Yazoo Hydroelectric Project

Project Management and Design Quality Control Plan

Report Status
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Distribution

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Vicksburg District

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Revision Log

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001	April 6, 2016	Draft for Rye Development Review
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1.0 Project Background and Description

1.1 Introduction

Rye Development LLC (Rye) team members generally apply the Quality Management (QM) Plan procedures set forth in CESPD R 1110-1-8 as applicable for A-E consulting firms, particularly Appendix C for Planning Studies and Appendix D for Engineering Studies. The Rye team will approach the review function using the same procedures that are employed by the U.S. Army Corps of Engineers (Corps), including Independent Technical Review (ITR) teams that are identified by the QM Managers specific to the type of work task and review requirements. With the combined expertise of available personnel on the team, we are able to field ITR teams that consist of qualified individuals according to the specific needs of the review effort.

The senior quality management team for the combined Yazoo projects will include [redacted] Rye QM Managers will be responsible for identifying the teams for each work task compiled from individuals that are independent and do not have either work responsibilities or supervisory responsibilities related to the review task. QM Managers will also be responsible for ensuring that Quality Control (QC) Certification (MLK comment - Quality Control Certification should be defined, or if it is defined in 1110-1-8 or later in this document, it should be so stated – the context indicates that QCC is a specific documented result flowing from the review)takes place. From the onset of each task order, the QM managers will identify a Review Team Leader, who will be responsible for developing a Quality Control Plan (QCP) for the work task. This QCP will include a statement of the plan objectives, a statement of the guidelines that will be followed for the review, a roster of the work team and review team members, a list of expected documents, a milestone list and schedule, and any deviations that are expected from typical or previously approved QCPs.

As the Project Developer, Rye will hold all external consultants to the same level of quality defined by this plan,. Consultants are expected to function as integral parts of both the design and engineering consulting team and the review team.

In addition to our ITR teams, Rye will establish a Board of Consultants (BOC) comprised of specialists in the design and construction of hydropower facilities, as well as the structural, geotechnical, and operational characteristics of earthfill dams similar to the Yazoo Projects. The BOC will help guide the design development beginning at the project initiation, ensuring project risks are clearly identified and addressed within the design analysis and documents, and the final designs and resulting constructed facilities represent the optimum configuration in terms of function, operation, safety, and constructability.

The Rye Team's quality assurance and control program is designed to:

- Actively include all levels of project management in the quality assurance and control program.

- Ensure that quality assurance and control is an integral part of the project and not simply an "end of job" review.
- Consider quality objectives and standards as equal or superior to budget and schedule considerations in all project management decisions.
- Ensure that developed scopes of work are technically complete and workable considering budgetary and scheduling constraints.
- Review adequacy of budgets and schedules for performing the work.
- Commit necessary resources to achieve the project objectives set by the Corps.
- Ensure frequent communication on progress of the work, problems, and accomplishments.
- Provide periodic review of project performance related to the planned schedule and budget goals.
- Confirm that project personnel with the proper credentials are preforming the work.
- Establish a quality assurance project plan for work on assignments that include field or laboratory investigations.
- Audit all work assignments. (MLK comment – this is not clear, what would the audit consist of?
- Assist personnel with appropriate training for work assignments.
- Ensure that all data and design inputs are scientifically valid, defensible, representative, and of known and acceptable precision and accuracy.
- Anticipate, identify, and avoid potential problems in completing the scope of work. (MLK comment – this sounds more like a PM function rather than a QM function).
- Require in-house peer review of work assignment performance.

The Rye Qualify Control Manager Team is comprised of a qualified group of very experienced professionals. The current QCM managers are as follows:

Table 1-1. Quality Control Managers

Quality Control Manager	Years' Experience	Responsible Field
[redacted]		

The Yazoo Hydroelectric Project consists of the Arkabutla Lake Hydroelectric Project (FERC Project No. 13704-002), Sardis Lake Hydroelectric Project (FERC Project No. 13701-002), Enid Lake Hydroelectric Project (FERC Project No. 13703-002), and the Grenada Lake Hydroelectric Project (FERC Project No. 13702-002). The proposed projects will be constructed at the Corps' existing Arkabutla, Sardis, Enid, and Grenada Dams located within the Yazoo River Basin in Mississippi.

In general, the four projects have a similar basic configuration consisting of a new powerhouse located adjacent to the discharge channel, generally about 200 to 300 feet downstream from the dam toe at each project. The existing intake structures will be used as the new powerhouse intake with a new penstock tied to the existing outlet works conduit. A new bifurcation chamber and gate structure will be constructed at the downstream end of the existing outlet conduit to control flows between the new powerhouse and the existing discharge channel.

A detailed description of the facilities is presented in the FERC license. The proposed powerhouse capacity and operating flows for each project are as follows:

- Arkabutla Lake Hydroelectric Project – two vertical Kaplan turbine-generator units with a combined capacity of 5.1 megawatts (MW). The project will operate in run-of-release mode from a minimum reservoir release flow of 50 cubic feet per second (cfs) to a maximum powerhouse flow of 1,400 cfs.
- Sardis Lake Hydroelectric Project – two vertical Kaplan turbine generator units with a combined installed capacity of 14.6 MW. The project will operate in a run-of-release mode from a minimum reservoir release flow of 300 cfs to a maximum powerhouse flow of 3,100 cfs.
- Enid Lake Hydroelectric Project – two vertical Kaplan turbine generator units with a combined capacity of 4.6 MW. The project will operate in a run-of-release mode from a minimum reservoir release flow of 50 cfs to a maximum powerhouse flow of 1,100 cfs.
- Grenada Lake Hydroelectric Project – two vertical Kaplan turbine generator units with a combined capacity of 9 MW. The project will operate in a run-of-release mode from a minimum reservoir release flow of 100 cfs to a maximum powerhouse flow of 2,250 cfs.

Rye plans to design and construct the Yazoo Projects in a programmed fashion ensuring effective utilization of project resources, flow management, and construction sequencing between each individual project. The similar project configurations will be used to streamline the facility layout and design to optimize construction efficiency.

2.0 Design Management Overview

2.1 Management Philosophy

Quality Assurance and Quality Control are given a very high priority at Rye. We are committed to assuring a high quality of service and products at every level of the team and every aspect of each task order. Our internal Quality Assurance and Quality Control (QA/QC) procedures, are consistent with the requirements and recommendations described in ER 1110-1-12 (Quality Management), and ER 1110-2-1150 (Engineering and Design for Civil Works Projects). We tailor our QA/QC plans to meet the Corps requirements as outlined within this plan.

2.2 Management Approach

The Rye management approach to ensuring that quality control and quality assurance is integrated into each work task is summarized as follows:

1. Our quality control requirement is applied to all task orders, regardless of size.
2. Quality control consists of normal supervision, review by the project engineer, and independent or peer review at designated stages.
3. Quality control shall be a deliberate and documented process, and will be planned and carried out under the supervision of the project manager, from inception through completion.
4. When sub consultants are involved on the project, special arrangements shall be made to coordinate the sub consultants' Design Quality Assurance Plan with our quality control plans and efforts.

The Rye team's proposed program management organization and structure is shown in Figure 2- 1 (Team Management Plan). This figure identifies the Team's Program Manager, Project Team members, Quality Managers and our scheduling and timeline management, cost management, quality management and product preparation, review and finalization.

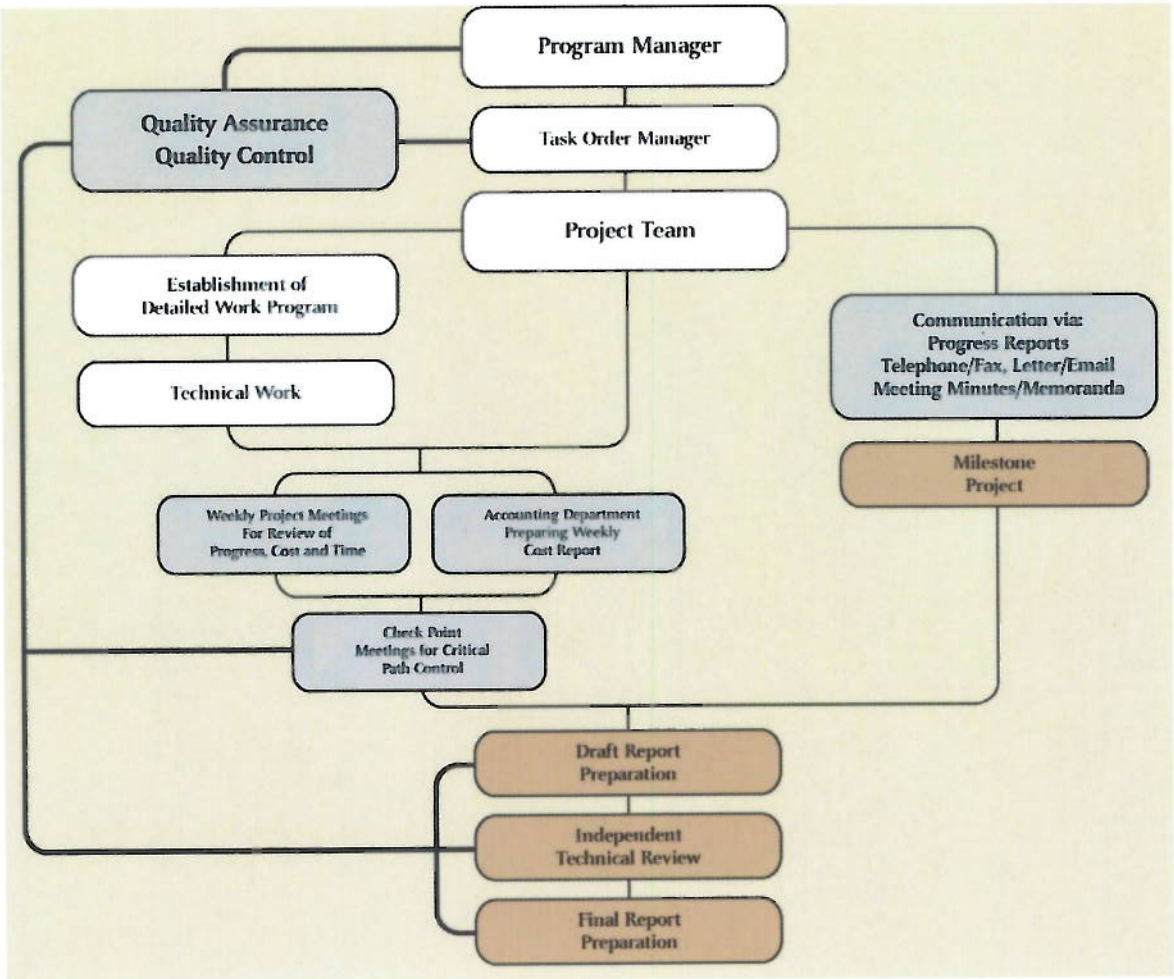


Figure 2-1. Team Management Plan

3.0 Project Team

3.1 Rye Development LLC Team

The Rye team members are presented in Table 3-1. It is anticipated that additional team members will be added to the Rye team from specialty consultants as the project development advances. The DQC plan and associated team directory will be updated to include the key team members from the specialty consulting companies.

