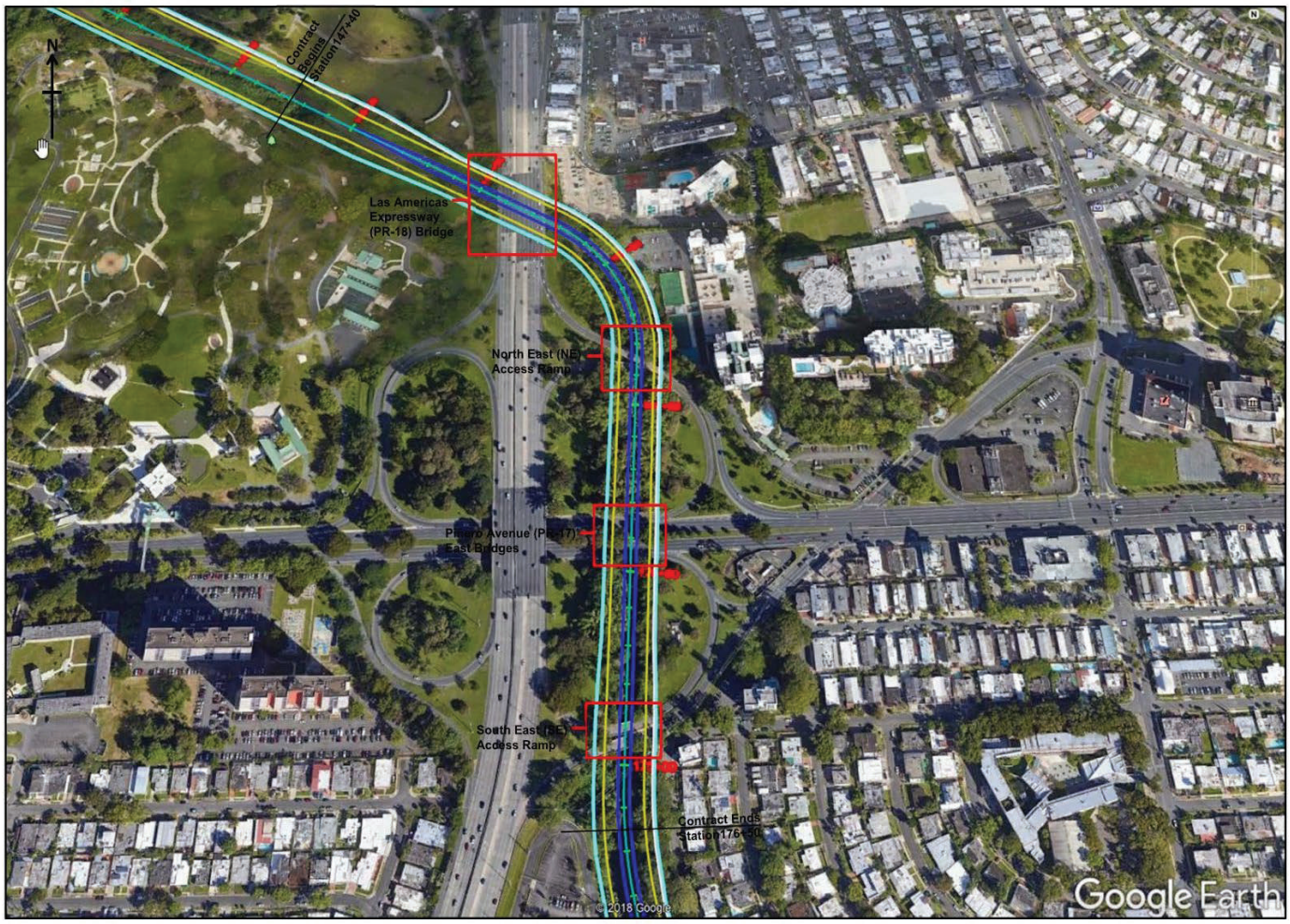
2.2 Site Location

The Rio Puerto Nuevo drainage basin is located within the San Juan Metropolitan Area along the northern coast of Puerto Rico. The basin extends from the southeast side of San Juan Harbor south into the foothills of the central mountains of Puerto Rico. The basin is traversed by the Rio Piedras, Rio Puerto Nuevo, Quebrada Margarita, Quebrada Josefina, Quebrada Dona Ana, Quebrada Buena Vista, and Quebrada Guaracanal.

2.3 Site Description and History

This QCP covers the design and the preparation of construction P&S, DDR, design calculations, and other supporting documentation for the subject project, as shown on **Figure 2-1**. The Rio Puerto Nuevo/Rio Piedras is the main drainage system for the San Juan Metropolitan Area. Intense development in the basin has altered the natural drainage patterns, which significantly increased the runoff rates and restricted the flows in the flood plain. More than 30 bridges (the 4 Las Americas Bridges among of them) have been identified as impeding flood flows and causing increased flooding. The watershed is mostly urbanized and covers an area greater than 25 square miles. Frequent and severe flooding affects more than 6,000 families and dozens of major public buildings and facilities located throughout the flood plain. Each major flood exceeding the 2-year frequency of occurrence storm event causes economic damages in the millions of dollars. Improvements are necessary for the Rio Puerto Nuevo/Rio Piedras and its five tributaries of the Rio Puerto Nuevo basin to safely pass precipitation events up to the 100-year return frequency storm event (1% annual probability of occurrence). Future main channel improvements (widening and deepening) require the four Las Americas Bridges to be modified.

In 1991, the Jacksonville District completed a General Design Memorandum (GDM) documenting proposed improvements to the Rio Puerto Nuevo/Rio Piedras drainage basin to relieve the effects of flooding. Refer to Section 5 - GFI, Item 1. The project consists of 11.2 miles of channel improvements to the existing river and its five tributaries. This project consists of a 2,900 linear foot segment in urban San Juan. The flood protection will be accomplished by channelizing the existing floodway of the Rio Piedras and its tributaries. When completed, the improvements will provide flood risk reduction up to the 100-year event. The proposed improvements of Rio Puerto Nuevo Channel at the four Las Americas Bridges at that time, 1991, was a composite channel section that would consist of a trapezoidal shape with lowered invert center-pilot section.



Google Earth Plan View of the four Las Americas Bridges and Puerto Nuevo Channel Improvements from Station 147+40 to Station 176+50.

Figure 2-1
Project Location Map

Currently, the Jacksonville District is preparing an updated Hydrologic and Hydraulic Study for the Rio Puerto Nuevo Flood Control Project, San Juan Puerto Rico and will provide the data and information in Memorandums of Record (MFRs) within the days indicated in the Section 5, GFI. The updated Hydrologic and Hydraulic MFRs will provide a new channel cross-section geometry and a new design for the stilling basin. The MFRs will also include discharges, water stages, and

velocities for design. Currently, banks are eroding, further exposing utilities as storm flows continue to scour where constricted on the sandy floor. Repairs to the storm sewer network will be evaluated based on size, condition, material, and capacity to convey design storm runoff.

