CITY OF DULUTH

REQUEST FOR PROPOSALS FOR

DESIGN SERVICES FOR WAABIZHESHIKANA: THE MARTEN TRAIL SEGMENT 7

RFP NUMBER 25-99767

ISSUED: OCTOBER 7, 2025

PROPOSALS DUE: NOVEMBER 7TH, 2025, 3:00PM CT

SUBMIT TO

CITY OF DULUTH
ATTN: PURCHASING DIVISION
CITY HALL, ROOM 120
411 WEST 1ST STREET
DULUTH, MN 55802

PART I – GENERAL INFORMATION

I-1. Project Overview. The City of Duluth is seeking a professional design firm to provide full professional Landscape Architectural and Civil Engineering design services for multi-use trail development of the Waabizheshikana: The Marten Trail Segment 7 from Perch Lake Landing, located at 12100 Hwy 23, westward to approximately 128th Avenue West, Duluth, MN 55808 (see Appendix B for a site map).

The scope of this project includes a topographic and existing conditions survey, wetland delineation, probable construction cost estimates, construction document preparation, permitting services, construction administration, development of Construction Quality Assurance Plan(s) for implementation of the designed improvements (see Part IV), and completion of necessary report preparation and coordination of environmental review to satisfy federal requirements.

Additional details are provided in **Part IV** of this RFP.

I-2. Calendar of Events. The City will make every effort to adhere to the following schedule:

Activity	Date
Pre-proposal Conference	Thursday October 16th, 2025, at 11am
Deadline to submit Questions via email to purchasing@duluthmn.gov	Wednesday October 22nd, 2025
Answers to questions will be posted to the City website no later than this date.	Thursday October 30th, 2025
Proposals must be received in the Purchasing Office by 3:00 PM on this date.	Friday November 7th, 2025

I-3. Rejection of Proposals. The City reserves the right, in its sole and complete discretion, to reject any and all proposals or cancel the request for proposals, at any time prior to the time a contract is fully executed, when it is in its best interests. The City is not liable for any costs the Responder incurs in preparation and submission of its proposal, in participating in the RFP process or in anticipation of award of the contract.

I-4. Pre-proposal Conference. The City will hold a **Strongly Recommended** pre-proposal conference at 11am on Thursday October 16th, 2025, as specified in the Calendar of Events. Interested proposers can attend via MS TEAMS through the link available at https://www.duluthmn.gov/purchasing/bids-requestfor-proposals/ or in-person at City Hall, 411 West 1st Street, Duluth, MN in the Lakeside Conference Room.

I-5. Questions & Answers. Any questions regarding this RFP must be submitted by e-mail to the Purchasing Office at purchasing@duluthmn.gov **no later than** the date indicated on the Calendar of Events. Answers to the questions will be posted as an Addendum to the RFP.

I-6. Addenda to the RFP. If the City deems it necessary to revise any part of this RFP before the proposal response date, the City will post an addendum to its website http://www.duluthmn.gov/purchasing/bids-request-for-proposals/. Although an e-mail notification will be sent, it is the Responder's responsibility to periodically check the website for any new information. Any addenda issued must be acknowledged on the Proposal Sheet attached as Appendix A.

I-7. Interviews/Demonstrations. The City reserves the right to request interviews or demonstrations.

I-8. Proposals. To be considered, hard copies of proposals must arrive at the City on or before the time and date specified in the RFP Calendar of Events. The City will not accept proposals via email or facsimile transmission. The City reserves the right to reject or to deduct evaluation points for late proposals.

Proposals must be signed by an authorized official. If the official signs the Proposal Cover Sheet attached as Appendix A, this requirement will be met. Proposals must remain valid for 60 days or until a contract is fully executed.

Please submit one (1) unbound paper copy of the Proposal and one (1) unbound paper copy of the Cost Proposal. The Cost Proposal should be in a separate sealed envelope.

All materials submitted in response to this RFP will become property of the City and will become public record after the evaluation process is completed and an award decision made.

I-9. Small Diverse Business Information. The City encourages participation by minority, women, and veteran-owned businesses as prime contractors, and encourages all prime contractors to make a significant commitment to use minority, women, veteran-owned and other disadvantaged business entities as subcontractors and suppliers**.** A list of certified Disadvantaged Business Enterprises is maintained by the Minnesota Unified Certification Program at http://mnucp.metc.state.mn.us/ .

I-10. Award. The agreement award will be based on the time and materials submitted in the proposal, but will be an hourly, not-to-exceed lump-sum agreement.

I-11. Term of Contract. The term of the contract will begin once the contract is fully executed and is anticipated to end by September 30, 2026. The selected Responder shall not start the performance of any work nor shall the City be liable to pay the

selected Responder for any service or work performed or expenses incurred before the contract is executed.

I-12. Agreement. The awarded proposer will be required to sign the agreement attached as Appendix F. Questions about the agreement should be submitted to purchasing@duluthmn.gov by the question deadline in the schedule above.

I-13. Prompt Payment of Subconsultants. Per MN Statute 471.425, Subd. 4a., Each contract of a municipality must require the prime contractor to pay any subcontractor within ten days of the prime contractor's receipt of payment from the municipality for undisputed services provided by the subcontractor. The contract must require the prime contractor to pay interest of 1-1/2 percent per month or any part of a month to the subcontractor on any undisputed amount not paid on time to the subcontractor. The minimum monthly interest penalty payment for an unpaid balance of $100 or more is $10. For an unpaid balance of less than $100, the prime contractor shall pay the actual penalty due to the subcontractor. A subcontractor who prevails in a civil action to collect interest penalties from a prime contractor must be awarded its costs and disbursements, including attorney's fees, incurred in bringing the action.

I-14. Mandatory Disclosures. By submitting a proposal, each responder understands, represents, and acknowledges that:

A. Their proposal has been developed by the Responder independently and has been submitted without collusion with and without agreement, understanding, or planned common course of action with any other vendor or suppliers of materials, supplies, equipment, or services described in the Request for Proposals, designed to limit independent bidding or competition, and that the contents of the proposal have not been communicated by the Bidder or its employees or agents to any person not an employee or agent of the Bidder.

B. There is no conflict of interest. A conflict of interest exists if a Responder has any interest that would actually conflict, or has the appearance of conflicting, in any manner or degree with the performance of work on the project. If there are potential conflicts, identify the municipalities, developers, and other public or private entities with whom your company is currently, or have been, employed and which may be affected.

C. It is not currently under suspension or debarment by the State of Minnesota, any other state or the federal government.

D. The company is either organized under Minnesota law or has a Certificate of Authority from the Minnesota Secretary of State to do business in Minnesota, in accordance with the requirements in M.S. 303.03.

I-15. Certification Regarding Lobbying. Funding for this project is provided by the Great Lakes Restoration Initiative with funding through the U.S. Environmental Protection Agency. The following certification is required for all contractors hired under this project. By submitting a proposal, each responder certifies, to the best of his or her knowledge and belief, that:

(1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

(2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

(3) The undersigned shall require that the language of this certification be included in the award documents for all sub-awards at all tiers (including sub-contracts, sub-grants, and contracts under grants, loans, and cooperative agreements) and that all sub-recipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, title 31 U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

I-16. Notification of Selection. Responders whose proposals are not selected will be notified in writing.

I-17. Payment. All compensation will be based on percentage of project completed and will not exceed the amount identified in the agreement. Weekly progress reports will be provided to the City and will include tracking of estimated percentage of overall project scope completed to date. Hourly task breakdown by employee is for evaluation purposes and does not imply that payment will be based on hours worked.

PART II – PROPOSAL REQUIREMENTS

Proposals not following the specified format or exceeding the page limit will not be reviewed. No additional sections or appendices are allowed. The delivered proposal shall be limited to 10 pages, excluding the front and back covers, the cover letter, and the cost proposal. This would be 10 single-sided 8.5" X 11" pages, 5 double-sided 8.5" X 11" pages, or a mixture thereof. The separate cost proposal can be an 11" X 17" sheet.

Proposers must submit a complete package in order to be considered. The submission package must include each of the sections below, in the following order.

II-1. Technical Proposal.

1. Proposal cover sheet (form provided in Appendix A).
2. Goals and Objectives: Restate *"your understanding"* of the goals and objectives, and the project tasks to demonstrate the responder's view and understanding of the project.
3. Experience: Describe the responder's background and experience with 3 similar projects. Project descriptions shall include a list of key staff and their role. Within the experience, the responder should demonstrate and provide proof of competency in the following areas:

    a. Multi-use trail development in constrained environments
    b. Producing accurate local market-based cost estimates

4. Personnel: Identify the personnel that will be conduct the project and detail their training and work experience. Clearly identify a single point of contact/overall as the project manager. Describe personnel qualifications to demonstrate ability to accurately and efficiently complete work for this project.

    The project team must include but not be limited to a licensed Landscape Architect and a licensed Civil Engineer.

    No change in personnel assigned to the project will be permitted without approval by the City.

    List whether or not the responder will be the sole consultant for the entire project. Include any sub-contractors who will be working with your firm on this project, their responsibilities, and a summary of applicable experience and qualifications.

5. Work Plan: Provide a detailed work plan identifying the tasks to be accomplished and the budget hours to be expended on each task. The work plan shall also identify the deliverables at key milestones in the project as well as any other services expected to be provided by the City.
6. Work Schedule: Provide an anticipated project schedule. The work schedule shall identify all key milestone dates. There is a strict completion date for all implementation of September 30, 2026, based on the funding source for this work. There is no possibility of extension.
7. References: Provide a minimum of three (3) non-City references including names, addresses, and telephone numbers, for whom the responder has performed similar services, and the reference can address past performance.
8. Byrd Anti-Lobbying Form: A signed Byrd-Anti Lobbying form which is attached to this RFP as Appendix E.

II-2. Cost Proposal. Provide, **in a separate sealed envelope**, one copy of the cost proposal clearly marked on the outside with "Cost Proposal" along with the responder's official business name and address. The terms of the proposal as stated must be valid for the length of the project.

The responder must also include a lump sum not-to-exceed total project cost, as well as subtotals for design services and bidding, and any sub-consultant fees. The cost proposal shall include all the following:

- A cover/transmittal letter.
- A subtotal of the contract cost for each task.
- A breakdown of the hours by task for each employee.
- Identification of anticipated direct expenses and rates for miscellaneous charges such as mileage and copies.
- Identification of any assumptions made while developing the cost proposal.
- Identification of any cost information related to additional services or tasks. Include this in the cost proposal but identify it as additional costs and do not make it part of the total project cost.
- The responder **must not** include any cost information within the body of the RFP technical proposal response.

PART III – CRITERIA FOR SELECTION

The proposals will be reviewed by City Staff. The intent of the selection process is to review proposals and make an award based upon qualifications as described therein. A 100-point scale will be used to create the final evaluation recommendations. The factors and weighting on which proposals will be judged are:

Qualifications and experience of the personnel and company	30%
Understanding of the project scope and work plan	25%
History of past work with the City of Duluth	25%
Cost to complete the project	20%

Proposals will be evaluated on a best value basis with 80% qualifications and 20% cost consideration. The review committee will not open the cost proposals until after the qualification points have been awarded.

PART IV – PROJECT DETAIL

IV-1. Project Scope. The City of Duluth is seeking a professional design firm to provide full professional Landscape Architectural and Civil Engineering design services multi-use trail development for Waabizheshikana: The Marten Trail Segment 7 from Perch Lake Landing, located at 12100 Hwy 23, westward to approximately 129th Avenue West, Duluth, MN 55808.

This project includes the following services:

1. Project Initiation: Site visits and other meetings as necessary with City staff.

2. Survey and Wetland Delineation: Complete survey of existing conditions with topographic detail, utilities, rights-of-way, property lines for adjacent private ownership, and wetland delineation services.

3. Permitting: Consultant to list in the RFP response any anticipated necessary permits (local, state, federal). Preparation and submission of any and all necessary permits shall be included in the scope of services provided. Permitting fees will be paid by the City of Duluth.

4. Market Rate Probable Cost Estimates: The consultant shall prepare a preliminary cost estimate for internal use for budgeting purposes with the preparation of the 30% design plans. Following the completion of the 60%, 90%, and final plans, cost estimates and quantity takeoffs shall be provided. Cost estimates must be based on local markets with at least 15% contingency.

5. Environmental Review: This project is federally funded by the Great Lakes Restoration Initiative. Therefore, an environmental review under the National Environmental Policy Act (NEPA) and the National Historic Preservation Act (NHPA Section 106) will be required for both sites. The consultant will prepare necessary report(s) and documentation as required for compliance with these Acts.

6. Production of Construction Plans and Specifications (including any necessary Special Provisions). Provide plan review sets to the City at 30%, 60%, 90% and Final CD for review and approval.

7. Development of Construction Quality Assurance Plan(s): The consultant shall prepare a Construction Quality Assurance Plan for the project for submission through the City for approval by the EPA for quality assurance specifications and processes that will be utilized during the implementation of designed access improvements. Guidance and detail of the requirements for Quality Assurance Project Plans are provided by the EPA (https://www.epa.gov/quality/epa-qar-5-epa-requirements-quality-assurance-project-plans). An additional guidance document is provided as Appendix C and an example is provided in Appendix D.

8. Bidding Assistance: The consultant will support the bidding phase as needed, including preparation of pre-bid meeting materials and addenda as necessary.

9. Construction Administration: The consultant will review contractor produced materials for conformance with the intent of the contract and proper integration with designs. The consultant shall include construction inspection, staking,

payment processing, documentation and recording, and final record of drawings. Assume 8 hours per week of on-site construction observation.

All work shall be performed in accordance with the most recent version of the City Standard Specifications and Engineering Guidelines (available on the City of Duluth website).

IV-2. Background. Waabizheshikana: The Marten Trail is envisioned to be a 10-mile multi-use, crushed limestone gravel trail along the waterfront of the St. Louis River. In 2019, a master plan for Waabizheshikana was adopted and trail development is guided by the plan, which is available on the City of Duluth website: https://duluthmn.gov/media/9110/website-version-of-wwft-1320.pdf (see page 63 for the recommendations described for Segment 7).

Segment 7 will connect Perch Lake Landing to Chambers Grove Park. MnDOT will be constructing roughly the western half of this segment during the Highway 23 roadway improvements project. Design services are needed to support implementation of the trail to connect the MnDOT constructed portion and Perch Lake Landing (see Appendix B for the site map).