Table 3-1. Rye Development LLC Team

Name	Position	Phone Number	Email
[redacted]			

3.2 Board of Consultants

In compliance with Article 304 of FERC license order issued December 28,2015 for all the four Yazoo projects, a board of consultants with extensive dam design and construction experience will be retained to review design as necessary. The board of consultants will be independent of Type II IEPR.

4.0 Project Communication

All communication will be coordinated through [redacted]. These communications include internal communication, contacts with client, consultants, and agencies; requests for data, meetings, or other information; and project documents (changes to scope/budget, meeting minutes, project memorandums and reports).

The intent of coordinating this communication is to reduce redundancy in discussing project issues and obtaining project information. Therefore, when direct contact between Rye team members and outside sources is required, it will not be restricted, except to keep [redacted] informed in advance of who will be contacted, and of the information gathered from outside sources.

4.1 Client Communications

Communications with the Corps, Vicksburg District will primarily be handled by [redacted].

4.2 Internal Communication

[redacted] will discuss project accomplishments to date, existing status, and upcoming work tasks with the Rye project team as needed.

4.3 Contract Changes

[redacted] is the only individual with authority to issue Contract Addendums, Change Orders, or contract document changes that impact the scope of the project.

4.4 Written Communication Correspondence

All written communication between team members will follow the Rye standard memorandum format. [redacted] will receive copies of all correspondence.

External correspondence will follow the Rye standard letter format. It will be signed by [redacted] or his designee.

4.5 E-mail Correspondence

All e-mail communication between team members will be saved and archived in the project electronic files at project closeout.

4.6 Documentation

Documentation of project communication shall be in accordance with Rye's Quality Assurance Procedures as outlined in the Quality Assurance/Quality Control Program.

4.7 Telephone Communications

Telephone communications of a significant nature will be documented on Rye's telephone conversation record form and placed in the project files.

4.8 Meetings

Meetings with the Corps will be scheduled in advance by Rye to support the project development.

4.9 Meeting Reports

Meeting reports will be prepared for significant meetings with the Corps and agencies. The Rye individual responsible for a meeting will ensure that the report is prepared. Any meeting, at which decisions are made, action items are assigned, or agreements reached must be documented. All actions will be noted in the meeting report.

4.10 Confidentiality

All information being collected or developed that designated as confidential is not to be released outside of Rye without approval of Ushakar Jha. All confidential information requested by outside sources will be carefully reviewed by [redacted] prior to release.

4.11 Filing of Correspondence

Each piece of written correspondence will be placed in the project file utilizing the established file system protocol.

5.1 Work Elements

As indicated previously, Rye will complete engineering analysis and prepare design documents for the Yazoo Projects which include:

- 5.1 MW hydroelectric facility at the existing Arkabutla Lake Project.
- 14 MW hydroelectric facility at the existing Sardis Lake Project.
- 4.6 MW hydroelectric facility at the existing Enid Lake Project.
- 9 MW hydroelectric facility at the existing Grenada Lake Project.

Construction plans and specifications, along with support documents, will be prepared and submitted to the Corps for review and comment at interim completion levels. The in-house independent technical review (ITR) process as described under Section 7 will also be conducted for each interim submittal.

5.1 Design Coordination Procedures

The design work tasks are organized and coordinated by the Design Project Manager and completed in a logical order in accordance with the project completion milestones. It is the project manager's responsibility to plan, organize, and control the project work to conform to the project scope, quality requirements, budget and overall schedule. The project engineer(s) working with the project manager is responsible for coordinating and supervising the various disciplines required to complete the project, disseminating project information, and coordinating the informal discussions between project design staff.

The project design will include the following deliverables:

- Design Criteria, Codes, and Standards
- 30 percent design
- 60 percent design
- 90 percent design
- 100 percent design

Each deliverable serves a specific objective and is distinguished by certain documents completed during that phase, as described in the following paragraphs. Successful execution of the project design requires systemic coordination and integration of many of the key activities in each design phase.

5.2 Design Criteria, Codes, and Standards

The design work effort will be initiated with the development of the design criteria, codes and standards which will set the basis for the design development. A design criteria report will be developed which clearly outlines the basis of design for all engineering disciplines as well as the

intended design approach, intended operation, existing available data, and supplemental information.

5.3 30 percent Design Development

The design development will be advanced with the completion of the design criteria report. The 30 percent work stage involves engineering computations and designs for the project advancing the conceptual design layouts for the project features. This phase of the work includes preparation of the engineering calculations, a set of preliminary engineering drawings, a design documentation report (DDR), and a technical specifications outline. Typical work elements completed for the 30 percent design include:

- Supplementary site survey data and geotechnical information, as required.
- Hydraulic analysis and calculations including computational fluid dynamics (CFD) modeling, if required.
- Drainage system layouts and calculations.
- Grading and drainage plans and major section cuts.
- Cross sections and details.
- Hydraulic profile and process flow diagram.
- Preliminary 30 percent design drawings including:
    - Plan, profile and section of the outlet conduit liner.
    - Plan and section of the bifurcation chamber.
    - Plan, profile, and section of the penstock.
    - Plan and section of the forebay structure.
    - Plans and sections of the powerhouse.
    - Plan, profile and section of the tailrace channel.
    - One line electrical drawing.
- Outline of the construction specifications.
- Approach for cofferdam and dewatering systems.
- Construction considerations.
- Draft DDR.
- Draft submittal register.

Typically, at the completion of the 30 percent design, the project layout and configuration is set and the detailed analysis of specific project elements will advance as part of the 60 percent design.

5.4 60 Percent Design Documents

The 60 percent design addresses the comments on the 30 percent design documents and advances the engineering analysis and details. Typical elements included in the 60 percent package include:

- Final geotechnical report.
- Final hydraulic profile and design criteria.
- Civil design details including excavation, sections, final grading, cofferdam and dewatering, drainage, and site utilities are defined.
- Structural engineering standard details and concrete outlines for all structures.
- Architectural code plans, along with powerhouse elevations.
- Mechanical schedules, standard details, and major equipment layouts, along with process flow diagrams.
- Electrical one line diagram, preliminary power plans, lighting plans, and electrical schedules.
- Updated submittal register.
- Preliminary technical specifications for all engineering disciplines.
- Updated DDR.
- Written response and back-check for comments on the 30 percent design documents.

5.5 90 percent Design Documents

At the 90 percent design completion level, all engineering design calculations are checked and drawings completed and cross-checked for all engineering disciplines. At this stage, the drawings and technical specifications are complete to a level of detail to support interdisciplinary coordination checking and a complete constructability review.

5.6 100 Percent Design Documents

The draft 100 percent completion stage follows the 90 percent design review and incorporates the internal, Corps, and outside agency reviewer's comments. At this stage, the contract documents are complete with signed approvals and engineers' registration seals as required by state law. The draft final submittal package consists of the following:

- Final DDR.
- Final contract drawings and specifications.
- Special design and engineering considerations for field personnel.
- Final submittal register.

Final back-check of all comments on the 90 percent design documents are complete and final construction documents ready for bid.

6.0 Schedule

The Rye team uses the Microsoft Project software for developing initial project schedules, and tracking and maintaining the schedule during the project. A weekly meeting of the Project Team facilitates monitoring the progress of the project very closely, and identifying any changes in project personnel or resources that may be required to meet project milestones and deliverable targets. It is the responsibility of Ushakar Jha to be aware of any issues that may affect the team's ability to meet project schedules. Timely review of intermediate products and deliverables by the Review Team also ensures that project schedules are met. As part of our established project planning process, the Team will develop detailed project schedules that identify task and milestone completion dates. Completion dates for individual tasks are constantly monitored and modifications are made when necessary.

The project team has the specialized expertise and depth of staffing to provide the complete range of anticipated services. The project team has the manpower, resources, experience, and management capabilities to respond quickly and competently to specific requests from the Vicksburg District. The team's experienced project manager and highly qualified, dedicated professional staff can ensure quality work, completed on schedule and within budget. The project team, supplemented with specialty consultants, has the capacity to readily perform the engineering tasks associated with the Yazoo Hydroelectric Projects by its qualified staff; active quality assurance programs, available equipment, planning tools, and standardized procedures developed during past projects.

A detailed schedule for the Yazoo Hydroelectric Project Development is attached in Appendix E. At the same time, Rye team would like to make USACE aware that this schedule is based on our estimate of having finalized design engineer and construction finances prior to June, 2016. Rye will provide USACE prior notice in case of any potential schedule modification.