2.4 Project Objectives

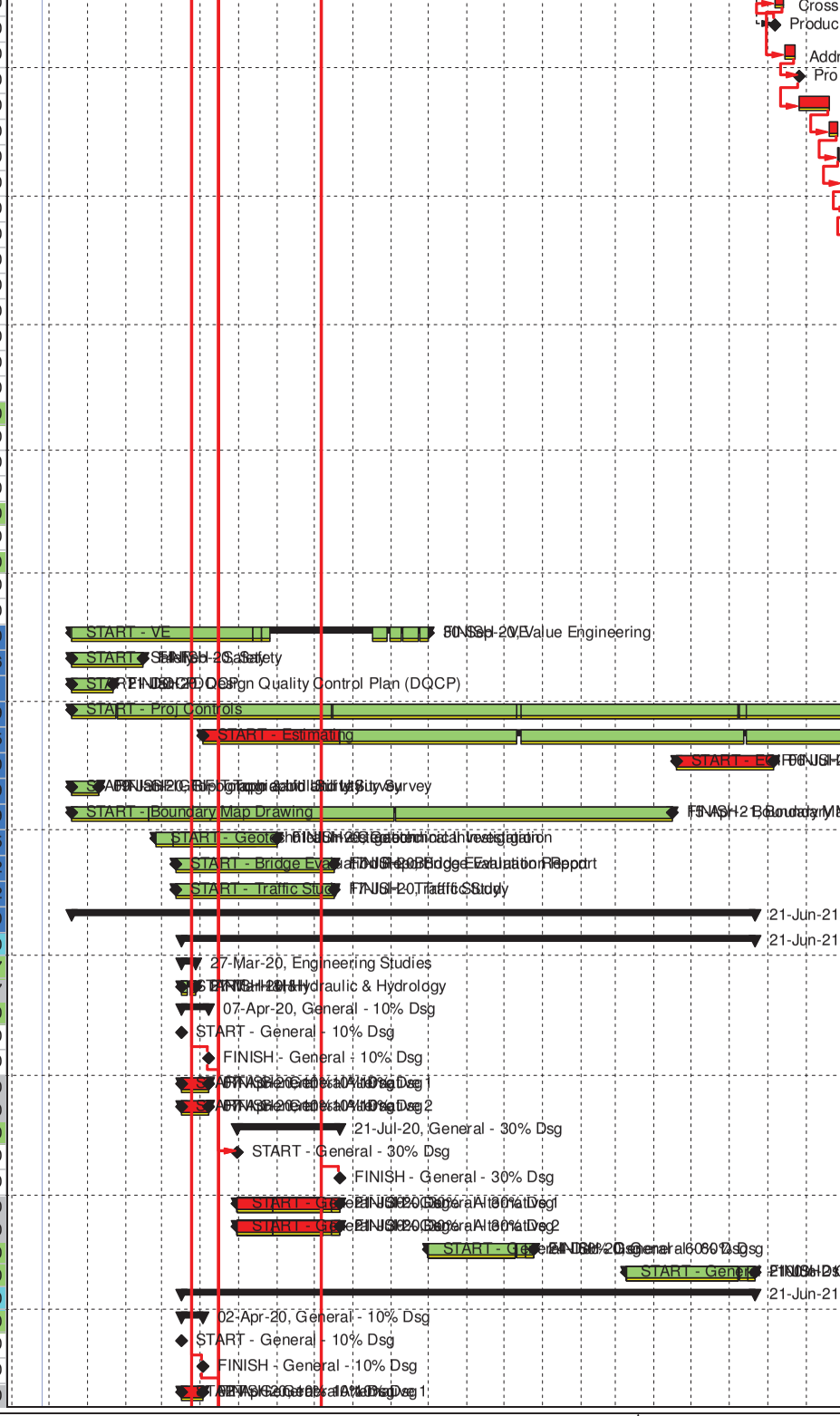
The objective of this work is to conduct activities necessary to prepare the construction plans and specifications, design document report, design calculations, and other supporting documentation for modification of the four Las Americas Bridges over Rio Piedras (Contract 4) under the Rio Puerto Nuevo Project.

2.5 Project Schedule

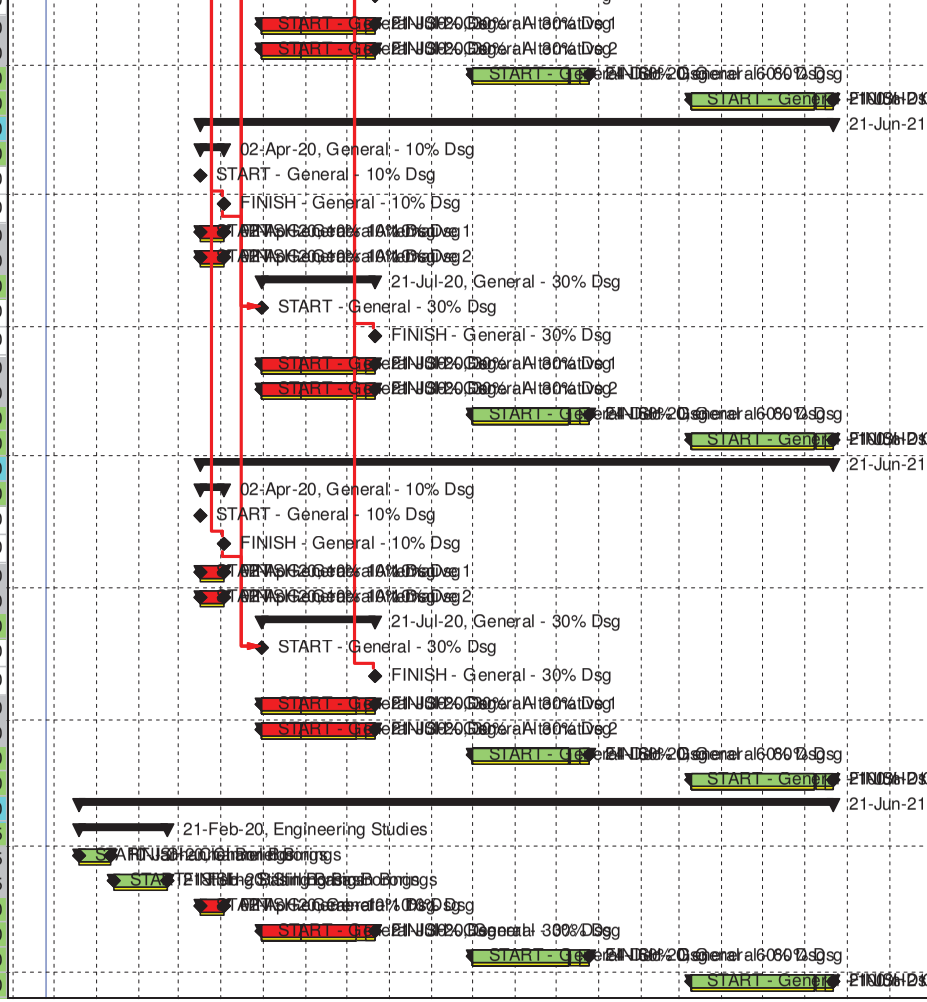
The project schedule is included as **Figure 2-2**.

	NTP (19.Dec.2019)	0	0	19-Dec-19*		0%	0%	0
	Contract Finish Date (11.Mar.2022)	0	0		11-Mar-22*	0%	0%	0
		566	566	19-Dec-19	11-Mar-22		0%	0
	Project Audit	566	566	19-Dec-19	11-Mar-22	0%	0%	0
	Project Execution Plan Approval - PxP	10	10	19-Dec-19	03-Jan-20	0%	0%	23
	START - Project Management	0	0	19-Dec-19		0%	0%	23
	Specification/Standard Details Translation	55	55	19-Dec-19	06-Mar-20	0%	0%	10
PF	Project Execution Plan Mtng	10	10	06-Jan-20	17-Jan-20	0%	0%	23
	Kick-off Meeting	1	1	27-Jan-20	27-Jan-20	0%	0%	23
M	PQM Meeting	1	1	30-Jan-20	30-Jan-20	0%	0%	537
	Bi-Weekly Meetings	533	533	06-Feb-20	11-Mar-22	0%	0%	0
	FINISH - Project Management	0	0		11-Mar-22	0%	0%	0
		365	365	19-Dec-19	25-May-21		0%	201
		5	5	09-Mar-20	13-Mar-20		0%	10
		155	155	12-Aug-20	23-Mar-21		0%	246
	START - External Sponsor Reviews	0	0	12-Aug-20		0%	0%	106
	FINISH - External Sponsor Reviews	0	0		23-Mar-21	0%	0%	246
		155	155	12-Aug-20	23-Mar-21		0%	105
		155	155	12-Aug-20	23-Mar-21		0%	105
		155	155	12-Aug-20	23-Mar-21		0%	105
		155	155	12-Aug-20	23-Mar-21		0%	105
		155	155	12-Aug-20	23-Mar-21		0%	105
		155	155	12-Aug-20	23-Mar-21		0%	105
		155	155	12-Aug-20	23-Mar-21		0%	105
	equirements	489	489	08-Apr-20	11-Mar-22		0%	0
	only)	16	16	08-Apr-20	29-Apr-20		0%	10
C1	10% - TRC Review	10	10	08-Apr-20	21-Apr-20	0%	0%	10
	Production / 10% submittal to TRC	0	0	08-Apr-20		0%	0%	10
C1	10% - TRC Meeting	1	1	22-Apr-20	22-Apr-20	0%	0%	10
	10% - Address TRC Comments	5	5	23-Apr-20	29-Apr-20	0%	0%	10
		43	43	22-Jul-20	21-Sep-20		0%	76
C2	30% - TRC Review	7	7	22-Jul-20	30-Jul-20	0%	0%	10
	Production / 30% submittal to TRC	0	0	22-Jul-20		0%	0%	10
C2	30% - TRC Meeting	1	1	31-Jul-20	31-Jul-20	0%	0%	10
	30% - Address TRC Comments	7	7	03-Aug-20	11-Aug-20	0%	0%	10
	Production / 30% submittal to USACE / Sponsor	0	0	12-Aug-20		0%	0%	10
	USACE-QAR / Sponsor Review	19	19	12-Aug-20	08-Sep-20	0%	0%	76
	CDM Smith evaluation of QAR / Sponsor review comments	4	4	09-Sep-20	14-Sep-20	0%	0%	76
	CDM Smith conference call to review QAR / Sponsor comments	1	1	15-Sep-20	15-Sep-20	0%	0%	76
	USACE-QAR / Sponsor back-check / close review comments	4	4	16-Sep-20	21-Sep-20	0%	0%	76
		90	90	28-Dec-20	03-May-21		0%	44
	Production / 60% submittal to TRC	0	0	28-Dec-20		0%	0%	10
C3	60% - TRC Review	10	10	28-Dec-20	11-Jan-21	0%	0%	10
C3	60% - TRC Meeting	1	1	12-Jan-21	12-Jan-21	0%	0%	10
	60% - Address TRC Comments	10	10	13-Jan-21	26-Jan-21	0%	0%	10
	Production / 60% submittal to USACE / Sponsor	0	0	27-Jan-21		0%	0%	10
	USACE-QAR / Review	21	21	27-Jan-21	24-Feb-21	0%	0%	10
	CDM Smith evaluation of Sponsor review comments	4	4	25-Feb-21	02-Mar-21	0%	0%	10
	CDM Smith conference call to review Sponsor comments	1	1	03-Mar-21	03-Mar-21	0%	0%	10
	USACE back-check / close review comments	4	4	04-Mar-21	09-Mar-21	0%	0%	10
	Production / Intermediate 60% submittal to USACE / Sponsor / IEPR	4	4	15-Mar-21	18-Mar-21	0%	0%	44
	USACE-ATR, USACE-BCOES, Sponsor, IEPR Review	20	20	19-Mar-21	15-Apr-21	0%	0%	44
	CDM Smith evaluation of USACE / Sponsor / IEPR review comments	1	1	16-Apr-21	16-Apr-21	0%	0%	44
	CDM Smith conference call to review ATR comments	1	1	19-Apr-21	19-Apr-21	0%	0%	44
	CDM Smith conference call to review Sponsor comments	1	1	20-Apr-21	20-Apr-21	0%	0%	44
	CDM Smith conference call to review IEPR comments	1	1	21-Apr-21	21-Apr-21	0%	0%	44

