DEPARTMENT OF THE ARMY
MISSISSIPPI VALLEY DIVISION, CORPS OF ENGINEERS
P.O. BOX 80
VICKSBURG, MISSISSIPPI 39181-0080

REPLY TO
ATTENTION OF:

CEMVD-PD-SP

6 DEC '16

MEMORANDUM FOR Commander, St Paul District

SUBJECT: Alteration Specific 408 Review Plan Submittal for the Crown Hydro, LLC Hydroelectric Project, Upper Saint Anthony Falls Lock and Dam

1. References:

a. Memorandum, CEMVP-EC, 9 September 2016, subject: St. Paul District, Crown Hydro, LLC Hydroelectric Project, Upper Saint Anthony Falls Lock and Dam Section 408 - Review Plan (RP) Approval (encl 1).

b. Memorandum, CEIWR-RMC, 20 September 2016, subject: Risk Management Center Endorsement, Crown Hydro, LLC, Hydroelectric Project, Upper Saint Anthony Falls Lock and Dam, 408 Request, Review Plan (encl 2).

c. Memorandum, CEMVD-RB-T, 20 October 2016, subject: St. Paul District, Crown Hydro, LLC Hydroelectric Project, Upper Saint Anthony Falls Lock and Dam Section 408 Review Plan Approval (encl 3).

d. EC 1165-2-214, Civil Works Review Policy, 15 December 2012.

e. EC 1165-2-216, Policy and Procedural Guidance for Processing Requests to Alter US Army Corps of Engineers Civil Works Projects Pursuant to 33 USC 408, 30 September 2015.

2. The enclosed Alteration Specific 408 RP (encl 4) has been prepared in accordance with EC 1165-2-214. The RP has been coordinated with the Upper District Support Team, the Risk Management Center, and the Business Technical Division who concurred with the plan in references 1.b. and 1.c., respectively.

CEMVD-PD-SP
SUBJECT: Alteration Specific 408 Review Plan Submittal for the Crown Hydro, LLC Hydroelectric Project, Upper Saint Anthony Falls Lock and Dam

3. I hereby approve this RP, which is subject to change as circumstances require, consistent with development under the Project Management Business Process. Subsequent revisions to this RP or its execution will require new written approval from this office. Non-substantive changes to this RP do not require further approval. The district should post the approved RP to its web site.

4. The MVD point of contact for this action is Mr. Ben Robinson, CEMVD-PD-SP, (601) 634-5310.

4 Encls

MICHAEL C. WEHR
Major General, USA
Commanding

DEPARTMENT OF THE ARMY
ST. PAUL DISTRICT, CORPS OF ENGINEERS
180 FIFTH STREET EAST, SUITE 700
ST. PAUL MINNESOTA 55101-1678

CEMVP-PM-B

09 Sep 16

MEMORANDUM FOR Commander, Mississippi Valley Division (CEMVD-PD-SP/Mr. Ben Robinson), P.O. Box 80 Vicksburg, MS 39181-0080

SUBJECT: St. Paul District, Crown Hydro, LLC Hydroelectric Project, Upper Saint Anthony Falls Lock and Dam Section 408 – Review Plan Approval

1. In accordance with EC 1165-2-216, the Crown Hydro, LLC Hydroelectric Project, Upper Saint Anthony Falls Lock and Dam Section 408 Specific review plan is attached for Mississippi Valley Division review and approval. This review plan establishes the review procedures to be used by the St. Paul District, Non-federal requestor and Independent external Peer Review panel for the hydroelectric Section 408 request.

2. The review plan was prepared in accordance with EC 1165-2-214 and EC 1165-2-216. As required by EC1165-2-216, approval of the review plan will be conducted by the Mississippi Valley Division commander.

3. The Section 408 Alteration Specific Review plan has been reviewed and endorsement is pending from the Risk Management Center, or RMC. The RMC indicated that providing this to the division at this time is appropriate.

4. If you have any questions regarding the transmittal package, please contact Mr. Robert Edstrom, project manager, at 651-290-5026.

SAMUEL L. CALKINS
COL, EN
Commanding

3 Encls
1. Hard Copy Review Plan
2. RMC Endorsement
3. CD of Review Plan with appendices

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS
RISK MANAGEMENT CENTER
12596 WEST BAYAUD AVE., SUITE 400
LAKEWOOD, CO 80228

REPLY TO
ATTENTION OF

CEIWR-RMC

20 September 2016

MEMORANDUM FOR: Commander, St. Paul District, ATTN: CEMVP-PM-B

SUBJECT: Risk Management Center Endorsement, Crown Hydro, LLC, Hydroelectric Project, Upper Saint Anthony Falls Lock and Dam, 408 Request, Review Plan

1. The Risk Management Center (RMC) has reviewed the Review Plan (RP) for – Crown Hydro, LLC, Hydroelectric Project, Upper Saint Anthony Falls Lock and Dam, dated 20 September 2016, and concurs that this RP complies with the current peer review policy requirements outlined in EC 1165-2-214 "Civil Works Review Policy" and EC 1165-2-216, "Policy and Procedural Guidance for Processing Requests to Alter US Army Corps of Engineers Civil Works Projects Pursuant to 33 USC 408", dated 15 December, 2012 and 31 July 2014 respectively.

2. This review plan was prepared by St. Paul District and the Requester, reviewed by the RMC, and all of RMC's review comments have been satisfactorily resolved. For this project a Type II IEPR (SAR) will be performed.

3. The RMC endorses this document to be approved by the MSC Commander. Upon approval of the RP, please provide a copy of the approved RP, a copy of the MSC Commander's approval memorandum to the RMC Senior Review Manager (rmc.review@usace.army.mil).

4. Thank you for the opportunity to assist in the preparation of this RP. Please coordinate all aspects of the Agency Technical Review and the Independent External Peer Review (as appropriate) efforts defined in the RP. For further information, please contact me at 601-631-5896

Sincerely,

HERR.DUSTIN.CHARLES.1384614082

Digitally signed by HERR.DUSTIN.CHARLES.1384614082
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Date: 2016.09.20 13:15:13 -05'00'

Dustin C. Herr, P.E.
Review Manager
Risk Management Center

CF:
CEIWR-RMC (Mr. Snorteland)
CEMVD-DQM (Division Quality Manager)

CEMVD-RB-T 20 Oct 2016

MEMORANDUM FOR CEMVD-PD-SP (Don Balch)

SUBJECT: St. Paul District, Crown Hydro, LLC Hydroelectric Project, Upper Saint Anthony Falls Lock and Dam Section 408 Review Plan Approval

1. Reference memorandum, CEMVP-EC, 9 Sep 2016, subject as above.

2. This office concurs with subject review plan.

3. RB-T point of contact is Scott Stewart, 601-634-5883, or Scott.Stewart@usace.army.mil.

for MICHAEL A. TURNER, P.E.
Chief, Business Technical Division

U.S. Army Corps of Engineers
Mississippi Valley Division
Saint Paul District

Review Plan for *Crown Hydro, LLC Hydroelectric Project, Upper Saint Anthony Falls Lock and Dam* Pursuant to 33 USC § 408

ENDORSED BY:

HERR.DUSTIN.CHARLES.1384614082

Digitally signed by HERR.DUSTIN.CHARLES.1384614082
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Date: 2016.09.20 13:02:17 -05'00'

Dustin Herr, P.E. DATE
USACE, Risk Management Center

APPROVED BY:

6 DEC '16

MICHAEL C. WEHR DATE
Major General, USA
Commanding

US Army Corps of Engineers®

Contents

1. Introduction

a. Purpose of This Review Plan

This Alteration-Specific Review Plan is intended to ensure quality of the review by the Saint Paul District for the request to alter a US Army Corps of Engineers (USACE) civil works project within the Saint Paul District's area of responsibility. This review plan was prepared in accordance with Engineer Circular (EC) 1165-2-216, "Policy and Procedural

Guidance for Processing Requests to Alter US Army Corps of Engineers Civil Works Projects Pursuant to 33 USC 408" (reference paragraph 7.c.(4) in EC 1165-2-216). It should be noted that EC 1165-2-216 has been extended to 30 September 2017. This review plan provides the review guidelines associated with a specific alteration request pursuant to 33 USC 408 (Section 408).

b. Guidance and Policy References

- EC 1165-2-214, Civil Works Review Policy, 15 December 2012
- EC 1165-2-216, Request to Alter USACE Civil Works Projects, 31 July 2014
- ER 1110-1-12, Quality Management, 21 July 2006
- ER 1110-2-1156, Safety of Dams – Policy and Procedure, 31 Mar 2014
- ER 1110-1-1807, Drilling in Earth Embankment Dams and Levees, 31 December 2014
- EM 1110-2-1913 Design, Construction, and Evaluation of Levees, 30 April 2000
- MSC and/or District Quality Management Plan(s)
- AE Quality Management Plan(s)
- USAF Periodic Inspection 10/ PA, 1 June 2015
- ER 200-2-2, Procedures for Implementing NEPA, 4 March 1998
- ER 200-2-3, Environmental Compliance Policies, 29 Oct 2010
- ER 1165-2-1, Hydroelectric Power, 30 July 1999
- ER 1130-2-510, Hydroelectric Power Operations and Maintenance Policies, 12 Dec 1996
- ER 1110-2-1462, Water Quality and Water Control Considerations for Non-Federal Hydropower Development at Corps of Engineers Projects, 20 Feb 1991
- ER 1110-2-1455, Corps Responsibilities for Non-Federal Hydroelectric Power Development Under the Federal Power Development Act, 29 June 1984
- ER 1110-2-1, Provisions for Future Hydropower Installation at Corps of Engineers Projects, 28 Jan 1982

The products applicable to determination of impacts to the operation and maintenance of the flood risk reduction project will be reviewed against published guidance, including Engineering Regulations, Engineering Circulars, Engineering Manuals, Engineering Technical Letters, Engineering Construction Bulletins, Policy Guidance Letters, implementation guidance, project guidance memoranda and other formal guidance memoranda issued by HQUSACE.

Per EC 1165-2-216, "A proposed alteration pursuant to Section 408 must meet current USACE design and construction standards." For dam modifications ER 1110-2-1156 lays out a risk informed process for the modification of dams. This ER must be followed when laying out the reviews required of the design and when assessing the risks of the

project. As Project risks are identified additional reviews may be required. This could include a Semi-Quantitative Risk Assessment (SQRA)

All drilling requests (including drilling for power poles, instrumentation, third party utilities, relief wells, and geotechnical drilling) are required to prepare a drilling plan in accordance with ER 1110-1-1807 and are subject to approval by the District Dam Safety Officer.

c. Description and Information

This Review Plan covers the project review procedures and requirements for documents submitted by Crown Hydro, LLC (Crown Hydro or the "requester") supporting a Section 408 request, and for District Quality Control of the Summary of Findings (SOF) report and National Environmental Policy Act (NEPA) compliance documents required for this action.

Crown Hydro, LLC has proposed hydroelectric turbine installation at Upper Saint Anthony Falls (USAF) Lock and Dam in Minneapolis, Minnesota for power generation. In accordance with the license granted by the Federal Energy Regulatory Commission (FERC) to the non-Federal entity Crown Hydro, LLC under number P-11175, a request has been submitted to begin the initial phases of designing, constructing, and operating a hydroelectric generation facility on the landward side of the lock chamber of the USAF Lock and Dam facility, extending beneath an existing gravity wall, parking area, and roadway.

Anticipated Documents to be reviewed for this 408 proposal include the following:

- A Public Waters Work Permit Application was submitted by Crown Hydro, LLC to the Minnesota Department of Natural Resources (MNDNR) on March 2, 2015. Crown Hydro, LLC obtained a 401 Water Quality Certificate from the Minnesota Pollution Control Agency (MPCA) on April 28, 1995. Crown Hydro, LLC and the MPCA continue to discuss whether a new Water Quality Certification is necessary or if an amendment to the existing certification is authorized;
- Design Documentation Report (DDR);
- Plans and Specifications;
- Construction submittals;
- Safety Submittals;
- NEPA Documentation to include an Environmental Assessment;
- Section 404 and/or Section 10 permit process;
- Corps of Engineers Section 408 analysis and approval which will cover the design of the new powerhouse structure and overall stability of the gravity wall;
- An emergency action plan;
- A systems safety management plan;

- A construction site security and restriction plan;
- A quality control and inspection plan;
- A plan for use of any property belonging to the Federal Government;
- An accident prevention plan;
- A plan for temporary access during construction;
- A subsurface investigation plan;
- An Operations, Maintenance and Regulating plan;
- An updated USAF Water Control Manual to include the proposed project modifications.
- Requestor's Review Plan for Type II IEPR (SAR)

Existing Project:

In 1937, Congress authorized the Minneapolis Upper Harbor Project which extended the Upper Mississippi River 9-foot navigation Project an additional 4.6 miles by constructing two locks to lift vessels over St. Anthony Falls and dredging the navigation channel. Upper Saint Anthony Falls lock and dam was completed in and placed in operation in September 1963. The normal lift is 49.2 feet with a chamber length of 400 feet and a width of 56 feet. The current Dam Safety Action Class (DSAC) rating of the dam being modified is 3. It is located on Mississippi River mile 853.9 in Minneapolis, Minnesota and consists of a horseshoe dam with a chord dam downstream and a concrete overflow spillway owned by Xcel Energy Center. The lock was closed to all traffic via the Water Resources Reform and Development Act (WRDDA) of 2014, but was not deauthorized. Pool levels are still controlled for city of Minneapolis water supply and hydroelectric power generation. During flood events, flow needs to be passed through the lock. There is a functioning tainter gate that is used when flows exceed 50,000 cubic feet per second (cfs) at the upper end of the chamber.