7.0 Quality Control and Internal Technical Review

7.1 Independent Technical Review

Rye will perform an Independent Technical Review (ITR) of all design products at the 60%, 90%, and 100% stage of completion. As part of this Project Management and Design Quality Control Plan, Rye has developed a Quality Control (QC) Plan for the Yazoo Hydroelectric Projects. This QC Plan is enclosed as Appendix B. Included within this plan is the following:

- Title and description of the product under review.
- List of the names, disciplines, and firms of product team members.
- List of review team members (by corresponding discipline and firm).
- Schedule for performing the review(s).
- Reviewer qualifications/requirements.

Rye understands the ITR does not relieve the design team from performing design computation checks and other peer review that is standard practice. Our team will conduct internal QA/QC reviews of work products and support documentation in accordance with the QA/QC guidelines. The ITR shall focus on: compliance with engineering principles and procedures; appropriateness of design criteria and engineering assumptions; factors of safety; completeness of design and level of detail.

The ITR process shall document each review performed using the standard comment/response process in the Dr. Checks database. Documentation of the ITR will include the following:

- Comments prepared by each review team member as submitted to the product team.
- Responses to each review team comment as prepared by the product team.
- Indication of the final disposition of the review team comment including a back check by the reviewer that the document was revised correctly.
- Certification signed by the review team leader indicating the review is complete.

The ITR certification form will be provided electronically. All comments shall be addressed to the satisfaction of the review team, unless otherwise approved by the Corps, prior to submission or delivery of the final product. [redacted] will coordinate the incorporation of comments from the ITR and other reviews, to make revisions concurrently. Process questions that arise during the ITR shall be forwarded to the Vicksburg District Quality Control Manager. The District will perform Quality Assurance (QA) in conjunction with the QC performed by Rye to ensure that an independent review is accomplished and a quality product is prepared.

7.2 Vicksburg District Quality Assurance

Rye will respond to all comments using the Dr. Checks database made by the Quality Assurance, Agency Technical Review, and Safety Assurance Review teams.

7.3 Board of Consultants (BOC)

Rye will assemble a BOC as per FERC license order Article 304 which will provide technical oversight and guidance for the project. The BOC will be comprised of qualified independent engineering consultants with extensive experience in dam design and construction. **Rye has not identified BOC members at this time.**

8.0 Health and Safety

8.1 Assignments

All Rye employees and their team members shall protect themselves and their associates from injury or disease resulting from project activities. Rye employees shall carry out their assignments with the health and safety of those involved as their primary concern. All employees will follow the Corps Safety and Health Requirements Manual (EM 385-1-1) while working in the field. This manual may be found at the following Internet address:

http://www.usace.army.mil/SafetyandOccupationalHealth/SafetyandHealthRequirementsManual.aspx

If necessary, we will assign a Health and Safety Coordinator who will advise and assist Ushakar Jha to identify anticipated hazards, develop preventative actions, and communicate these hazards and actions to the project team. A Health and Safety checklist will be completed for the project and distributed to the project team.

8.2 Preventive Action

Rye will develop actions to be implemented during project activities, if required, to eliminate, or minimize, the exposure of the project team and other personnel to anticipated hazards. These may include specific

personnel project assignments, safety procedures, monitoring protocols, protective gear (hard hats, safety vests, safety glasses, ear protection, boots, etc.) and emergency and contingency plans and contacts.

Preventive actions include maintaining safe working areas, and exercising caution and safe working practices while in the field. Personnel will be equipped with first aid kits for all field visits. All field team members will be provided with appropriate emergency numbers as well as the location of the nearest emergency medical treatment facility at the start of each site visit. Other preventive measures may be implemented by Ushakar Jha as deemed necessary.

9.0 Project Administration

9.1 Drawing Requirements and Standards

The format and standards for the design drawings shall follow the Rye CAD standards. The drawing format, organization, and content shall be consistent with Corps standards to the extent possible.

9.2 Technical Specifications

The format and contents of the technical specifications shall follow the Rye standards, which are based on the Construction Specifications Institute (CSI) format.

9.3 Design Documentation Report

The format and contents of the design documentation report shall meet the FERC guidelines for a supporting design report, as well as the Corps standard DDR format and content.

9.4 Project Filing

Project files have been established for this project using the file control system shown in Appendix

D. There will be a single central project file. All official documents are to go into the project files. This includes items that are received as well as those sent. Examples include:

- All correspondence, both internal and external;
- Reports from all meetings where decisions are made or agreements are reached;
- Phone call records, faxes, and email; and
- Technical reports, memos and summaries.

9.5 Electronic Files

A subdirectory for the storage of all project electronic files has been set up for the project. Electronic files shall be maintained throughout the project design development.

Appendix A

Project Descriptions

Yazoo Hydropower Facilities

Project Descriptions

Introduction

On December 28, 2015, the Federal Energy Regulatory Commission (Commission or FERC) published an Order Issuing Original License for the construction and operation of the following four hydropower developments at the U.S. Army Corps of Engineers' (Corps') existing dams located on tributaries to the upper Yazoo River in Mississippi:

- The proposed 5.1-megawatt (MW) Arkabutla Lake Hydroelectric FERC Project No. 13704 (Arkabutla Lake Project) would be at river mile (RM) 86 on the Coldwater River in Tate and DeSoto Counties, Mississippi. The project would occupy 48.2 acres of federal land administered by the Corps.
- The proposed 14.6-MW Sardis Lake Hydroelectric FERC Project No. 13701 (Sardis Lake Project) would be at RM 69 on the Little Tallahatchie River in Panola County, Mississippi. The project would occupy 59 acres of federal land administered by the Corps.
- The proposed 4.6-MW Enid Lake Hydroelectric FERC Project No. 13703 (Enid Lake Project) would be at RM 14.5 on the Yocona River in Yalobusha County, Mississippi. The project would occupy 30 acres of federal land administered by the Corps.
- The proposed 9-MW Grenada Lake Hydroelectric FERC Project No. 13702 (Grenada Lake Project) would be at RM 47.3 on the Yalobusha River in Grenada County, Mississippi. The project would occupy 35.5 acres of federal land administered by the Corps.

Existing Facilities

The proposed projects, collectively referred to as the Yazoo Projects (or projects), would use existing outlet works at the Arkabutla, Sardis, Enid, and Grenada Lake dams. The dams are managed, maintained, and operated by the Corps as components of its Yazoo Basin Headwater Project.[1]

The Arkabutla, Sardis, Enid, and Grenada dams are earth-filled embankment dams each with a concrete-lined, uncontrolled spillway located near the end of the dam. The existing outlet works, passing through the dams, consist of an intake tower; a reinforced-concrete conduit;[2] regulating gates; a stilling basin; and an outlet channel.

Proposed Hydropower Facilities

At each project, FFP proposes to modify the Corps' existing outlet works as described below.

[1] The Corps' Yazoo Basin Headwater Project includes the Arkabutla dam, Sardis dam, Enid dam, and Grenada dam. The primary purpose of the headwater project is flood control.

[2] The outlet works at Enid dam contain two (northern and southern) conduits, while the other three dams have a single outlet conduit.

Arkabutla Lake Project

The proposed Arkabutla Lake Project would consist of the following new facilities: (1) a 325- foot-long, 15.5-foot-diameter, steel liner to be installed within the existing outlet conduit; (2) a 50-foot-long, 15.5-foot-wide, 25-foot-high, steel-lined concrete bifurcation chamber containing two gates that would be used to direct flow either to the Corps' existing outlet works or to a new forebay located on the downstream side of the dam adjacent to the existing outlet channel; (3) a 272-foot-long, 12-foot-diameter steel penstock leading from the bifurcation chamber to the forebay; (4) a 60-foot-wide, 50-foot-long, 83-foot-high, concrete forebay, containing a 54-foot- wide, 54-foot-high trashrack with 3-inch spacing and a 5-foot-wide, 30-foot-high, surface-release fish bypass outlet gate; (5) a 19-foot-long, 10-foot-wide, 10-foot-deep plunge pool below the fish bypass outlet gate; (6) an 80-foot-wide, 46-foot-long, concrete powerhouse, to be constructed adjacent to the outlet channel, containing two vertical Kaplan turbine-generator units with a combined installed capacity of 5.1 MW; (7) a 200-foot-long, 85-foot-wide tailrace; (8) a 1,574- foot-long, medium-voltage, buried transmission line connecting the powerhouse to a substation and (9) a 2,712-foot-long, 12.5-kilovolt (kV), overhead transmission line connecting the substation to a utility-owned distribution line.

Sardis Lake Project

The proposed Sardis Lake Project would consist of the following new facilities: (1) a 510-foot- long, 15.5-foot-diameter steel liner to be installed within the existing outlet conduit; (2) a 50-foot- long, 15.5-foot-wide, 20-foot-high, steel-lined concrete bifurcation chamber containing two gates that would be used to divert flow either to the Corps' existing outlet works or to a new forebay located on the downstream side of the dam adjacent to the existing outlet channel; (3) a 250-foot- long, 15.5-foot-diameter steel penstock leading from the bifurcation chamber to the forebay; (4) a 78-foot-wide, 50-foot-long, 102.6-foot-high, concrete forebay containing a 78-foot-wide, 60-foot- high trashrack with a 3-inch spacing and a 5-foot-wide, 41-foot-high, surface-release fish bypass outlet gate; (5) a 45-foot-long, 10-foot-wide, 10-foot-deep plunge pool below the fish bypass outlet gate; (6) a 120-foot-wide, 85-foot-long, concrete powerhouse, to be constructed adjacent to the outlet channel, containing two vertical Kaplan turbine-generator units with a combined installed capacity of 14.6 MW; (7) a 200-foot-long, 100-foot-wide tailrace; (8) an 887-foot-long, medium- voltage, buried transmission line connecting the powerhouse to a substation; and (9) a 6,210-foot- long, 161-kV, overhead transmission line connecting the substation to a utility-owned distribution line.