Cross-check Review	6	6	07-Jul-21	14-Jul-21	0%	0%	0
Production / Pre-Final 100% submittal to Cross-check	0	0	07-Jul-21		0%	0%	0
Address Cross-check comments	7	7	15-Jul-21	23-Jul-21	0%	0%	0
Production / Pre-Final 100% submittal to USACE / Sponsor	0	0	26-Jul-21		0%	0%	0
USACE Review	19	19	26-Jul-21	19-Aug-21	0%	0%	0
CDM Smith evaluation of USACE-QAR review comments	5	5	20-Aug-21	26-Aug-21	0%	0%	0
CDM Smith conference call to review USACE-QAR comments	1	1	27-Aug-21	27-Aug-21	0%	0%	0
USACE back-check / close review comments	5	5	30-Aug-21	03-Sep-21	0%	0%	0
Production / Pre-Final 100% submittal to USACE / Sponsor	3	3	07-Sep-21	09-Sep-21	0%	0%	0
USACE-ATR, Sponsor, BCOES Review	18	18	10-Sep-21	05-Oct-21	0%	0%	0
CDM Smith evaluation of USACE-ATR / Sponsor / BCOES review comm	4	4	06-Oct-21	11-Oct-21	0%	0%	0
CDM Smith conference call to review USACE-ATR comments	1	1	12-Oct-21	12-Oct-21	0%	0%	0
CDM Smith conference call to review Sponsor comments	1	1	13-Oct-21	13-Oct-21	0%	0%	0
CDM Smith conference call to review USACE-BCOES comments	1	1	14-Oct-21	14-Oct-21	0%	0%	0
USACE-ATR / Sponsor / BCOES back-check / close review comments	2	2	15-Oct-21	18-Oct-21	0%	0%	0
USACE-ATR Certification	2	2	19-Oct-21	20-Oct-21	0%	0%	0
y)	3	3	21-Oct-21	25-Oct-21		0%	0
Production / Final submittal to USACE	0	0	21-Oct-21		0%	0%	0
USACE Verification Review	2	2	21-Oct-21	22-Oct-21	0%	0%	0
CDM Smith conference call to review USACE-BCOES comments	1	1	25-Oct-21	25-Oct-21	0%	0%	0
USACE only)	5	5	26-Oct-21	01-Nov-21		0%	0
Production / Corrected Final Submittal To USACE	5	5	26-Oct-21	01-Nov-21	0%	0%	0
ocess	90	90	02-Nov-21	11-Mar-22		0%	0
Construction Contract Bidding Period & Amendment Submittal	76	76	02-Nov-21	21-Feb-22	0%	0%	0
Production / Conform Submittal to USACE	14	14	22-Feb-22	11-Mar-22	0%	0%	0
	200	200	19-Dec-19	30-Sep-20		0%	10
	40	40	19-Dec-19	14-Feb-20		0%	526
	22	22	19-Dec-19	21-Jan-20		0%	81
	557	557	19-Dec-19	28-Feb-22		0%	9
	367	367	03-Apr-20	13-Sep-21		0%	125
tion Report	55	55	19-Apr-21	06-Jul-21		0%	0
	14	14	19-Dec-19	09-Jan-20		0%	89
	337	337	19-Dec-19	15-Apr-21		0%	229
	70	70	24-Feb-20	01-Jun-20		0%	35
	90	90	12-Mar-20	17-Jul-20		0%	12
	90	90	12-Mar-20	17-Jul-20		0%	12
	383	383	19-Dec-19	21-Jun-21		0%	10
	323	323	16-Mar-20	21-Jun-21		0%	10
	10	10	16-Mar-20	27-Mar-20		0%	17
	10	10	16-Mar-20	27-Mar-20		0%	17
	17	17	16-Mar-20	07-Apr-20		0%	10
START - General - 10% Dsg	0	0	16-Mar-20		0%	0%	10
FINISH - General - 10% Dsg	0	0		07-Apr-20	0%	0%	10
	17	17	16-Mar-20	07-Apr-20		0%	10
	17	17	16-Mar-20	07-Apr-20		0%	10
	57	57	30-Apr-20	21-Jul-20		0%	10
START - General - 30% Dsg	0	0	30-Apr-20		0%	0%	10
FINISH - General - 30% Dsg	0	0		21-Jul-20	0%	0%	10
	57	57	30-Apr-20	21-Jul-20		0%	10
	57	57	30-Apr-20	21-Jul-20		0%	10
	59	59	01-Oct-20	24-Dec-20		0%	10
	73	73	10-Mar-21	21-Jun-21		0%	10
Access Ramp	323	323	16-Mar-20	21-Jun-21		0%	10
	14	14	16-Mar-20	02-Apr-20		0%	10
START - General - 10% Dsg	0	0	16-Mar-20		0%	0%	10
FINISH - General - 10% Dsg	0	0		02-Apr-20	0%	0%	10
	14	14	16-Mar-20	02-Apr-20		0%	10