Proposed Project:

With the exception of a portion of the transmission line, which will be located in public right-of-way, Crown Hydro, LLC is proposing to construct and operate a hydropower facility located entirely on the U.S. Army Corps of Engineers (USACE) property along the Mississippi River in Minneapolis, Minnesota (see Figure 1). The project purpose is to provide clean, renewable energy. The Crown Hydro Project (Proposed Project) is a 3.4 megawatt (MW) hydropower facility located at the Upper St. Anthony Falls Lock and Dam as shown on Figure 2. The Proposed Project would generate an estimated 21,200 megawatt-hours (MWh) of electric energy per year, which could power approximately 2,300 homes. Through an agreement with Xcel Energy, the requester intends to sell the electricity produced by the Proposed Project to Xcel Energy. The requester would use a portion of the Mississippi River flow to generate power while maintaining run-of-river

conditions without operating changes to upstream storage. The surface area of the upper pool formed by the St. Anthony Falls Project (FERC No. 2056) is approximately 360 acres. The Upper pool has no designated net or gross storage capacity for power production purposes, although Xcel Energy does install flashboards on the horseshoe dam. If river flows are inadequate, the proposed facility would be shut off and no power would be generated. Based on the flows at the site, the Proposed Project is expected to operate 74 percent of the time on an annual basis.

The project adds hydropower production to an existing lock and dam that currently does not produce energy. The Proposed Project would use the existing horseshoe shaped dam with the main spillway, which have a combined hydraulic height of about 50 feet (also known as St. Anthony Falls). Xcel Energy (formerly Northern States Power) St. Anthony Falls Project (FERC No. 2056) has operating hydropower located on the east side of the dam. Xcel owns and maintains the horseshoe dam and main spillway.

The Proposed Project would have two 1.7 megawatt turbines, for a total of 3.4 megawatts of capacity. There are no plans or provisions for additional capacity. Operation of the Proposed Project would use automated equipment with the capability to be manually overridden from the powerhouse and the Upper St. Anthony Lock control room, as necessary.

The principal features for the Proposed Project, shown on Figure 2, consist of the following:

· A headrace canal – the existing intake canal of the lock and dam.

· A new intake structure – extending approximately 25 feet-upstream of the powerhouse, containing two 14-feet tall by 16-feet wide trash racks with 3-inch clear spacing to limit fish entrainment and impingement.

· Two new 8.5-foot diameter turbine penstocks (pipes) 50 feet in length conveying water to the turbines.

· Two new vertical axial flow turbine units with a total hydraulic capacity of 1,000 cfs. Each unit has four blades, 5.56-foot in diameter, designed for 45-foot hydraulic head.

· Two new generators connected to the turbines by a 20-foot long direct vertical shaft.

· Two new discharge draft tubes to convey water from the turbines to the new tailrace tunnel.

· A new 14-foot wide by 10-foot tall tailrace tunnel. The tunnel expands to 16-foot wide and 14-foot tall on the downstream side of the Stone Arch Bridge to limit flow velocities entering the river. The total length of the new tailrace tunnel is 930 feet.

· A new underground transmission line approximately 700 feet in length will connect the project to the Xcel grid at Portland Avenue. The powerhouse structure footprint will be approximately 88-feet by 42-feet. The roof of the powerhouse structure will roughly match the West River Road parking lot level to the south (El.807), extending about 17-feet above the USACE parking lot to the east. Construction of the project would occur on USACE owned property using approximately 2 acres for staging and excavation. The majority of the project will be underground. The above ground footprint of the Proposed Project totals approximately 4200 square-feet. The requester is in the process of securing approval from the FERC for licensing of the project. Construction of the Proposed Project would begin after environmental clearance and permitting has occurred; as well as completion of the Corps 408 process, anticipated in 2017. Construction is estimated to take approximately four months for the major components. Heavy equipment, such as excavators, cranes, and dump trucks would be used. Major construction would occur during the fall and winter in order to minimize the potential impacts to recreational use, and seasonal weather conditions, such as heavy rain.

Prior to starting excavation, cofferdams would be used on the downstream end of the existing headrace canal and also downstream at the discharge point of the proposed tailrace tunnel to keep water out of the construction area and reduce the potential for sedimentation. This would affect less than one third of an acre of water and would prevent water flow into the construction area.

Proposed Project construction would remove accumulated debris and excavate the headrace canal, if necessary. The current plan includes underground tunneling 400 feet, extending from the powerhouse under the existing USACE parking lot to a point on the upstream side of the Stone Arch Bridge. Underground tunneling would use jetting, cutter head, or another method to remove sandstone, but would not require blasting. The remaining 530 feet of tunnel would be constructed using an open-cut trench that will be backfilled and restored. A portion of the roadway that crosses under the Stone Arch Bridge, providing access to a parking area and access road to the lower St. Anthony Falls lock and dam, would be temporarily removed, and would be replaced with new roadway after installation of the tailrace tunnel is complete. The bottom of the tunnel would be located above the foundations of the Stone Arch Bridge. No disturbance to the Stone Arch Bridge structure or foundations would occur from construction of the Proposed Project.

Temporary access during construction for USACE employees would be provided from Portland Avenue to the USACE facilities until completion. The powerhouse, which includes the penstocks, turbines, and generators, would be constructed on the upstream side of the Lock and USACE parking lot along the right bank. The housing for the generator would be visible, but the majority of the powerhouse components would be located underground, including the electrical cable to transport the power generated

by the Proposed Project. The outlet of the tailrace tunnel will be submerged and hardly visible.

After necessary revisions and review by the drilling team, the Corps approved the subsurface investigation plan on January 28, 2015. Borings began on March 9th due to unseasonably cold temperatures in February. Information from recent soil borings and design documents will be provided as part of the Corps Section 408 process to demonstrate that stability and geological soundness of the Corp's structures will be maintained.

Plans for maintaining security during construction and restoring the security perimeter after construction will be coordinated with and approved by the Corps. Use of the Corps parking area during construction will be coordinated with the St. Paul District Real Estate Branch and Operations Branch staff. Crown Hydro construction will occur during one winter construction season. After construction the parking area will be replaced to its pre-construction condition based on review by the St. Paul District.

As the intake ports located on either side of the lock wall allow cross-flow through the wall, temporary plates will be placed over the intake ports to prevent inflow to the coffered area during construction. The design and installation of these plates will be reviewed by, and coordinated with, Corps staff.

The velocity of flows from the 16-foot wide x 14-foot high discharge tunnel and the effect those flows would have on boaters and potential scouring near the navigation channel and potential change in flow near the small-boat signal on the upstream guide wall have been reviewed prior to submittal of this review plan. The water control manual will require an update as part of the requestor's proposed USAF project modification under 408.

The Corps is responsible for developing procedures for monitoring construction activities associated with the Proposed Project per EC 1165-2-216, Paragraph 7.c (9)(a). These monitoring procedures will be developed during the Corps' initial comment period on the 90% complete plans and specifications provided by the requester. The requester's 90% submittal will include the method of contracting, which can impact how the plans and specifications are laid out as well as determining the Corps' construction management oversight methodology and process.

d. Review Management Organization (RMO) Coordination:

The RMO is responsible for managing the overall peer review effort described in this Review Plan. The RMO for the peer review effort described in this Review Plan is the USACE Risk Management Center (RMC). As the RMO, the RMC will determine if the proposed alteration is to be presented to the Dam Senior Oversight Group (DSOG). The

proposed alteration includes installation of hydropower turbines at USAF lock and dam, with the primary risk associated with excavation of a tail race and potential impacts to the existing lock and dam structure. Because this structure is in a major urban center with a high population and also plays a role in water supply, we anticipate that this proposed alteration will require DSOG review

Project Location: The project is located in Minneapolis, Minnesota on the west bank of the Mississippi River. See Figure 1. The address is 1 Portland Avenue, Minneapolis, Minnesota 55401.

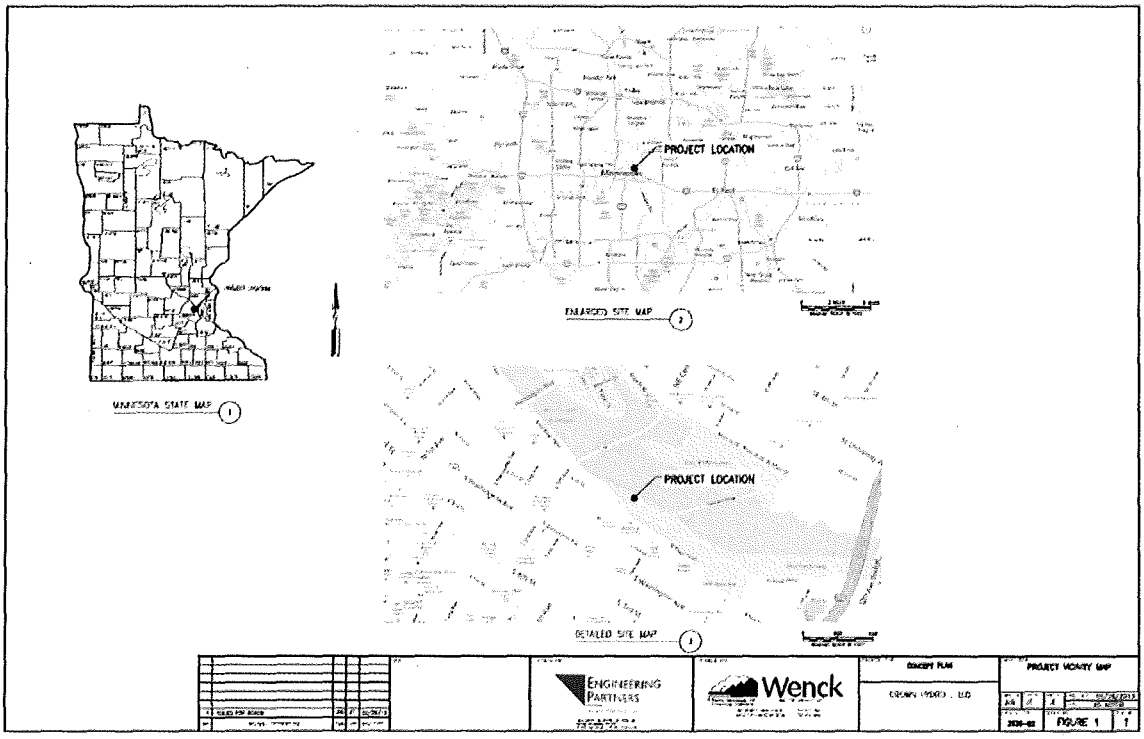

Figure 1: Project Location

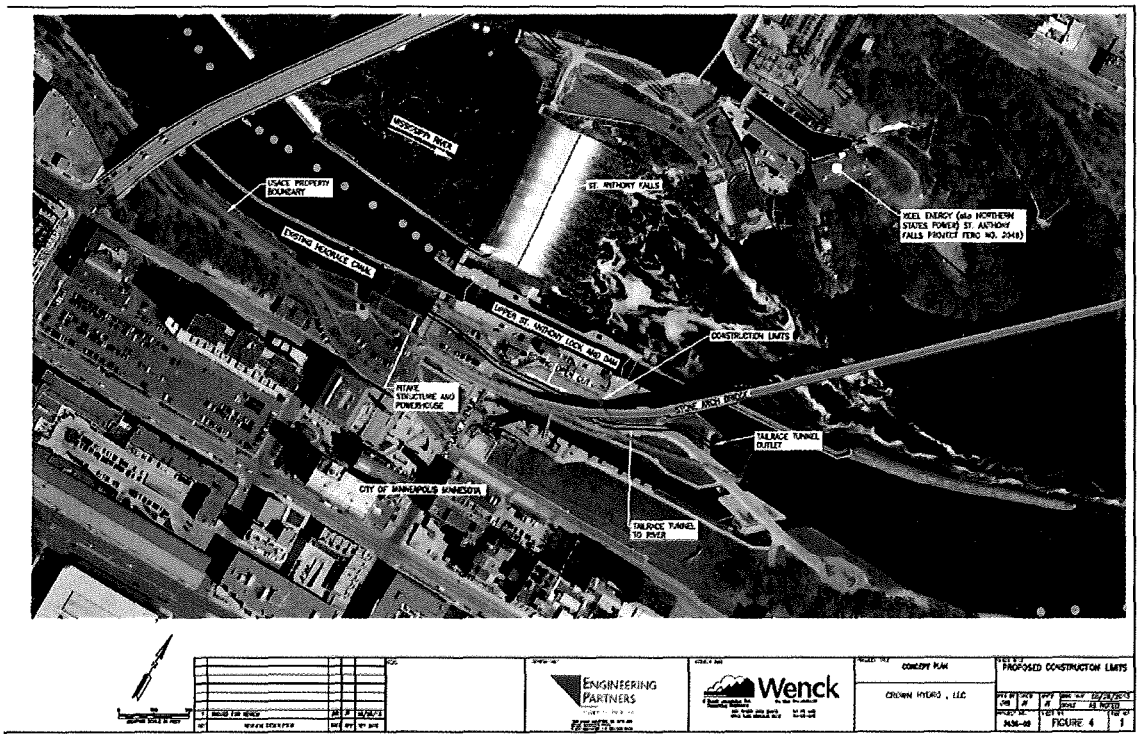

Figure 2: Project Features

2. Execution Plan and Review Requirements

a. Level of Review Required by the District

The review of this alteration request shall include a district-led Agency Technical Review (ATR), reference paragraph 7.c. (4) in EC 1165-2-216. Per EC 214 the District's Chief of Engineering has determined that a SAR will be required.