Enid Lake Project

The proposed Enid Lake Project would consist of the following new facilities: (1) a 320-foot- long, 10.25-foot-diameter, steel liner to be installed within the existing, northern outlet conduit;

(2) a 50-foot-long, 20-foot-wide, 20-foot-high, steel-lined concrete bifurcation chamber containing two hydraulically operated gates that would be used to divert flow either to the existing outlet channel or to a new forebay located downstream of the dam adjacent to the existing outlet channel;
(3) a 240-foot-long, 10-foot-diameter, steel penstock leading from the bifurcation chamber to the forebay;
(4) a 55-foot wide, 50-foot-long, 100-foot-high, concrete forebay containing a 55-foot- wide, 63-foot-high trashrack with 3-inch spacing and a 5-foot-wide, 38-foot-high, surface-release

fish bypass outlet gate; (5) a 37-foot-long, 10-foot-wide, 10-foot-deep plunge pool below the fish bypass outlet gate; (6) an 80-foot-wide, 50-foot-long, concrete powerhouse, to be constructed adjacent to the outlet channel, containing two vertical Kaplan turbine-generator units with a combined installed capacity of 4.6 MW; (7) a 150-foot-long, 75-foot-wide tailrace; (8) an 181- foot-long, medium-voltage, buried transmission line connecting the powerhouse to a substation; and (9) a 2,036-foot-long, 12.5-kV, overhead transmission line connecting the substation to a utility-owned distribution line.

Grenada Lake Project

The proposed Grenada Lake Project would consist of the following new facilities: (1) a 327.5- foot-long, 16-foot-diameter, steel liner to be installed within the existing outlet conduit; (2) a 50- foot-long, 16-foot-wide, 20-foot-high, steel-lined concrete bifurcation chamber containing two hydraulically operated gates that would be used to divert flow either to the existing outlet channel or to a new forebay located on the downstream side of the dam adjacent to the outlet channel; (3) a 260-foot-long, 14-foot-diameter, steel penstock; (4) a 78-foot wide, 50-foot-long, 86-foot-high, concrete forebay containing a 78-foot-wide, 48-foot-high trashrack with 3-inch spacing and a 5- foot-wide, 34-foot-high, surface-release fish bypass outlet gate; (5) a 35-foot-long, 10-foot-wide, 10-foot-deep plunge pool below the fish bypass outlet gate; (6) a 120-foot-wide, 60-foot-long, concrete powerhouse, to be constructed adjacent to the outlet channel, containing two vertical Kaplan turbine-generator units with a combined installed capacity of 9 MW; (7) a 150-foot-long, 70-foot-wide tailrace; (8) a 670-foot-long, medium-voltage, buried transmission line connecting the powerhouse to a substation; and (9) a 1,980-foot-long, 12.5-kV, overhead transmission line connecting the substation to a utility-owned distribution line.

Project Operation

The proposed hydroelectric projects would operate in a run-of-release mode, generating electricity using flows made available by the Corps that would otherwise pass each dam via the Corps' outlet facilities.[3] The Corps' current target minimum flow releases are 50 cubic feet per second (cfs) at Arkabutla and Enid dams, and 100 cfs at Sardis and Grenada dams.

The Corps currently releases flows and maintains lake elevations in accordance with the flood control rule curves in its Master Water Control Manual (Water Control Manual) for the Yazoo Basin Lakes (Corps, 2000). The Corps draws the lakes down in the fall and winter to provide storage for floods in the spring. The manual also provides for flood control and other benefits, including recreation, fish and wildlife, and incidental navigation. The minimum hydraulic capacity of the powerhouses (with one unit operating) would be 50 cfs at the Arkabutla and Enid Lake Projects, 300 cfs at the Sardis Lake Project, and 100 cfs at the Grenada Lake Project. The maximum hydraulic capacity of the powerhouses (with both units operating) would be 1,400 cfs at the Arkabutla Lake Project; 3,100 cfs at the Sardis Lake Project; 1,100 cfs at the Enid Lake Project; and 2,250 cfs at the Grenada Lake Project.

[3] Run-of-release operation would not alter water levels in the upstream impoundment or river flows downstream of the projects.

At each project, when flow releases are less than the minimum hydraulic capacity of the turbines, the turbines would shut down, and all flows would be routed through the new fish passage bypass outlet or the discharge gates to the stilling basin. When releases are between the minimum and maximum capacity of the turbine units, a minimum flow would pass through the fish passage bypass outlet, and the remainder would pass through the turbines. Flows in excess of the maximum hydraulic capacity of the turbine units would be passed through the new fish passage gate and the discharge gate. The proposed Arkabutla Lake, Sardis Lake, Enid Lake, and Grenada Lake Projects would generate about 19,000, 52,000, 17,700, and 31,000 megawatt-hours (MWh) per year, respectively.

Arkabutla Lake Hydroelectric Project

The proposed 5.1-megawatt (MW) Arkabutla Lake Hydroelectric Project (Arkabutla Lake Project) would be located at the U.S. Army Corps of Engineers' (Corps') existing Arkabutla dam on the Coldwater River near the town of Hernando, in Tate and DeSoto Counties, Mississippi (figure 2). The proposed Arkabutla Lake Project would occupy 48.2 acres of federal land administered by the Corps and would generate an average of about 19,000 megawatt-hours (MWh) of energy annually.

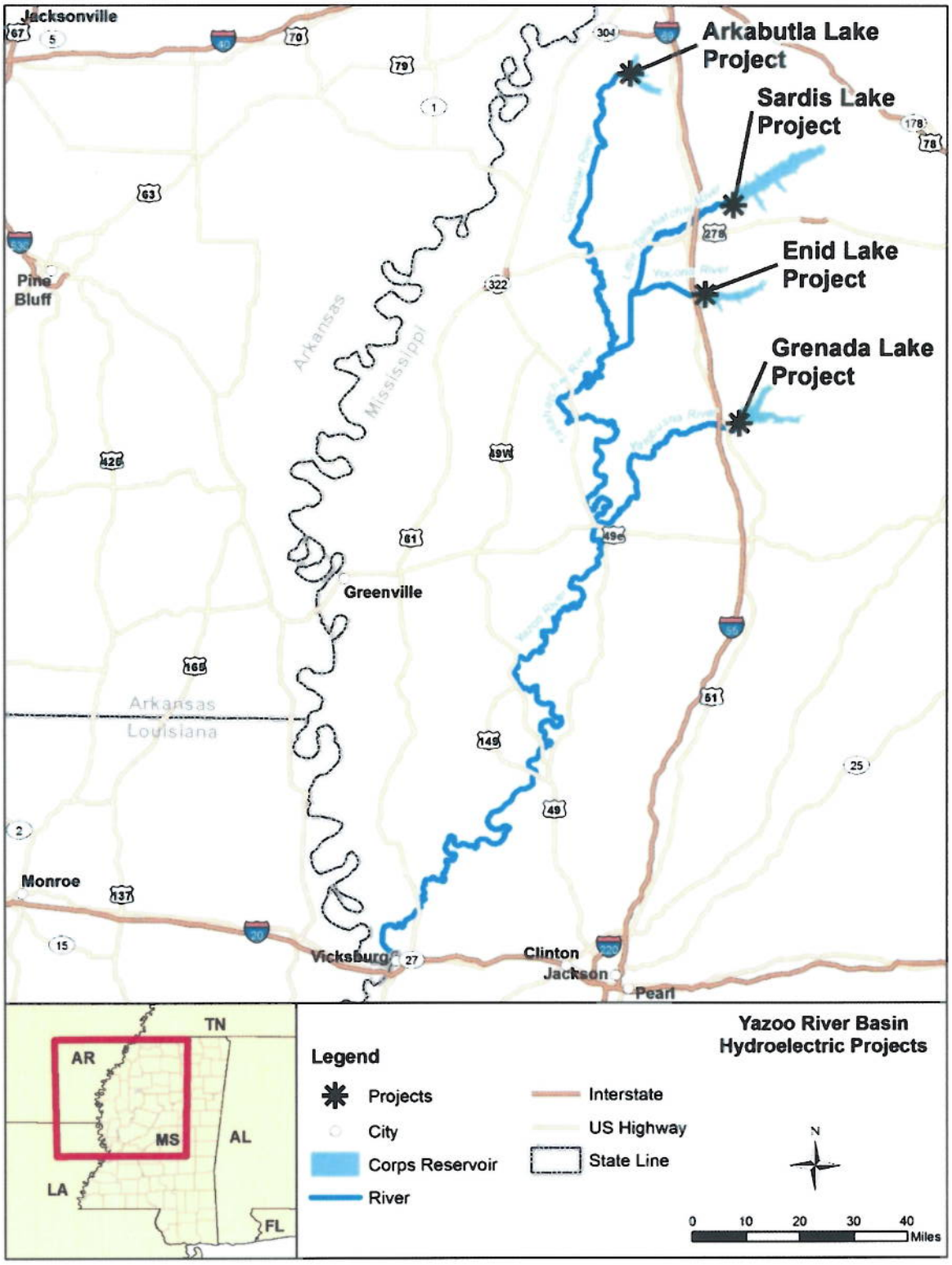


Figure 1. Proposed project locations in the Yazoo River Basin (Source: staff).