In 2024, the City of Duluth was awarded a grant from the U.S. Environmental Protection Agency with funding through the Great Lakes Restoration Initiative to support public access improvements along the St. Louis River Estuary. Extensive habitat restoration and remediation along the Estuary supports new opportunities for education and recreation for communities, and improvements funded through this federal award are intended to reconnect communities to the St. Louis River. The design services procured under this request are supported by the grant.

PART V – APPENDICES

Appendix A: Proposal Cover Sheet – this form must be completed and returned with the proposal.
Appendix B: Site Map
Appendix C: Quality Oversight Guidance for Construction Implementation – this document contains additional guidance for Construction Quality Assurance Project Plans from the EPA.
Appendix D: EXAMPLE Construction Quality Assurance Plan – CQAP for Perch

Lake project

Appendix E: Byrd Anti-Lobbying Form

Appendix F: Professional Landscape Architectural Services Agreement

Appendix G: Grant Agreement

APPENDIX A - PROPOSAL COVER SHEET
CITY OF DULUTH
RFP# 25-99767

Bidder Information:	
Bidder Name	
Mailing Address	
Contact Person	
Contact Person's Phone Number	
Contact Person's E-Mail Address	
Federal ID Number	
Authorized Signature	
Name & Title of Authorized Signer	
Email of Authorized Signer	

ACKNOWLEDGMENT OF ADDENDA

ADDENDUM #	INITIAL/DATE
ADDENDUM #	INITIAL/DATE
ADDENDUM #	INITIAL/DATE
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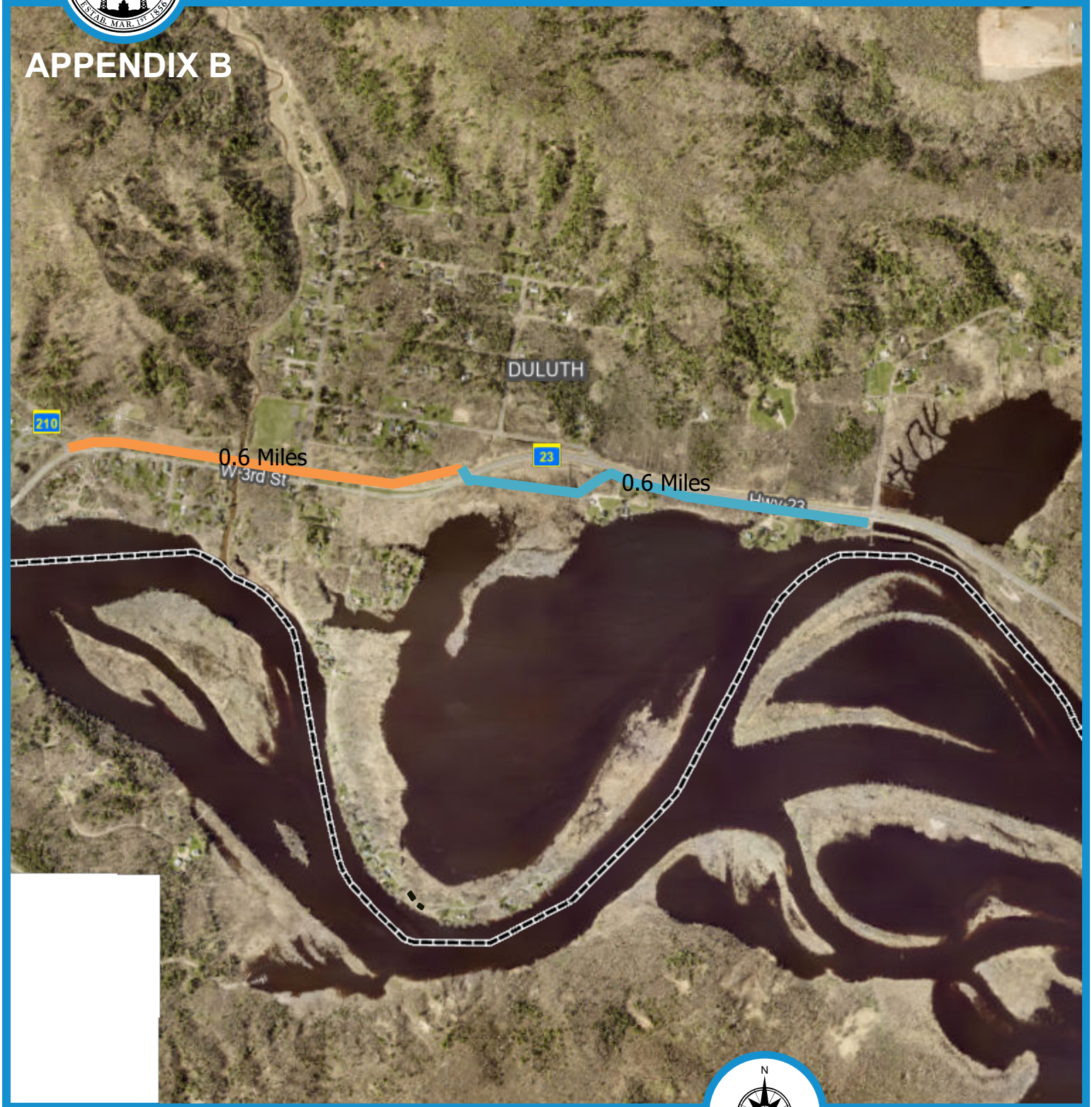
ADDENDUM #	INITIAL/DATE

County Land Explorer

St. Louis County, Minnesota

St. Louis County MN

APPENDIX B



Waabizheshikana Segment 7

To Be Constructed by MNDOT - HWY23

To Be Constructed by City of Duluth

N

0 0.1 0.2 0.4 0.6

mi

County Land Explorer

St. Louis County **www.stlouiscountymn.gov/explorer** Minnesota

Disclaimer

This is a compilation of records as they appear in the Saint Louis County Offices affecting the area shown. This drawing is to be used only for reference purposes and the County is not responsible for any inaccuracies herein

Map created using County Land Explorer
www.stlouiscountymn.gov/explorer

 Printed: 2/11/2025

APPENDIX C

United States Environmental Protection Agency | Office of Environmental Information Washington, DC 20460 | EPA/240/B-05/001 January 2005

Guidance on Quality Assurance for Environmental Technology Design, Construction, and Operation

EPA QA/G-11

FOREWORD

The U.S. Environmental Protection Agency (EPA) has developed an Agency-wide Quality System, which is authorized by EPA Order 5360.1 A2 (U.S. EPA, 2000a). The Order provides that all environmental programs performed by or directly for EPA are to be supported by individual quality systems that comply fully with the American National Standard *Specifications and Guidelines for Quality Systems for Environmental Data Collection and Environmental Technology Programs* [American National Standards Institute/American Society for Quality Control (ANSI/ASQC) E4-1994] (ANSI/ASQC, 1994). While previous guidance and requirements documents published by EPA have focused primarily on quality systems for environmental data collection, this *Guidance on Quality Assurance for Environmental Technology Design, Construction, and Operation* describes how to develop a quality system for environmental technology programs.

This document provides guidance to EPA program managers and planning teams as well as to the general public as appropriate. It does not impose legally binding requirements and may not apply to a particular situation based on the circumstances. EPA retains the discretion to adopt approaches on a case-by-case basis that differ from this guidance where appropriate. EPA may periodically revise this guidance without public notice.

This document is one of the *U.S. Environmental Protection Agency Quality System Series* documents. These documents describe the EPA policies and procedures for planning, implementing, and assessing the effectiveness of the Quality System. After five years from the date of publication, EPA plans to review this document and either reissue it without modification, revise it, or remove it from the *U.S. Environmental Protection Agency Quality System Series* documents. Questions regarding this document or other *Quality System Series* documents should be directed to the Quality Staff at:

U.S. EPA
Quality Staff (2811R)
1200 Pennsylvania Avenue, NW
Washington, DC 20460
Phone: (202) 564-6830
Fax: (202) 565-2441
E-mail: quality@epa.gov

Copies of the *Quality System Series* documents may be obtained from the Quality Staff directly or by downloading them from its Home Page:

www.epa.gov/quality

PREFACE

Guidance on Quality Assurance for Environmental Technology Design, Construction, and Operation provides a technical overview for applying quality assurance (QA) and quality control (QC) practices to engineering projects involving environmental technologies, an all-inclusive term used to describe pollution control devices and systems, waste treatment processes and storage facilities, and site remediation technologies and their components that may be utilized to remove pollutants or contaminants from or prevent them from entering the environment.

This guidance document is intended for use by technical managers and QA staff responsible for engineering design, construction, and operation, by: (1) providing basic guidance on applicable QA and QC practices; (2) outlining engineering planning, construction, and operation processes that may require QA and QC elements; and (3) identifying resources and references that may be utilized by environmental professionals during the design, construction, and operation of environmental technologies.

The guidance discussed is non-mandatory and is intended to be a technical engineering and QA guide for project managers and QA staff in environmental programs to help them to better understand when and how QA and QC practices should be applied to engineering work. That is, it is a resource for users to help them understand the range and scope of QA and QC practices in support of environmental technologies. This guidance is not written exclusively for engineers even though highly-technical engineering terminology and recognized good engineering principles/practices are used, but may be used by managers with non-engineering backgrounds. As a further aid, the guidance uses and refers to applicable *basic quality principles* when discussing the application of QA and QC during a project.

Accordingly, this guidance should not be regarded as an engineering manual or as a complete reference on basic quality principles.

TABLE OF CONTENTS

TABLE OF CONTENTS (continued)

TABLE OF CONTENTS (continued)

CHAPTER 1

INTRODUCTION

1.1 PURPOSE AND OVERVIEW

The purpose of this guidance is to provide users with an understanding of the basic quality assurance (QA) and quality control (QC) procedures that may be used in planning, implementing, and assessing the design, construction, and operation of *environmental technologies*, an all-inclusive term used to describe pollution control devices and systems, waste treatment processes and storage facilities, and site remediation technologies and their components that may be utilized to remove pollutants or contaminants from or prevent them from entering the environment. This guidance is intended to complement the requirements defined in the American National Standard *Specifications and Guidelines for Quality Systems for Environmental Data Collection and Environmental Technology Programs* (ANSI/ASQC E4-1994) (ANSI/ASQC, 1994) by (1) providing basic guidance on applicable QA and QC practices; (2) outlining engineering planning, construction, and operation processes that may require QA and QC elements; and (3) identifying resources and references that may be utilized by environmental professionals during the design, construction, and operation of environmental technologies.

This document is not a manual on engineering design, construction, or operation. Rather, it is intended to be a guide for technical project managers and QA staff in environmental programs to help them to better understand when and how QA and QC practices should be applied to engineering work. That is, it is a resource for users to help them understand the range and scope of QA and QC practices in support of environmental technologies. Accordingly, while this guidance is not written exclusively for engineers, it does use highly-technical terminology and may be used by managers with non-engineering backgrounds. As a further aid, the guidance uses and refers to good engineering principles/practices (GEPs) when discussing the application of QA and QC during a project. There are many other texts and manuals in the literature that can provide more details on the subjects discussed in this guidance.

Moreover, this document is non-mandatory guidance and all parts of the document may be used with discretion. It is not intended to imply any requirements for the use of environmental technology. Such requirements are defined by appropriate environmental statute or regulation, or as part of an applicable extramural agreement (e.g., contract, assistance agreement) or enforcement agreement, order, or other enforceable document.

1.2 BACKGROUND

ANSI/ASQC E4-1994 defines a quality system as ". . . a structured and documented management system describing the policies, objectives, principles, organized authority, responsibilities, accountability, and implementation plan of an organization for ensuring quality in its work processes, products (items), and services." It further explains, ". . . the quality system

provides the framework for planning, implementing, and assessing work performed by the organization and for carrying out required QA and QC." The present guidance document presents the basic quality elements for technology implementation.

The U.S. Environmental Protection Agency (EPA) Quality System conforms to ANSI/ASQC E4-1994 and bases the implementation of its Quality System on the principles and practices found in this American National Standard. Part C of the E4 standard provides the specifications for the design, construction and fabrication, testing, and operation of environmental technology. As noted above, the term "environmental technology" includes devices and systems used in environmental programs to duplicate environmental conditions for test purposes or to control, prevent, treat, or remediate waste in process discharges (e.g., emissions, effluents) or the ambient environment. Usually, this term will apply to hardware-based systems; however, it can also apply to general methods or techniques used for pollution prevention, source reduction, or containment of contamination to prevent further movement of the contaminants.

Quality systems have been developed for a wide range of disciplines and industries. Within the environmental community, most available guidance on the subject has focused primarily on data quality issues. In more recent years, this topic has been broadened to include the full continuum of environmental projects. For purposes of this document, the quality system includes the development and implementation of comprehensive procedures as well as process checks to ensure compliance with all aspects of environmental technology deployment. Included in this scope are planning, design, procurement, fabrication, feasibility study, construction, shakedown, operation, maintenance, and performance evaluation of environmental technologies. Project management activities such as staffing, budget tracking, and organizational communication are also included in this scope to the extent that they relate to the quality system. Because quality assurance related to data generation and management is covered by existing EPA Quality System guidance, that topic is not discussed in this document. However, it is assumed that whenever environmental data are needed to formulate design criteria or equipment specifications or to evaluate technology performance, the appropriate QA and QC for environmental data operations will be applied.

1.3 INTENDED AUDIENCE

This document is intended to provide clear, coherent, and user-friendly guidance for project managers, engineering planning teams, and QA staff. Because it is technical in nature, users should have a general knowledge of the good engineering practices and basic quality principles used. Officials in EPA and other state and federal agencies, as well as non-government organizations, may find it useful for implementing quality systems when deploying environmental technologies. The intended audience for this guidance includes QA officers, site remedial project managers, persons responsible for site clean-ups, and other environmental professionals involved with environmental technology design, construction, and operation. It is designed to assist all those responsible for writing, reviewing, or approving quality management plans or quality assurance project plans for environmental technology projects.

1.4 TERMS AND DEFINITIONS

The following definitions indicate how selected key terms are used in this document. A complete set of terms and definitions will be found in Appendix A.