FINISH - General - 30% Dsg	0	0		21-Jul-20	0%	0%	10
	57	57	30-Apr-20	21-Jul-20		0%	10
	57	57	30-Apr-20	21-Jul-20		0%	10
	59	59	01-Oct-20	24-Dec-20		0%	10
	73	73	10-Mar-21	21-Jun-21		0%	10
PR-17) East Bridges (E&W)	323	323	16-Mar-20	21-Jun-21		0%	10
	14	14	16-Mar-20	02-Apr-20		0%	10
START - General - 10% Dsg	0	0	16-Mar-20		0%	0%	10
FINISH - General - 10% Dsg	0	0		02-Apr-20	0%	0%	10
	14	14	16-Mar-20	02-Apr-20		0%	10
	14	14	16-Mar-20	02-Apr-20		0%	10
	57	57	30-Apr-20	21-Jul-20		0%	10
START - General - 30% Dsg	0	0	30-Apr-20		0%	0%	10
FINISH - General - 30% Dsg	0	0		21-Jul-20	0%	0%	10
	57	57	30-Apr-20	21-Jul-20		0%	10
	57	57	30-Apr-20	21-Jul-20		0%	10
	59	59	01-Oct-20	24-Dec-20		0%	10
	73	73	10-Mar-21	21-Jun-21		0%	10
Access Rampo	323	323	16-Mar-20	21-Jun-21		0%	10
	14	14	16-Mar-20	02-Apr-20		0%	10
START - General - 10% Dsg	0	0	16-Mar-20		0%	0%	10
FINISH - General - 10% Dsg	0	0		02-Apr-20	0%	0%	10
	14	14	16-Mar-20	02-Apr-20		0%	10
	14	14	16-Mar-20	02-Apr-20		0%	10
	57	57	30-Apr-20	21-Jul-20		0%	10
START - General - 30% Dsg	0	0	30-Apr-20		0%	0%	10
FINISH - General - 30% Dsg	0	0		21-Jul-20	0%	0%	10
	57	57	30-Apr-20	21-Jul-20		0%	10
	57	57	30-Apr-20	21-Jul-20		0%	10
	59	59	01-Oct-20	24-Dec-20		0%	10
	73	73	10-Mar-21	21-Jun-21		0%	10
oor and Stilling Basin	383	383	19-Dec-19	21-Jun-21		0%	10
	45	45	19-Dec-19	21-Feb-20		0%	115
	15	15	19-Dec-19	10-Jan-20		0%	115
	30	30	13-Jan-20	21-Feb-20		0%	115
	14	14	16-Mar-20	02-Apr-20		0%	10
	57	57	30-Apr-20	21-Jul-20		0%	10
	59	59	01-Oct-20	24-Dec-20		0%	10
	73	73	10-Mar-21	21-Jun-21		0%	10



Section 3

Organization and Responsibilities

CDM Smith's proposed quality management organization is designed to ensure customer satisfaction. All team personnel, including subcontractors, are subject to the QA/QC requirements. Team members have responsibility for the accuracy and completeness of the contract documents prepared for this project and must check all materials accordingly. Team members will take responsibility for items they are qualified to handle and escalate items to the next higher-level items that exceed their qualifications or for which higher-level review is necessary.

3.1 Management Philosophy

CDM Smith's quality management philosophy includes a vision to be a leader in providing AE services to the federal government and to be noted for consistent excellent performance. This vision is embodied in our goal to provide exceptional client service. To achieve consistently excellent performance, we emphasize a culture oriented toward continuous improvement. Our firm's expectation is that our team members will use the available tools and procedures to foster teamwork and consistently produce high-quality work products. Every team member is responsible for meeting such expectations and standards and for suggesting ways to improve our QA/QC tools and procedures.

3.2 Management Structure

The project organization for this TO is designed to provide clear lines of functional and program responsibility and authority supported by a management control structure as shown on **Figure 3-1**. The management structure involves the USACE Engineering Technical Lead (ETL), Contracting Officer's Representative (COR) and Contracting Officer (CO) and the CDM Smith PM. A general description of the project delivery team (PDT), quality control team (QCT), and the roles and responsibilities included for this TO QCP is presented below.

3.3 Project Delivery Team

The PDT is responsible for the preparation, execution, supervision, and coordination of all TO activities according to the appropriate guidance for design assignments under this TO.

The PDT has been selected based on the following:

- Technical discipline requirements
- Prior site or similar experience
- Cost-effectiveness (expertise level commensurate with requirements)
- Project complexity

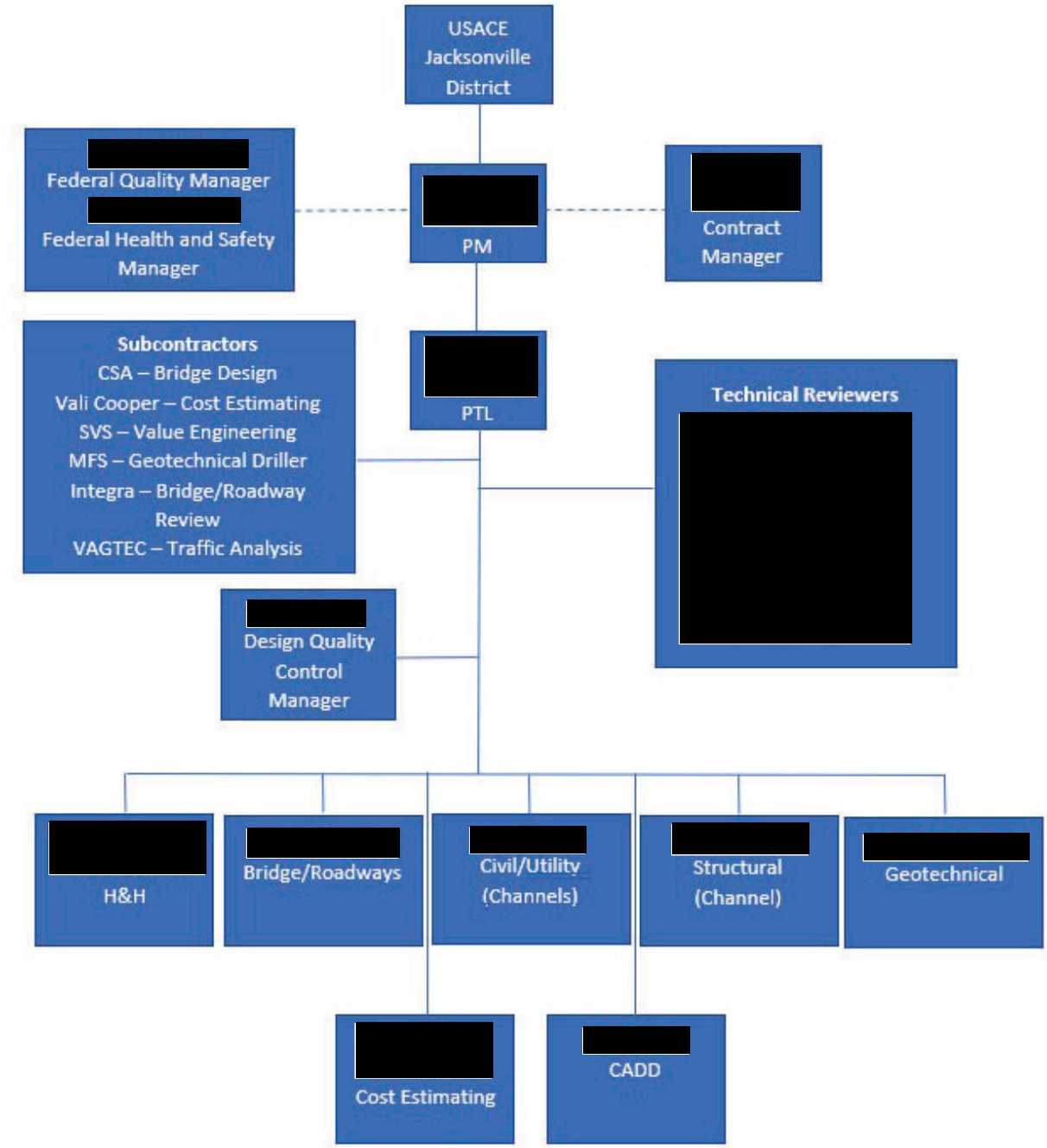


Figure 3-1
Project Team Organization Chart

Technical and support staff, including hydrologic and hydraulic engineers, civil engineers, electrical engineers, geotechnical engineers, structural engineers, cost estimators, computer-aided drafting operators, and clerical personnel, will be used to support the PDT's efforts. Personnel assigned to the PDT and their responsibilities are determined task by task.

Communications within the PDT are of utmost importance. Client comments, agency requirements, and changes in scope and schedule are to be quickly and accurately communicated to other members of the PDT. Project design calls with the PDT will be conducted monthly, at minimum, by the Project Manager. Additional coordination meetings and calls with the PDT will be made as needed or as required. The frequency of the coordination meetings may be adjusted depending upon project requirements. The TOM will conduct coordination calls as needed with the program management team.

3.3.1 Contract Manager

Contract Manager, [redacted], P.E., has primary responsibility for the overall indefinite delivery, indefinite quantity contract. The contract manager will make sure the project team delivers a quality, timely product to USACE.

3.3.2 Project Manager

[redacted], P.E. is the PM and is responsible for coordinating the work effort with the USACE ETL and COR. The PM is directly responsible for the technical content, schedule adherence, subcontract procurement and management, and financial management of the TO. The PM will be the primary contact with the USACE ETL and COR for this TO.

The PM is directly responsible for the coordination and execution of all specific task-delegated activities as outlined in the SOW. It is his responsibility to ensure that all tasks are conducted in strict compliance with these documents. The PM is responsible for seeing that interdisciplinary coordination has taken place among the disciplines involved before issuing any deliverables for client review. Team members will report directly to the PM on all matters relating to the specific TO assignment. The PM will provide direct oversight of the team members.