Drilling Program Plans must be reviewed and approved by the District Dam Safety Officer (Dams) or Levee Safety Officer (Levees). If any drilling fluid or other stabilizing or circulating media is proposed, a technical review performed by the Geotechnical and Materials Community of Practice (G&M CoP) Standing Committee on Drilling and Instrumentation is required. The plan will then require approval from the District DSO/LSO pending satisfactory resolution of the technical review comments, see ER 1110-1-1807.

b. Level of Review Required by the Requester

The requester is responsible for ensuring the quality of the information submitted to the St. Paul District as part of the Section 408 request. The requester's design and review team main points of contact will be the following:

NAME	ORGANIZATION	DISCIPLINE	EMAIL/PHONE
Joel Toso	Wenck Associates	Project Manager, Hydrology/Hydraulics	jtoso@wench.com 763-252-6831
Chad Underwood	Engineering Partners	Geotechnical	chad@epillc.net 612-886-3730
Greg Greenlee	Engineering Partners	Structural/ Dam & Levee Safety	greg@epillc.net 612-886-3730
Dean Sather	Merjent	Environmental/ Cultural	dsather@merjent.com 612-924-3984
Mark Deady	Wenck Associates	Civil, Utilities, Cost	mdeady@wenck.com 763-479-4214
Rich Savelkoul	Martin & Squires, P.A.	Real Estate	rsavelkoul@martinsquires.com 651-767-3745
Rob Latta	Harris Companies	Mechanical	rlatta@hmcc.com 651-602-6671
Paul Kaeding	Barr Engineering	Electrical	pkaeding@barr.com 952-832-2969

Quality control will also be monitored via Type II IEPR team reviews, and Corps-led ATR reviews. The vertical team will be involved in the engineering and design review process at the 90% plan and specification interval.

1) Quality Assurance and Quality Control (QA/QC) Review.

   QA/QC is the review of basic science and engineering work products focused on fulfilling the project quality requirements defined in the Quality Control Plan (QCP) of the requester. See Attachment 2. QC will consist of quality checks and reviews as outlined in the QCP. QA/QC reviews will be accomplished by the requester. The requester should provide USACE with documentation regarding the QA/QC assurance procedures followed in the development of the project design. This documentation should be in the form of a report that identifies:

   i. Purpose and scope of the review;
   ii. Description of the review team and a short statement on their qualifications;
   iii. Summary of the review performed during design;
   iv. Lessons learned and major changes made during the review;
   v. All internal QC comments and resolutions;
   vi. Supplemental studies or analyses performed during the design, e.g. geotechnical reports, etc.

2) Safety Assurance Review (SAR).

A SAR, also known as a Type II IEPR, shall be conducted on design and construction activities for flood risk management projects as well as other projects where potential hazards pose a significant threat to human life. External panels will review the design and construction activities prior to initiation of physical construction and periodically thereafter until construction activities are completed. The charges to the SAR panels complement the ATR process and do not duplicate it. The SAR will be accomplished by the requestor. A SAR is to be provided by an A/E firm contracted by the requestor or arranged with another government agency to manage external to USACE. For a SAR, the selection of the review panel members will use the National Academy of Sciences (NAS) Policy which sets the standard for "independence" in the review process. The requestor's Design of Record AE *cannot* procure the experts. A site visit will be scheduled for the SAR team.

Per EC 1165-2-214, the requester's proposed alteration will require a SAR. Paragraph 1 and Appendix E of EC 1165-2-214 provides that a SAR is required when the Proposed Project induces hazards which pose a significant threat to human life. This project will alter a dam that provides flood risk management capability and pool elevation for municipal water systems to a major metropolitan area.

EC 1165-2-214 states that SAR panels are to be comprised of independent, recognized experts from outside the USACE in the appropriate disciplines, representing a balance of expertise suitable for the review being conducted; and that the Review Management Organization (RMO), in this case the Risk Management Center (RMC), and the local District are responsible for establishing and contracting for the SAR services. However, when a non-Federal interest (such as a Project Sponsor) undertakes a study, design, or implementation of a Federal project, or requests permission to alter a Federal project, the non-Federal interest is required to undertake, at its own expense, any SAR that the Government determines would have been required if the Government were doing the work. In this case, the requester will contract with an additional A/E firm not involved in the project design to conduct the required SAR. The requester is aware that the selection of SAR review panel members must be based in the National Academy of Science (NAS) Policy which sets the standard for "independence" in the review process. The Review Management Organization (RMO) and the local district retain responsibility for approving the composition and makeup of the SAR team.

The IEPR undertaken by a non-Federal Interest will be submitted as part of the approval request package for review by USACE.

The general purpose of the SAR is to consider the adequacy, appropriateness, and acceptability of the design in assuring public health, safety, and welfare. The SAR will be a larger-scale, holistic review that encompasses the breadth of the project from start to finish. The SAR will address the underlying planning, engineering, safety assurance, and environmental analyses performed, not just one aspect of the project. A SAR is required for any project where potential hazards pose a significant threat the human life. This includes all projects involving levees or dams. The RMO will assist the requestor in developing the charge questions for the SAR. Specifically, the reviewers will be given a charge that includes the following:

- Reviews should identify, explain, and comment upon the assumptions presented by the designer that underlie all the analyses, as well as evaluate the soundness of models, surveys, investigations, and methods. A review panel should bring important issues to the attention of the Corps. Review panels should be able to evaluate whether the interpretations of analysis and the conclusions based on analysis are reasonable.
- Peer reviews, no matter how useful, should not be expected to resolve fundamental disagreements and controversies. Reviewers should aim to draw distinctions between criticisms of the regulations and guidelines and criticisms of how well the designers conformed to the guidance. Reviews should focus on assumptions, data, methods, and models.
- Reviews will assist the designers in making decisions, but reviewers should not be asked to make decisions. Reviewers should avoid findings that become "directives" in that they call for modifications or additional studies or suggest new conclusions and recommendations. Reviewers engaged in the review processes should be selected based upon their independence and professional expertise and should not be "stakeholders".
- Review panels should highlight areas of disagreement and controversies that may need resolution.

The review will consist of specific items as designated by the RMO and the ATR team. In general, the reviewers will be required to:

- Focus on unique features and changes from the assumptions made and conditions that formed the basis for the design during the planning phase.
- Evaluate whether the interpretations of analysis and conclusions based on analysis are reasonable.

- Offer their opinions as to whether there are sufficient analyses upon which to base a recommendation.
- For the Engineering and Design (E&D) phase – focus on unique features and changes from the assumptions made and conditions that formed the basis for the design during the planning phase. Address the following questions:
    - Do the assumptions made during the decision document phase for hazards remain valid through the completion of design as additional knowledge is gained and the state-of-the-art evolves?
    - Do the project features adequately address redundancy, resiliency, or robustness with an emphasis on interfaces between structures, materials, members, and project phases?
    - Do the project features and/or components effectively work as a system?
- The Corps construction staff will be making periodic quality assurance inspections during the construction of critical features. The construction contractor and construction manager/designer roles in QC/QA will be reviewed as part of the construction documents.

c. Decision-Level Determination

In accordance with EC 1165-2-216 the Section 408 final decision level resides with the Director of Civil Works at HQUSACE. The proposed alteration meets two of the seven criteria in EC 1165-2-216 that requires HQUSACE review.

- The proposed alteration is for installation of hydropower facilities.

d. District Review Purpose

The review of all work products will be in accordance with the guidelines established within this review plan. The purpose of this review is to ensure the proper application of established criteria, regulations, laws, codes, principles and professional practices.

For the purposes of Section 408, the ATR team will make the following determinations:

1) Impair the Usefulness of the Project Determination. The objective of this determination is to ensure that the proposed alteration will not limit the ability of the project to function as authorized and will not compromise or change any authorized project conditions, purposes or outputs.
2) Injurious to the Public Interest Determination. Proposed alterations will be reviewed to determine the probable impacts, including cumulative impacts, on the public interest. The decision whether to approve an alteration will be

determined by the consideration of whether benefits are commensurate with risks.

3) Legal and Policy Compliance Determination. A determination will be made as to whether the proposed alteration meets all legal and policy requirements.

4) Verify Appropriate Decision Level. Verify whether or not HQUSACE review and decision is required.

3. District-led Agency Technical Review Team

The District-led Agency Technical Review Team is comprised of reviewers with the appropriate independence and expertise to conduct a comprehensive review in a manner commensurate with the type of proposed alteration described in Section 1.b of this review plan. District ATR reviewers have been selected from the Corps of Engineers Review Certification and Access Program (CERCAP) list.

Name	Organization	Discipline	Email/Phone
Nanette Bischoff	CEMVP-PM-B	Project Manager, ATR Lead	Nanette.m.bischoff@usace.army.mil 651-290-5426
Nathan Wallerstedt	CEMVP-PM-B	District 408 Coordinator	Nathan.h.wallerstedt@usace.army.mil 651-290-5477
Doug Crum	CEMVP-EC-G	Technical Lead, Geotechnical, Dam Safety	Douglas.a.crum@usace.army.mil 651-290-5651
Brian Johnson	CEMVP-EC-H	Hydrology	Brian.ke.johnson@usace.army.mil 651-290-5652
Brian Alberto	CEMVP-EC-H	Hydraulics	Brian.t.alberto@usace.army.mil 651-290-5721
Tony Fares	CEMVP-EC-D	Structural	Tony.s.fares@usace.army.mil 651-290-5568
Christine Moss	CEMVP-EC-D	Civil	Christine.r.moss@usace.army.mil 651-290-5025
Mark Klika	CEMVP-EC-D	Mechanical	Mark.s.klika@usace.army.mil 651-290-5575
Dave Kollars	CEMVP-EC-D	Electrical	David.h.kollars@usace.army.mil 651-290-5607
Stephanie Dupey	CEMVR-RE-PA	Real Estate	Stephanie.t.dupey@usace.army.mil 651-290-5369
Mike DeRusha	CEMVP-OP-LD	Operations	Michael.e.derusha@usace.army.mil 651-290-5934
Sheldon Edd	CEMVP-EC-C-E	Construction	Sheldon.d.edd@usace.army.mil 651-290-5865
Melissa Jenny	CEMVP-OP-R	Regulatory	Melissa.m.jenny@usace.army.mil 651-290-5363

Dave Potter	CEMVP-PD-C	Environmental/ NEPA/ Cultural	David.f.potter@usace.army.mil 651-290-5713
Joe Willging	CEMVP-OC	Policy Compliance/ Legal Review	Joseph.m.willging@usace.army.mil 651-290-5500
Kevin Richards	CEIWR-RMC-ED	Civil Engineer	Kevin.s.richards@usace.army.mil 303-241-8380
Michael Barner	CENWP-HDC-C	Product Coordinator	Michael.d.barner@usace.army.mil 503-808-5289
Thomas Davidson	CEIWR-RMC-WD	Engineering Geologist	978-318-8572 Thomas.A.Davidson@usace.army.mil

The ATR team reviews the various work products and assures that all the parts fit together in a coherent whole. The ATR team may be provided draft and intermediate versions of documents so that team can become familiar with reach/element documents and provide "critical" comments, but that the primary ATR is on final products at 90% complete plans and specifications. ATR is designed to be a relatively continuous process with reviews synchronized with the PDT's production of products and supporting analyses. The purpose of the ATR, in addition to the requirements of paragraph 2.d., is to:

- Review the non-Federal designers' deliverables for completeness
- Ensure the quality and credibility of the engineering and design information
- Ensure that the appropriate problems and opportunities are addressed
- Confirm that appropriate solutions are considered
- Assure that reasonable cost, scheduling and associated risks are presented
- Confirm that the recommended design, contracting method and construction process are in accord with current policies and industry standards
- Confirm that the design can be implemented in accordance with environmental laws and statues.

The ATR criteria are as follows:

- Products will be reviewed against published guidance, including Engineering Regulations, Engineering Circulars, Engineering Manuals, Engineering Technical Letters, Engineering Construction Bulletins, Policy Guidance Letters, implementation guidance, project guidance memoranda, and other formal guidance memoranda issued by HQUSACE. Any justified and approved waivers

should have been obtained from HQUSACE for any deviations from USACE guidance;

- Concepts and project costs are valid;
- The FERC Hydropower licensee is aware of its requirements and concurs with the proposed recommendations;
- The design is feasible and will be safe, functional, constructible, environmentally sustainable, within the Federal interest;
- All relevant engineering and scientific disciplines have been effectively integrated;
- Appropriate computer models and methods of analysis were used and basic assumptions are valid and used for the intended purpose;
- The source, amount, and level of detail of the data used in the analysis are appropriate for the complexity of the project;
- The project complies with accepted practice within USACE;
- Content is sufficiently complete for the current phase of the project and provides an adequate basis for future development effort;
- Project documentation is appropriate and adequate for the project phase.

a. Review Procedures

Reviews will be conducted in a fashion which promotes dialogue regarding the quality and adequacy of the required documentation. The ATR team will review the documents provided. The products provided by the requestor will undergo an ATR at a 90% completion. Additional reviews may be done as needed throughout the project's design, both prior to and following the 90% ATR review, to insure all aspects of the proposed project have undergone adequate review. The ATR team will be available to review any data or documentation at any time for the proposed project to ensure the requestor is in compliance with all Corps of Engineers guidance, regulations, and Federal law.

The four key parts of a review comment will normally include:

1) The review concern – identify the deficiency or incorrect application of policy, guidance, or procedures.
2) The basis for the concern – cite the appropriate law, policy, guidance, or procedure that has not been properly followed.

3) The significance of the concern – indicate the importance of the concern with regard to its potential impact on the district's ability to make a decision as to whether to approve or deny the Section 408 request.
4) The probable specific action needed to resolve the concern – identify the action(s) that the requester must take to resolve the concern.
   In some situations, especially addressing incomplete or unclear information, comments may seek clarification in order to then assess whether further specific concerns may exist. The ATR documentation must include the text of each ATR concern, a brief summary of the pertinent points in any discussion, including any vertical coordination, and the agreed upon resolution.