Constructor – The party assigned by the developer in charge of technology construction. The constructor's role should be specifically defined in the developer/constructor contract.

Design team – The parties responsible for the design of an environmental technology application. Depending on the scope of the project, this may consist of one or more professionals employed by the developer, or it may include representatives of various contractors and subcontractors as well.

Developer – The organization(s) responsible for site development and technology construction/implementation. The developer may be a single organization, as in the case of a site-specific treatability study for which the technology developer is also the site developer. In other cases, additional parties are involved, especially in the case of a large-scale technology implementation.

Good engineering principles/practices (GEPs) – A broad set of QA, conservation, and safety activities, techniques, and approaches that are commonly accepted throughout the engineering profession.

Owner – The company or organization that has the lead role in the development of the project and implementation of the environmental technology in question. The owner can be a private firm that actually owns the property, or it can be a site developer or architectural and engineering design firm that has been hired by the owner to manage the environmental technology installation from beginning to end, or it may be the private- or public-sector organization responsible for clean-up.

Project team – The parties involved in the construction and/or operation of an environmental technology application. Depending on the scope of the project, this may consist of one or more professionals employed by the developer, or it may include representatives of various contractors and subcontractors as well.

Responsible party – An individual or organization that has contributed to contamination problems at a site or has assumed site responsibility and is therefore a participant in the environmental technology application.

1.5 PERIOD OF APPLICABILITY

Consistent with the *EPA Quality Manual for Environmental Programs* (U.S. EPA, 2000b), after five years, EPA plans to review this guidance and either reissue it without

modification, revise it, or remove it from the EPA Quality System series. In addition, this guidance may be revised within five years if EPA determines that such a need exists.

1.6 ORGANIZATION OF THIS GUIDANCE DOCUMENT

The structure of this document is based on the organization used in Part C of the E4 standard:

General
Planning
Design of Systems
Construction/Fabrication of Systems and Components
Operation of Environmental Technology
Assessment and Response
Verification and Acceptance of Systems

The remainder of the document is organized as follows:

- Chapter 2 presents general quality system principles and elements.

- Chapter 3 describes QA and QC practices that should be considered for project planning and management, including quality systems and policies, organizational structure, project staffing, communication strategies, and document and records control.

- Chapter 4 addresses QA and QC practices and related activities that should be considered during the design of environmental technologies. Topics discussed as they apply to QA and QC include design process planning; organizational and technical interfaces; design inputs; the design process and its outputs; development of operation and maintenance (O&M) procedures; review of design alternatives; design documentation; and design verification, validation, and changes.

- Chapter 5 describes QA and QC practices and related activities that should be considered during construction and fabrication of environmental technology systems and components. Topics discussed as they apply to QA and QC include: site selection; review of resources; contractual arrangements; procurement of supplies, equipment, and services; scheduling and tracking; cost and materials management; inspection, testing, control, and tracking; and construction certification.

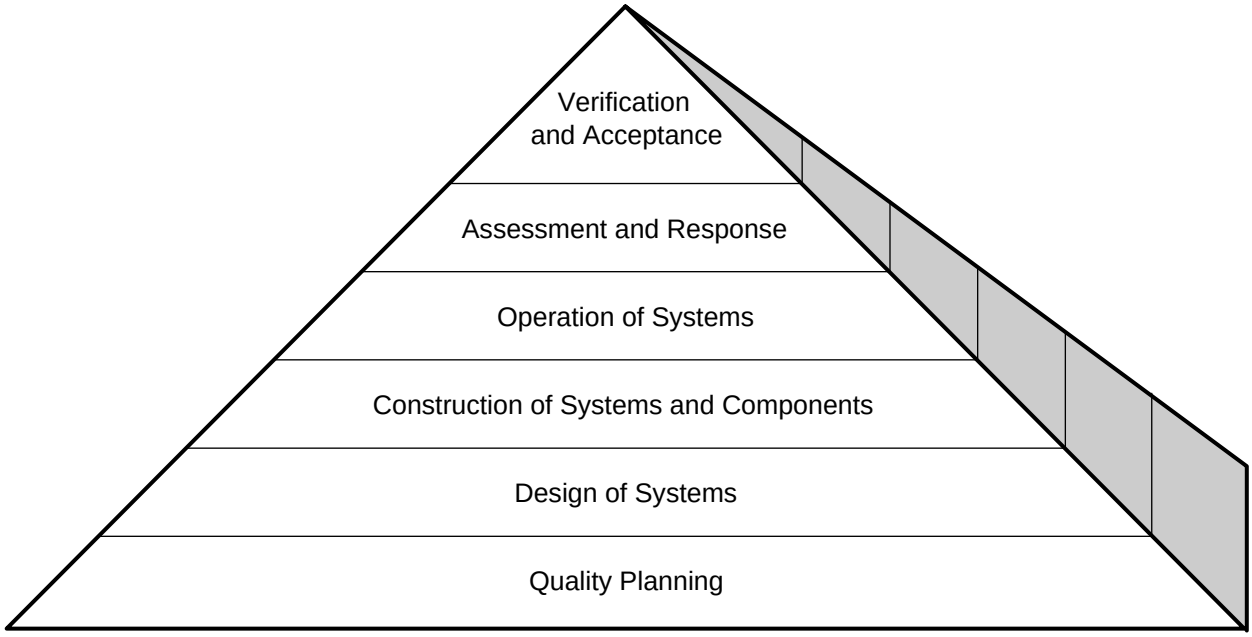
- Chapter 6 presents QA and QC practices and related activities that should be considered during the operations and maintenance phase of environmental technology deployment. These include planning and training; O&M

considerations during the design, construction, fabrication, system start-up, and normal operations phases; inspection and testing; and handling issues.

- Chapter 7 describes quality system practices that should be considered for assessment and response during the course of a project as well as during verification and acceptance of systems.

CHAPTER 2

GENERAL QUALITY SYSTEM PRINCIPLES



GENERAL GUIDING PRINCIPLES applicable to environmental technology design, construction, and operation

2.1 INTRODUCTION

This chapter provides an overview of QA principles applicable to process design, construction, and operation. Subsequent chapters will provide QA and QC specifications for specific implementation stages. While these topics can apply to a wide range of operations, they have been tailored to meet the objectives of environmental technology design, construction, and operation.

2.2 GENERAL GUIDING PRINCIPLES

Quality assurance is the system of operations that provides the user with the knowledge and assurance that project activities are likely to meet specific project objectives. In addition, **quality control** activities document the level of quality obtained during process operations. While the general environmental community has been provided with numerous guidance documents that cover specific aspects of quality assurance for environmental data operations, this guidance document breaks new ground by addressing quality assurance and quality control for environmental technology applications.

The following general guiding principles (which are adapted from the E4 standard) underlay the structure and content of this guidance document:

Quality planning – All work involving the design, construction, and operation of environmental technology should be planned, documented, and controlled as needed to achieve conformance with approved quality criteria.

Design of systems – Processes and procedures should be established and implemented to ensure that environmental technologies are designed using sound engineering/scientific principles and appropriate quality standards.

Construction of systems and components – Construction, fabrication, manufacture, and erection of systems and components should be performed under appropriately controlled conditions according to the drawings and specifications of the approved design.

Operation of systems – Environmental technologies should be operated in accordance with approved design documentation and operating instructions and guides.

Assessment and response – Work performed during the design, construction, and operation of environmental technology that affects quality should be assessed regularly to ensure that approved planning and design specifications and operating guides are being implemented as prescribed.

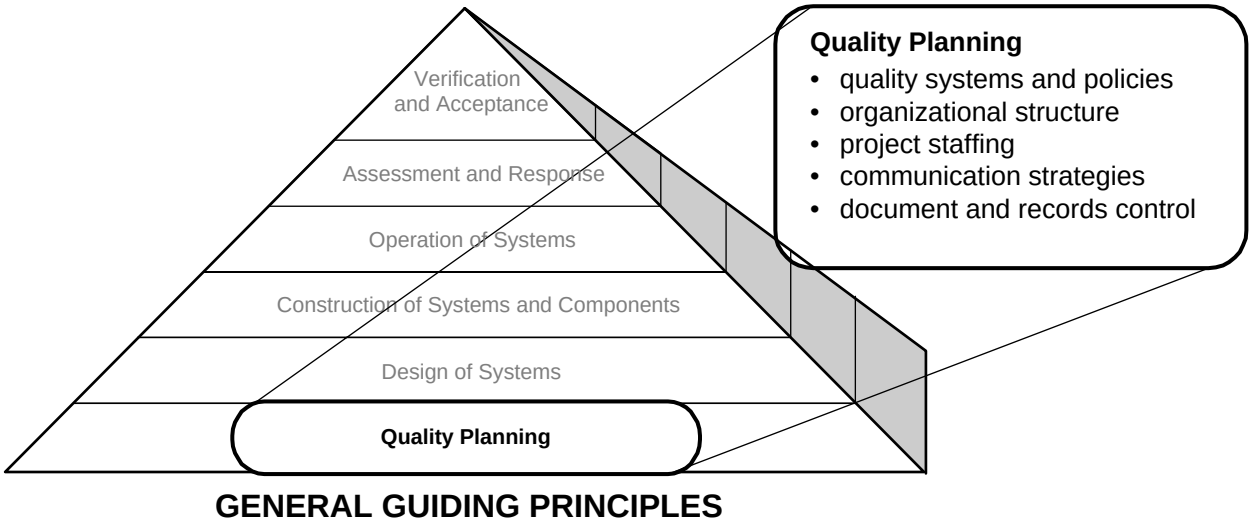
Verification and acceptance – The performance of environmental technology should be verified according to its intended use as documented in approved design specifications. When acceptance criteria are not met, deficiencies should be resolved and reassessments conducted as necessary.

Note that these principles span the three main phases of EPA's Quality System: planning (principles 1–2), implementation (principles 3–4), and assessment (principles 5–6).

Each of these general guiding principles is supported by a set of applicable lower-tier basic quality principles; these lower-tier principles will be detailed in the remainder of this document. In addition, at several points in subsequent chapters, there will be lists of GEPs that are pertinent to a particular topic. GEPs are a broad set of QA, conservation, and safety guidelines that are common to all engineering disciplines and are included in this document as an aid for those with an interest in exploring a broader suite of engineering issues and approaches. However, the primary focus of this document is on engineering QA topics. See Appendix B for a more complete list of several categories of GEPs that are most likely to be applicable to the design, construction, and operation of environmental technologies.

CHAPTER 3

PLANNING AND MANAGEMENT



3.1 PURPOSE AND OVERVIEW

Basic Quality Principle
Adherence to quality principles and practices in project management, not only in the planning stages but throughout the project, is key to the successful implementation of an environmental technology.

Basic to any technology design and implementation are the planning stages. Planning is an organized activity, typically begun and driven by the manager to define how to design the environmental technology; amass qualified personnel; acquire quality components and materials; and construct, install, and ultimately operate and/or evaluate an environmental technology meeting the appropriate quality criteria.

3.2 QUALITY SYSTEM DESCRIPTION

Basic Quality Principle
Every organization implementing an environmental technology should be driven by a policy that defines quality expectations.

Quality policies are usually defined at the highest level of a company, corporation, or government agency. In order to ensure that quality performance is achieved, the organization

quality policy should state the requirement for employee integrity, confirm management's commitment to meet contractual obligations, and place responsibility for quality with those who perform the work. An organizational quality policy should direct the employees to ascend to the highest possible work ethic, and in turn the organization should provide the resources necessary to achieve these expectations.

The corporate or organizational quality policy should be connected to the type of environmental technology to be tested, maintained, or operated through a project-specific quality plan. Identification of the needs and expectations of all involved parties or stakeholders should be included. The project-specific quality plan is therefore used to guide personnel in performing appropriate procedures, using specified equipment, and performing specified operational and maintenance checks. Therefore, the purpose of this plan is to ensure that all work will be performed by qualified personnel, to ensure that project objectives can be achieved, and to document design, construction, and operational quality. This plan should be carefully reviewed and scrutinized prior to project initiation. Subsequent specifications in the plan should be followed by all personnel. Deviations from planned procedures should occur only with permission of the party responsible for technology implementation and should always be documented and approved by QA and technical personnel before being implemented. The project-specific quality plan for a technology evaluation, therefore, should reflect an agreement reached among all parties prior to project initiation as to how a process will be evaluated and how it will be determined to be successful or not successful. The importance of this approved and signed document is that it is an agreed-upon plan, laying down the ground rules of technology implementation and/or evaluation prior to project initiation. This helps define project objectives and defines how to achieve these objectives.

3.3 ORGANIZATIONAL STRUCTURE/CHAIN-OF-COMMAND AND RESPONSIBILITIES

Basic Quality Principle
Organizational structure should be defined at every level in which QA and QC activities are necessary.

The first level of organization for which appropriate QA and QC practices should be defined is the project owner's organization. This may be an individual, a private firm, or a government agency. The organizational structure should clearly indicate that project management and QA responsibilities are separate and independent and should clearly define the lines of communication for all parties. Following this level is the organization of the individual project to which the technology operation is to be applied. Both project management and QA personnel should report to the highest management levels. Each program and/or project should also provide resources designated for QA organizational leaders and QA assessments. Responsibilities and authority of each level should be defined and individual responsibilities should be outlined, including those of subcontractors (if any). This is important for those instances when construction or operation of a technology is stopped because of quality issues

and operations reviewed due to unexpected occurrences. It is also important that these entities understand and commit to the organizational goals and project objectives.

In the example of a hazardous waste site remediation project where a responsible party is known, the site developer is typically the organization responsible for site development and technology construction/implementation. The developer may be a single organization, as in the case of a site-specific treatability study where the technology developer is also the site developer. In other cases, additional parties are involved, especially in the case of a large-scale technology implementation. A site developer may subcontract with firms to perform site grading and material handling; installation of infrastructure, such as sewers, foundations, footers, berms, and lagoons; installation of specialized equipment, such as boilers or water treatment facilities; and a variety of other functions. It is important that the site owner enlist the developer and its subcontractors in following the quality goals and project objectives.

A state or federal oversight agency may be involved in projects including regulatory compliance. For site-specific treatability studies, a third-party evaluator contracted by the site owner or the regulatory agency may be involved. Local community organizations and environmental groups may also be involved in these types of evaluations and in full-scale technology implementations. The needs of all of these organizations, sometimes referred to as "interested parties," should be addressed in the planning stages of the project.