3.3.3 Project Technical Leader and Designer of Record

[redacted], P.E. will be the Project Technical Leader (PTL). He will advise the PM and the PDT on technical matters, review the technical review committee (TRC) comments, and advise the design team as required.

3.3.4 Design Quality Control Manager and Designer of Record

[redacted], P.E. will serve as the designer of record and design quality control manager (QCM) for this project, responsible for the compliance of the work with this QCP and the SOW.

3.3.4 Senior Technical Experts and Project Staff

The project team will be composed of senior technical experts and project staff. They will guide the project technical approach, support specific TO deliverables, and coordinate with other project team members as appropriate.

The team members will execute all activities as outlined in the SOW. The team will consist of the appropriate disciplines to complete the task scope of work.

The key project staff (**Table 3-1**) is composed of the senior technical experts and project staff who will serve in key roles to direct and perform the services as stated in the SOW.

Table 3-1 Key Project Staff

Discipline	Personnel	Phone Number	Email Address
Contract Manager	[redacted]	[redacted]	[redacted]
Project Manager	[redacted]	[redacted]	[redacted]
Project Technical Leader	[redacted]	[redacted]	[redacted]
Design Quality Control Manager	[redacted]	[redacted]	[redacted]
CADD	[redacted]	[redacted]	[redacted]
Structural (Channel)	[redacted]	[redacted]	[redacted]
Cost Estimating	[redacted]	[redacted]	[redacted]
Geotechnical	[redacted]	[redacted]	[redacted]
Civil (Channels) and Utilities	[redacted]	[redacted]	[redacted]
Bridges/ Roadways	[redacted]	[redacted]	[redacted]
Hydraulics & Hydrology	[redacted]	[redacted]	[redacted]

3.3.5 Subcontractors

Our project team includes the following subcontractors.

3.3.5.1 CDM Caribbean Engineers

- San Juan-based A-E firm
- Engineering design services and EOR.

3.3.5.2 CSA Architects and Engineers (CSA)

- Large business and a team subcontractor
- San Juan-based full-service A-E firm
- Bridge design and associated roadway design for Las Americas Expressway (PR-18)
- Electrical utility coordination and relocation

3.3.5.3 Integra Design Group

- Small Disadvantaged business based in San Juan
- PRHTA Qualified Resource Review

3.3.5.4 Vali Cooper International (VCI)

- Service-disabled veteran owned small business and a team subcontractor
- Construction Cost Estimating
- Construction Schedule

3.3.5.5 Strategic Value Solutions (SVS)

- Woman-owned small business and a team subcontractor
- Value-engineering.
- Value-Engineering workshop to be led by a Certified Value Specialist (CVS). The VE workshop will be led/facilitated by the SVS facilitator, although CDM Smith staff will comprise the VE participants (multiple engineering disciplines)

3.3.5.6 MFS Construction LLC (MFS)

- Small Disadvantaged business based in San Juan
- Geotechnical drilling and investigations

3.3.5.7 VAG Transportation Engineering Consultants, PSC (VAGTEC)

- Small Disadvantaged business based in San Juan
- Traffic flow analysis

Team subcontractors will be expected to review their work products before submittal to the project team and to provide the PM with documentation that QC reviews were conducted. Quality requirements will be specified in the respective SOW and checked by the QA reviewer selected by the PM. Subcontractors must implement the following QA requirements:

- Perform services according to the SOW.
- Permit on-site audits.
- Maintain documentation as required in the SOW.
- Conduct internal QC review of work products before submittal to CDM Smith.
- Notify CDM Smith of quality problems and corrective actions taken.

3.4 Quality Control Team

The QCT is responsible for implementing the QCP to ensure high quality is maintained throughout all stages of the project. The QCT will independently review deliverables and recommend the approval or disapproval of the end products (as detailed in Section 4). Personnel assigned to the QCT and descriptions of their responsibilities are discussed below.

3.4.1 Design Quality Control Manager

The project's design QCM, [redacted], P.E., is responsible for supporting the project team by ensuring all work is conducted in accordance with this QCP and the SOW requirements. The design QC manager works with the project team members to select appropriate quality measures and tracks implementation of the quality requirements for the project. At minimum, the design QC manager ensures the following steps are applied to all deliverables:

- Preparation of deliverables is completed in accordance with applicable engineering, environmental, regulatory, and other USACE guidance.
- Information is in an acceptable form such that it may be used effectively by USACE.
- Engineering and design work address the requirements outlined in the following Engineer Regulations (ER) documents: ER 5-1-14 USACE Quality Management System and ER 1110-1-12 Quality Management, and all applicable documentation listed in Appendix A of the Scope of Work.
- The submitted work products are completed in accordance with the task order SOW and the indefinite delivery contract performance requirements and are reviewed in accordance with the QC requirements described in this QCP.

3.4.2 Technical Review Committees

The technical review committees (TRC) are qualified individuals not involved with the project daily. They are responsible for confirming the proper application of clearly established criteria, regulations, laws, codes, principles, and professional practices.

Each TRC team member reviews each product for consistency across the various disciplines of the project. The TRC team members also review his/her discipline's elements and how the elements impact and align with the project's functions. Independent technical reviewers are listed in **Table 3-2**.

As selected by the PM in conjunction with the PTL and contract manager, senior technical staff will conduct TRCs through a technical review of specific design deliverables before their submittal, according to the SOW requirements. Technical reviewers will provide reviews for the project team before submittal to USACE to ensure that the deliverables are technically adequate and consistent among the specifications, related drawings, and discipline sections of reports, studies, or other deliverables. The TRCs will be formed to provide technical expert reviews at critical design phases, and a TRC will be conducted on the P&S deliverables and the DDRs. The TRCs will address adequacy and appropriateness of technical data; pertinent application of existing and new technology; and whether a sound, practical, cost-effective approach has been made.

Table 3-2 Technical Reviewers

Discipline	Technical Reviewers	Phone Number	Email Address
Civil (Channels)	[redacted]	[redacted]	[redacted]
Bridge/Roadways	[redacted]	[redacted]	[redacted]
Cost Estimating	[redacted]	[redacted]	[redacted]
Geotechnical	[redacted]	[redacted]	[redacted]
Hydrology and Hydraulics	[redacted]	[redacted]	[redacted]
Structural	[redacted]	[redacted]	[redacted]

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Section 4

End Products

The QC procedures will be applied to all end products, defined as planning and technical documents and/or design P&S, required by this contract. Documents will be prepared by appropriately qualified personnel selected by the PM and PTL. For documents prepared by multiple authors, the PM will conduct a project planning session to review the objectives and format are clear. The TRC and editorial review processes are outlined in Sections 5.2.1 and 5.2.2.

4.1 Planning Documents

The PM and the PTL will prepare the project work plan, APP, QCP, and TO schedules as required by the SOW. These documents will be revised based on comments or changes received from USACE.

4.2 Subcontract Documents

To procure quality technical services to implement the TO, the project team will prepare a subcontractor SOW for the assignments requiring subcontractor services, describing technical and quality requirements, required bid items, and deliverables. The SOW will be prepared by staff with experience in the technical area and knowledge of the project objectives. Technical and quality reviews will be performed as described in Section 5 to ensure that the SOW contains the required elements. These elements include details of the tasks to be performed, experience, permits and certifications required, technical and QA/QC requirements, schedule, safety requirements, expected submittals for the bid package and deliverables during and at the end of the performance of the work, and criteria for selection.

4.3 Technical Documents

The end products prepared according to the SOW will include DDRs, P&S, and other technical design submittals. The PTL will be responsible for the preparation of the end products. Contents of reports or other end products will be according to the SOW.

Technical memoranda, draft and final reports, and other technical deliverables will be prepared and are subject to the internal reviews described in Section 5. After internal review, the draft reports, technical memoranda, and design submittals will be submitted to USACE for comments. Comments received from USACE will be incorporated into final reports, memoranda, and design submittals as prescribed in the TO requirements. DrChecks will be used to track and document resolution of technical review comments, at the request of USACE for specific assignments. The following design submittals will be prepared according to the SOW.

4.3.1 Design Document Report

The DDR will be submitted in draft form to solicit feedback from USACE and sponsor review. Written responses to comments received from USACE staff on the submittals will be prepared using DrChecks to track and document resolution to all technical review comments. Checking procedures as outlined in Section 5.4.3 will be used for each submittal.