The requester will submit the entire 90% Section 408 documentation package to the Corps, including the plans, hydraulic and hydrologic analyses, environmental compliance documentation (for this project an EIS), real estate documentation, geotechnical analyses, structural analyses, and the quality control report. The St. Paul District will conduct ATR on the provided documents, and will provide appropriate comments to the requester. The requester will modify the submittals in accordance with Corps ATR comments, and will resubmit them for back checking. This process will be repeated until all Corps comments are satisfied.

b. Products to Undergo ATR

Specific products the ATR team will review will include but is not limited to the Plans, Specifications, DDR, relevant design documents, etc.

c. Required ATR Team Experience and Requirements

The Saint Paul District ATR team expertise required for this review plan are listed below:

Specialized experience for each of the disciplines is summarized below:

ATR Lead: The ATR team lead is a senior professional with extensive experience in reviewing Section 408 alteration requests and conducting ATRs. The ATR lead has the necessary skills and experience to lead a team through the ATR process.

Hydraulic Engineering: Reviewer will ensure that the hydraulic analysis was properly completed and that the changes to flow patterns and sedimentation/scour are acceptable.

Hydrology: Reviewer will ensure that the hydrologic analysis was properly completed and is consistent with hydrologic adequacy data and requirements for the existing facilities.

Geotechnical Engineering: Reviewer will ensure that the designed project meets Corps standards, the design assumptions are reasonable, and the geotechnical analyses are complete. The reviewer shall have experience with subsurface explorations, field and laboratory testing, selection of geotechnical parameters, and design of rock founded gravity structures, earth retention systems, construction shoring, and tunneling.

Structural Engineering: Reviewer will ensure that the designed project meets Corps standards for structural features, the design analysis are complete, and the estimated quantities are reasonable. The reviewer shall have experience designing rock founded gravity structures, earth retention systems, construction shoring, and tunneling.

Civil Engineering: Reviewer will ensure that the designed project meets Corps standards for civil-site features, utility features, and the design analyses are complete.

Dam Safety: The reviewer(s) will ensure that the designed project meets Corps standards for dams and the design analyses are complete.

Environmental/NEPA/Cultural: Reviewer will be responsible for reviewing ecosystem protection of the Mississippi River and ensuring the proper NEPA and cultural resource compliance activities were completed.

Real Estate: Reviewer will ensure that all of the lands necessary for the project are accounted for and properly documented.

Mechanical Engineering: Reviewer will ensure that the designed project meets Corps standards for mechanical features, the design analyses are complete. The reviewer shall have experience designing pumping stations and hydropower plants.

Electrical Engineering: Reviewer will ensure that the designed project meets Corps standards for electrical features and the design analyses are complete. The reviewer shall have experience reviewing and designing pumping stations and hydropower plants.

Policy Compliance/Legal Review: The Corps Project Manager and the District Dam Safety Officer will conduct the primary section 408 policy reviews for the District. District Counsel will conduct their own review and, per guidance, any decision document forwarded by the district for higher authority review and approval will be accompanied by a legal sufficiency certification from District Counsel. MSC

reviewers will conduct a quality assurance review of the district's policy and legal reviews and recommendations.

Operations: Reviewer will ensure that the designed project does not interfere with Corps operations. The reviewer shall have experience with operations at the site, and with reviewing design documents.

Construction: Reviewer shall have experience with the methods of construction necessary to construct the proposed project, in particular, tunnel boring, deep excavation and shoring. The review will ensure that the designed project is constructible.

Regulatory: Reviewer will verify that the designed project and construction practices are in compliance with Corps permits.

Engineering Geologist: Reviewer will ensure that the licensee has correctly interpreted the subsurface investigations and applied such findings to their design.

d. Completion and Certification of the ATR

At the conclusion of each ATR effort, the ATR team will prepare a Review Report summarizing the review. Review Reports will be considered an integral part of the ATR documentation and shall:

i. Identify the document(s) reviewed and the purpose of the review;
ii. Disclose the names of the reviewers, their organizational affiliations, and include a short paragraph on both the credentials and relevant experiences of each reviewer;
iii. Include the charge to the reviewers;
iv. Describe the nature of their review and their findings and conclusions;
v. Identify and summarize each unresolved issue (if any); and
vi. 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.

ATR may be certified when all ATR concerns are either resolved or referred to the vertical team for resolution and the ATR documentation is complete. The ATR lead will prepare a completion of ATR and Certification of ATR. It will certify that the issues raised by the ATR team have been resolved (or elevated to the vertical team). The completion and certification should be completed based on the work reviewed to date for the project. A Sample Completion of ATR and Certification of ATR are included in Attachment 1.

The ATR team members will determine whether the proposed alteration would impair the usefulness of the federal project, be injurious to the public interest, or meets legal and policy requirements. ATR team members will provide their comments to the District Section 408 Coordinator, who will use the comments to

determine if the proposed alteration can be approved in accordance with EC 1165-2-216. Conflicts in addressing ATR comments will be elevated to the functional chief and MVD for resolution if necessary. Following ATR, the District Section 408 Coordinator will compile a Summary of Findings in accordance with Step 5 from EC 1165-2-216 (with an appendix of ATR Comments and Resolution) and obtain the endorsement of the District Dam Safety Program Manager, the District Dam Safety Officer, the District Counsel, and other District leadership before recommending to the District Commander that the proposed alteration be approved or denied.

The Hydropower Design Center (HDC) is required to review the design documentation per ER 1110-2-1454 and ER 10-1-53. The HDC will be reviewing the submittals concurrently with the ATR team. The reviewers and their specialties are listed in the ATR Team roster. HDC will receive all submittals the district receives and be invited to any meetings with the requester.

4. Requester Led SAR

a. Required SAR Panel Expertise

The following provides an estimate of the SAR panel members and the types of expertise that should be represented on the review panel. All panel members shall be "distinguished experts in engineering, hydrology, or other appropriate disciplines." WRDA 2007. Panel members should have an advanced degree and be professionally registered.

Geotechnical Engineer - The Geotechnical reviewer will ensure that the designed project meets Corps standards, the design assumptions are reasonable, and the geotechnical analyses are complete. The reviewer shall have experience with subsurface explorations, field and laboratory testing, selection of geotechnical parameters, and design of rock founded gravity structures, earth retention systems, construction shoring, and tunneling.

Engineering Geologist - Reviewer will ensure that the licensee has correctly interpreted the subsurface investigations and applied such findings to their design.

Hydraulic Engineer – Reviewer will ensure that the hydraulic analysis was properly completed and that the changes to flow patterns and sedimentation/scour are acceptable.

Structural Engineer – Reviewer will ensure that the designed project meets Corps standards for structural features, the design analysis are complete, and the estimated quantities are reasonable. The reviewer shall have experience designing rock founded gravity structures, earth retention systems, construction shoring, and tunneling.

Civil Engineer – Reviewer will ensure that the designed project meets Corps standards for civil-site features, utility features, and the design analyses are complete.

Construction Engineer - Reviewer shall have experience with the methods of construction necessary to construct the proposed project, in particular, tunnel boring, deep excavation and shoring. The review will ensure that the designed project is constructible.

b. Completion and Certification of the SAR

The SAR will be managed by an AE firm which meets the criteria set forth in EC 1165-2-214. DrChecks review software may be used to document the SAR comments and aid in the preparation of the Review Report but is not required.

Comments should address the adequacy and acceptability of the engineering, models, and analyses used. SAR comments should generally include the same four key parts as described for ATR comments in Section 4.

No later than 60 days following each milestone, 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;

i. Include the charge to the reviewers;
ii. Describe the nature of their review and their findings and conclusions; and
iii. 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.

This review report, including reviewer comments and a recommendation letter will be provided to the RMC as soon as they become available.

5. Review Schedule and Cost

a. Review Schedule

The review schedule is dependent on the FERC license amendment required by the requestor. The order of review will be DQC, ATR, and finally, IEPR Type II. Reviews are an iterative process and will be applied to applicable documentation outlined in this Review Plan. At this time, there is not enough information regarding completion of the FERC license amendment requirements to determine a review schedule.

CROWN HYDROELECTRIC FACILITY - PRELIMINARY CONSTRUCTION SCHEDULE

Task Description	Duration Days	August 2016	September 2016	October 2016	November 2016	December 2016	January 2017	February 2017	March 2017	April 2017
Mobilization and Security Fencing	2									
Construct Excavator Surface at Intake	4									
Install Intake Area Cofferdam	10									
Install Intake Area Dewatering Equipment and Commence Dewatering	1									
Excavate and Remove Rock at Intake and Powerhouse Area	20									
Excavate Tunnel Portion of Tailrace	15									
Construct Concrete Tailrace Section in Tunnel	10									
Install Tailrace Outlet Cofferdam and Commence Dewatering	5									
Excavate Cut and Cover Portion of Tailrace	15									
Install Precast Section of Tailrace	15									
Backfill and Construct Temporary Roadway Over Tailrace	20									
Construct Concrete Base for Draft Tube	3									
Construct Concrete Foundation and Walls For Mechanical Room Level	5									
Install Turbines and Penstocks	10									
Construct Concrete Foundations, Floors and Walls for Penstock and Powerhouse Building	45									
Construct Concrete Inlet Structure, Bulkhead, and Trash Rack	10									
Construct Intake Channel and Tailrace Outlet Retaining Walls	10									
Placement of Rip Rap at Intake and Outlet Areas	5									
Remove Dewatering Equipment and Cofferdams	5									
Complete Powerhouse Building	20									
Install Mechanical and Electrical Equipment	15									
Mechanical and Electrical Equipment Testing	10									
Bituminous Pavement and Roadway Restoration	10									
Landscaping and Vegetation Restoration	5									
Demobilization	2									

Pictured is the anticipated Crown Hydroelectric, LLC construction schedule. This schedule is preliminary and dependent on the requestor obtaining a FERC license amendment and the completion of necessary DQC, ATR, and IEPR Type II reviews on applicable documentation outlined in this Review Plan.

b. Review Cost

The cost of review will be funded out of the Hydropower Business Line of the Maintenance and Operations program, account 641 funds, which are distributed quarterly, based on need. The estimated federal cost of review of hydropower plans, specifications and construction is $400,000. The review will be tracked under P2 project 151781, under an activity set up for this effort.

6. Public Participation of Review Plan

As required by EC 1165-2-214, the approved Review Plan will be posted on the District public website (http://www.mvp.usace.army.mil/Missions/Civil-Works/Programs-Project-Management/Review-Plans/). The public will have 30 days to provide comments on the documents; after all comments have been submitted, the comments will be provided to the technical reviewers. 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 review plan are necessary. This engagement will ensure that the peer review approach is responsive to the wide array of stakeholders and customers, both within and outside the federal government.

7. Review Plan Points of Contact

Name/Title	Organization	Email/Phone
District Section 408 Coordinator	CEMVP-PMB	nathan.h.wallerstedt@usace.army.mil 651-290-5477
RMC Review Manager	CEIWR-RMC	rmc.review@usace.army.mil
District Dam Safety Program Manager	CEMVP-EC-G	douglas.a.crum@usacea.rmy.mil 651-290-5651
District Dam Safety Officer	CEMVP-EC	michael.j.bart@usace.army.mil 651-290-5303
MVD Dam Safety Program Manager	CEMVD-RB-T	bradley.w.martin@usace.army.mil 601-634-7122
MVP District Support Team (DST)	CEMVD-DST	ben.c.robinson@usace.army.mil 601-634-5310
District FERC Coordinator/ Project Manager	CEMVP-PM-B	nanette.m.bischoff@usace.army.mil 651-290-5426
District alternate FERC Coordinator	CEMVP-PM-B	robert.k.edstrom@usace.army.mil 651-290-5026

A. COMPLETION OF AGENCY TECHNICAL REVIEW

The Agency Technical Review (ATR) has been completed for the Crown Hydro, LLC proposed hydroelectric turbine installation for power generation at Upper Saint Anthony Falls (USAF) Lock and Dam in Minneapolis, Minnesota. The ATR was conducted as defined in the Alteration-Specific Review Plan to comply with the requirements of EC 1165-2-216. During the ATR, compliance with established policy principles and procedures and legal requirements was verified. This included the determination whether the proposed alteration would impair the usefulness of the federal project or was injurious to the public interest. All comments resulting from the ATR have been resolved.

SIGNATURE _____ _____

Name Date
ATR Team Leader
Office Symbol

SIGNATURE _____ _____

Nathan Wallerstedt, PMP Date
District Section 408 Coordinator
CEMVP-PM-B

SIGNATURE _____ _____

Nathan Snorteland Date
Director
CEIWR-RMC

CERTIFICATION OF AGENCY TECHNICAL REVIEW

Significant concerns and the explanation of the resolution are as follows: *Describe the major technical concerns and their resolution.* As noted above, all concerns resulting from the ATR of the project have been fully resolved.

SIGNATURE _____ _____

Name Date
Chief, Engineering Division (home district)
Office Symbol

SIGNATURE _____ _____

Name Date
Dam or Levee Safety Officer[2] (home district)

Office Symbol

[2] Only needed if different from the Chief, Engineering Division.

B. SCOPE OF WORK - INDEPENDENT EXTERNAL PEER REVIEW

Crown Hydro, LLC Hydroelectric Project
Upper Saint Anthony Falls Lock and Dam

1. General Background.

This document provides the scope for a Type II Independent External Peer Review (IEPR) of the design and construction of the proposed Crown Hydro, LLC Hydroelectric project at Upper Saint Anthony Falls (USAF) Lock and Dam, thus ensuring the quality and credibility of U.S. Army Corps of Engineers decision documents. This IEPR covers the project review procedures and requirements for documents submitted by Crown Hydro, LLC (Crown Hydro or the "requester") to the Type II IEPR reviewing authority in +upport of the Corps of Engineers Section 408 request, District Quality Control of the Summary of Findings (SOF) report, and National Environmental Policy Act (NEPA) compliance documents required for this project.

Crown Hydro, LLC has proposed hydroelectric turbine installation at Upper Saint Anthony Falls (USAF) Lock and Dam in Minneapolis, Minnesota for power generation. In accordance with the license granted by the Federal Energy Regulatory Commission (FERC) to the non-Federal entity Crown Hydro, LLC under number P-11175, a request has been submitted to begin the initial phases of designing, constructing, and operating a hydroelectric generation facility on the landward side of the lock chamber of the USAF Lock and Dam facility, extending beneath an existing gravity wall, parking area, and roadway.