3.4 PROJECT TEAM STAFFING

Basic Quality Principle
Different phases of a project call for staffing of appropriate and competent personnel for the following activities and organizations: site owner/management, design, construction, and operation.

The project owner/management may fill a variety of staffing roles depending upon the scope of the project and the experience of the available personnel. These roles may be limited to project oversight by using the design firm as the project manager or may include roles in project management, project design, portions of construction, and process operation. Design, construction, and operation are likely to involve several organizations employing different personnel for each of the separate stages. Engineering and design professionals are more likely to be involved in everyday activities during design, while some of these same personnel are likely to be in a supervisory or assessment role during construction and operation. Construction personnel may be involved in the design phase to provide input to limitations on the design posed by the site or by construction activities. They may also provide training for system operation.

The owner functions include project management and, potentially, any of the other functions previously described. Therefore, project managers with sufficient experience in environmental installations are the primary project staff sought by the project owner. This

experience would typically include budgeting, scheduling, design reviews, personnel management, and management of various subcontractors. In addition, other support personnel may be needed, including personnel knowledgeable in legal and regulatory requirements and management controls associated with contracts and management of subcontractors.

The project team involved in the design (e.g., the site owner, the design firm, and the construction contractor) should work together to effectively establish and maintain procedures to complete the definitions of specifications and control and to verify the design of the project to ensure that specifications are met. Often, engineers develop the specifications and the design plans with input from the project owner, regulators, and other team members of interested parties. Portions of the design may be farmed out to specialty design firms as needed. The project manager for the design firm should appoint personnel not directly involved in the design to perform periodic design review, verification, and validation. Ideally, a team of experts should perform design reviews at set intervals.

Construction personnel should be competent and experienced in the types of construction to be performed. Construction firms typically have personnel experienced in areas such as materials handling, metal working, welding and pipe fitting, electrical and plumbing installations, concrete work and masonry, and carpentry. The construction contractor may use its own personnel, subcontract specialty crafts (e.g., electrical and plumbing) or work requiring specialized equipment (e.g., large cranes), or may utilize day labor (typically for manual labor requiring a minimum of skill). It is the responsibility of the construction manager to ensure that the personnel used are qualified and trained to perform the specific planned construction activities.

Operations personnel should be competent and experienced in operating environmental systems similar to the planned project. These personnel may be current employees of the project owner or may be new hires specifically for the project. Typically, either the design firm or the constructor, or both, will assist the owner in training personnel on the operation of the system.

Training programs should include training of management and field personnel to ensure competency in the required knowledge and skills necessary for technology deployment. Subcontractors who are participating in the program should also be trained, including those added to the program or project at a later date. Training should be initiated by the project owner early in the project design phase. Initial training should consist of an overview of the project goals, QA specifications, and overall and project-specific organizational structure and lines of communication. As the project progresses from design to construction, training programs and procedures are constantly updated to cover construction activities, especially any that were not anticipated in the initial procedures and training. This is often a good time to incorporate "lessons learned" during the design and initial construction stages, especially in regard to communication failures or modifications made to improve communication processes. As the project moves to the technology implementation phase, key training elements include technology operational procedures, field responsibilities, and reporting of field operations. How poorly or how well systems are performing in the field is communicated to all appropriate personnel.

3.5 COMMUNICATION STRATEGY/PROCEDURES

Basic Quality Principle
Effective project planning and implementation depend upon good coordination among all parties, which, in turn, depends on effective communication among those same parties.

The project should be viewed as a whole process from conception to completion, and an overall communication strategy should be developed for the entire project. Critical information should be communicated to the correct team members in a timely fashion. Communication strategies and procedures related to technology operation, construction, and design are similar to other areas of environmental management. These include development and implementation of overall program- and project-specific training procedures and implementation of chain-of-command and lines-of-communication procedures built into the organizational hierarchy.

During the development of a strategy for communication, mechanisms for ensuring that communication is occurring throughout the project team should be implemented. This includes communication with oversight agencies, the developer, the operator, the evaluator, local communities, associated organizations, or others that have a vested interest in the project. The key is to ensure design and/or operation expectations are communicated to all personnel. The goal should be an overall balance that ensures adequate dissemination of information while avoiding over-communication.

3.6 DOCUMENT AND RECORDS CONTROL

Basic Quality Principle
Documents should be controlled to ensure that the correct documents are being used.

For the purpose of this guidance document, the term *document control* is defined as the act of ensuring that program/project-specific documents are reviewed for adequacy, approved for release by authorized personnel, and distributed to and used at the location where the prescribed activity is performed. Documents that should be controlled are, at a minimum, those that specify requirements, prescribe processes, or establish the design of environmental processes. Examples include drawings, specifications, management plans, procedures, technical reports, test reports, and any documents pertaining to legal requirements (e.g., permits, codes).

Applicable GEPs include:

- backup/duplicate copies;
- maintaining/archiving electronic and/or paper copies;
- distribution/delivery/circulation list for control documents;
- document/records authentication and verification;
- document approval procedures; and
- reviews—peer, project level, program level, organizational, and legal.

3.6.1 Document Preparation, Review, Approval, and Issuance

Project management should identify the individuals or organizations responsible for the preparation, review, approval, and issuance of controlled documents. Procedures for controlling documents should be developed. These procedures should specify that the documents requiring control be identified and that the documents then be assigned control numbers (e.g., the document version) and dated. Where applicable, a master list of controlled documents may be specified for a project (e.g., all design drawings and specifications). Regardless of whether a master list is generated, document control numbers should be placed on each page of the document along with the page number, date, and document version. A distribution list for reviewers and/or document users should be incorporated into the document when possible. Document control procedures should be implemented when documents are first prepared.

Documents should be reviewed for adequacy, correctness, and completeness prior to approval and issuance. The organization requesting review should identify the specific review criteria and any pertinent background information. Reviewers should be individuals other than the document originator and should include the applicable technical specialist(s) of each organization affected by the document being reviewed. Other specialists in the fields of QA, environmental compliance, and safety should also review the documents, as needed. The document originator should specify the date that comments are due and, as warranted, the form in which any comments should be transmitted (e.g., document markups, summary memos, or electronic markups or review copies). The document review procedures should also specify the approval process. In some cases, each reviewer may be requested to submit an approval when all comments have been incorporated into the document and the final version is satisfactory to all reviewers. In other cases, the document originator may be responsible for document approval after incorporating review comments.

3.6.2 Document Distribution and Use

The distribution and use of controlled documents and forms that document or prescribe work, including changes and editorial corrections to documents, should be controlled to ensure that current and approved copies are available for use by those persons doing the work. A limited and known number of copies should be distributed. This is important to prevent someone not on the distribution list from getting and using a copy that is later superseded but not distributed to that individual. The effective date should be clearly identified on each controlled document; when appropriate, the duration that the document is in effect should be indicated. Documents should be used only for their intended purpose and any caveats or exclusions should be clearly marked on the document. It is important that appendices, attachments, and footnotes containing such information be included with all copies. As with the distribution and use of controlled documents, the disposition of obsolete documents should be controlled to avoid inadvertent use.

3.6.3 Document Changes

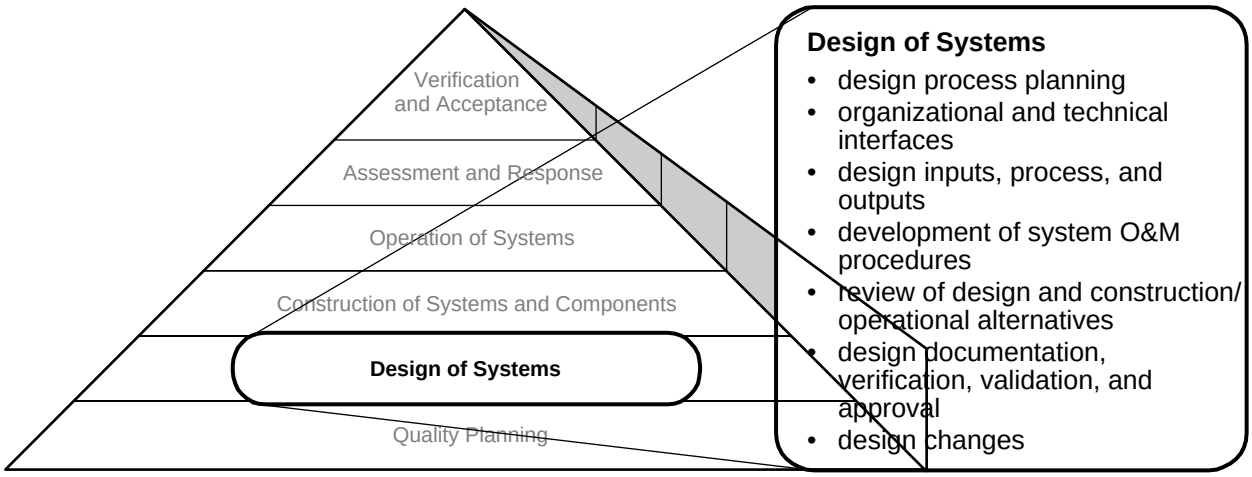
Changes to documents should be reviewed and approved by personnel with similar expertise to those that performed the original review and approval. Changes should be clearly noted in the document, and document dates and subsequent versions should reflect that changes have been made. Procedures for review should normally be the same as those used for the original document. Minor changes, such as grammar, spelling, and minor formatting changes would not normally require review.

3.6.4 Document and Record Storage and Archiving Methods/Criteria

Records should be maintained to reflect the achieved level of quality for completed work and/or to fulfill any contract or statutory requirements. Federal records must be maintained in accordance with applicable Federal records schedules. Record-keeping procedures should specify what records are to be prepared, reviewed, authenticated, and maintained. Records should be indexed and classified so that they can be expeditiously identified and retrieved. Maintenance procedures for records should include provisions for retention, protection, preservation, traceability, and retrieval. Retention times for Federal records are determined by applicable Federal records schedules. Other retention times should be determined based on contractual or statutory requirements or management requirements, whichever is longer. Documents should be stored in such a manner and location as to protect and preserve the information contained in the documents. This means that records are to be protected from damage, loss, and deterioration, whether the records are in paper or electronic form or both. Document identification and storage procedures should ensure that documents can be traced to their original source and are easily retrievable; this calls for a systematic approach for document storage. When evidentiary records are involved, chain-of-custody and confidentiality procedures should be prescribed and implemented.

CHAPTER 4

DESIGN OF SYSTEMS



4.1 PLANNING AND THE DESIGN PROCESS

Basic Quality Principle
The engineering/design professional, contractor, or subcontractor (*the design team*) should establish and maintain documented procedures to control and verify the design of the "environmental technology" in order to ensure that QA specifications are met.

In the design phase of a project, the functional specifications stated during the conceptual phase are given form, and documents are prepared to define the project for construction and operation. Planning and managing the design effort involve elements of organization, staff selection, management, control, and coordination aimed at achieving quality in the project. The developer or designee selects a design team, or at a minimum designates an individual, who will serve as the *design team leader* for managing the design. The design team leader should prepare *design criteria* that will outline the specifications of the design. It is important, therefore, to define the design team organization and specify responsibilities required for its implementation.

Crucial to the design criteria are project objectives that are developed for project evaluation and detail the measurements or information suitable to meet developer specifications. It is not adequate to state the objective; there should also be a description of the methods that will be used to determine whether or not the objectives are achieved. Precisely defining these objectives will determine the ultimate ability of measuring project success. The design team should therefore define the ultimate goal of their operation when determining project objectives.

Questions that should be considered as part of project design include the following: (1) Is the operation a long-term technology for clean-up of a particular contaminant or site, or is it for demonstration purposes? (2) Is this technology to be used at other, similar sites also under the purview of the site responsible party? (3) Will design and construction phases be time limited in order to meet operation specifications? (4) Who will operate and maintain the technology? (5) Who is ultimately responsible for ensuring that technology specifications have been achieved and, if the technology is for clean-up efforts, who will be responsible for certifying site clean-up?

Design criteria should clearly state the design staffing specifications and selection criteria and provide the basic guidelines for initiation and coordination of the design process, for example, meeting schedules and budgets while maintaining quality. Activities should then be assigned to qualified personnel equipped with adequate resources. These plans are updated as the design evolves.

Design criteria include the various GEPs that will drive the design processes. Designed procedures, equipment, structures, and facilities should be flexible to the extent possible to accommodate variations when required. When toxic or highly dangerous materials are involved, designs should include sufficient safeguards with adequate engineering controls for safe operation. Interchangeability of resources, such as materials, personnel, equipment, etc., should be considered during the design planning phase as a means to control project cost and improve system reliability and resilience. During the design planning stage, the purchasing and procurement, fabrication and construction, and the operations and maintenance teams should be consulted to avoid compromising financial, logistical, or technical situations, after the fact.

Planners and managers should strive to incorporate the following GEPs during design planning:

- fail-safe/intrinsically safe design of procedures, processes, equipment, structures, and facilities;
- flexible built-in designed procedures, processes, equipment, structures, and facilities;
- design of self-correcting procedures and processes;
- analysis of availability and interchangeability of all resources, such as materials, personnel, and equipment;
- automatic communication/notification procedures and processes among all team members;
- integration of planning, design, purchasing/procurement, fabrication, construction/installation processes, and O&M procedures and requirements;
- integration/optimization of human, material, energy, and economic resources and logistical, political, social, environmental, and technical factors;
- modeling and simulation of technical, logistical, economic, social, environmental, and political systems prior to, during, and after installation/implementation;
- sound project management principles/practices; and
- automatic shutdown of systems, equipment, and processes.

Construction and deployment of an environmental technology entails that specific operations be followed and maintained. Because many environmental technologies may

be innovative and may have undergone very little field testing, however, the design team is responsible for achieving quality objectives during construction based upon previously set standards and performance criteria and based upon their experience and ability to adjust designs to adapt to new applications and to changing conditions. When the project involves retrofitting or scale-up of an existing environmental technology, the design team should review and analyze all available documentation related to the planning and implementation of the original design, construction, and system operations, and if possible, interview and consult with the previous design team staff. Incident reports and existing documentation should then be carefully reviewed and analyzed to avoid potential pitfalls.