The DDR will be submitted for USACE review at four stages: Preliminary 30%, Intermediate 60%, Pre-Final 100%, and Corrected Final. The DDR will include narrative outlining the basis for the design, design drawings, and calculations supporting the work to the level required by ER 1110-2-1150 and all applicable requirements listed in Appendix A of the SOW. Written responses to comments received from USACE and the project sponsor on the DDR submittals will be prepared using DrChecks to track and document resolution to all agency technical review comments. Checking procedures as outlined in Section 5.4.3 will be used for each submittal. The TRCs will convene at the Preliminary 30%, Intermediate 60%, Pre-Final 100%, and Corrected Final submittal levels.

4.3.2 Plans and Specifications

The P&S will be submitted for USACE review at four stages: Preliminary 30%, Intermediate 60%, Pre-Final 100%, and Corrected Final milestones. The P&S will include design drawings and specifications. At the 30%, 60%, 100%, and corrected final submittals, a budgetary cost estimate will be prepared using the MII cost estimating tool.

The design drawings will be prepared using ERDC/ITL TR-12-6 A/E/C CAD Standard Release 6.0 (August 2015) and ERDC/ITL TR-12-1 A/E/C Graphics Standard Release 2.0 (August 2015). Specifications will be prepared in accordance with Guidance for the Preparation of Corps of Engineers Guide Specifications (CEGS), CEHNC-ED-ES-G (May 1998) and SpecsIntact Single Master Reference List (SMRL) (15 June 1999).

Written responses to comments received from USACE on each submittal will be prepared using DrChecks to track and document resolution to all review comments. Checking procedures as outlined in Section 5.4.3 will be used for each submittal. The TRCs will convene at the Preliminary 30% and Intermediate 60% design phases. Red-yellow-green review of the final P&S submittal will also be conducted.

4.3.3 Other Technical Deliverables and Reports

There are several other technical deliverables and reports that will accompany the design deliverable milestones including cost estimates, geotechnical data, the Bridge Evaluation Report, Value Engineering Report, Traffic Study Report and the Engineering Considerations and Instructions Report (ECIR). Each of these technical deliverables and reports will require internal Technical Specialist Review (TSR) and then preparation of a final draft for USACE review. Written responses to comments received from USACE staff on the submittals will be prepared using DrChecks to track and document resolution to all technical review comments. Checking procedures as outlined in Section 5.4.3 will be used for each submittal.

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Section 5

Critical Stages for Quality Control

Compliance with specific quality requirements must be verified at critical stages of project execution. The critical stages of QC for various tasks are discussed in the following sections. Before the start of any activity, it is the PTL's responsibility to confirm the project team members know the technical and quality requirements for the tasks they perform. An initial kick-off can be done through a project initiation conference or other similar means.

The project team is responsible for reviewing and becoming acquainted with the project documents. The PM will allow time for the staff to read and prepare for designated tasks before start of work. Questions or clarifications may be addressed during the project initiation meeting or as needed during bi-weekly team coordination meetings.

CDM Smith shall provide a written record of all significant discussions and telephone conversations on matters relative to the project. Copies of these records will be included in the DDR and submitted to USACE.

5.1 Project Quality Management (PQM) Workshop

An PQM workshop facilitated by CDM Smith and attended by representatives of USACE and CDM Smith is scheduled for January 31, 2020. Key project staff will discuss the project purpose, objectives, and expectations, gain consensus of project stakeholders about most important factors in success (critical success factors [CSFs]), and develop a plan of action and schedules to support PDT to meet objective (processes, activities, and tasks [PATs]). The primary purpose of the meeting is to disseminate information so that all tasks are performed according to the SOW. Progress coordination meetings also will be held bi-weekly to discuss the status of work products and services.

5.2 Control of Document Preparation

The document authors are responsible for the quality of work they produce. In addition, staff independent of the document preparation will perform checks to confirm that the end product is compliant with the established requirements documented in this QCP. The procedures used for controlling the quality of the critical stages of document development include:

- As detailed in Section 4, a draft of each technical document will be prepared. Draft documents will be checked by project team members, including interdisciplinary and intradisciplinary checking as required before completion.
- Following the completion of a draft version, a technical specialist review will be conducted by team members not directly involved in the document preparation. Comments will be documented, signed by the approved technical reviewer, and provided to the document preparer.
- The document author, technical reviewer, and PTL will resolve all comments.

- The draft document will be revised to incorporate the accepted comments resulting from the technical specialist review. Accepted comments are defined as comments provided by the technical reviewers that are accepted by the author for inclusion in or correction of the document. Non-accepted comments will be discussed with the technical reviewer for resolution; if necessary, the PM, PTL, or QC manager may be consulted to resolve the issue.
- Upon revision of the draft document, a final review of the document for format, grammar, and spelling will be performed by an editorial reviewer.
- After reproduction, the draft document will be issued to the USACE document distribution list for review.
- Following receipt of comments from USACE, comments will be addressed, and changes will be incorporated into the document.
- A technical review of the revised document will be conducted, as necessary, by approved reviewers to ensure technical adequacy of the document and to check that all stakeholder comments have been incorporated.
- The PM will distribute the revised draft or final documents to USACE as per the SOW.

5.2.1 Independent Technical Review

Technical document review is an independent review of a document containing technical information by appropriate and approved technical staff. Technical reviews of various draft and final documents will be performed prior to submission to USACE. A technical document review is a critical review of work done by one or more of CDM Smith's qualified reviewers who are independent of the document. The review is performed to ensure technical accuracy, accomplishment of project objectives, and conformance to established requirements.

Each independent technical reviewer, or Technical Specialist Reviewer (TSR) with significant experience in a variety of technical areas, or area of specialty (for TSRs), will be selected from CDM Smith's senior staff. The PM and PTL will select technical reviewers with appropriate expertise to review each document. Technical document deliverables will be checked to verify that all comments were adequately resolved. The Independent Review Form will be retained in CDM Smith's project files in auditable conditions and submitted to USACE upon request.

- Following completion of each pre-draft document, technical specialist review is performed.
- The technical reviewer will sign the Independent Review Form.
- The author, PM, PTL, and independent technical reviewers will resolve all comments.
- The pre-draft document will be revised to incorporate the accepted comments or changes resulting from technical review. Accepted comments are defined as those comments provided by the independent reviewers that are accepted by the author and included in or corrected in the document. Comments that are not accepted will be discussed with the technical review for resolution. If necessary, the PM, PTL, or QC manager may be consulted to resolve the issue.

Table 5-1 lists documents requiring technical review. Technical review of each document will be performed after the document is completed and ready for submittal.

Table 5-1 Acceptability Criteria for End Products

End Product	Source of Acceptability Criteria	Required Reviews/ Comments
Planning Documents		
QCP	CDM Smith Project Lifecycle – Review as per Section 3 of QCP USACE ER-1110-1-12	Technical and QA
APP and SSHP	USACE Safety and Health Requirements Manual, EM 385-1-1 Occupational Safety and Health Administration Code of Federal Regulations 1910 and 1926 regulations CDM Smith Health and Safety Manual	Health and Safety Manager
Design Project Execution Plan	CDM Smith Project Lifecycle 040.10 Plan Quality Management	Technical and QA
Subcontract Documents		
SOWs for geophysical underground utility locator, drilling, surveying, test pit excavation	Federal Acquisition Regulations CDM Smith Project Lifecycle 080.20 Plan Procurements CDM Smith Project Lifecycle – Review as per Section 5 of QCP	Technical and QA
Technical Documents		
Draft (30%) Design Package, including the Design Document Report (DDR), Geotechnical Data and the Boundary Map Drawings	CDM Smith Project Lifecycle 120.10 Check Deliverables and 130.10 Review Deliverables CDM Smith Implementation Guide – Technical Review Committee (TRC)	QC and TRC
Bridge Evaluation Report	CDM Smith Project Lifecycle 120.10 Check Deliverables and 130.10 Review Deliverables CDM Smith Implementation Guide – Technical Specialist Review (TSR)	QC and TSR
Value Engineering Report		
Traffic Study Report		
Draft (60%) Design Package, including the updated DDR	CDM Smith Project Lifecycle 120.10 Check Deliverables and 130.10 Review Deliverables CDM Smith Implementation Guide – TRC	QC and TRC
Pre-Final 100% Design Package, including the Final DDR	CDM Smith Project Lifecycle 70.10 Manage Quality, 120.10 Check Deliverables and 130.10 Review Deliverables CDM Smith Implementation Guide – TRC	QA, QC and Technical
	CDM Smith Project Lifecycle 70.10 Manage Quality, 120.10 Check Deliverables and 130.10 Review Deliverables CDM Smith Implementation Guide – TRC	QA of specification section Project Technical Lead review
	CDM Smith Project Lifecycle 70.10 Manage Quality, 120.10 Check Deliverables and 130.10 Review Deliverables CDM Smith Implementation Guide – TRC	Project Technical lead review
Engineering Considerations and Instructions Report (ECIR)	CDM Smith Project Lifecycle 120.10 Check Deliverables and 130.10 Review Deliverables CDM Smith Implementation Guide – Technical Specialist Review (TSR)	QC and TSR

5.2.2 Quality Assurance and Editorial Reviews

Applicable planning and technical project documents will be subject to QA review in accordance with CDM Smith's QA program. A QA review is an independent document review performed by an authorized quality assurance specialist (QAS) to verify the document meets specified QA/QC requirements. The QAS are trained and authorized by the Quality Assurance Manager (QAM) to perform QA reviews of individual categories of documents. The QAS review is selected by the PM.