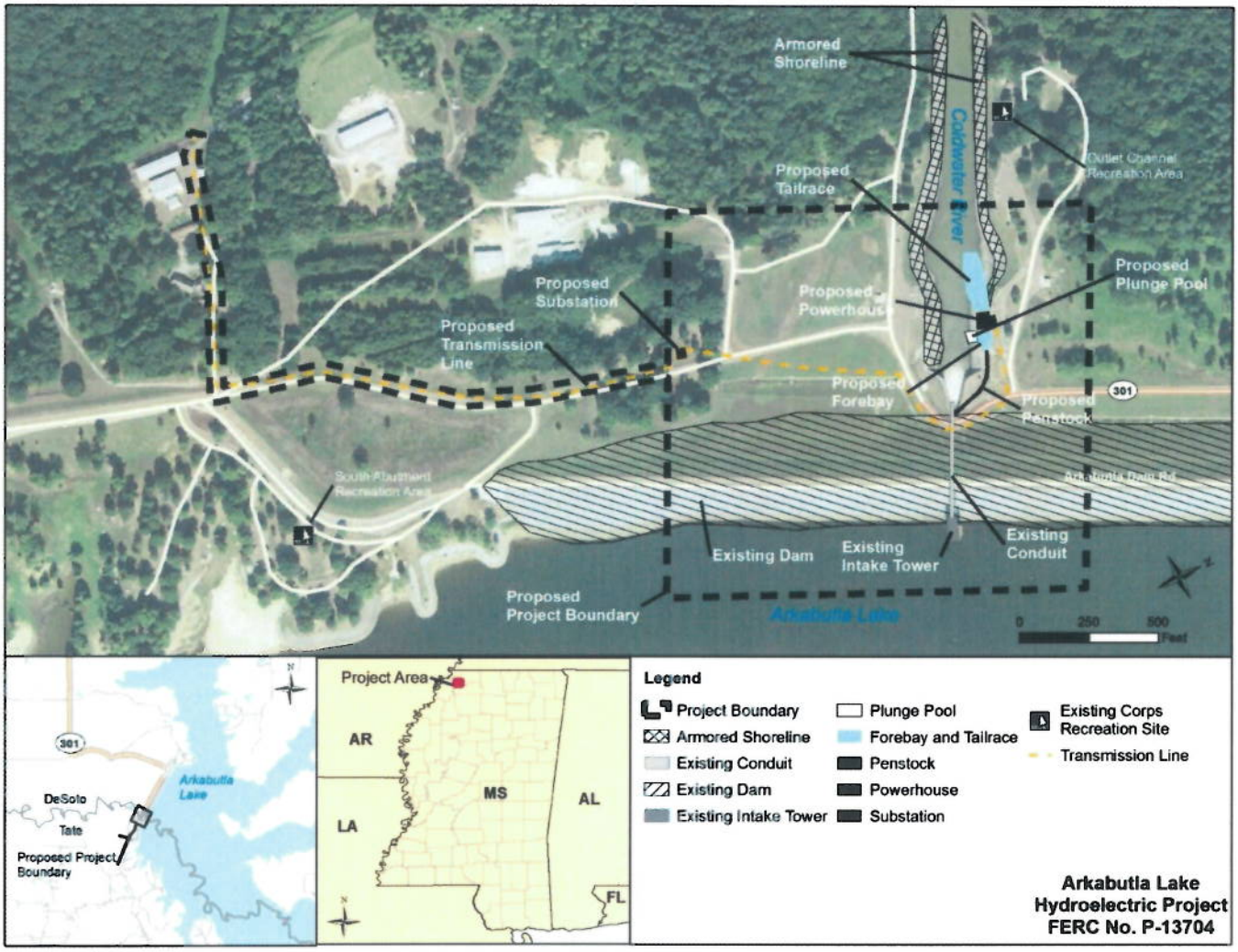


Figure 2. Proposed project facilities for the Arkabutla Lake Hydroelectric Project (Source: staff).

Sardis Lake Hydroelectric Project

The proposed 14.6-MW Sardis Lake Hydroelectric Project (Sardis Lake Project) would be located at the Corps' existing Sardis dam on the Little Tallahatchie River near the town of Sardis, in Panola County, Mississippi (figure 3). The proposed Sardis Lake Project would occupy 59 acres of federal land administered by the Corps and would generate an average of about 52,000 MWh of energy annually.

Enid Lake Hydroelectric Project

The proposed 4.6-MW Enid Lake Hydroelectric Project (Enid Lake Project) would be located at the Corps' existing Enid dam on the Yocona River near the town of Enid, in Yalobusha County, Mississippi (figure 4). The proposed Enid Lake Project would occupy 30 acres of federal land administered by the Corps and would generate an average of about 17,700 MWh of energy annually.

The proposed 9-MW Grenada Lake Hydroelectric Project (Grenada Lake Project) would be located at the Corps' existing Grenada dam on the Yalobusha River near the town of Grenada, in Grenada County, Mississippi (figure 5). The proposed Grenada Lake Project would occupy 35.5 acres of federal land administered by the Corps and would generate an average of about 31,000 MWh of energy annually.

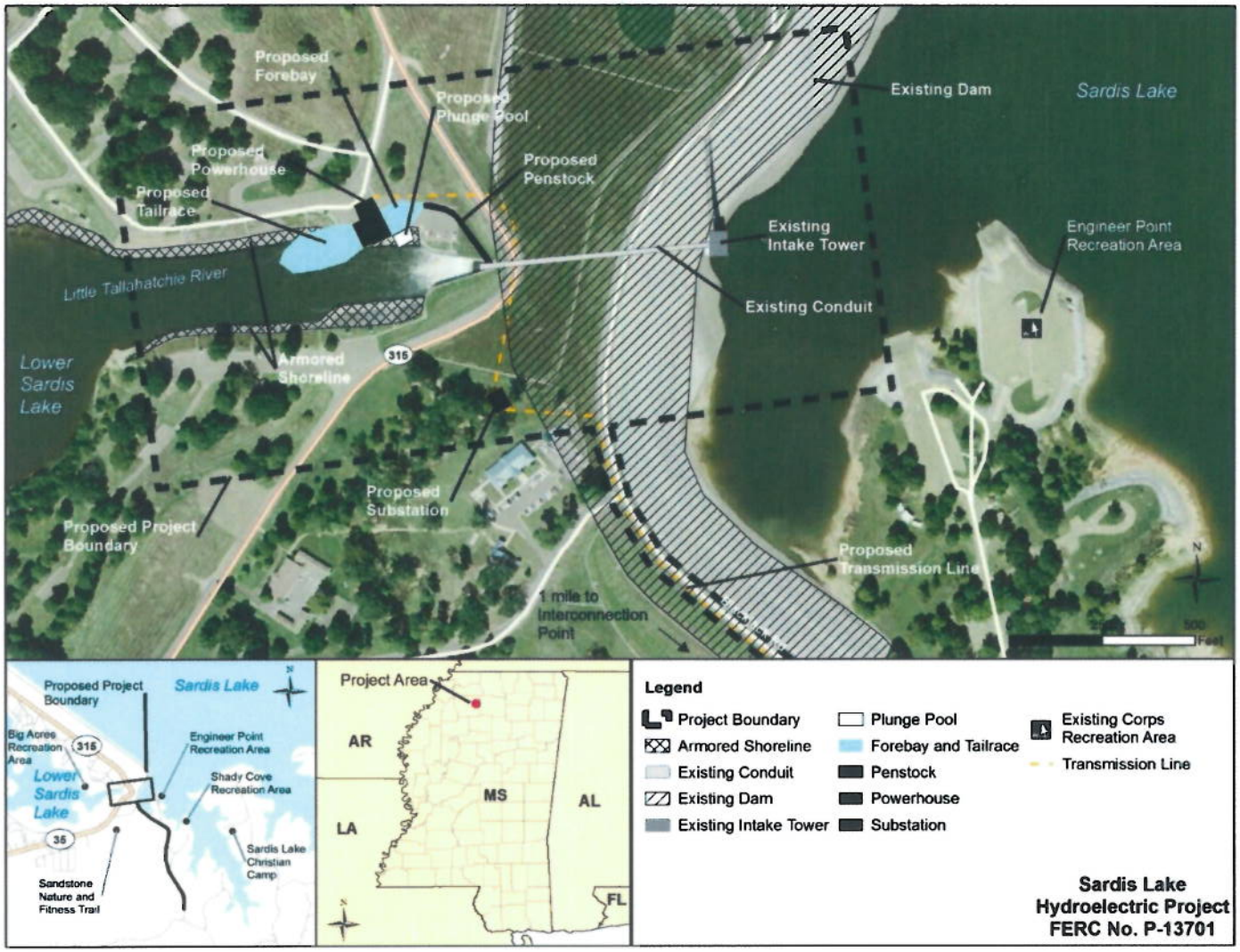


Figure 3. Proposed project facilities for the Sardis Lake Hydroelectric Project (Source: staff).