2. Project Description.

With the exception of a portion of the transmission line, which will be located in public right-of-way, Crown Hydro, LLC is proposing to construct and operate a hydropower facility located entirely on the U.S. Army Corps of Engineers (USACE) property along the Mississippi River in Minneapolis, Minnesota (see Figure 1). The project purpose is to provide clean, renewable energy. The Crown Hydro Project (Proposed Project) is a 3.4 megawatt (MW) hydropower facility located at the Upper St. Anthony Falls Lock and Dam as shown on Figure 2. The Proposed Project would generate an estimated 21,200 megawatt-hours (MWh) of electric energy per year, which could power approximately 2,300 homes. Through an agreement with Xcel Energy, the requester intends to sell the electricity produced by the Proposed Project to Xcel Energy. The requester would use a portion of the Mississippi River flow to generate power while maintaining run-of-river conditions without operating changes to upstream storage. The surface area of the upper pool formed by the St. Anthony Falls Project (FERC No. 2056) is approximately 360

acres. The Upper pool has no designated net or gross storage capacity for power production purposes, although Xcel Energy does install flashboards on the horseshoe dam. If river flows are inadequate, the proposed facility would be shut off and no power would be generated. Based on the flows at the site, the Proposed Project is expected to operate 74 percent of the time on an annual basis. The project adds hydropower production to an existing lock and dam that currently does not produce energy. The Proposed Project would use the existing horseshoe shaped dam with the main spillway, which have a combined hydraulic height of about 50 feet (also known as St. Anthony Falls). Xcel Energy (formerly Northern States Power) St. Anthony Falls Project (FERC No. 2056) has operating hydropower located on the east side of the dam. Xcel owns and maintains the horseshoe dam and main spillway.

The Proposed Project would have two 1.7 megawatt turbines, for a total of 3.4 megawatts of capacity. There are no plans or provisions for additional capacity. Operation of the Proposed Project would use automated equipment with the capability to be manually overridden from the powerhouse and the Upper St. Anthony Lock control room, as necessary.

The principal features for the Proposed Project, shown on Figure 2, consist of the following:

· A headrace canal – the existing intake canal of the lock and dam.

· A new intake structure – extending approximately 25 feet-upstream of the powerhouse, containing two 14-feet tall by 16-feet wide trash racks with 3-inch clear spacing to limit fish entrainment and impingement.

· Two new 8.5-foot diameter turbine penstocks (pipes) 50 feet in length conveying water to the turbines.

· Two new vertical axial flow turbine units with a total hydraulic capacity of 1,000 cfs. Each unit has four blades, 5.56-foot in diameter, designed for 45-foot hydraulic head.

· Two new generators connected to the turbines by a 20-foot long direct vertical shaft.

· Two new discharge draft tubes to convey water from the turbines to the new tailrace tunnel.

· A new 14-foot wide by 10-foot tall tailrace tunnel. The tunnel expands to 16-foot wide and 14-foot tall on the downstream side of the Stone Arch Bridge to limit flow velocities entering the river. The total length of the new tailrace tunnel is 930 feet.

· A new underground transmission line approximately 700 feet in length will connect the

Project to the Xcel grid at Portland Avenue. The powerhouse structure footprint would be approximately 88-feet by 42-feet. The roof of the powerhouse structure will approximately match the West River Road parking lot level to the south (El.807), extending about 17-feet above the USACE parking lot to the east. Construction of the project would occur on USACE owned property, using approximately 2 acres for staging and excavation. The majority of the project would be underground. The above ground footprint of the Proposed Project totals, approximately 4200 square-feet. The requester is in the process of securing approval from the FERC for licensing of the project. Construction of the Proposed Project would begin after environmental clearance and permitting has occurred; as well as completion of the Corps 408 process, anticipated in 2017. Construction is estimated to take approximately four months for the major components. Heavy equipment, such as excavators, cranes, and dump trucks would be used. Major construction would occur during the fall and winter in order to minimize the potential impacts to recreational use, and seasonal weather conditions, such as heavy rain.

Prior to starting excavation, cofferdams would be used on the downstream end of the existing headrace canal and also downstream at the discharge point of the proposed tailrace tunnel to keep water out of the construction area and reduce the potential for sedimentation. This would affect less than one third of an acre of water and would prevent water flow into the construction area.

Proposed Project construction would remove accumulated debris and excavate the headrace canal, if necessary. The current plan includes underground tunneling 400 feet, extending from the powerhouse under the existing USACE parking lot to a point on the upstream side of the Stone Arch Bridge. Underground tunneling would use jetting, cutter head, or another method to remove sandstone, but would not require blasting. The remaining 530 feet of tunnel would be constructed using an open-cut trench that will be backfilled and restored. A portion of the roadway that crosses under the Stone Arch Bridge, providing access to a parking area and access road to the lower St. Anthony Falls lock and dam, would be temporarily removed, and would be replaced with new roadway after installation of the tailrace tunnel is complete. The bottom of the tunnel would be located above the foundations of the Stone Arch Bridge. No disturbance to the Stone Arch Bridge structure or foundations would occur from construction of the Proposed Project.

Temporary access during construction for USACE employees would be provided from Portland Avenue to the USACE facilities until completion. The powerhouse, which includes the penstocks, turbines, and generators, would be constructed on the upstream side of the Lock and USACE parking lot along the right bank. The housing for the generator would be visible, but the majority of the powerhouse components would be located underground, including the electrical cable to transport the power generated by

the Proposed Project. The outlet of the tailrace tunnel will be submerged and hardly visible.

After necessary revisions, the Corps approved the subsurface investigation plan on January 28, 2015. Borings began on March 9th due to the unseasonably cold temperatures in February. Information from recent soil borings and design documents will be provided as part of the Corps Section 408 process to demonstrate that stability and geological soundness of the Corp's structures will be maintained.

Plans for maintaining security during construction and restoring the security perimeter after construction will be coordinated with and approved by the Corps. Use of the Corps parking area during construction will be coordinated with the St. Paul District Real Estate Branch and Operations Branch staff. Crown Hydro construction will occur during one winter construction season. After construction the parking area will be replaced to its pre-construction condition based on review by the St. Paul District.

As the intake ports located on either side of the lock wall allow cross-flow through the wall, temporary plates will be placed over the intake ports to prevent inflow to the coffered area during construction. The design and installation of these plates will be reviewed by, and coordinated with, Corps staff.

The velocity of flows from the 16-foot wide x 14-foot high discharge tunnel and the effect those flows would have on boaters and potential scouring near the navigation channel and potential change in flow near the small-boat signal on the upstream guide wall have been reviewed prior to submittal of this review plan.

The Corps is responsible for developing procedures for monitoring construction activities associated with the Proposed Project per EC 1165-2-216, Paragraph (9) (a). These monitoring procedures will be developed during the Corps' initial comment period on the 90% complete plans and specifications provided by the requester. The requester's 90% submittal will include the method of contracting, which can impact how the plans and specifications are laid out as well as determining the Corps' construction management oversight methodology and process.

3. Objective

The objective of this work is to assess, analyze, interpret, and evaluate design/engineering and construction criteria through a process known as Type II Independent External Peer Review (IEPR) Safety Assurance Review (SAR) for the proposed Crown Hydro, LLC Hydroelectric Project at USAF Lock and Dam. Reviews will be in general accordance with the Water Resources Development Act (WRDA) 2007 (Public Law 110-114) Section 2035, and the procedures described in USACE, Civil

Works Review Policy (Engineer Circular (EC) 1165-2-214, dated 15 December 2012).

IEPR typically assesses the quality of data collection procedures, the robustness of the methods employed, the appropriateness of the methods used, the extent to which the conclusions follow from the analysis, and the strengths and limitations of the overall products.

The IEPR will be conducted by subject matter experts with extensive experience in engineering issues associated with lock and dam construction, operations and maintenance. The subject matter experts will be charged with responding to specific technical questions as well as providing a broad technical evaluation of the overall project. The review panel shall focus on answering the general questions listed in Appendix B for each phase of the project. The IEPR panel of experts will not perform a detailed review of calculations but shall assess whether the data, models, and assumptions made to develop the design are adequate. The panel should evaluate whether the interpretations of analysis and conclusions based on data and analysis are reasonable. The review panel is granted the flexibility to bring important issues to the attention of decisions makers, however, the review panelists are instructed to not make a recommendation on whether a particular alternative should be implemented. Panelists may, however, offer their opinions as to whether there are sufficient analyses upon which to base a recommendation. Panelists should avoid findings that become "directives" in that they call for modifications or additional studies or suggest new conclusions or recommendations. The panel team shall be responsible for ensuring that all comments represent the group, be non-attributable to individuals, and where there is lack of consensus, note the non-concurrence and why.

Project Stakeholder representatives may attend panel meetings, but may not participate in the management or control of the group. Stakeholders must refrain from participating in the development of any reports or final work product of the group.

The review may reveal additional documentation that will be required for the IEPR. The IEPR Team will request additional documentation (if necessary). IEPR teams are not expected to be knowledgeable of Army and administration policies, nor are they expected to address such concerns. However, an IEPR team should be given the flexibility to bring important issues to the attention of decision makers.

4. References

The following references to USACE regulations shall be followed in conducting the IEPR. The most recent documents shall be used and are available at http://www.publications.usace.army.mil/ The Project Stakeholders and IEPR Team shall recommend any additional references or criteria not listed for a determination of adding

them to the Scope of Work.

General

- EC 1165-2-214, Water Resources Policies and Authorities - Civil Works Review 15 December 2012
- EM 385-1-1, Safety and Health Requirements, 15 September 2008
- ER 1110-1-12, Engineering and Design - Quality Management, 31 March 2011 (change 2)
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Geotechnical Engineering

- EM 1110-2-1901, Engineering and Design - Seepage Analysis and Control for Dams, 30 April 1993
- EM 1110-2-1902, Engineering and Design - Slope Stability, 31 October 2003
- EM 1110-2-1913, Engineering and Design - Design and Construction of Levees, 30 April 2000
- EM 1110-2-1914, Engineering and Design: Design, Construction and Maintenance of Relief Wells, 29 May 1992
- EM 1110-2-2300, Engineering and Design - General Design and Construction Considerations For Earth and Rock-Fill Dams, 30 July 2004
- EM 1110-2-2502, Engineering and Design - Retaining and Flood Walls, 29 September 1989
- EM 1110-2-2504, Engineering and Design - Design of Sheet Pile Walls, 31 March 1994
- EM 1110-2-2906, Engineering and Design - Design of Pile Foundations, 15 January 1991
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Materials Engineering

- ER 1110-1-1901, Project Geotechnical and Concrete Materials Completion Report for Major USACE Project, 22 February 1999
- EM 1110-2-1906, Laboratory Soils Testing, 20 August 1986
- ER 1110-2-1911, Engineering and Design - Construction Control for Earth and Rock-Fill Dams, 30 September 1995
- EM 1110-2-2000, Engineering and Design - Standard Practice for Concrete for Civil Works Structures, 31 March 2001
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- EM 1110-2-2002, Evaluation and Repair of Concrete Structures, 30 June 1995
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- EM 1110-2-2100, Engineering and Design - Stability Analysis of Concrete Structures, 1 December 2005
- EM 1110-2-2102, Waterstops and Other Preformed Joint Materials for Civil Works Structures, 30 September 1995
- EM 1110-2-2104, Engineering and Design - Strength Design for Reinforced-Concrete Hydraulic Structures, 20 August 2003
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- EM 1110-2-2400, Engineering and Design - Structural Design and Evaluation of Outlet Works, 02 June 2003
- EM 1110-2-2502, Engineering and Design - Retaining and Flood Walls, 29 September 1989
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- EM 1110-2-6053, Engineering and Design - Earthquake Design and Evaluation of Concrete Hydraulic Structures, 01 May 2007
- EM 1110-2-6054, Inspection, Evaluation and Repair of Hydraulic Steel ER 1110-2-100, Periodic Inspection and Continuing Evaluation of Completed Civil Works Structures, 15 February 1995
- ETL 1110-2-584 Hydraulic-Steel-Structures, 30 June 2014
- ETL 1110-2-575 Evaluation-of-I-Walls, 1 September 2011

Hydrologic and Hydraulic Engineering

- EM 1110-2-1602, Engineering and Design - Hydraulic Design of Reservoir Outlet Works, 15 October 1980
- EM 1110-2-1413, Hydrologic Analysis of Interior Areas, 1987.
- EM 1110-2-1603, Engineering and Design - Hydraulic Design of Spillways, 16 January 1990

- EM 1110-2-1619, Risk-Based Analysis for Flood Damage Reduction Studies, 1996
- EM 1110-2-2902, Engineering and Design - Conduits, Culverts, and Pipes, 31 March 1998
- EM 1110-2-3600, Engineering and Design - Management of Water Control Systems, 30 November 1987
- ER 1110-8-2 (FR), Inflow Design Floods for Dams and Reservoirs, 1 March 1991
- ER 1110-2-240, Water Control Management, 8 October 1998
- ER 1130-2-530, Flood Control Operations and Maintenance Policies, 30 October 1996
- ER 1110-2-8156, Preparation of Water Control Manuals, 31 August 1995
- ER 1100-2-8162, Incorporating Sea Level Change in Civil Works Projects, 31 December 2013
- ECB 2014-10, Guidance for Incorporating Climate Change Impacts to Inland Hydrology in Civil Works Studies, Designs and Projects, 2 May 2014
- ETL 1100-2-1, Procedures to Evaluate Sea Level Change: Impacts, Responses and Adaptations, 30 June 2014

Mechanical and Electrical Engineering

- EM 1110-2-3105, Mechanical and Electrical Design of Pumping Stations, 30 November 1999

Civil Engineering

- UFC 3-201-01 1 June 2013, Civil Engineering

5. Items Available for Review

- A Public Waters Work Permit Application was submitted by Crown Hydro, LLC to the Minnesota Department of Natural Resources (MNDNR) on March 2, 2015. Crown Hydro, LLC obtained a 401 Water Quality Certificate from the Minnesota Pollution Control Agency (MPCA) on April 28, 1995. Crown Hydro, LLC and the MPCA continue to discuss whether a new Water Quality Certification is necessary or if an amendment to the existing certification is authorized;
- Design Documentation Report (DDR);
- Plans and Specifications;
- Construction submittals;
- Safety Submittals;

- NEPA Documentation to include an Environmental Assessment;
- Section 404 and/or Section 10 permit process;
- Corps of Engineers Section 408 analysis and approval which will cover the design of the new powerhouse structure and overall stability of the gravity wall;
- An emergency action plan;
- A systems safety management plan;
- A construction site security and restriction plan;
- A quality control and inspection plan;
- A plan for use of any property belonging to the Federal Government;
- An accident prevention plan;
- A plan for temporary access during construction;
- An Operations, Maintenance and Regulating plan.