4.1.1 Feasibility Studies and Reviews (FSRs)

In some cases, conceptualizing and planning for construction and deployment of environmental technologies may entail the development and study of various alternatives. This may be particularly true when design decisions involve different choices of technology or engineering approaches. These are often known as *feasibility studies*. Such activities are a joint effort of the technology developer, design team leader, and, if available, the constructor and operator. The resources spent in formulating, investigating, and studying alternative approaches to decisions will vary depending on the size and complexity of the project.

Prior to undertaking the formal design and development activities, the design team may conduct FSRs to gain full understanding and establish a sound working knowledge of the various technical, logistical, and economic factors, challenges, and issues involved with the deployment of the designated environmental technology at the specified site. Controls and measures should be defined, identified, and set in place to allow updating of the various FSRs during the course of design, construction, and operation of the deployed technology.

In addition to the GEPs listed in Section 4.1, designers should consider the following GEPs when conducting the various FSRs:

- reuse of materials required for technology operation or development;
- reduced use of virgin materials, wastes generated, energy sources, and human resources;
- recycling/recovery of materials, utilities, and energy sources;
- conservation of materials and energy sources;
- substitution of materials and energy sources with cleaner, better, cheaper, more reliable, and more readily available alternatives: and
- use of interlocks as safety measures.

Technical feasibility studies include life cycle analysis, environmental impact statements, and investigation of alternative solutions. The various alternatives studied will affect project performance and appearance, life-cycle cost, cost/benefit ratio, schedule of completion, and socioeconomic and environmental impacts. The number of alternatives chosen for examination, the extent to which each is subjected to detailed planning evaluation, and whether more than one “preferred” alternative is selected for final design are key decisions best made early in the project planning and scoping process.

Logistical feasibility studies include analyses of alternatives for the procurement, distribution, deployment, maintenance, and replacement of materials and personnel. Economic feasibility studies include cost-benefit analyses and analyses of short- and long-term economic impacts on the community and the region. Cost alternatives that should be carefully analyzed and considered include design cost, capital cost of construction, operation and maintenance costs, various life-expectancy or design-life periods, return on investment, cost comparison of deploying the environmental technology on a full-scale basis versus deploying it in stages, value of extra cost for aesthetics, and cost/benefit ratios.

Feasibility studies allow for insight and investigation into all aspects that may impact technology construction and operation. The FSRs, as stated previously, are important in considering alternative solutions and determining whether those alternatives can offer a realistic solution.

4.1.2 Resource Identification and Allocation

Identification and allocation of resources, including personnel, should be performed during design planning in order to ensure adequate resources will be available during construction and operation of a technology. Resource requirements should specify the level of quality needed to accomplish the stated objectives. The design team may include engineers, scientists, and perhaps geologists or others familiar with the workings of the process and of the site being considered for remediation; they should be trained in QA principles and in all standard operating procedures governing their areas of responsibility. Each professional discipline plays a role in offering input into the technology design. Identification and allocation of the correct mix of design team professionals is therefore crucial to achieving the project's technical as well as economic success.

4.2 ORGANIZATIONAL AND TECHNICAL INTERFACES

Basic Quality Principle
Organizational and technical interfaces should be identified during planning stages and controlled appropriately during the design efforts.

Organizational and technical interfaces include organizations and individuals, such as the site owner, regulatory agencies, design professional, construction/fabrication contractor, equipment and materials supplier, and the technology operator. When the project involves retrofitting or scale-up of an existing environmental technology, to the extent possible, interfaces with the previous designers, construction contractors and operators, and suppliers should be identified and incorporated into the prevailing organizational structure. Overall project and technical organizational flowcharts should be used to identify the participating organizations and individuals and their respective roles, responsibilities, and authority.

Typically, the design team leader keeps the developer and design team members informed on the design's status, normally submitting monthly (or more frequent, if necessary) progress reports to the owner. These reports contain information on meetings held and work accomplished in the subject period. Most importantly, design problems and issues should be recognized as early in the process as possible and reported to the appropriate decision makers (e.g., technology developer); those problems that may cause a change in scope, budget, or schedule should be promptly identified, documented, communicated, and resolved among the participating parties.

4.3 DESIGN INPUTS

Basic Quality Principle
Prior to the start of the design phase, the owner and the design, construction, and operations teams, separately as well as collectively, should identify all pertinent design characteristics for the project.

Applicable *design inputs*, such as conceptual design reports, performance specifications, regulatory requirements, codes, and standards should be documented and controlled by those responsible for the design in accordance with the following specifications:

- Design inputs should be identified and documented and their selection reviewed and approved by those responsible for the design.
- Design inputs should be specified and approved on a timely basis and to the level of detail appropriate to permit the design work to be carried out correctly in a manner that provides a consistent basis for making design decisions, accomplishing design verification, and evaluating design changes.
- Changes from approved design inputs and reasons for the changes should be identified, approved, documented, and controlled.
- Design inputs based on assumptions that call for re-verification should be identified and controlled.

During the design input phase, as part of the technical directives, the developer usually outlines the desired GEPs (see box) that the design professional can incorporate into the design, to the extent possible. In addition, early identification of appropriate codes and standards can prevent reworking plans and specifications and save considerable cost and delay. Codes and standards are developed by governmental units and industry or professional-technical associations to protect the public's health and safety. Because codes and standards typically address particular aspects of design, construction, and operation of a technology, the design team can expect to find a number of codes and standards applicable to a project, including those pertaining to civil, mechanical, electrical, structural, and process engineering, as well as architecture. Applying codes and standards to the design may sometimes be difficult, especially for design professionals working on a project in an unfamiliar geographical area (as in the case

of a remote but hazardous or toxic waste site), but is required in order to comply to specified regulations.

4.4 DESIGN PROCESS

Basic Quality Principle

The responsible design organization(s) should define, manage, and document the design activities on a timely basis and to the level of detail appropriate to permit the design process to be carried out correctly, effectively, and in a timely manner and to permit verification that the design meets specifications.

The following issues should be addressed as part of the design process:

- Design methods, materials, parts, equipment, and processes that are key to the function of the structure, system, or component should be selected and reviewed for suitability of application.
- Changes from all specifications and standards, including the reasons for the changes, should be identified, approved, documented, and controlled.
- Applicable information derived from experience, as set forth in reports or other documentation, should be made available to cognizant design personnel.
- If the design effort is to support an existing technology retrofit or scale-up, the designers should take into account the design inputs, design outputs, and the actual performance of the existing products and processes against their respective design expectations. Such analyses provide a better understanding of the limitations of the technology and the challenges it is likely to face when retrofitted and/or scaled up.

The following GEPs should be considered when establishing/developing the design inputs:

- reuse of materials required for technology operation or development;
- reduced use of virgin materials, wastes generated, energy sources, and human resources;
- recycling/recovery of materials, utilities, and energy sources;
- conservation of materials and energy sources;
- substitution of materials and energy sources with cleaner, better, cheaper, more reliable, and more readily available alternatives;
- use of commercially available and tested materials, products, processes, equipment, and supplies;
- computerized/remote control of unit operations and processes;
- use of lockout/tagout procedures and equipment during systems fabrication/installation and operations; and
- prevention of calamities through process hazard analysis, hazardous operations analysis, failure mode and effects analysis, fault tree analyses, and incident investigations.

4.5 DESIGN OUTPUTS

Basic Quality Principle
Design output should be documented and expressed in terms that can be verified against design criteria (including specific acceptance criteria) and validated.

Design output documents should:

- meet the design-input specifications,
- contain or make reference to acceptance criteria, and
- identify those characteristics of the design that are crucial to the safe and proper functioning of the technology and its components (e.g., operating, storage, handling, maintenance, and disposal requirements).

Design output documents are usually reviewed and approved before release. The distribution of the design output documents should be controlled and, where deemed critical, verified.

4.6 DEVELOPMENT OF SYSTEM OPERATION AND MAINTENANCE PROCEDURES

Basic Quality Principle
O&M specifications should be considered in each phase of project planning, design, construction, and start-up.

In the preliminary design phase, decisions are made relating to site selection and access, process choice, equipment selection, and other elements that impact operation and maintenance of the completed project. Since decisions made here limit flexibility in subsequent phases of the project, O&M coordinators and advisers should be consulted for choices of brands or models of equipment to be selected, arrangements or layout of facilities, access for equipment repair, routine operation and maintenance procedures, and other design features that influence O&M costs and activities.

Effective operation and maintenance entails up-front planning to ensure that products and services will perform according to project specifications. The various stages of the project (planning, design, construction, start-up, and operation) each involve input from O&M staff. Roles of O&M staff are certainly weighted towards process operation, but if input is not provided during planning or design, technology processes may suffer from over-design whereby standard “off the shelf” equipment is not used, or they may suffer from operations that are difficult to maintain. O&M staff input provides a “reality check” for the design and planning stages and provides assistance during construction and start-up.

Environmental technology should be operated in accordance with approved design documentation and operating instructions and guides. Designers should ensure that the technology operating guides and manuals include, but are not limited to:

- appropriate controls for materials (including consumables) and measuring and testing equipment;
- configuration management;
- operating procedures and parameters for specific components and systems configuration, including specified safety limits;
- spill, fire, and other hazard safety procedures;
- process equipment control and maintenance, including specifications during abnormal conditions for inspection and test situations and fault and emergency conditions;
- special environments, time, temperature, or other factors affecting the quality of operation; and
- the skill, capability, and knowledge of operators to meet operational, environmental, and quality goals. This should be accomplished through the use of specific standards, resources, and worker training and certification.

4.7 REVIEW OF DESIGN AND CONSTRUCTION/OPERATIONAL ALTERNATIVES

Basic Quality Principle
At appropriate stages of design (e.g., 30, 60, and 90%), formal documented reviews of the design are planned and conducted.

Design reviews or audits for purposes of validation are cornerstones of the design professional's QA program. Design review can be carried out by members of the design team or an independent review board selected for their expertise. Design audits are performed by individuals other than members of the design team. Design reviews or audits have the purpose of establishing the levels of quality of the design by identifying unsound concepts, analyzing the overall feasibility of the project, eliminating redundancies, and assisting in interdisciplinary coordination. Participants at each design review should include representatives of all pertinent functions/disciplines concerned with the design stage being reviewed, as well as other specialist personnel, as required. Records of all such reviews should also be maintained.

4.8 DESIGN DOCUMENTATION

Basic Quality Principle
The design professional should establish and maintain documented procedures for identification, collection, indexing, access, filing, storage, maintenance, and disposition of design output documents including drawings, calculations, and results, as well as references, standards, codes, design basis, and assumptions used in the design process.

Under almost all circumstances, design results and outputs are checked, verified, and certified by a qualified professional belonging to the pertinent discipline. Peer and QA review should be incorporated to ensure it will be understandable and meet specifications. When the project involves technology retrofit or scale-up, the designer should recheck, re-verify and, if determined to be critical for the current design, even re-certify the design results and outputs of the preceding version of the technology. Design documentation and records, which provide evidence that the design and the design verification processes were performed in accordance with project specifications, should be collected, stored, and maintained in accordance with documented procedures. The documentation includes not only final design documents (such as drawings and specifications) and revisions thereto, but also documentation that identifies the important steps, including sources of design inputs that support the final design. Maintaining and ensuring quality during the design process entails that specific documentation standards be followed so that appropriate and relevant information is conveyed to all personnel involved during the design, construction, and operation phases of the environmental technology.

4.9 DESIGN VERIFICATION

Basic Quality Principle
The verification process evaluates the completeness, correctness, and conformance or compliance of the design in terms of meeting contractual, method, or procedural specifications.

At appropriate stages of design, design verification should be performed to ensure that the design output meets the design stage specifications. The design verification measures should be recorded. The following measures can be applied to verify the adequacy of the design:

(a) Design verification should be performed using one or a combination of the following methods:

- performing alternative calculations (calculations or analyses that are made using alternate methods to verify correctness of the original calculations or analyses and the appropriateness of any assumptions, input data used, any computer programs, or other calculation methods used);

- comparing with prevailing/proven design (for example, when the project involves retrofitting or scale-up of existing technology);
- testing under laboratory, field, or simulated conditions (for example, treatability tests and/or mathematical modeling coupled with computer simulation); and
- reviewing the design stage documents before release.

(b) The particular design verification method should be identified and its use justified.

(c) The results of design verification should be documented, including the identification of the verifier.

(d) Design verification should be performed by competent individuals or groups other than those who performed the original design (but they may be from the same organization). If necessary, this design verification may be performed by the originator's supervisor providing that:

- the supervisor did not specify a singular design approach or rule out certain design considerations and did not establish the design inputs used in the design,
- the supervisor is the only individual in the organization competent to perform the verification, and
- the determination to use the supervisor is documented and approved in advance.

(e) Design verification should be performed at appropriate times during the design process.

- Verification should be performed before release for procurement, manufacture, construction, or release to another organization for use in other design work.
- Design verification should be completed before relying on the item to perform its function.

(f) The extent of the design verification should be based on the complexity of design, risk, uniqueness of the design, degree of standardization, technology's state of the art, and similarity with previously proven designs. When the design has been subjected to a verification process in accordance with this standard, the verification process need not be duplicated for identical designs.

(g) Use of a previously proven design should be controlled as follows:

- The applicability of standardized or previously proven designs should be verified with respect to meeting pertinent design inputs for each application.
- Known problems affecting standard or previously proven designs and their effects on other features should be considered.
- The original design and associated verification measures should be adequately documented and referenced in the files of subsequent application of the design.
- Changes in previously verified designs prompt re-verification. Such re-verifications should include the evaluation of the effects of those changes on the overall previously verified design and on any design analyses upon which the design is based.

(h) Design verification and approval should be performed in a timely manner.

4.10 DESIGN VALIDATION AND APPROVAL

Basic Quality Principle
Design validation is performed through assessments (see Chapter 7) to ensure that the designed products, processes, and procedures conform to defined user needs.

Validation is confirmation by examination and provision of objective evidence that the particular requirements for a specific intended use are fulfilled. Typically, design validation follows successful design verification and occurs prior to installation and/or final deployment. When design adequacy is to be validated by qualification tests or pre-operational test runs, the tests are identified and the test configurations are clearly defined and documented. Testing demonstrates adequacy of performance under conditions that simulate the most adverse design conditions. Operating modes and environmental conditions in which the item should perform satisfactorily should be considered in determining the most adverse conditions. Test results should be documented and evaluated by the responsible design organization to ensure that test specifications have been met. Test results should then be reviewed and validated by an independent individual (outside the organization) technically competent to understand the particular item or product under study.