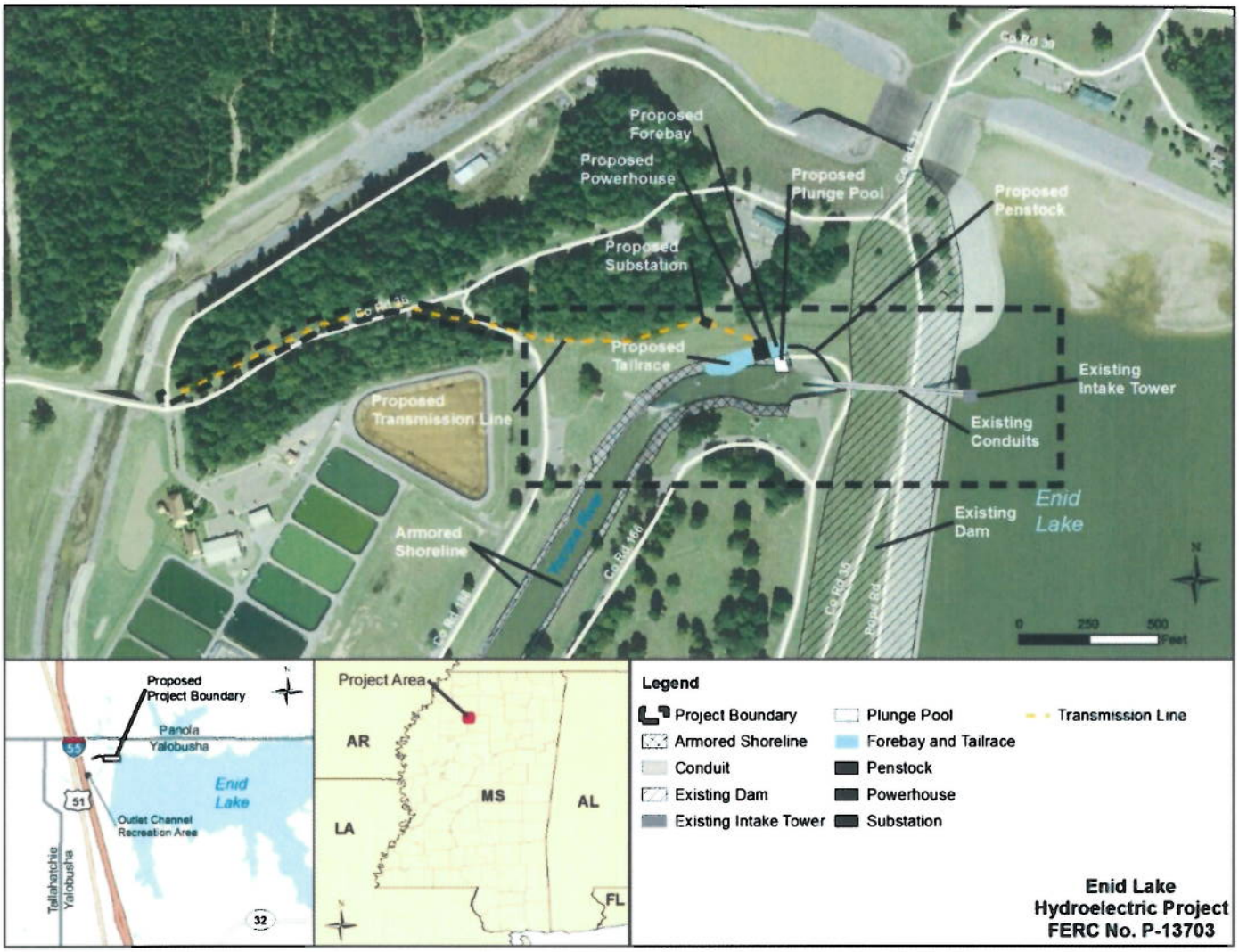


Figure 4. Proposed project facilities for the Enid Lake Hydroelectric Project (Source: staff).

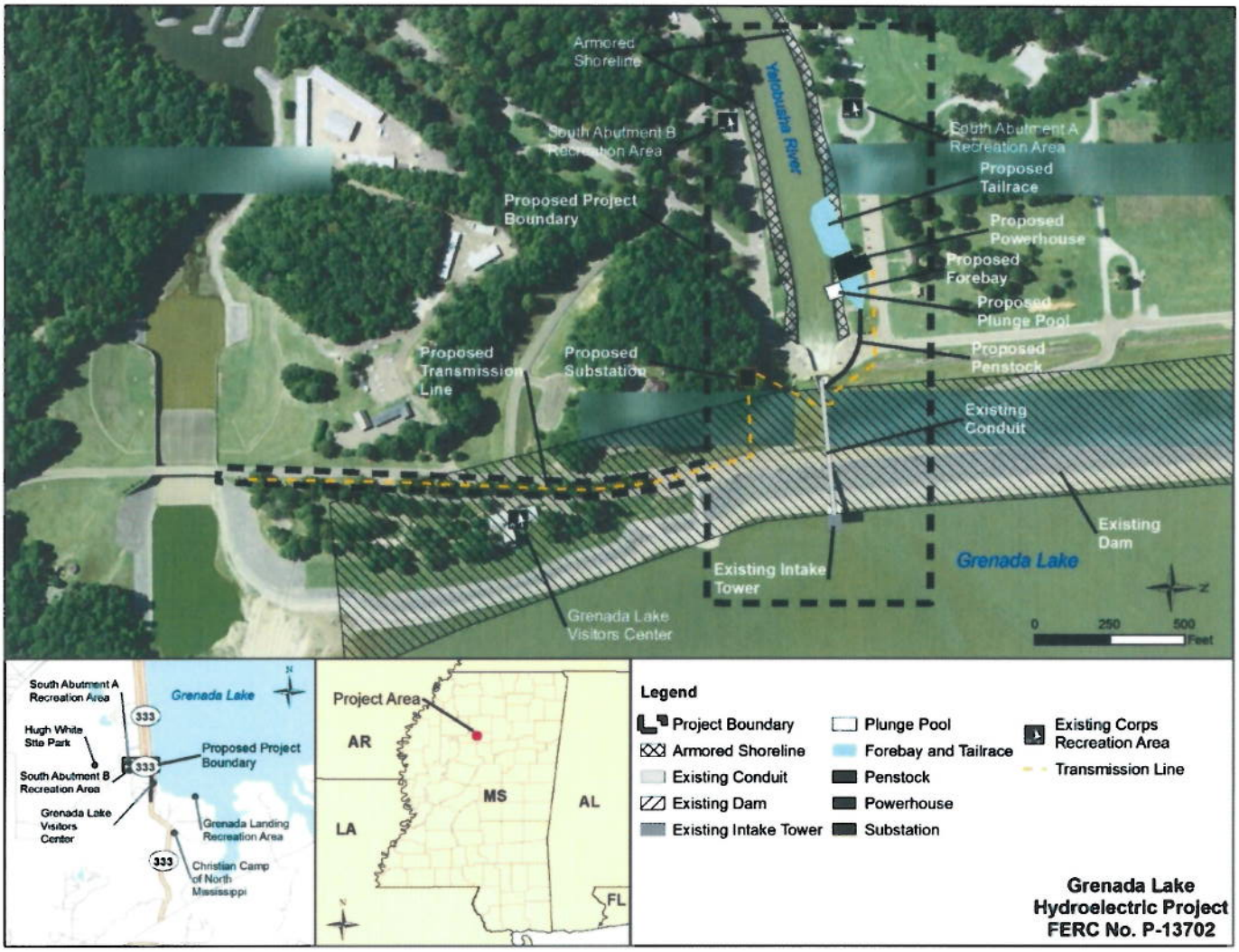


Figure 5. Proposed project facilities for the Grenada Lake Hydroelectric Project (Source: staff).

Appendix B

Quality Control Plan

ITR Quality Control Plan Yazoo Hydroelectric Projects

1. Purpose

This document summarizes the quality control features used in the completing the project engineering design and deliverables.

2. Applicability

This plan applies to completion of all deliverables with the project. The normal project internal design review and coordination by senior staff "checkers" shall be performed prior to and independent of the quality control measures outlined herein.

3. General

a. Type of Project: Design

b. Location: Yazoo Basin, Mississippi

c. Authorization: Memorandum of Understanding (MOU) between Rye Development LLC and the USACE, Vicksburg District

d. Project Description: See Project Management Plan Appendix A

e. Customer/Sponsor Name: Rye Development LLC

4. Project Development Team (Design/Study Team)

See Project Management Plan, Paragraph 3.3.

5. Contract and QC Budgets

Total Contract Budget: $_____

ITR Budget: $_____

See Project Management Plan, Appendix A, Scope of Work, for detailed project budgets.

6. Review Schedule and Major Product Milestones

See the Project Management Plan, Section 6, for detailed schedule and major product milestones.

7. Project Risk Analysis

No extensive risks are anticipated with this project.

PROJECT ITR QUALITY CONTROL PLAN WORKSHEET

PROJECT: Yazoo Hydroelectric Projects
JOB TITLE: Sardis Lake Hydroelectric Project
TYPE OF DOCUMENT:
DESCRIPTION/SCOPE:
DATE ITR COMPLETED:

MOU No.

Est. Const. Cost:

DATE QCP PREPARED:
QCP PREPARER:
ITR PERFORMED BY:
BUDGET FOR ITR: TBD
ACTUAL COST OF ITR: TBD

PROJECT DELIVERY TEAM			
NAME	GRADE	DISCIPLINE	COMPANY or OFFICE

INDEPENDENT TECHNICAL REVIEW TEAM				
NAME	GRADE	DISCIPLINE	COMPANY or OFFICE	Availability Sect Branch

MAJOR PRODUCT MILESTONES		IN-PROGRESS & FINAL REVIEWS	
ITEM (Kickoff, Deliverables, Advertise, Award)	DATE	ITEM (QC, BCOE, and ITR Reviews)	DATE
Notice to Proceed		Internal 30% Review	
Kickoff Meeting		60% ITR	
30% Design Complete		90% ITR	
60% Design Submittal		100% ITR	
100% Design Submittal			
Final Plans and Specifications			

District Approval by: _____

Filename:

_____

Review

Comments Project: Location:

___ Corps __ Rye __ ITR __BOC	Design Document ____D. Memo ___P&S ____ BCOE	Discipline ___Concept Arch. ___Prelim. Civil ___Final Mech/Elect. Struct.	REVIEW CONFERENCE A-comment accepted W-comment withdrawn (if neither, explain)	DESIGN OFFICE C-correction made (if not, explain)	Back Check By: (Initials)
Date:	Reviewer:	Telephone:			Page 4 of 46

Item No.	Drawing Sht. Spec. Para.	COMMENTS	Action taken on Comments by:
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			

Quality Assurance/Quality Control
Certification Form

Review Point: (Specify Percent of Completion)
30%, 60%, 90%, 100%

Project Number:

XXX

Project Description:

XXX

Staff:

Name	Position

In-House Discipline:

☒ Civil	☒ Mechanical	☐ Transportation
Hydraulics	Structural	Agricultural
Environmental	Permitting/Nat. Res.	Other:_____

Sub-consultants:

☒ Electrical	☐ Geotechnical	☐ Architecture
Survey	GIS	Traffic
Public Involvement	Other: Landscape Deign	

Work Products:

☒ Planning Report	☒ Cost Estimates	☒ Pre-design
☐ Plans and Specifications	☐ Open House Displays	☐ Meeting Minutes
Maps	Permits	Other:_____

Schedule: (Define Project Milestones and Reviews)

Date	Event

QA/QC:

Kick-Off Meeting

QA/QC Team: (Define QA/QC Team Members):

Name	Position

Certification:

_____ _____

Project Manager Date

_____ _____

Lead QA/QC , P.E. Date

_____ _____

QC Manager Date

Appendix C

Health and Safety Checklist – Design Phase

RYE DEVELOPMENT PROJECT SAFETY FORM

Date:	Proposal #:	PM: [redacted]
Client: U.S. Army Corps, Vicksburg	Project Name:	Sardis Lake Hydroelectric Project
Any Rye Development consultants on site?		