- Following incorporation of technical review comments, an authorized QAS will complete a QA review to verify that the document meets client and CDM Smith quality requirements.
- The QA reviewer will sign the Independent Review Form. Table 5-1 lists the document types that require QA review.
- The author, PM, and QAS reviewer will resolve all comments.
- The draft document will be revised to incorporate accepted comments or changes resulting from QA review.
- Following revision of the document, a final review for correct formatting, grammar, and spelling will be performed by a staff member selected by the PM.

Prior to document production, an editorial review will be performed to check for readability, accuracy, consistency, grammar, and punctuation. All elements of the deliverable are reviewed, including the text, table of contents, attachments, tables, figures, acronyms, and references.

5.2.3 Final Quality Control Check

The PM, PTL and design QC manager are responsible for the quality of all work performed. As CDM Smith's PTL, [redacted] will perform a final QC check of all planning and technical documents listed in Section 4. This final check will verify all comments were appropriately addressed; confirm the technical, QA, and editorial reviews were conducted; verify consistency between hard copy and electronic version of each deliverable; and confirm all pages print correctly.

5.2.4 Monthly Progress Reports

Monthly progress reports will be provided to the USACE PM to summarize work completed, budget expended, and to provide an updated project schedule. The monthly progress reports will be prepared by the PM and reviewed by the contract manager before submittal to USACE.

5.3 Control of Procurement Activities

Services that directly affect the quality of results and work products are controlled to provide for technical adequacy and quality. Procurement of services is processed to confirm that the Federal Acquisition Regulations are followed. These services include all the subcontractors to be used for the TO activities.

A SOW is prepared for each subcontract, outlining the required technical services; project objectives; schedule; submittals and documentation; quality requirements; experience; licenses and certification; health and safety requirements; terms and conditions; and applicable local,

state, and federal standards. The SOWs are subject to technical and QA review before distribution. Technical responses to solicitations are evaluated to comply with technical and quality requirements before a subcontract award.

Team subcontractors are responsible for performing their own QC steps in accordance with their QC program and TO requirements. These requirements will be defined in the SOWs of the applicable subcontracts. Documentation of the QC steps implemented by the subcontractor must be submitted to the PM. If the PM or other project team members observe any nonconformance, CDM Smith will document the nature of the deficiency and inform the subcontractor that corrective action is necessary. The subcontractor and PM will document all undertaken corrective measures.

5.4 Control of Design Activities

Procedures for controlling design activities for the end products identified in Section 4 are summarized below. The QC procedures for activities such as model work, design, specifications, calculations, verifications of model outputs, and drawings are detailed below.

5.4.1 Standard Operating Procedures and Standardized Methods

Standardized methods will be used to the extent possible to maintain consistency and ensure accurate and defensible outputs of the computer models used to generate data outputs.

5.4.2 Deviations from Approved Standards and Practices

If deviations from the TO plans are required, they will be documented using technical memorandum and discussed with the USACE PM before the change is implemented. The impact, if any, of deviations on project quality objectives will be documented and placed in the project files.

5.4.3 Checking Procedures

During design activities, all work products will undergo thorough and continuous checking in accordance with CDM Smith design quality procedures. Independent reviews and checking will be conducted by technically qualified CDM Smith individuals who are not involved with the work product or a member of the project team.

Neat, systematic, and complete calculations will be completed for each project task. Special attention will be given to documenting design references, sketches, and notes, which will permit others to easily review the basis of computations. The reviewer's name and date will be printed on each work product. The reviewer’s name and date are considered evidence that work products have been checked and will be provided to the report’s technical reviewer. Separate forms to document QC checks are not required when the reviewer’s name and date are noted on the work product itself.

5.4.3.1 Checking Calculations and Spreadsheets

Mathematical calculations will be checked by an independent reviewer. Checking will be performed throughout the design process at the completion of each set of calculations and spreadsheets. The person performing the check will be technically capable of independently performing the calculations and will initial and date the calculation checked. Discrepancies will be

discussed and resolved to technical correctness and the resolution noted. If necessary, the PM, PTL, or design QC manager will be consulted to resolve any discrepancies.

The complete thought process and mathematical accuracy will be reviewed. The applicable formulas and design criteria will be referenced on the computation paper or spreadsheets and will be reviewed during the checking process. Corrections will be clearly noted on the calculations, and erroneous figures will be crossed out. Revisions will be reviewed with the individual who made the original calculations.

5.4.3.2 Checking Drawings, Maps, and Sketches

Drawings, maps, and sketches (including cross-references between text and specifications) will be checked by an independent reviewer. Checking of all drawings, maps, and sketches will be performed before client submittals.

A drawing checker may be the designer if the technical input is checked by someone else. If the technical input is not checked by someone else, the design and drawing checking functions are assigned to two individuals to provide an independent check.

Drawings are checked for technical and dimensional accuracy, clarity, and adherence to applicable standards. The checker initials and enters the date on the drawing.

5.4.3.3 Checking Tables, Charts, and Data Sheets

Charts and data sheets will be checked by an independent reviewer. Checking of all tables, charts, and data sheets will be performed before submittal of the draft and final deliverables. Each chart will be read thoroughly to confirm accuracy, appropriateness, and coordination with the text. Corrections will be clearly marked and discussed with the author.

5.4.3.4 Checking Specifications

Specifications will be checked by an independent reviewer. Checking of the specifications will be performed before client submittals. Each page of the specifications will be thoroughly read to confirm accuracy, appropriateness, and coordination with the drawings. If a specification references another document (e.g., another specification or catalog number), the reviewer will verify that the reference is correct. Similarly, references to the specifications on the design drawings will be checked for compatibility. Corrections will be clearly marked and discussed with the author.

5.4.3.5 Checking Cost Estimates

Cost estimates will be checked by an independent cost estimator. Cost estimate checking will be performed at each submittal phase (Preliminary 30%, Intermediate 60%, Pre-Final 100%, and Corrected Final submittals). Cost estimates will be checked for mathematical accuracy, reasonableness of data, and assumptions to verify that all items in the project have been accounted for and included in the estimate. Cost estimates also will be checked to confirm that all related items, such as contractor's overhead and profit and a contingency allowance, have been included. Corrections and revisions will be clearly noted.

5.4.3.6 Final Consistency Check (Red-Yellow-Green)

A final check for consistency between the specifications and design drawings will be performed before final DDR and P&S submittals. All correct items will be marked in yellow, and revisions and/or additions will be indicated in red and reviewed with the original designer. The person making the corrections will circle the red marks on the print in green and return it to the reviewer for back-checking. Drawings and specifications prepared at the preliminary, intermediate, and pre-final stages in the design process require independent checking. Designs and specifications near completion require the red-yellow-green check.

5.4.4 Technical Review Committees

TRCs are composed of several staff members, serving as independent reviewers, who have expertise in the technical areas and the work to be reviewed. The TRC meets as a committee to review and comment on the concepts and/or work products. Subjects typically addressed include adequacy and appropriateness of technical data; pertinent application of existing and new technologies; and whether a sound, practical, and cost-effective approach has been made.

The TRC review may be held after preparation but prior to the submittal of the preliminary (30%) and intermediate (60%) design submittals. The TRC and the design team will resolve all comments. The draft document will be revised to incorporate the accepted comments or changes. Accepted comments are defined as those comments provided by the TRC that are accepted by the author for inclusion or correction of the document. Only valid and applicable comments will be incorporated into documents

After revision of the draft document, a final review of a document for format, grammar, and spelling will be performed. After reproduction, the document will be submitted to USACE for review.