If validation testing indicates that modifications to the item are called for to obtain acceptable performance, the modification should be documented and the item modified and retested or otherwise validated to ensure satisfactory performance. When tests are performed on models or mockups, applicable scaling laws are normally identified or established and verified. The results of model test work are then subjected to error analysis, when applicable, prior to use in final design work.

4.11 DESIGN CHANGES

Basic Quality Principle
All design changes and modifications should be identified, documented, reviewed, and approved by authorized personnel before their implementation using clearly defined documented procedures.

Design changes should be controlled in accordance with the following instructions:

(a) Changes to final designs, field changes, and nonconforming items dispositioned "use as is" or "repair" should be justified and subject to design control measures commensurate with those applied to the original design.

(b) Design control measures for changes should include provisions to ensure that the design analyses for the item are still valid.

Designers should consider the following GEPs when addressing design changes:

- worker training/retraining, including hands-on training;
- worker registration/certification;
- certification/permitting of work procedures, processes, equipment, and environment; and
- routine/periodic inspections, testing and compliance audits of systems, procedures, processes, equipment, etc.

(c) Changes should be approved by the same groups or organizations that reviewed and approved the original design documents.

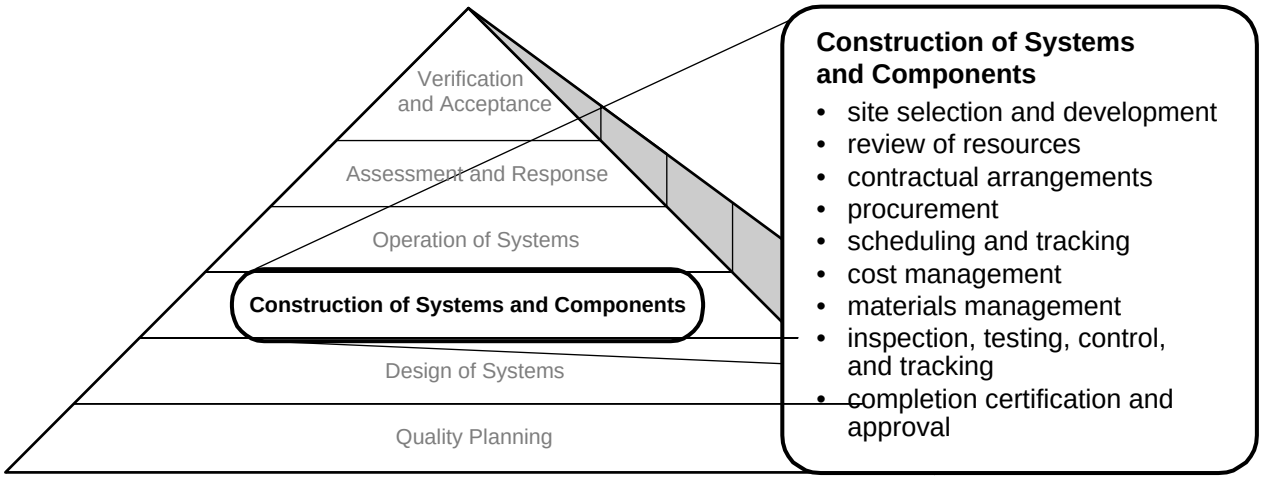
(d) If a significant design change becomes necessary because of an incorrect original design, the design process and design verification methods and implementing procedures should be reviewed and modified as appropriate. These design deficiencies should also be documented.

(e) Field changes should be incorporated into the applicable design documents.

(f) Design changes that affect related implementing procedures or training programs should be communicated to the appropriate organizations.

CHAPTER 5

CONSTRUCTION/FABRICATION/INSTALLATION OF SYSTEMS AND COMPONENTS



GENERAL GUIDING PRINCIPLES

5.1 INTRODUCTION

Basic Quality Principle
Quality in the construction, fabrication, and installation phase of a project is achieved by establishing, implementing, and maintaining documented procedures to control and verify that technical specifications and QA and QC criteria are met.

Project planning for the construction, fabrication, and installation of an environmental technology should be undertaken by the developer or the lead agency. The technology developer may decide to contract with a design professional or the constructor to perform the design and planning activities. Once design and planning activities are completed, the developer may then contract with a construction professional to fabricate the environmental technology. Alternately, the technology developer may perform these assignments "in-house." Either method involves being responsible for specific compliance with the specifications for the project, including planning and enforcement of site safety programs (designated in a separate health and safety plan); means, methods, and sequencing of construction; management; meeting applicable codes, permit requirements, and other public agency regulations pertaining to his/her operations; and quality control related to construction activities as discussed in this chapter.

5.2 SITE SELECTION AND DEVELOPMENT

Basic Quality Principle
Project site specifications should be established and documented.

Site selection and development activities may take place during the planning and design phases. It should be confirmed, for example, that site selection is appropriate for the specific environmental technology being constructed based upon levels of contamination present at the chosen site. Other aspects of site development typically include, but are not limited to, construction of access roads; extension of utilities to the site; traffic control measures including detour routes; and relocation of utilities, highways, and other facilities. Utility extensions and relocations are frequently performed by the applicable utility, although such activities may be included in the overall project construction contract. Considerations of cost, construction sequencing and scheduling, site congestion, safety, and contractor qualifications will all impact the decision on site selection considerations.

GEPs that are applicable to site selection and development include:

- analysis of availability and interchangeability of resources, such as materials, personnel, and equipment;
- site surveys, including topographical, geological, hydrogeological, hydrological, seismic, wind and weather patterns, as well as social and economical factors;
- automatic communication/notification procedures and processes among all team members;
- integration of planning, design, purchasing/procurement, fabrication, construction/installation processes, and O&M procedures and requirements;
- modeling and simulation of technical, logistical, economic, social, environmental, and political systems prior to, during, and after installation/implementation;
- use of lockout/tagout procedures and equipment during systems fabrication/installation and operations; and
- prevention of calamities through process hazard analysis, HAZOP, FMEA, fault tree analysis, and incident investigation.

5.3 REVIEW OF RESOURCES

Basic Quality Principle
Management should identify resources available, how they are allocated, and associated responsibilities for resource allocation.

The planning procedures should specify the intended source of required resources and the funding for personnel, materials, and equipment. Resources available to the responsible party, design professional, and constructor for project construction may place constraints on project activities and influence the decisions pertaining to project specifications, planning and design, contracting strategies, and construction operation and quality. It is the responsibility of project management and, ultimately, of senior management to ensure that resources for quality assurance are available. Reporting procedures and delineation of responsibilities for resource reviews should be established. In addition, such reviews should result in the establishment of

procedures and mechanisms for securing the needed resources for construction within the framework of prevailing local, state, and federal regulations.

5.3.1 Financial Resources

Applicable GEPs for financial resources include:

- design of self-correcting procedures and processes and
- integration of planning, design, purchasing/procurement, fabrication, construction/installation processes, and O&M procedures and requirements.

The technology developer or responsible party is in charge of securing funds to plan, design, and construct the project. This may be a cooperative effort between several different parties and/or agencies. The availability of these funds, beginning with the onset of the planning phase, will be critical to completion of the project in a timely fashion and to the ultimate quality of the project. Adequate funding of "up front" activities, such as preliminary planning, hydrogeological studies, alternative investigations, and other activities to delineate design criteria and project specifications, is crucial to adequately define the design and reduce the risk of unanticipated events during construction. This can include, for example, additional funding for verification of contaminant levels at the site in order to ensure operational success of the technology. The completion of a project in a manner that ensures the quality of the constructed system entails that the financial interests of all members of the project team (responsible party, design professional, constructor, suppliers, subcontractors, specialty fabricators, etc.) be considered. Financial capabilities should be considered in the planning stages as well as in the contractual and implementation phases of the project.

5.3.2 Human Resources

GEPs that apply to the management of human resources include:

- analysis of availability and interchangeability of all resources, such as materials, personnel, and equipment;
- integration/optimization of human, material, energy, and economic resources and logistical, political, social, environmental, and technical factors during each critical phase of the project;
- worker training/retraining, including hands-on training; and
- worker registration/certification.

During the initial stages of project planning, the responsible party evaluates the human resource needs of the project. Continuity of key management and professional staff and the availability of a skilled workforce are important factors that contribute to the quality of the project. Project team staffing was discussed in detail in Section 3.4.

5.3.3 Construction Materials

The availability and cost of materials for construction influence planning, design, and construction operations. In planning construction activities, the responsible party or authorized representative should evaluate the availability and cost of specific materials in the local market, transportation costs for materials not available locally, storage and preparation procedures, and scheduling aspects related to

transportation and specially prepared materials. Material costs can include specialty products requiring fabrication; however, off the shelf availability of such items should be investigated to ensure that material costs are kept to a minimum. All such considerations should be evaluated early in the planning stages to ensure timely completion of the project using quality materials.

Applicable GEPs for construction materials include:

- reuse of materials required for technology operation or development
- reduced use of virgin materials, wastes generated, energy sources, and human resources;
- recycling/recovery of materials, utilities, and energy sources;
- conservation of materials and energy sources;
- substitution of materials and energy sources with cleaner, better, cheaper, more reliable, and more readily available alternatives.

5.3.4 Supplier Manufacturing Capabilities

Specialized equipment may call for sophisticated manufacturing capabilities that are available only from a limited number of suppliers. Environmental technologies often involve this type of equipment. This can include, for example, specialized sampling equipment used to monitor technology success or specialty products required for technology construction. In order to ensure completion of the project on time, it is important that such materials and suppliers be identified at the early stages of planning and steps be taken to assess manufacturing and delivery capabilities. In addition, material specifications may be used to document project needs and ensure quality components are manufactured. A review of the manufacturer's implemented quality system, as well as implementation of external quality oversight (audits or inspection of large scale specialty items), are important. (See Chapter 7 for further discussion of assessments.)

5.4 CONTRACTUAL ARRANGEMENTS

Basic Quality Principle
The responsible party or technology developer should implement applicable contracting requirements for project design and construction.

Since most contracting issues are not directly related to QA, the details of contracting and procurement activities will not be covered in detail in this document. However, because there are some critical QA elements that should be addressed in contracting and procurement activities, associated roles and responsibilities for technical and QA personnel will be discussed here and in Section 5.5. While contracts are usually negotiated in a different part of the company or organization, technical personnel usually will be required to have some involvement. Generally, and subject to applicable procurement regulations and requirements, technical personnel furnish a statement of work (including detailed construction blueprints) outlining technical tasks that will be required on the part of the contractor and will recommend qualified contractors following technical evaluations of proposals.

Any procurement actions undertaken by EPA or other Federal departments and agencies based on this guidance must comply with applicable procurement regulations (e.g., Federal Acquisition Regulation) and requirements. This guidance is not intended to change or replace any applicable procurement regulations required by the user organization, including Federal and State regulations and statutes. Similarly, use of this guidance by a non-government organization may be subject to contract or other requirements for procurement.

In general, contractual documents usually include four basic elements: (1) solicitation documents, (2) contract forms, (3) contract conditions, and (4) plans and specifications. The types of solicitation documents will depend on the contract mechanism and form selected. Regardless of contract type, documentation related to requests for proposal, technical statement of work and specifications, qualification statements, formal solicitation documents, technical questions and responses, and other correspondence leading up to the selection of the constructor are part of the contract record and should be properly controlled from initiation of the solicitation process through completion of the project. This is likely to be a requirement of the procurement process and is an important practice from a quality stand point. Again, applicable Federal procurement regulations and policies will determine the appropriate contractual arrangement for Federal users.

Applicable GEPs for constructual contracts include:

- design of self-correcting procedures and processes;
- analysis and interchangeability of all resources, such as materials, personnel, and equipment;
- automatic communication/notification procedures and processes among all team members;
- integration of planning, design, purchasing/procurement, fabrication, construction/installation processes, and O&M procedures and requirements;
- integration/optimization of human, material, energy, and economic resources and logistical, political, social, environmental, and technical factors during each critical phase of the project;
- sound project management principles/practices;
- worker training/retraining, including hands-on training;
- worker registration/certification;
- certification/permitting of work procedures, processes, equipment, and environment;
- use of automatic safety/corrective action triggers in technical, logistical, political, social, environmental, and economic situations; and
- routine/periodic inspections, testing and compliance audits of systems, procedures, processes, and equipment, etc.

Also part of the typical contractual record are contract conditions, including milestone and completion dates, general and supplementary conditions, terms and methods of payment, indemnifications, risks and liabilities assumed by each party, warranties and guarantees, and contract termination conditions. Plans and specifications typically include detailed design drawings for facilities to be constructed, materials specifications, specifications for construction or modification of utilities, and any other applicable drawings and specifications, such as field change orders, appropriate sign-offs at various phases of construction, and as-built drawings.

Applicable legal requirements and specific administrative requirements of the site owner will dictate how long and in what form these and other contractual documents should be retained. The control of contract documents has been addressed in the publication, *The Uniform Locations of Subject Matter and Information in Construction Documents* (ASCE, 1981).

Standardization of construction contracts, in particular, is desirable in order to simplify the solicitation process and reduce the cost of soliciting bids and responding to such inquiries. Additionally, the use of standardized contract forms and language reduces the chance of errors and misunderstandings among the various parties. Many professional organizations and various industry associations have worked individually and jointly to develop standard forms, contracts, general conditions, and other contractual documents with this goal in mind. Examples of "standardized" contracts may be obtained from the Engineers Joint Contract Document Committee, the American Institute of Architects, and the Attorney General's Chamber. In addition, a standardized form of contractual conditions has been prepared and is widely recognized for international work. The form was prepared by the International Federation of Consulting Engineers (FIDIC) in consultation with lending institutions and constructor associations. The form can be found in *Conditions of Contract for Works of Civil Engineering Construction* (FIDIC, 1992). A guide to the use of FIDIC conditions was published in 1989 and is available through the American Consulting Engineers Council (ACEC) (ACEC, 1989).