6. Specific Tasks

The IEPR Team, experienced in the assessment, analysis, and evaluation for SAR of projects conducted through their established IEPR process of design, engineering, and construction peer reviews, shall perform general and specific tasks.
The IEPR Team shall perform reviews in accordance with the reviewable materials identified in this document. The IEPR Team may recommend to the Stakeholders additional or alternate review materials as a result of the review process.
Note that the IEPR is an extension (not a replacement) of an Agency Technical Review (ATR) performed by USACE according to the requirements outlined in ER 1110-1-12, Engineering and Design Quality Management; however, the intent of the SAR is to complement an ATR and to avoid impacts to program schedules and cost. Where appropriate and reasonable, an ATR and SAR may be performed concurrently and in concert if it enhances the review process. The SAR is a strategic level review and every effort should be made to avoid having the SAR duplicate the ATR.
The following tasks shall be performed independent of Stakeholder supervision, direction or control to fulfill independence criteria of an IEPR:

Task 1. Work Plan to Conduct the IEPR: The IEPR team will prepare a draft and final work plan that provides the process for conducting the IEPR, including screening criteria for peer reviewers, selection of peer reviewers, schedule, charge to peer reviewers (revised as necessary with input from the Stakeholders to include in final IEPR work plan), communications protocols, meetings with Stakeholders quality control procedures, and compilation / documentation / dissemination of peer review comments. The IEPR Team will conduct the IEPR in accordance with this work plan to assure that all services are performed, evaluated, reviewed and provided in a manner that meets professional engineering quality standards. The IEPR team will establish processes to maintain

independence and individuality of each expert reviewer's respective discipline, comments, assessments, evaluations, and reports associated with design criteria and project components inherent and related to their respective professional design/engineering and construction discipline to ensure the integrity of the safety assurance review criteria. This work plan shall include a Communications Plan. All communication to Crown Hydro, LLC and Stakeholders shall go through Mr. Joel Toso of Wenck Associates, representing Crown Hydro, LLC as the project manager.

Task 2. Selection of IEPR Panel: The review will take the form of a panel of experts, and the members are limited to reviewing and commenting on the work being done by others. The peer review can work concurrent with on-going work, be interactive as needed, and provide real time over-the-shoulder input. Timely input on the appropriateness of hazard analyses, models and methods of analysis used, and the assumptions made is critical to maintaining project schedules. The IEPR team will identify an expert(s) for each discipline and level from the list below to serve on the IEPR panel. The experts will also be referenced as expert reviewers. Selection will be based on availability, technical credentials, and absence of perceived or actual conflict of interest (expert reviewers selected are preferred to fully support all required Type II IEPRs for all relevant project phases in order to ensure consistency for review). At a minimum, one member is required, but the panel composition shall be a size appropriate for the size and complexity of the project. Composition of the panel can change depending on the need of the particular phase of review.

Selection of expert reviewers for IEPR efforts will adhere to the National Academy of Science (NAS) Policy on Committee Composition and Balance and Conflicts of Interest. Prior to submitting the IEPR panel for approval, the review team lead shall obtain a statement from each of the panel members indicating willingness to participate and the absence of a conflict of interest (COI). The IEPR team will be required to submit the NAS COI form for all reviewers with the proposed list of panel members. The following website provides academy guidance for assessing composition and the appropriate forms (also available in Appendix C) for prospective panel members in General Scientific and Technical Studies: http://www.nationalacademies.org/coi/index.html. The review team lead shall also develop criteria for determining if review panels are properly balanced, as defined by criteria in the contract, both in terms of professional expertise as well as in points of view on the project at hand. If necessary, the review team lead shall remove and replace panel members during a review if a conflict arises. All potential reviewers carry professional and personal biases, and it is important that these biases be disclosed when reviewers are considered and selected. The review team lead shall determine which biases, if any, will disqualify prospective reviewers. The IEPR team will provide Crown Hydro, LLC and USACE with the final independent external expert reviewer list, including their credentials and NAS forms, for approval. Expert reviewers will be

industry leaders in their required field of review stated below and have experience in design and construction of projects similar in scope to this proposed hydropower project. Expert reviewers shall be registered professionals in their discipline in the state of Minnesota. The expert reviewers must also have a college degree in their discipline. A graduate degree in engineering is preferable, but not required except as noted, as hands-on relevant engineering experience in the listed disciplines is more important. Expert reviewers included in the proposal for selection of the base contract shall be submitted first. The panel members shall not have any financial or litigation association with Crown Hydro, LLC; the Design A/E; their engineering teams, subcontractors or construction contractors. Areas of conflict may include current employment by Federal or State governments, participation in developing the subject project, a publicly documented statement advocating for or against the subject project, current or future interests in subject project or future benefits from the project, and paid or unpaid participation in litigation against Crown Hydro, LLC or Stakeholders. The IEPR team will provide brief biographies and detailed resumes (i.e. long form resumes) for the proposed IEPR panel members with the task order proposal. The detailed resume shall include relevant project experience similar in scale and scope to this project and address the specific expertise described below for each discipline. The IEPR team shall consist of the following panel members:

1. **Hydrology and Hydraulic (H&H) Engineering panel member(s)** shall be a Level 3 reviewer and a registered professional engineer in Minnesota from an Architect-Engineer or consulting firm, a public agency, or academia with a minimum of 20 years of experience in hydraulics and hydrologic engineering, and have a minimum BS degree or higher in engineering. Active participation in related professional engineering and scientific societies is encouraged. The panel member shall have extensive experience in the application of HEC computer modeling programs, risk and uncertainty analysis, hydraulic engineering with an emphasis on hydropower projects, with extensive background in hydraulic theory and practice, and river geomorphology. The H&H panel member(s) should be familiar with USACE application of risk and uncertainty analyses in hydropower projects. The H&H panel member(s) shall have experience associated with hydropower projects, and the analysis and design of hydraulic structures such as outlet works, spillways, and stilling basins, channels and levees, and large river control structures. The H&H panel member(s) must have performed work in hydrologic analysis, floodplain analysis, hydraulic design of channels and levees using various channel and bank protection works, and river sedimentation. The H&H panel member(s) must demonstrate knowledge and experience with physical modeling and the application of data from physical model testing to the design of stilling basins and scour protection, and in the ability to coordinate, interpret, and explain testing results with other engineering

disciplines, particularly structural engineers, geotechnical engineers, and geologists. In regard to hydrologic analysis, the H&H panel member(s) must demonstrate knowledge and experience with the routing of inflow hydrographs through flood control reservoirs utilizing multiple discharge devices, including gated sluiceways and gated spillways –and/or- modeling large river systems and possess a thorough understanding of the dynamics of open channel flow systems, floodplain hydraulics, and interior flood control systems. The H&H panel member(s) shall also have a familiarity with standard Corps hydrologic and hydraulic computer models (including but not limited to HEC-1, HEC-HMS, HEC-RAS, FLO-2D, and HEC-DSS) used in drawdown studies, dam break inundation studies, hydrologic modeling and analysis for dam safety investigations. The H&H panel member(s) shall have familiarity with preparing plans and specifications for USACE projects, knowledge of USACE design and construction procedures and policies, and USACE levee safety assurance policy and guidance. The H&H panel member(s) shall have experience in evaluating risk reduction measures for dam safety assurance projects.

2. **Civil Engineering** panel member(s) shall be a Level 3 reviewer and a registered professional civil engineer in Minnesota from an Architect-Engineer or consulting firm, a public agency, or academia with a minimum of 20 years of civil engineering experience and have a minimum Bachelor of Science degree or higher in engineering. Active participation in related professional engineering and scientific societies is encouraged. The Civil Engineering panel member(s) shall have experience in the design, layout, and construction of hydropower structures. Experience in associated contracting procedures and total cost growth analysis is desired. The Civil Engineering panel member(s) shall have demonstrated knowledge in a variety of construction-related activities involving site layout, surveying, 3- dimensional modeling, construction techniques, grading, hydraulic structures, erosion control, earthwork, concrete placement, design of access roads, retaining walls design, and relocation of underground utilities. Practical knowledge of construction methods and techniques as it relates to structural portions of projects is required.

3. **Geotechnical Engineering** panel member(s) shall be a Level 3 reviewer and a registered professional engineer in Minnesota from an Architect-Engineer or consulting firm, a public agency, or academia with a minimum of 20 years of experience in the geotechnical design of dams and gated structures within a riverine environment, experience in subsurface investigations; field & laboratory testing and the determination of in-situ material properties; soil compaction and earthwork construction; soil mechanics; seepage and piping; slope stability evaluations; bearing capacity and settlement; and scour protection design. A minimum Masters degree or higher in geotechnical engineering is required. Active participation in related

professional societies is encouraged. The Geotechnical panel member(s) should be a recognized expert in dam design and analysis. Geotechnical panel member(s) shall have at least 20 years or more experience in the general field of geotechnical engineering; experience in: subsurface investigations; field & laboratory testing and the determination of in-situ material properties; soil compaction and earthwork construction; soil mechanics; seepage and piping; landslide and slope stability evaluations; bearing capacity and settlement; liquefaction analyses and analysis of earthquake-induced embankment/structural deformation; foundation inspection and assessment; foundation grouting and other foundation treatment methods including construction of foundation seepage barriers; the determination and evaluation of dynamic site-specific response spectra analysis and the evaluation of soil-structure interaction; the design, installation and assessment of instrumentation; the design and installation of geosynthetics and geomembranes; erosion protection design; sheet piling, and retaining wall design; drilling and blasting, and underground tunnel design; preparing plans and specifications for USACE projects, and knowledge of USACE design and construction procedures and policies. The Geotechnical panel member(s) shall have knowledge and experience in the forensic investigation of seepage, settlement, stability, and deformation problems. The Geotechnical panel member(s) shall have experience in evaluating risk reduction measures for dam safety assurance projects.

4. **Structural Engineering** panel member(s) shall be a Level 3 reviewer and a registered professional engineer in Minnesota from an Architect-Engineer or consulting firm, a public agency, or academia with a minimum of 20 years of demonstrated experience, and have a minimum Bachelor of Science degree or higher in engineering with significant focus on hydropower projects. The Structural Engineering panel member(s) shall have extensive experience in the design and construction of hydraulic structures for large and complex civil works projects. The Structural engineering panel member(s) should be a recognized expert in stability analysis and structural design of flood risk management gate structures associated with dams, the determination and evaluation of dynamic site-specific response spectra analysis, and the evaluation of soil-structure interaction. The Structural Engineering panel member(s) should be proficient in performing stability analysis using limit equilibrium analysis; design and construction of deep sheet pile walls; design and installation of pile foundations; and concrete design. The Structural panel member(s) shall have familiarity with preparing plans and specifications for USACE projects, knowledge of USACE design and construction procedures and policies, and USACE dam safety assurance policy and guidance. The Structural panel member(s) shall have experience in evaluating risk reduction measures for dam safety assurance projects. In addition, at least one of the expert reviewers shall have recent and relevant experience

on multi-million dollar projects verifying the constructability of the proposed designs and then verifying that these projects were being constructed per the Plans and Specifications.

The panel responsibilities shall include, but not be limited to, the following:
a. Conduct the review for the subject project in a timely manner in accordance with the study and Review Plan schedule;
b. Follow the "charge", but when deemed appropriate by the team lead, request other products relevant to the project and the purpose of the review;
c. Receive from Crown Hydro, LLC any public written and oral comments provided on the project;
d. Provide timely written and oral comments throughout the development of the project, as requested;
e. Assure the review avoids replicating an ATR and focuses on the questions in the "charge", but the panel can recommend additional questions for consideration. The SAR panel may recommend to the RMO additional or alternate questions;
f. Offer any lessons learned to improve the review process;
g. Submit reports in accordance with the review plan milestones;
h. The facilitator shall be responsible for insuring that comments represent the group, be non-attributable to individuals, and where there is lack of consensus, note the non-concurrence and why.

Task 3. Peer Review Critical Items List (CIL): The IEPR team shall prepare an IEPR critical items list that shall include all project components which are critical to the project mission. The criticality of each item shall be evaluated/reviewed and discussed along with possible failure scenarios. Procedures for evaluating/reviewing the critical items in the design; construction; and Operations & Maintenance phases shall be addressed. The onsite staff required for each phase and for each item requiring review shall be discussed. The critical item list will be a final list that should be the best effort given the information available at the start of the IEPR process. As the task progresses, the final list may be modified and the IEPR team will prepare a revised final list.