5.5 Assessments

The PM, PTL, and design QC manager are responsible for the quality of all work performed. The design QCM, Luis Perez, will assess and monitor performance according to this QCP. CDM Smith's performance management system includes assessing project activities according to requirements stated in the SOW and QCP. Therefore, project activities may be subject to one or more periodic assessments such as self-assessments, office surveillance, or office audits. All assessments will be conducted according to CDM Smith Quality Assurance Auditors' Guidance.

5.5.1 Corrective Action

Any deficiencies found during the project or as result of a self-assessment, surveillance, or audit will be dealt with immediately. The design QCM will assign the individuals responsible for implementing the approved corrective action plan. The PM will be responsible for ensuring corrective actions are taken as appropriate. In the case of major nonconformance, a follow-up assessment may be performed at the recommendation of the design QC manager to ensure that corrective actions have been implemented.

Section 6

Acceptability Criteria and Evaluation Methods

Acceptability criteria and a method to determine if acceptability criteria have been met are defined in the following documents:

- Engineer Regulations
  - ER 5-1-14 USACE Quality Management System
  - ER 11-1-321 ARMY Programs Value Engineering
  - ER 415-1-10: Contractor Submittal Procedures
  - ER 415-1-11: Biddability, Constructability, Operability, Environmental and Sustainability (BCOES) Reviews
  - ER 415-1-15: Construction Time Extensions for Weather
  - ER 1110-1-12: Quality Management
  - ER 1110-1-1300: Cost Engineering Policy and General Requirements
  - ER 1110-1-8155: Specifications
  - ER-1110-1-8159: Engineering and Design-DRCHECKS
  - ER 1110-2-112: Required Site Visits to Construction Sites by Design Personnel
  - ER 1110-2-401: Operation, Maintenance, Repair, Replacement, and Rehabilitation Manual for Projects and Separable Elements Managed by Project Sponsors
  - ER 1110-2-1150: Engineering and Design for Civil Works Projects
  - ER 1110-2-1302: Civil Works Cost Engineering
  - ER 1110-2-1806: Earthquake Design and Evaluation for Civil Works Projects
  - ER 1110-2-8152: Planning and Design of Temporary Cofferdams
  - and Braced Excavation
  - ER 1110-2-8159: Live Cycle Design and Performance

- Engineer Manuals
  - EM 385-1-1: Safety and Health Requirements Manual (November 2014)
  - EM 1110-1-1000: Photogrammetric Mapping
  - EM 1110-1-1002: Survey Markers and Monumentation
  - EM 1110-1-1003: NAVSTAR Global Positioning System Surveying
  - EM 1110-1-1004: Deformation Monitoring and Control Surveying
  - EM 1110-1-1005: Topographic Surveying
  - EM 1110-1-1804: Geotechnical Investigations
  - EM 1110-1-1904: Settlement Analysis
  - EM 1110-1-1905: Bearing Capacity of Soils
  - EM 1110-1-1906: Soil Sampling
  - EM 1110-1-2909: Geospatial Data and Systems
  - EM 1110-2-1601: Hydraulic Design of Flood Control Channels

- EM 1110-2-1602: Hydraulic Design of Reservoir Outlet Works
- EM 1110-2-1603: Hydraulic Design of Spillways
- EM 1110-2-1902: Slope Stability
- EM 1110-2-1906: Laboratory Soils Testing
- EM 1110-2-1913: Design and Construction of Levees
- EM 1110-2-2000: Standard Practice for Concrete for Civil Works Structures
- EM 1110-2-2002: Evaluation and Repair of Concrete Structures
- EM 1110-2-2007: Structural Design of Concrete Lined Flood Control Channels
- EM 1110-2-2100: Stability Analysis of Concrete Structures
- EM 1110-2-2102: Waterstops and Other Preformed Joint Materials for Civil Work Structures
- EM 1110-2-2104: Strength Design for Reinforced Concrete Hydraulic Structures
- EM 1110-2-2105: Design of Hydraulic Steel Structures
- EM 1110-2-2502: Retaining and Flood Walls
- EM 1110-2-2504: Design of Sheet Pile Walls
- EM 1110-2-2902: Conduits, Culverts, and Pipes
- EM 1110-2-2906: Design of Pile Foundations
- EM 1110-2-3400: Painting – New Construction and Maintenance
- EM 1110-2-5025: Engineering and Design – Dredging and Dredged Material Management
- EM 1110-2-6050: Response Spectra and Seismic Analysis for Concrete Hydraulic Structures
- EM 1110-2-6053: Earthquake Design and Evaluation of Concrete Hydraulic Structures

- Engineer Technical Letters

  - ETL 1110-2-577: Use of Spiral Welded Pipe Piles

- Technical Manuals

  - TM 5-618: Paints and Protective Coatings
  - TM 5-809-6: Structural Design Criteria for Structures Other Than Buildings
  - TM 5-811-1: Electrical Power Supply and Distribution
  - TM 5-818-4: Backfill for Subsurface Structures
  - TM 5-818-5: Dewatering and Groundwater Control
  - TM 5-818-8: Engineering Use of Geotextiles

- Miscellaneous Standards

  - Guidance for the Preparation of Corps of Engineers Guide Specifications (CEGS), CEHNC ED-ES-G (May 1998)
  - SpecsIntact Single Master Reference List (SMRL) (15 June 1999)

- Technical Reports

  - ITL-92-11: The Seismic Design of Waterfront Retaining Structures

- CDM Smith Quality Program
- CDM Smith's *Health and Safety Program Manual* (CDM Smith 2012)

Table 5-1 and **Table 6-1** reference the applicable guidance documents that define the acceptability criteria for each end product described in Section 4 and each critical stage for QC described in Section 5, respectively. Methods to evaluate compliance with acceptability criteria, such as checking, and reviews are discussed in Section 5.

Table 6-1 Acceptability Criteria for Critical Stages

Critical Stage	Source of Acceptability Criteria
Technical Reviews	CDM Smith Implementation Guide – Technical Review Committee – review as per Section 5 of QCP
QA Reviews	CDM Smith Project Lifecycle 70.10 Manage Quality, 120.10 Check Deliverables and 130.10 Review Deliverables CDM Smith QA Program 30.20.130.10.30 Conduct QA review
Office Audit	CDM Smith Project Lifecycle 090.10 Conduct Audits, Section 5 of QCP CDM Smith QA Program Procedures for Conducting Auditing – CDM Smith *Quality Assurance Auditors Guidance,* current revision
Checking Procedures	CDM Smith Project Lifecycle 70.10 Manage Quality, 120.10 Check Deliverables and 130.10 Review Deliverables and Section 5.4.3 of QCP
Checking Calculations and Spreadsheets	CDM Smith Project Lifecycle 100.10 Hold Quality Assurance Review and Section 5.4.3.1 of QCP
Checking Drawings, Maps, and Sketches	CDM Smith Project Lifecycle 100.10 Hold Quality Assurance Review and Section 5.4.3.2 of QCP
Checking Cost Estimates	CDM Smith Project Lifecycle 100.10 Hold Quality Assurance Review and Section 5.4.3.5 of QCP
Final Consistency Check	CDM Smith Project Lifecycle and Section 5.5 of QCP

Section 7

Quality Control Documentation and Recordkeeping

Documentation related to QC and execution of the project will be available in the project files for review by USACE personnel. Project deliverables will be submitted to USACE for review and approval before implementation.

7.1 Telephone Conversation Records

Using a telephone conversation record, the PM will record project-related telephone conversations with USACE and other project personnel resulting in direction or decisions pertinent to the TO activities. These records will be maintained in the project file to ensure accurate recordkeeping of all communications related to the work.

7.2 Meeting/Teleconference Minutes

The PM will record all project meetings with USACE and other project personnel. These meeting minutes will be typed and distributed to all meeting participants and maintained in the project file to ensure accurate recordkeeping.

7.3 Project Files

All documentation related to the QC process and project execution will be maintained in the project record file system. The files will be maintained according to CDM Smith requirements.

7.3.1 Documentation of QC Checks in Project Files

Evidence of review and checking will be documented and maintained in the project file.

7.3.2 Documentation of Independent Technical, Quality Editorial Reviews in Project Files

The documentation of technical specialist reviews, TRCs, quality reviews and editorial reviews will be retained in the project files.

7.3.3 Documentation of Red-Yellow-Green Reviews

The documentation of completion of red-yellow-green reviews of the final DDR and P&S documents will be retained in the project files.

7.4 Recordkeeping

File maintenance, storage, and control of all deliverables and other project records will occur in ProjectWise. A standardized project filing system will be used to quickly access documents as needed and simplify file inventorying during project closeout. All records are accessible, and copies will be provided to USACE upon request.

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