It is important that organizational and technical interfaces be established in the contractual process and clearly defined in the contractual documents. The construction team leader establishes the project specifications and communicates them to the team members, provides commensurate funding, encourages cooperation and communication among all team members, ensures adherence to project specifications, and establishes a schedule that is adequate to complete the project in a quality fashion. As part of project definition, it is critical that quality expectations be translated into clear, concise written specifications. In many cases, the design professional will assist in defining project specifications based upon agency expectations and QA and QC objectives. This process of defining project requirements may be iterative. However, it is important that they be fully defined as early as possible in the pre-design stage of the project. Ideally, the constructor's project supervisor or operations manager should be involved in these discussions so as to better document quality expectations for implementation by procurement personnel in the appropriate contract documents.

In negotiated contract selection, qualifications statements may be solicited and evaluated (usually by technical staff), in accordance with applicable procurement regulations and requirements, to determine the constructor best qualified to perform the desired work. The responsible organization solicits proposals from potential offerors; the award is made on the basis of satisfying proposal elements defined by the organization or contracting entity. Such elements typically include:

- understanding of the project demonstrated by the constructor (based on the supplied scope of work);

- approach to the project, including utilization of unique and cost-effective approaches;
- proposed unit or lump-sum cost of the work, including fees;
- key management and supervisory personnel to be assigned to the project, including the role specified and the availability or commitment of these personnel; and
- plans and staffing to ensure compliance with safety, quality control, environmental, and other regulatory issues.

Additional elements that may be included are:

- proposed schedule with milestones and completion date(s);
- organization of project activities;
- use of local resources (materials, labor, etc.);
- availability of crafts, use of subcontractors, and minority and small business involvement;
- business information, such as labor and overhead costs, insurance, and contracting policies; and
- design of temporary structures, utilities, and transportation services.

The interfaces between the technical personnel and the procurement/contracting personnel should be clearly defined and implemented to ensure that all technical needs are communicated to the procurement/contracting personnel for implementation in accordance with applicable regulations and requirements. As shown in the following section, it may be necessary for the technical and QA personnel to interact with the procurement/contracting personnel to address quality requirements during various steps in the procurement process to ensure the acquisition of satisfactory items or services from the final contractual arrangements.

5.5 QUALITY PRACTICES IN PROCUREMENT ACTIVITIES

Basic Quality Principle
The responsible party and participating organizations, including the design professional, construction contractor, and facility operators should ensure that procured products and services meet established technical and QA objectives and that they perform as specified.

Quality should be an integral element of every procurement activity in the life cycle of an engineering project involving environmental technology. The following general discussions indicate points in a general procurement process where important quality control and quality assurance practices should be defined by technical and QA personnel for implementation by procurement/contracting personnel in accordance with applicable procurement regulations and requirements. These discussions are intended to provide guidance to technical personnel regarding their roles and responsibilities on quality-related actions that may need to be applied

during the procurement phases in engineering projects so that accurate and effective technical advice can be given to the procurement/contracts personnel.

5.5.1 Quality Practices in Procurement Planning

Early planning of and a systematic approach to procurement activities are important to ensure project quality, particularly for items and services that are integral to fabrication or construction of equipment necessary to the engineering project. It is important that organizational responsibility be identified and documented for applicable QA and QC activities such as specification of QA and QC requirements in the contract documents, pre-award audits and inspections to determine contractor capabilities, and technical and quality reviews of submitted bids or proposals. Typically, these activities will be performed by technical or QA personnel working with the procurement or contracting personnel. In addition, it is important that the sequence of actions (e.g., completion of a purchase requisition will occur before supplier bids are requested or a purchase order is awarded) and applicable milestones (e.g., signatures, award date, delivery of supplies or services, etc.) be documented and comply with any applicable procurement regulations or contract requirements. Standard elements of the procurement process typically include preparation, review, and change control of procurement documents; identification and selection of procurement sources; preparation of statement of work or specifications; evaluation and award of bid or proposal; verification of receipt and acceptance of the item or service; evaluation of supplier performance; and quality assurance records.

5.5.2 Quality Practices in the Evaluation of Suppliers

Supplier selection is based partly upon the purchaser's technical evaluation of the supplier's capability to provide the items or services in accordance with the specifications established in the procurement documents and subject to applicable procurement regulations and requirements. Identification of those within the organizations responsible for supplier source evaluation, including the appropriate QA organization, is important to ensure that quality supplies and services are procured. In most cases, these technical personnel will be responsible for determining whether or not the engineering design specifications have been satisfied in the supplier's proposal. Development and implementation of standardized evaluation and award procedures is also important to maintain the integrity of the selection process and ensure that supplier selection results in quality supplies and services. Supplier evaluation should ideally include a review of the supplier's history for satisfactorily providing similar products and services. Alternatively, an evaluation of the supplier's QA program, including quantitative or qualitative documentation of past performance, may be performed (usually by technical personnel) when permitted or authorized by applicable procurement regulations and requirements. In the case of suppliers that are new and do not have documentation of past performance, the supplier's technical and QA capabilities can be assessed based on an evaluation of the supplier's facilities, personnel, and quality program.

5.5.3 Quality Practices in Proposal Technical Evaluation

The solicitation proposal evaluation process determines the extent to which the supplier conformed to the specifications of the procurement document (e.g., request for proposal). This evaluation is typically performed by a team of contract specialists, technical experts, and QA personnel, subject to applicable procurement regulations and requirements. This process evaluates the skill and experience of the supplier's technical personnel; other technical considerations, such as the technical approach identified by the supplier; supplier past performance and production capability; QA program organization, procedures, and personnel; and any exceptions noted or changes in technical approach and specifications recommended by the supplier. Any such exceptions, recommended changes, or deficiencies identified during the evaluation should be resolved (or a commitment obtained from the supplier to resolve the issue), in accordance with applicable procurement regulations and requirements, before the contract is awarded. It is advisable that the purchaser's technical and QA personnel conduct a QA management review and confirm the acceptability of the supplier's QA provisions before the contract is awarded and/or work is started.

5.5.4 Quality Practices in Work Plans and Other Documents

Work plans and similar documents are often part of the quality assurance plan, and, in such cases, should include the following technical elements consistent with applicable procurement regulations and requirements:

- A scope of work detailing the technical and administrative (e.g., progress reports) specifications.

- Other technical specifications, such as design bases (identified and referenced); design drawings and other documents (e.g., codes regulations, procedures, etc.); and tests, inspections, hold points, or acceptance criteria used to monitor and evaluate supplier performance.

- QA provisions, including (1) QA specifications and documentation, (2) pass-down specifications that the supplier is required to incorporate into any sub-tier procurement documents, and (3) applicable QA documents from the purchaser if those are to be implemented in lieu of supplier QA procedures.

- Documentation of QA and QC procedures that may be outside normal industry standards such as usually would be specified in a standard operating procedure. This is especially important for suppliers of services. For example, a supplier may be using a standard operating procedure that is industry-accepted but may not satisfy specific project specifications. This type of situation would benefit from additional monitoring to ensure project specifications are achieved.

5.5.5 Quality Practices in Document Review and Approval

Procurement documents should be reviewed by trained personnel with access to and understanding of the procurement scope and requirements, and in accordance with applicable procurement regulations and requirements. Typically, the contractual aspects of these documents are reviewed by procurement/contracting personnel and the technical (and QA) aspects are reviewed by technical and QA personnel. Comprehensive review against the document requirements may help to ensures full compliance with procurement procedures. This review should help the responsible organization select the best-qualified supplier. This, in turn, increases the likelihood that appropriate and sufficient-quality supplies will be procured, thus helping to ensure that project quality is maintained. Reviews should be performed and documented, along with any changes, in accordance with applicable procurement regulations and requirements prior to the procurement document being issued to the supplier.

5.5.6 Considerations in Evaluating Supplier Quality Management Capability

In some circumstances in the engineering project process, it may be appropriate to require a supplier to have a quality system that conforms to a recognized consensus standard like ISO 9001:2000, *Quality Management Systems - Requirements* (ISO, 2000), as permitted in the Federal Acquisition Regulations in 48 CFR Part 46. In order to confirm that its quality system conforms to such standards, the supplier may demonstrate its conformity through a certification process. Such certificates are widely recognized and accepted, and may provide the customer with increased assurance that the supplier is capable of performing at a level that meets the needs of the customer. However, certification alone may not be sufficient to ensure that the supplier can perform to expectations in providing specific products and services. It may be necessary to assess or audit the supplier's performance directly. These audits are generally allowed under Federal procurement regulations and are typically conducted by customer's technical and QA personnel. The specifications for the audits are derived from the approved procurement documents and specifications.

5.5.7 Quality Conditions in Acceptance of Items or Services

Typically, acceptance by the purchaser of items or services received from the supplier will involve four parts, subject to applicable procurement regulations and requirements:

- source verification,
- receiving inspection,
- post-installation testing, and
- supplier certification of conformance.

Source verification involves acceptance of any goods or services by the purchaser based on monitoring, auditing, or other surveillance activities performed by the supplier. The extent of monitoring and the inspection intervals should be determined based upon the complexity and/or importance of the purchased item or service and previous experience with the supplier and in

accordance with applicable procurement regulations and requirements. Documented evidence of acceptance of the item or service is then furnished to the receiving party. Typically, such inspections are performed by technical personnel and/or QA personnel.

Receiving inspection is used by the purchaser to accept an item in accordance with established inspection procedures, which, in turn, are driven by the established product specifications and applicable procurement regulations and requirements. The inspection verifies, as applicable, product identification and configuration, dimensions, physical characteristics, cleanliness, and lack of damage. Inspections also include a review of the adequacy and completeness of supplier documentation. Accordingly, it is expected that the technical personnel conducting the inspections should have the necessary knowledge of the specifications and skills to evaluate the received items.

Post-installation testing is used frequently in engineering projects to verify that an item meets the specifications of the purchaser. It is critical that the purchaser's specifications be fully documented in advance of the project and that acceptance criteria be mutually agreed upon by the purchaser and supplier. This testing can be in the form of an onsite audit of the equipment supplied. A flow meter, for example, may be tested by calibration after installation to ensure that accuracy and precision specifications meet supplier and purchaser QC specifications. Again, such testing typically performed by technical personnel who will advise the procurement/contracting personnel regarding the acceptability of the items.

In lieu of or in addition to the above acceptance methods, the purchaser may require that the supplier provide a certificate of conformance with applicable technical standards or criteria (such as ISO 9001 mentioned earlier). The certificate identifies the purchased material or equipment along with the purchase order or other identification number traceable to the procurement document. This certificate should identify the codes, standards, specifications, or other procurement requirements met by the item. It is important that this certificate be signed or otherwise authenticated by a responsible official. For example, this certificate of conformance may be an American Society for Testing and Materials certification or other similar authentication that the product performs as specified. Verification of such certificates of conformity is typically performed by technical personnel who will advise the procurement/contracting personnel regarding the acceptability of the items.

5.5.8 Quality Considerations in Control of Supplier Nonconformance

The purchaser and supplier should document an agreed-upon process for handling items that do not conform with procurement document specifications and in accordance with applicable procurement regulations and requirements. At a minimum, the supplier should report nonconforming items to the purchaser within the allotted time frame and utilize the mechanism set up for nonconformance procedures. It is important, therefore, that such procedures establish specific guidelines for handling nonconforming items. In any case, the purchaser ultimately verifies the disposition of the nonconforming items. The technical guidelines should be provided

by the technical personnel to the procurement/contracting personnel, who will conduct discussions with the supplier in accordance with applicable regulations and requirements.

5.5.9 Quality Considerations in the Use of Commercial-Grade Items

The design may specify commercial-grade items. The items should be clearly identified in the design drawing or specifications by the technical personnel and conveyed to the procurement personnel. Any source selection specifications should also be identified in the procurement document from the manufacturer's published product description in accordance with applicable procurement regulations and requirements. Alternative suppliers, product grades, or products typically may be utilized only if the purchaser approves the change or replacement. Acceptance by the purchaser will be based on verification by technical personnel in the design organization that the alternative commercial product performs the intended function and meets design specifications in accordance with applicable procurement regulations and requirements. Acceptance of commercial grade items should be based upon (1) inspection or testing by the purchaser to ensure that the item meets manufacturer's specifications, (2) verification that the item received was the item ordered, (3) confirmation that no damage was sustained during shipment, and (4) confirmation that appropriate documentation was received and is acceptable. Technical personnel are responsible for advising the procurement/contracts personnel regarding the technical acceptability of commercial grade items.

5.6 SCHEDULING AND TRACKING

Basic Quality Principle
Early construction planning by the responsible party, design professional, and constructor enables schedule milestones to be included in the construction contract.

Significant issue dates for design elements and key delivery dates for supplies, materials, and factory-fabricated items should be included in the construction schedule to integrate design, procurement, and construction before construction begins. Other relevant schedule dates, such as utility hookups or changeovers, should be included. It is important that the schedules be based upon labor workforce availability and realistic production rates and quantities. Equally important is that the responsible party recognizes the necessity for preparing, coordinating, reviewing, and approving shop drawings and other submittals and allows sufficient time for such reviews.

5.7 COST MANAGEMENT

Basic Quality Principle
During the construction and fabrication of system components, the constructor's (and all subcontractors') estimates should be tracked, refined, and updated.

Documented procedures should be established that will allow control and tracking of construction costs for each phase/area/activity of the construction as well as for the overall project. Work productivity should also be tracked to identify problem areas. Identifying and, if necessary, correcting cost trends early in the process should help prevent overruns, quality problems, and disputes.

5.8 MATERIALS MANAGEMENT

Basic Quality Principle
The constructor should establish a documented plan to control and track purchasing, receiving, special storage, and in-storage maintenance of materials for the project and the time frame.

A documented plan may include a system that will key material deliveries to the project schedules. The availability of materials should be a prime consideration any time the project schedule is revised. Productivity and quality often suffer when crews are started and stopped repeatedly due to material shortages. Construction materials will generally fall into one of two major classes: *in situ* materials and manufactured items.

In situ materials include soils and rocks used for backfill, construction bases (e.g., gravel bases for roads and foundations), or components of site structures (e.g., clay used in landfill and lagoon liners and berms, limestone in cement, or gravel in concrete). Depending upon the material requirements, these materials may be excavated at the site or may be shipped from local, regional, or national suppliers. Transportation of these materials should be considered in construction scheduling, especially during severe weather. Stockpiles onsite may be used to provide a steady supply of materials; the location and footprint of such stockpiles should be considered during site planning.