Task 4. Orientation Briefing: In coordination with Crown Hydro, LLC and Stakeholders, the IEPR team will participate in an orientation briefing conducted by Crown Hydro, LLC between selected members of the Stakeholders and all of the IEPR team. The purpose of this first meeting will be to familiarize the IEPR Team members with the project specifics and objectives of the review. This briefing should also provide an opportunity for the IEPR team to ask clarifying questions of the Stakeholders to assist in the development of final panel comments. Briefing materials will be provided by Crown Hydro, LLC/Stakeholders prior to the briefing. The briefing will take place via a

concurrent site visit and office visit for critical IEPR panel members. Selected critical members of the IEPR team required to attend in person are the Project Manager, Facilitator, an H&H Engineer, and Civil Engineer.

Task 5. Progress Communications: Monthly e-mail updates of progress and status shall be sent to the Crown Hydro, LLC project manager by the IEPR team lead. The monthly e-mail updates will include progress conducted during the previous month's period, planned progress for the next month, and any problems encountered.

Task 6. IEPR of Design Phase:
Design Phase - The IEPR team review will occur at the 90% completion of the Design Documentation Report (DDR), Plans and Specifications. The Crown Hydro, LLC will provide these documents to the IEPR team electronically for distribution to the peer reviewers.
Processes shall be consistently utilized by the IEPR team to maintain independence and individuality of each expert reviewer's respective discipline, comments, assessment, and reports of design/engineering/construction components pertinent to the expert reviewers' respective discipline to ensure the integrity of the safety assurance review criteria. Expert reviewers shall analyze and assess various components identified in, but not limited to, the critical items list. The IEPR panel shall evaluate/review the Design Phase documents in accordance with the General Charge Guidance (Appendix B) and provide their comments in tabular form to Crown Hydro, LLC.

Task 7. Prepare Project Review Reports: This task will be performed by the IEPR team for the Project Design Phase package. The IEPR team will prepare a Project Review Report for each review conducted. The Project Review Reports shall focus on answering the general questions in Appendix B and the review panel shall clearly address these questions in the review report. The Interim Project Review Reports shall be submitted for Crown Hydro, LLC and USACE approval within 28 calendar days after closeout of comments. At a minimum, each report will include an introduction, the composition of the review team, a summary of the review during design, any lessons learned, and appendices for conflict of interest disclosure forms, for comments to include any appendices for supporting analyses and assessments of the adequacy and acceptability of the methods, models, and analyses used. In addition, the reports shall contain appendices to include documentation of the expert reviews performed under Task 6 and all comments. All comments in the report will be finalized by the panel prior to their release to Crown Hydro, LLC for each review plan document and all comments shall be back-checked and closed by the time the reports are submitted for Crown Hydro, LLC approval.

7. Deliverables

The IEPR Team will provide one (1) hard copy and one (1) electronic copy of: the work plan (Task 1), IEPR panel selections (Task 2), IEPR review comments in tabular format (Task 6) and all Review Reports (Task 7) to Crown Hydro, LLC. Electronic submittals shall contain all electronic files on DVD, CD, or other appropriate electronic media. The briefings for the expert reviewers will be furnished in Microsoft PowerPoint or Adobe PDF formats. Reports generated by the IEPR Team will not be released for publication or dissemination without a Crown Hydro, LLC Representative's written approval.

C. REQUESTOR'S AE QA/QC POLICY

Plan to be used for Crown Hydro documents to be submitted to the US Army Corps of Engineers.

August 15, 2016

Corporate Quality Assurance and Quality Control Policy for the Wenck Enterprise

WENCK

Responsive partner.
Exceptional outcomes.

Prepared by:

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APPENDICES

1.0 Introduction

This Corporate Policy defines the commitment to quality assurance (QA) and quality control (QC) for the Wenck Enterprise (Wenck). It defines quality assurance expectations as well as essential practices for risk management and project management. In addition it provides the framework for more detailed procedures to be developed and implemented by the Project/Proposal Managers for quality control for individual projects/proposals. This Policy also defines roles and expectations for Project/Proposal Managers and Project/Proposal Team Members to ensure QA/QC expectations are met.

1.1 QUALITY ASSURANCE

Quality assurance is defined as providing confidence to clients that the services provided meet their objectives.

The client is central to our work, so quality may be characterized as meeting the client's defined objectives. In addition to specific technical objectives, included are such factors as degree of completeness, accuracy, compatibility, applicability, reliability, presentability, cost effectiveness, operability, constructability, safety, applicable code compliance, and maintainability.

Providing quality services is considered essential to the continued viability and well-being of Wenck, as it contributes to a high degree of client satisfaction, increased value of services, a high professional reputation, reduced sales and marketing costs, cost-effective project management, and the elimination of professional liability claims.

Accordingly, quality assurance is to receive high priority in project planning and execution, so that services are performed with the appropriate standard of care for the professional services being undertaken, and the terms of the professional service agreement for the specific project.

1.2 QUALITY CONTROL

Quality control is defined as implementation of quality measures, such as planning, supervision, documentation, and reviews, to meet quality assurance requirements.

Quality assurance is accomplished through quality control. A project Quality Control Plan will be established and implemented on each project and managed by the Project Manager.

While many factors and procedures are involved in providing quality services, it is only by every individual's dedication to quality and by the implementation of quality control, using established procedures on a project-by-project basis, that high quality services will be consistently provided. In a service organization such as Wenck, quality is as much a matter of attitude as it is the implementation of specific procedures.

2.0 Basic Elements of Quality Control

Many procedures employed during project execution relate to quality control, the basic elements of which are described below. These elements should be clearly addressed and defined in the QC Plan for the project.

2.1 DEFINITION OF SCOPE, BUDGET, AND SCHEDULE

Quality control begins during proposal preparation when the project scope and Wenck's responsibilities are developed and defined. These planning activities generally occur during the proposal phase by the Proposal Manager (who may also eventually be the Project Manager). If the Proposal Manager is not the Project Manager, the Proposal Manager must include the anticipated Project Manager in the proposal development.

The proposal stage must follow the Wenck "Marketing and Proposal Process" (copy provided in Appendix C). As well, the Wenck Associates Governance Plan defines levels of authority for review and approval of corporate commitments for proposals (summary provided in Appendix C).

Thorough definition of the client's objectives and expectations, scope, budget, and schedule is essential for both effective internal project planning and execution, and externally to satisfy the client. It is the responsibility of the Proposal Manager to establish the needs of the client and to coordinate the proposed scope, budget, and schedule to meet and exceed these needs. Generally, this will require input from discipline specific "doer" project team members as it is unlikely that the Proposal Manager will be able to anticipate the hours required from every discipline necessary to successfully execute a project.

The proposed scope, budget, and schedule must account for the QA/QC requirements that will be necessary for the project.

Proposals must go through an adequate QA review prior to delivery to a client, similar to the requirements defined for project deliverables. The QA review at the proposal stage should evaluate if the proposed scope, budget, and schedule adequately meet the client's objectives, and adequately protect and/or represent Wenck in regards to risk management, technical capabilities, profit, contractual agreements, etc.

2.2 PROFESSIONAL SERVICES AGREEMENT

Development and definition of a project's objectives is a joint effort of the client and Wenck, and is set forth in the professional services agreement between them. The importance of a professional services agreement that expresses with specificity and clarity the scope of services to be performed, the responsibilities of all parties, and the other basic elements of an agreement cannot be over-emphasized. Failure to do so often results in misunderstandings, disputes, cost overruns, dissatisfied clients, and even litigation which could have been avoided with a well-written agreement.

Since professional services usually produce "software" results such as reports, designs, and recommendations (as opposed to "hardware" products), care should be taken to avoid terms which unduly raise the applicable standard of care or imply perfection or

absoluteness. The use, in an agreement with a client, of such terms as "warrant", "guarantee compliance", "coordinate, control and direct others", "supervise construction", and "As-Builts" may obligate Wenck to a higher standard than that of exercising reasonable care, skill, and diligence in the performance of professional services.

The standard of care language may be different for each professional services agreement, however, Wenck's preferred language is: *"The standard of care for all professional services performed by Consultant under this Agreement shall be the care, skill, and diligence used by members of Consultant's profession practicing under similar circumstances at the same time and in the same locality. Consultant makes no warranties, express or implied, under this Agreement or otherwise, in connection with Consultant's services."*

2.3 SELECTION OF PROJECT TEAM MEMBERS

Project Team Members are assigned by considering such factors as skills and experience required, budget, availability, schedules, and overall composition of the Project Team. The level of experience and capabilities of each member should be considered in relationship to other members as to achieve a complementary balance among the Project Team to provide quality professional service, best "value" to the client, and profit to Wenck.

A key part of determining Project Team Members also involves defining those who will perform the quality review roles for the project. The QA Team may be peers, the Project Team participant's supervisor(s), and/or the Project Manager. For larger projects, it may be necessary to define a QA Manager who will lead and coordinate the QA Team. The QA Manager will work closely with the Project Manager to meet the project expectations, scope, schedule, and budget. The Project Manager and/or QA Manager should identify those responsible for:

1) Technical Review (product is correct, complete, accurate, and meets client's objectives).
2) Grammatical/Format Review (product is grammatically correct and presents consistent format).

2.4 PROJECT ORIENTATION MEETING

A thorough understanding of the client's objectives and the project scope, work plan, profit plan, budget, and schedules by the Project Team Members is necessary prior to starting the project. Therefore, a project orientation (project "kick off") meeting should be held at the start of the project to include the Project Manager, Proposal Manager, Project Team Members, and QA Team Members.

The roles and expectations of the QA Team and/or QA Manager should be clearly defined and communicated with the entire Project Team.

2.5 PROJECT REVIEW MEETINGS

Formal project review meetings provide an opportunity for the Project Team to present results, status and adjustment of plans, and problems to the Project Manager. These meetings encourage proactive identification of potential concerns or opportunities to enhance the project. For larger projects, it is recommended that a minimum of two meetings should be held, one at the 30 to 40 percent completion point and another at the 60 to 70 percent point.

2.6 CLIENT COORDINATION AND REVIEW MEETINGS

Proper coordination with the client is necessary to inform the client of project status and results, to obtain client input, and to provide for informed and timely client decision-making during the project. Keeping the client informed and up-to-date is an important, but easily overlooked, task. Failure to do so can lead to "surprises" that strain client relations and adversely impact project elements, such as budgets and schedules. Client requirements for meetings must be established during the definition of project scope, as defining the client's expectations for communication and meetings is critical. In some cases, it is necessary to establish the need for an adequate number of meetings and level of contact. The number and frequency of meetings depend upon client requirements, degree of client participation and decision-making, and type and size of the project. Client meetings and coordination details should be clarified by the Project Manager prior to, and reviewed during, the project orientation meeting.

2.7 QUALITY ASSURANCE REVIEW

The results of all services performed are to be reviewed or checked as appropriate prior to submittal or disclosure to a client. This includes such deliverables as written reports, letters, spreadsheets, calculations, CADD drawings, GIS figures, databases, designs, figures, etc. Such review will be provided by the QA Team and/or QA Manager assigned to the project. All work should be reviewed and checked for conformance with the factors of quality, including technical accuracy, completeness, grammar, and presentability (e.g., consistency, formatting). It is the Project Manager's responsibility to review results and submittals for conformance to the client's objectives and any client-specific standards.

In some cases, clients may request rough or preliminary drafts of reports, progress prints of drawings, preliminary field data, etc., and providing this information may be desirable to keep the client informed and to allow for client input. Even though such materials may be considered "draft," in all cases such progress submittals should be reviewed so that obvious errors or omissions are corrected prior to submittal. These expectations must be defined up front (preferably in writing) with the client. For example:

- Preliminary (concept) Draft: this is a rough draft and errors may be acceptable.
- Draft: this should be Wenck's final internal product but marked as "draft" because client has not yet reviewed it.
- Draft-Final: usually part of a final edit/review/revise exchange.
- Final: the client has declared the product complete for use.

The amount of time spent and degree of thoroughness depends on the nature of the submittal, its anticipated use by the client, and the relationship between Wenck and the client. In no case shall any submission be made to a client without the approval of the Project Manager, or his/her designee. All draft or preliminary documents provided to clients shall be clearly marked as such.

It is Wenck's Corporate QA/QC Policy that QA review will be completed for all project deliverables. ***Note that it is not acceptable to omit QA review from a project scope due to problems with project budget overruns and/or project schedules.*** The Project Manager is expected to work with the Project Team and QA Team to discuss any such issues and define a means to ensure that QA/QC expectations have been met. It is generally preferable no matter what the cause, that the Project Team and QA Team continue to bill to the project to provide an understanding of a true project costs. As necessary, a Project Manager should involve the Director of Operations and/or the Director

of Technical Services if such problems arise with project scope, schedule, or budget that may impact the ability to complete QA/QC expectations. It is the responsibility of the Project Manager to discuss errors with the project team and any re-work that is required. It is the responsibility of the Project Manager to address overruns due to scope changes with the client and if possible negotiate a change order.

2.8 SUPERVISION OF WORK PERFORMED

The attainment of quality control in services provided is the responsibility of every Project Manager providing services. This responsibility is most effectively carried out through adequate day-to-day supervision and guidance of Project Team Members. It is the responsibility of every Project Manager to provide adequate supervision and guidance of Project Team Members under him or her.

As required for a project, the Project Manager should work with a Project Team member's direct supervisor or senior staff member for coordination of availability/schedule, workload balance, and/or supervision needs.

2.9 PROJECT DOCUMENTATION

The keystone of the maintenance of quality control is documentation. In almost every given situation, only proper documentation of directions, decisions, and other descriptions concerning the project objectives and the agreement will provide for precise client communications. In addition, such documentation provides adequate support of Wenck's or the client's position in the event of misunderstanding, dispute, or litigation with various parties. It is essential that written documentation be developed for discussions, telephone communications, meetings, and actions by or with the client and others if those items are expected to have an effect on the project. Any documentation of discussions or meetings should include action items, those responsible for those action items and dates action items are due.

QA review should be clearly documented for a project. Depending on the size of the project and types of deliverables, this documentation may take different forms. A QA review checklist may be appropriate for larger projects, whereas documenting QA completed through time tracking (e.g., timesheet comments field) may be adequate for others. The Project Manager should clearly define for the Project Team Members and QA Team Members the expectations for documentation of QA review.