Check the Services to be Provided by Rye	X
In-Office	
Generate/Review/Edit Design Drawings	
Generate/Review/Edit Specifications, O&M Manual(s) or Technical Reports/Documents	
Coordinate/Arrange/Organize the Transfer or Communication of Data	
Not Applicable	
Other (explain)	
Out-of-Office / On-Site	
On-site observation	
Walk-through survey	
Data gathering	
Inspection	
Structural Condition Survey	
Not Applicable	
Other (explain)	

Check Potential Risks Rye Personnel May Encounter Completing This Project	X
Confined spaces or potential for engulfment	
Working at *elevated heights* or platforms	
Trenches or *excavations*	
Mobile machinery / other non-vehicle transportation	
Inadequate *ventilation*	
Exposure to *air contaminants*	
Exposure to excessive *noise*	
Vehicle *traffic*	
Working over or near a *waterway*	
Working near airplane *runway/taxiway*	
Contact with solid or liquid *chemicals/wastes*	
Biohazard/sewage/landfill wastes	
Radioactive material	
Non-ionizing *radiation* (includes sunburn)	
Asbestos	
Lead-based *paint*	
Electrical hazards other than office	
Facility equipment with *moving parts*	
Heat/Cold Stress	
Biological – snakes, poison ivy, bears	
Unrecognized safety risks to McMillen personnel	
Other (explain)	

Check the Best Description of the Project Location	X
Construction or demolition site	
Industrial facility	
Municipal water/wastewater facility or fluid transfer system	
Health care, justice facility or other commercial building	
Landfill or potential waste site	
Natural habitat site with minimal previous development	
Wilderness or remote locations	
Open waterway site	
Waste recovery/recycling facility/site	
Power generation facility/site	
Airport related site	
Research facility	
Federal government facility/site	
Known or highly suspected Hazardous Waste Site	
Track, roadway or other ground trans. thoroughfare	
Rail or highway bridge	
Non-ionizing radiation tower site or communications facility	
Not applicable	
Other (explain)	

Check Others Likely to be On-Site When Rye Personnel are On-Site	X
General contractor	
Client rep	
Equipment or material vendor	
Subcontractor	
Building or site owner or manager	
General public	
Municipal or utility employee	
Another A/E type firm	
Government regulator or inspector.	
Not applicable	
Others (explain)	

Special Notes

After this form is completed, discuss any conditions requiring safety clarification or compliance issues with the OSC & Corporate Safety. Place original in the project file with copy to OSC.

Revised: 01/24/01

MISCELLANEOUS

- Has the nearest medical facility been located?
- Do all employees have the proper PPE? (Hard Hats, Safety Glasses, Traffic Vests, Steel Toe Boots, etc.)
- Is a First Aid Kit available?
- Was Safety included in the project "kick off" meeting?
- All accidents require the completion of an Accident/Incident Investigation Report. (See your OSC)
- Complete a Potential Unsafe Conditions Report for all potentially (serious) unsafe conditions.

TRAFFIC SAFETY

- Follow the Traffic Control Plan. Read it!
- Never tamper, remove, or relocate signs/barricades.
- Notify local governing agency if closure of a lane will take place.
- File required permits with OSC.
- Flaggers must be properly trained. Verify in project briefing.
- Surveying vehicles must be equipped with a yellow revolving light.
- Advanced Signing is required if parked along roadway greater than two hours.
- All state/municipality and/or MUTCD guidelines should be reviewed prior to going into the field.

RAILROAD

- Employees must attend Rye Development roadway worker training annually and meet specific requirements of the railway client and carry Rye Development training wallet card.
- Always assume that a train or rail equipment might come at any time, from either direction.
- Identify the employee-in-charge. (Railroad provided)
- EIC must conduct a job briefing of on-track safety before any Rye Development employee fouls a track.
- Know method of on-track safety to be applied. EIC will tell you.
- Know designated place of safety where employees will clear for trains. Make sure everyone knows.

CONFINED SPACE ENTRY

- Is entry into the confined space necessary? If not, Do Not Enter. Plan for rescue before entering.
- Supervisor must approve permit before entry. Permit must be completed.
- Initial atmospheric testing must be done before entry.
- All team members must be formally trained.

BIOLOGICAL HAZARDS

- Identify all irritant and toxic plants at the project site. (Poison Ivy, Sumac)
- Use barrier creams when necessary.
- Use insect repellant containing DEET and promptly remove all ticks.

EXCAVATIONS

- Trenches more than 4 feet deep must have a means of exit every 25 feet of lateral travel.
- All trenches must have a designated "competent person."

- Trenches 5 feet or deeper must use sloping, shielding, or shoring to protect employees from cave-in.
- Trenches must be inspected by competent person daily or after conditions change.

STAIRWAYS & LADDERS

- A stairway or ladder must be provided at all points of access that have a break in elevation of 19 inches or more.
- Ladders must extend over the upper surface at least 3 feet.
- Only use ladders with an ANSI "1" or "1A" rating.

HEAT STRESS

- Maximize daily fluid intake.
- Take frequent rest breaks in a cool or shaded area.
- Workers should be as physically fit as possible.
- Check pulse, and work at pace to keep heart rate below 110 beats/min.

SITE SPECIFIC HAZARDS

- List any site specific hazards present and what precautions are being used to protect employees:
- _____
- _____
- _____
- _____
- _____
- _____
- _____
- _____
- _____
- _____

DOCUMENT REVIEWED BY:

Have all employees review this document when they arrive on site:

Reviewed by: **Date:**_____

_____

_____

_____

_____

BE SURE THE OFFICE OSC HAS A COPY OF THIS FORM

This list does not cover all federal, state, and county regulations to ensure a project site is in compliance.

Any questions concerning Health & Safety please feel free to contact the Project Manager, [redacted]

[redacted]

Appendix D

File Control System

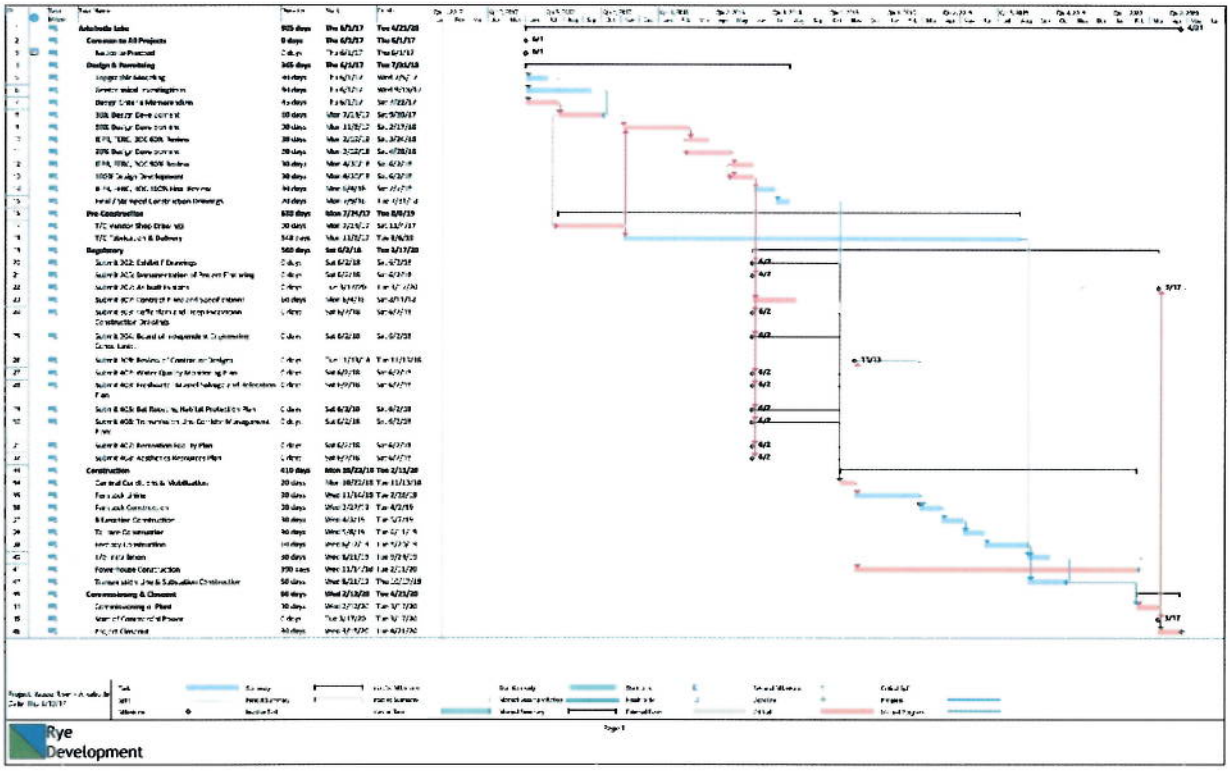
Preliminary Project File Directory

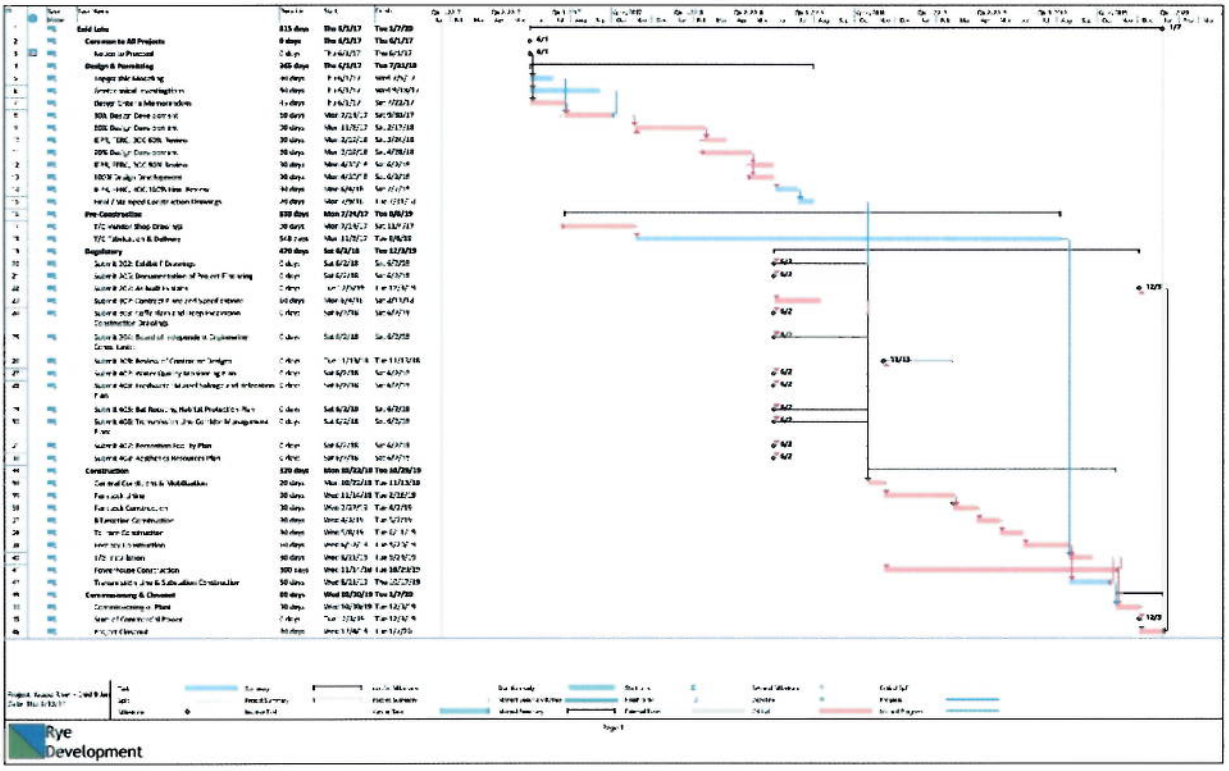
No.	Main Directory	Sub-directory
0.0	Contract	
1.0	Subcontracts	
2.0	Administration	
2.1		Workplan
2.2		Correspondence
2.3		Schedule
2.4		Progress Reports
2.5		Team Directory
3.0	Meetings	
3.1		Internal Meetings
3.2		USACE Meetings
3.3		Agency Meetings
4.0	Data Collection	
4.1		FERC License Applications
4.2		FERC License
4.3		EA
4.4		Sardis Lake
4.5		Arkabutla
4.6		Enid
4.7		Grenada
5.0	Reports	
5.1		Design Documentation Report
5.2		Other Reports
6.0	Plans and Specifications	
6.1		CAD
6.2		Design Standards and Codes
6.3		Civil Design
6.4		Architectural Design
6.5		Structural Design
6.6		Mechanical Design
6.7		Electrical Design
6.8		Instrumentation and Controls
6.9		Specifications
7.0	Memos	
7.1		Memorandums
7.2		Technical Memorandums
8.0	GIS	
9.0	Cost Estimates	
10.0	Photos (File by Date)	
11.0	Quality Control/Quality Assurance	
11.1		Project Management and Design Quality Control Manual
11.2		ITR Reviews
11.3		BOC Reviews
12.0	Construction	
13.0	Submittal Packages	
13.1		Design Criteria Report

No.	Main Directory	Sub-directory
13.2		30% Design Submittal
13.3		60% Design Submittal
13.4		90% Design Submittal
13.5		100% Design Submittal
13.6		Final Stamped/Signed

Appendix E

Schedule


Rye
Development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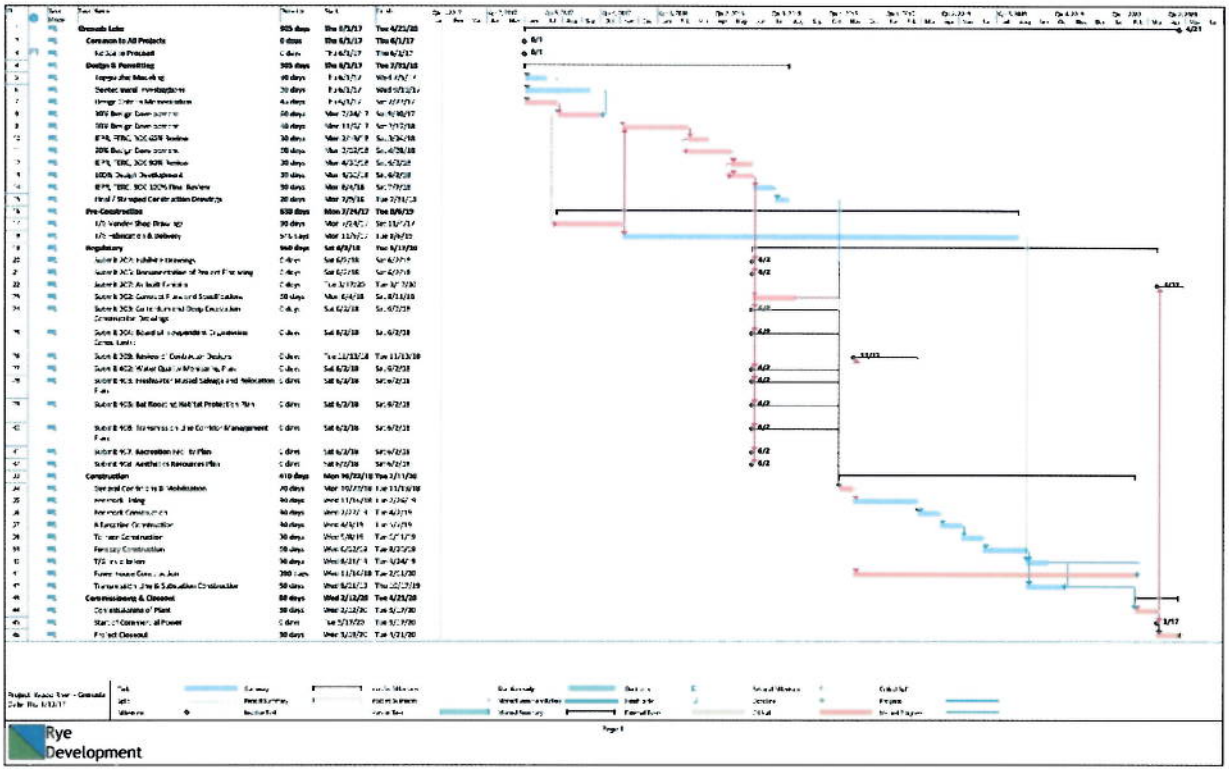
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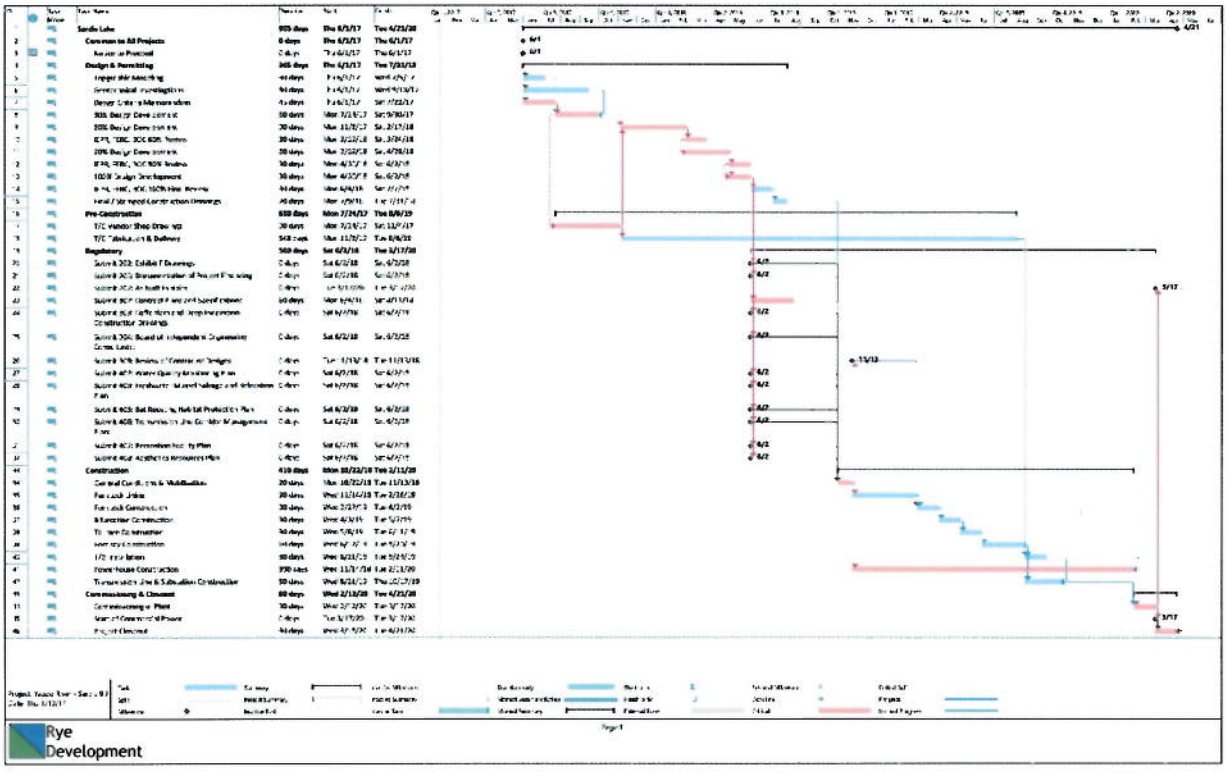
Development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Development