The establishment of a project filing system and providing for and maintaining complete and current project files and documentation is the responsibility of the Project Manager and supported by the Project Team Members (including the QA Team). **This includes both paper and electronic files.** The Project Manager should clearly define the project filing system expectations to the Project Team Members. It is important that files, calculations, drawings, specifications, reports, letters, memoranda, etc., represent complete documentation of assumptions, internal and external communications, calculations, decisions made, and results. It is important that the files be neat, orderly, and organized in a logical fashion for future reference. The project filing system must be maintained throughout the project (beginning to end) so that Project Team Members have access to project information in a timely and efficient manner. Project filing must follow **Wenck's Corporate Records Management Policy**.

Upon project close-out, all project files must be collected, organized and purged of clearly unnecessary information and duplicates, and maintained or stored in the proper status depending upon continuing phases and need. Project records retention must follow **Wenck's Corporate Records Management Policy**, and/or client specific requirements defined in the Professional Services Agreement for the project.

3.0 Project Quality Control Plan

In order to effectively plan for quality control in projects and to monitor results**, a project Quality Control Plan (QC Plan) will be established and implemented for each project**. This QC Plan will be managed by the Project Manager, and may include input and support from the QA Team and/or QA Manager for the project. The Project Manager has ultimate responsibility and accountability for project quality and, as such, has final authority to release reports, designs, cost estimates, and other work results. During the course of the project, the Project Manager is responsible for implementing, monitoring, revising, and updating the project QC Plan.

The QC Plan may vary in length and requirements depending on the size, scope and nature of the project. For example, a small project with a limited scope of work and project deliverables will have a limited amount of quality review requirements. In this situation, a brief QC Plan or a more informal methodology (e.g., simply documenting the QA Review tasks completed) may be appropriate. However, in comparison, a larger project with numerous tasks and deliverables will have a much greater need for quality review. Therefore, the Project Manager must identify and plan for the required elements of quality control that are necessary for the project. For a project with a larger scope, a QC Plan will be formally documented and maintained. Other tools may be used by a Project Manager to define the QC elements, as appropriate for a project. For example, a Project Management Plan may serve a dual purpose as the QC Plan if properly developed and executed.

A QC Plan template is provided in Appendix A. A QC Plan should include the following elements, as applicable, for the project:

1. Project identification (client, project title, work order number, location).
2. Wenck Project Team and QA Team Members (name and project role, including supervisory and management personnel and sub-consultants).
3. Client Project Team (name and project role, including other consultants and contractors working on the project).
4. Brief of engineering agreement.
5. Client objectives.
6. Wenck project scope and schedule.
7. Work plan (work assignments and schedules, etc.).
8. Project communication procedures (lines of communications between all parties, distribution requirements for letters, telephone memos, technical information exchange, etc.).
9. Client reviews (what and when) and client review meetings (purpose, dates scheduled, participants, location).
10. Review of subcontractor work (with assignment of Wenck personnel responsible for technical control and contract administration of such work).
11. Wenck project review meetings (purpose, scheduled, participants, location).

12. Review and checking procedures (procedures to be followed and any special project requirements), and how these will be documented for the project (e.g., use of a QA Review Documentation form).
13. Technical guidelines and standards (required standards/guidelines and/or any special or unusual standards/guidelines to be followed). A detailed list of all standards, codes, etc., to be followed need not be presented in the QC Plan provided these are established elsewhere (e.g., in project design criteria in the case of design projects) and clearly defined in the QC Plan as to where these are identified and listed.
14. Project Manager requirements for approval of project deliverables prior to their submittal to the client and/or other parties (e.g., regulatory agencies, other contractors or consultants, etc.).
15. Project filing and records retention requirements for project documents (both paper and electronic). Define any special retention requirements that are beyond the normal Wenck Records Management Policy. Define if/how project notes, draft documents, etc. should be filed and/or retained.

If a special technical or management quality control program is required, it should be identified in the project QC Plan but detailed elsewhere. For example, a special program may be necessary in the following circumstances:

Project with a non-typical client.

- Unusual terms and conditions of agreement.
- Use of new (innovative or alternative) technology.
- Significant level of subcontracted effort or a joint venture.

The Project Quality Control Plan should be shared with the Project Team during the project orientation (project "kick off") meeting.

4.0 Quality Expectations & Accountability

Meeting QA/QC requirements for a project is the responsibility of the Project Manager *and* each Project Team Member. Quality of work must take precedence from the beginning of the project through the final deliverable. The expectations for quality at Wenck are defined below.

A QA Review Documentation Template is provided in Appendix B to document that QA review has been adequately completed for a project.

4.1 PROPOSAL MANAGER EXPECTATIONS

- Work with the designated Project Team and QA Team Members (including the Project Manager, if different) to adequately define and plan for QA/QC in the project scope, budget, and schedule during the proposal stage.
- Follow the Wenck "Marketing and Proposal Process".
- Follow the Wenck Associates Governance Plan regarding levels of authority for review and approval of corporate commitments.
- Coordinate and ensure completion of QA review of the Proposal prior to submittal to a client.

4.2 PROJECT MANAGER EXPECTATIONS

- Follow the elements of quality control defined in this Corporate QA/QC Policy, specifically Section 2.0.
- Review and understand the project proposal scope, budget and schedule for both Project Team Members and QA Team Members.
- Prepare a QC Plan for the project. The complexity of the QC Plan will be based on the size and scope of the project.
- Clearly communicate project scope, schedule, and budget to the Project Team Members.
- Clearly communicate QA/QC expectations and roles to Project Team Members.
- Clearly communicate with the Client, Project Team and the QA Team throughout project implementation as to any changes in scope, schedule or budget.
    - Discuss with the client any issues that may not have been well understood at project kick-off but that affect scope. This is especially true for issues of safety or code compliance. Any issues involving scope of necessity also involve fees.
    - Define and communicate with the Client what the preliminary draft, draft, draft-final and final deliverables will be, and clearly set the expectations for the preliminary draft, draft, and draft-final deliverables.
    - Provide encouragement/motivation not only for the Project Team to complete tasks on time but for the Client to send information or approve deliverables at scheduled milestones. Both the Project Team and the Client are responsible for completing a project on schedule; it is the responsibility of the Project Manager to identify and help resolve any critical path issues.

- Coordinate and ensure completion of QA review. *QA review cannot be omitted from a project scope due to problems with project budget or schedule.*
- Define who has final authority for accepting edits and changes.
- Perform final checks of project deliverables prior to submittal to the client.
- Document the completion of QA review for the project.
- Complete project documentation and records retention for project files (electronic and paper). Document the completion of QA review for the project.

4.3 PROJECT TEAM MEMBER EXPECTATIONS

- Plan for and allow enough time for internal review of work products by Project Manager or QA Team prior to due date.
- Review your own work for accuracy and completeness prior to providing to others on the Project Team for review. Do not rely on others to identify errors that you may know are present in your work product.
- Clearly communicate project progress to the Project Manager, and steps taken to ensure quality of work items.
- Clearly communicate project related questions or concerns with the Project Manager related to project scope, schedule, and budget.
- Work with the QA Team to clarify and resolve review findings.
- Support the project documentation and filing systems (electronic and paper), including supporting QC/QC documentation, as established for the project by the Project Manager.

4.4 QA TEAM MEMBER AND QA MANAGER EXPECTATIONS

- Work with the Project Manager to define expectations for QA review of project tasks and deliverables, including scheduling and who will direct the work.
- Complete thorough QA review of deliverables. Be honest and clear in edits or suggestions that improve the deliverable.
- Clearly communicate QA progress to the Project Manager and Project Team Members.
- Clearly communicate project related questions or concerns with the Project Manager related to project scope, schedule and/or budget.
- Work to resolve any questions or concerns from the Project Manager and/or Project Team Members regarding any review findings.
- Support the project documentation and filing systems (electronic and paper), including supporting QA/QC documentation, as established for the project by the Project Manager.

4.5 ACCOUNTABILITY

All Project Managers and Project Team Members will be held accountable for QA/QC of project work.

Project Managers should adequately document the QC Plan for a project, as applicable based on the size and scope of the project. A QC Plan Template is provided in Appendix A for use. In addition, Project Managers should clearly document that QA review has been completed for all projects, regardless of the size or scope of the project. A QA review Documentation template is provided in Appendix B. Either this template, or another adequate form of documentation, should be used. This documentation should be maintained in the project folder (either paper files or electronic files).

Project Managers may be requested by their direct supervisor or manager, or by their facilitator during performance reviews, to show documentation of QC Plans and/or QA review completion for a project. If any concerns regarding quality are raised to the Wenck Leadership by peers and/or clients, Wenck Leadership may request this documentation from a Project Manager. Project Managers will be held accountable for any quality issues depending on the project situation and severity, and if warranted, will be removed from the project.

Project Team Members are responsible for delivering quality work projects to their Project Managers and the QA Team for review. Project Team Members should review and check their own work on an ongoing basis throughout the project, as appropriate for the specific task and deliverable for which they are responsible. Project Team Members should work with their QA Team to discuss and resolve any comments or technical issues found during QA review, and use the feedback as an opportunity to learn from and develop in their technical skills and areas of expertise. If quality issues continue over time and/or are routinely repeated, the Project Team Member may be removed from the project by the Project Manager as warranted.

5.0 Employee Acknowledgement

I hereby acknowledge that I have read and understand the Corporate Quality Assurance and Quality Control Policy for the Wenck Enterprise. I understand that it is my responsibility to follow the requirements of this QA/QC Policy and that I will be held accountable to them. I further understand that the contents of this Policy are subject to change but employees will be advised of any changes. If I do not understand any provision of the Policy, I shall contact my facilitator or the Technical Services Director for clarification.

Employee Signature: _____

Print Name: _____ Date: _____

NOTE: Employees will be required to acknowledge receipt of the QA/QC Policy (via electronic PDF) by signing this acknowledgement.

THIS COPY TO REMAIN IN THE POLICY

Appendix A

QC Plan Template

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QUALITY CONTROL PLAN

PROJECT NO.: **CLIENT:**

PROJECT START DATE: **PROJECT MANAGER:**

PROJECT DESCRIPTION:

OTHER PROJECT INFORMATION: [Note other information as applicable; e.g., work order number, Wenck office location, etc.]

I. PROJECT OVERVIEW

BRIEF OF ENGINEERING AGREEMENT: [Define]

CLIENT OBJECTIVES: [Define]

KEY DELIVERABLES AND DUE DATES: [Define]

II. PROJECT TEAM

WENCK PROJECT & QA TEAM MEMBER	WENCK SUPERVISOR / MANAGER	PROJECT ROLE
[Name]	[Name]	[Define]

WENCK SUBCONTRACTORS	PROJECT ROLE
[Name, Company]	[Define]

CLIENT PROJECT TEAM (INCLUDING OTHER CONSULTANTS/CONTRACTORS)	PROJECT ROLE
[Name, Company]	[Define]

III. PROJECT COMMUNICATION

[Define communication procedures: lines of communication between all parties, distribution requirements for letters, memos, technical information exchange, etc.]

IV. PROJECT WORKPLAN

Define specific tasks/deliverables and schedules/due dates for Wenck Project Team Members (including QA Team Members). Define Client review schedules/due dates for deliverables as well. This information could be provided in other formats, such as Bar or Gantt Charts, Critical Path Method Schedules, or Wall Schedules.

PERSON RESPONSIBLE	SPECIFIC TASKS /DELIVERABLES	SCHEDULES / DUE DATES
[Name]	[LIST]	[Define]

SUBCONTRACTOR WORK REVIEW: [Define subcontractor work and assignment of Wenck Project Team Members responsible for technical control and contract administration of such work.]

PROJECT MANAGER APPROVAL OF DELIVERABLES: [Define the Project Manager requirements for approval of deliverables prior to their submittal to client and/or other parties (e.g., regulatory agencies, other contractors or consultants, etc.)]

V. PROJECT MEETINGS

INTERNAL PROJECT MEETINGS

DATE/TIME	LOCATION	PURPOSE	ATTENDEES

CLIENT MEETINGS

DATE/TIME	LOCATION	PURPOSE	ATTENDEES

VI. QA REVIEW PROCEDURES

PROCEDURES TO FOLLOW: [Define procedures to be followed and any special Project requirements. Define how these will be documented for the project. Define if there will be a QA Checklist used for the project.]

VII. TECHNICAL STANDARDS OR GUIDELINES

TECHNIAL STANDARDS OR GUIDELINES TO FOLLOW: [Define required technical standards/ guidelines and/or any special or unusual standards/guidelines to be followed. A detailed list of all standards, codes, etc. to be followed need not be presented herein provided these are established elsewhere (e.g., in project design criteria in the case of design projects) and clearly and clearly defined herein as to where these are identified and listed.]

VIII. PROJECT FILING AND RECORDS RETENTION

[Define Project filing and records retention requirements for project documents (both paper and electronic). Define any special retention requirements that are beyond the normal Wenck Records Management Policy. Define if/how project notes, draft documents, etc. should be filed and/or retained.]

Appendix B

QA Review Documentation Template

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QA REVIEW DOCUMENTATION

PROJECT NO.: **CLIENT:**

PROJECT START DATE: **PROJECT MANAGER:**

PROJECT DESCRIPTION:

I. DOCUMENTATION OF COMPLETION OF QA REVIEW

TASK/DELIVERABLE	QA TEAM MEMBER	DATE REVIEW COMPLETED	PM OR QA MANAGER REVIEW COMPLETED*	COMMENTS
[List]	[Name]	[Date]	[Initial, Date]	[Define]

**PM or QA Manager shall initial/date when their review is completed. If not applicable or not completed, state "N/A" or "No" and provide explanation in comments.*

II. ADDITIONAL COMMENTS