Manufactured items include a wide variety of materials. Examples include metal or plastic piping; paints and sealers; liners or other plastic products; structural steel; electrical conduit, wiring, circuit breaker, switches, and other electrical components; motors, pumps, and other mechanical installations; plywood, particle board, and other wood and timber products; brick and other masonry products; and asphalt. As with *in situ* materials, identification of suppliers, establishment of contractual relationships, development of quality specifications, and consideration of schedule are all important elements of materials management. Materials quality specifications may be established by broadly-accepted standards developed by organizations, such as the American Society for Testing and Materials, the American Concrete Institute, Institute of Electrical and Electronic Engineers, and so forth. Alternatively, site-specific standards may be developed by the design firm. A good list of acceptance standards for a variety of materials is presented in the American Society of Civil Engineers guide, *Quality in the Constructed Project: A Guide for Owners, Designers and Constructors* (ASCE, 2000).

5.9 INSPECTION, TESTING, CONTROL, AND TRACKING

Basic Quality Principle
An important part of the work planning process is to identify the items and processes to be inspected or tested, the parameters or characteristics to be evaluated, the techniques to be used, the acceptance criteria, any hold points, and the organization responsible for performing the tests and inspections.

Inspection and testing of specified items and processes are conducted using established acceptance and performance criteria. The acceptance of items and processes is made by and documented by qualified and authorized personnel. It is important that equipment used for inspections and tests be calibrated. An inspection and testing program for the construction/fabrication/installation of environmental technology should be in accordance with the following key specifications.

First, it is important that a planning program be implemented for the inspection, testing, and monitoring of materials. Several objectives should be considered:

- the quality of supplies should be verified in accordance with specified procedures,
- the inventory of supplies and materials should also be monitored to ensure the continuity of construction activities, and
- the workmanship and adherence to technical specifications should be verified for specially-fabricated materials and equipment.

Second, a thorough and comprehensive inspection, testing, and monitoring program should be implemented. This may involve the inspection of supplies and materials in process at the supplier location. Alternatively, inspections may be made of goods ready for shipment from the supplier or as received by the constructor or the contractor.

Third, the performance of inspections and testing, as well as the results, should be fully documented. This is critical in cases where problems and defects occur and there is a disagreement between the receiver and the supplier as to the quality of the product or material or as to who is responsible. Since such problems cannot be predicted, it is important that thorough documentation be an integral part of the inspection and testing process.

Finally, a quality assurance program is vital to the inspection and testing program. It is important that any monitoring, measuring, testing, and data collection equipment be properly selected and utilized. Equipment selection entails that the equipment measure the parameter within the established acceptance range. Therefore, the testing equipment should be properly sized such that its measurement range and accuracy meets those standards established for the product or material. In addition, the testing equipment should have a precision range that encompasses the agreed-upon tolerance limits for the product. As has been discussed previously, the acceptance range and tolerance limits should be established in advance, agreed

upon with the supplier, and fully documented in the appropriate contractual documents. Not only should the measurement instrument be properly selected, it should be properly used and controlled to ensure the reliability of testing results. The equipment should be used according to the manufacturer's instructions for that equipment. Frequent performance and documentation of equipment calibration is important, especially under harsh operating conditions. Zero checks and calibration with known standards are typically the minimum calibration specifications. Additional calibration procedures may include measurement of internal standards (standard incorporated into the matrix to be measured) or other more sophisticated QA procedures. Equally important to the selection and calibration of testing equipment are the qualifications of inspection and test personnel. Training in inspection and testing procedures, equipment use and calibration, and proper procedures to document inspections and tests is critical to the success of any quality assurance program.

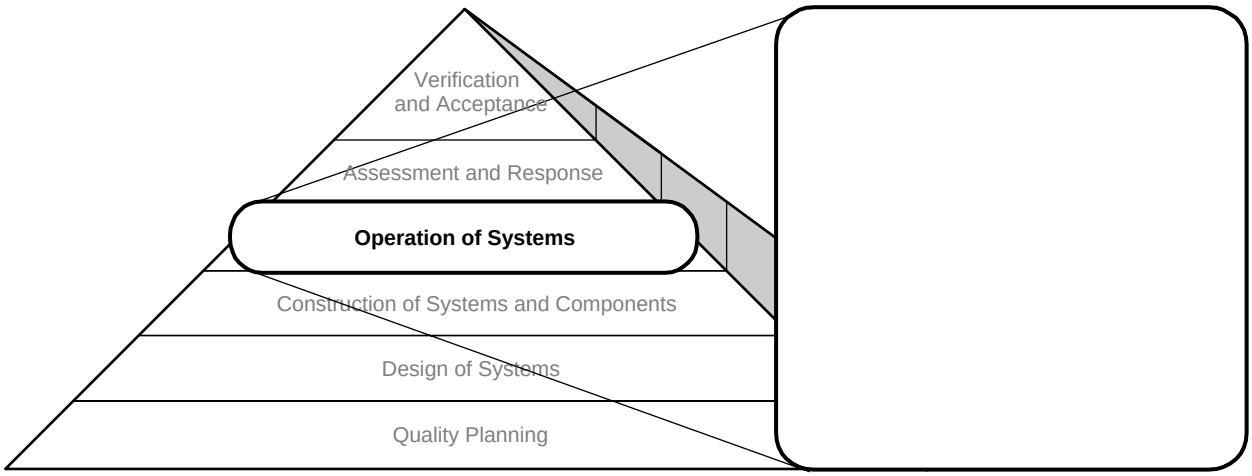
5.10 COMPLETION APPROVALS

Basic Quality Principle
During the planning phase of the project, specifications for construction completion certification and approvals of external agencies and other groups should be established, documented, and communicated with appropriate individuals.

Environmental technology construction projects may have two levels of approvals: (1) internal and (2) external/independent/regulatory. Internal certifications and approvals consist of the design professional verifying/authenticating and certifying for the responsible party the completion of part or all of the construction/fabrication/installation. When a project is completed (or critical portions thereof), many agencies require some sort of release or affidavit, or both, certifying that work has been done substantially in accordance with the appropriate contract documents. Furthermore, information on the location or completeness of record drawings and certain project-specific design/construction documents may be required. In addition to formal regulatory review, environmental projects involving other stakeholders (e.g., local communities, environmental groups, etc.) may require approval by these stakeholders or their technical representatives.

CHAPTER 6

SYSTEM OPERATION AND MAINTENANCE



6.1 INTRODUCTION

Basic Quality Principle
O&M factors influence life-cycle costs, continuity of service, durability, public health and safety, environmental impact, and other features of the completed environmental technology project/program/facility.

The operational characteristics and maintenance of the project after completion determine the success in meeting project objectives. Consideration of O&M specifications in each phase of project planning, design, construction, and start-up is therefore desirable. For all projects, active participation of the developer from an O&M viewpoint adds to the developer's understanding of the design criteria and the effort to translate the design specifications into an operating facility meeting project specifications. In the planning and design of the project, the O&M concern is with input to and review of design-phase activities; in the construction phase, the concern is with construction observation and inspection; in the start-up phase, the concern is with verification, testing, and acceptance; and in the operational phase, the concern is with the operation and maintenance of the constructed project. O&M procedures are normally established and documented to ensure control and compliance for each of the various stages of the project as discussed below.

6.2 PLANNING FOR O&M INPUT AND TRAINING

Basic Quality Principle
The developer may select from a number of options providing for consideration of the various O&M issues as they influence design, construction, and operation of the environmental technology.

The following issues should be addressed while planning for O&M:

- The developer may appoint a member of the O&M staff as project coordinator to advise the design professional and the constructor from the O&M standpoint. For this assignment the developer should find an experienced individual, preferably a candidate to head up the operations team for the completed facility.

- The developer may contract with the design professional to have an experienced professional member of the design team or a qualified consultant provide the appropriate O&M advice and review.

- The developer may delegate members of the O&M staff to work under the design professional in observation and/or inspection of construction activity during the construction phase. This assignment provides an opportunity for O&M personnel to become familiar with the project while performing construction phase duties.

- The developer may delegate members of the O&M staff to work with the design professional and constructor during the start-up phase of the project.

- The developer may contract with the design professional and/or constructor to provide review of and advice for operation and maintenance programs for some defined time after the project has been taken over by the operating staff.

6.3 O&M CONSIDERATIONS DURING DESIGN PHASE

Basic Quality Principle
Decisions made during the design phase relating to site selection and access, process choice, equipment selection, and other elements of the project will impact O&M of the completed project and limit flexibility in subsequent phases of the project.

Reviews stressing the operability and maintainability of various features of the project are scheduled at appropriate points in the design phase and at final design. The frequency and depth of these reviews vary with the size and complexity of the technology to be deployed. Reviews from an O&M perspective normally include the following:

Physical plant considerations – Size and layout of working space to be provided; suitability of equipment types, including efficiency in operation, maintenance schedule, and costs for the equipment; provisions for bypassing and isolation equipment for maintenance; specialized services, such as laboratory and chemicals; staff amenities; efficient land utilization; specific layout of equipment, process, and control systems to provide O&M accessibility; lay-down space and removal paths; appropriate flexibility and redundancy in equipment and controls; and provisions for adequate manufacturer-supplied materials, and spare parts information should be considered.

Control strategies – Alternative strategies on efficiency of operations and staffing.

Life-cycle cost considerations – Building materials and equipment.

Environmental considerations – Provisions to mitigate odors, noise, and undesirable aesthetic effects, as well as the possible need for a public-relations program.

Safety considerations – Equipment, protective devices, etc.

Personnel – Budget planning and O&M staffing.

During the design phase, the developer is responsible for communicating needs, constraints, expectations, and requirements regarding performance, operation, and maintenance of the proposed facility and for providing timely reviews. The developer is also responsible for providing adequate O&M input and determining (with the help of the design professional and the O&M coordinator) O&M budget and staffing requirements. The design professional is then responsible for preparing the plans and specifications incorporating O&M considerations.

6.4 O&M CONSIDERATIONS DURING CONSTRUCTION/FABRICATION/ INSTALLATION PHASE

Basic Quality Principle
The construction phase of the project provides an opportunity for the developer's O&M coordinator to make the transition from the advisory and reviewer roles of the design phase to more active roles.

Activities contributing to project construction that can provide valuable information for O&M personnel include:

- inspection and testing of materials and equipment;
- observation of installation and testing of equipment by the constructor;
- observations of construction activities pertaining to utility routing and locations, installation problems affecting O&M, and arrangements of project elements as they affect operational safety and maintenance; and

- assistance to the design professional in preparation and review of the O&M manuals and procedures.

6.5 SYSTEM START-UP

Basic Quality Principle
The O&M staff are key players in the start-up of any project.

The purpose of start-up phase activities is to demonstrate that project elements constructed or installed by the constructor are in working order, and that the facility performs as planned by the developer and the design professional. This activity gives the O&M staff the opportunity to become familiar with the project under the guidance of the constructor and design professional. Start-up of an environmental technology may require the organization and training of a start-up group composed of representatives from the developer, design professional, constructor and O&M staff.

6.5.1 Planning the Start-Up Program

Responsibility for organizing and leading the start-up program is generally part of the developer agreement with the constructor. With responsibility for start-up established, the start-up team is assembled with representation from the design professional, constructor, and developer, with particular emphasis on representation from the O&M staff. Activities of the team in planning for start-up include:

- preparing and reviewing start-up programs and procedures,
- determining construction completion status,
- planning for supervision of system testing and correlation of deficiencies, and
- reviewing final inspection reports and project closeout submittals.

Planning for an environmental technology/treatment system/facility start-up calls for a well-defined approach and documented procedures and methods for:

- hazardous operations review/analysis,
- safety checking/testing,
- operator training,
- system start-up (start-up procedures),
- standard operating procedures, and
- emergency shutdown procedures.

The interaction and exchange of information among the principal parties involved in the project may be outlined in a start-up manual along with planning, scheduling, testing, and other activities planned by the start-up team. Start-up manuals should be structured to fit the project.

Simple, direct, and brief language is preferred. Aids such as forms, checklists, and tabulations are useful.

6.5.2 Start-Up Activities

Project start-up activities demonstrate the integration of various constructed systems into a unified facility. Start-up activities are generally based on the premise that project elements completed by the constructor have met the material, workmanship, and performance specifications. Start-up activities are structured to:

- determine that each component of the project is in working order;
- determine that these components can be integrated to operate as a facility, which performs as planned by the developer and design professional;
- provide a means of training O&M personnel in the operation of each of the components and of the completed facility (O&M during the start-up of the project provides opportunity for the O&M staff to view technology operations with guidance from the design professional and the constructor);
- validate O&M instructions and manuals prepared by the design professional or others;
- check the file of record documents (plans, specifications, manufacturers' operating instructions, maintenance instruction, etc.) for appropriate scope and detail; and
- serve as a vehicle for acceptance of the constructor's completed contract and turnover of the facility to the O&M staff for operation.

6.6 NORMAL/ROUTINE OPERATIONS

Basic Quality Principle
Documented procedures should be established prior to the start of the operating phase and refined, fine-tuned, and updated, as needed, for all substantial activities that constitute the system operation.

The post-construction, post-start-up operating phase of the project is generally the sole responsibility of the developer and the O&M staff. The O&M staff works with and/or through the constructor in seeking enforcement of all applicable warranties (and performance standards) and correction of any defects found in the constructor's work. The O&M staff may also wish to consult with the design professional to request clarification and amplification of operating and maintenance manuals, to seek advice in fine-tuning project operations, and to ask for assistance in testing and evaluating performance for conformance to design criteria and project specifications. Established documented procedure should include the following:

Process control and monitoring – To ensure that process output (the product or discharge stream) complies with reference standards/codes, quality plans, and/or documented procedures, and stays within the permissible tolerance criteria.

Equipment control and maintenance – To ensure that each piece of equipment within a process, process train, or system performs its intended task with the appropriate degree of accuracy and reliability.

Technology operating guides also provide helpful information about systems and processes. They normally include, but are not limited to:

- appropriate controls for measuring and testing equipment;
- operating procedures and parameters for specific components and system configurations, including specified safety limits;
- process equipment control and maintenance;
- special environments, time, temperature, or other factors affecting the quality of operation; and
- the skill, capability, and knowledge of operators to meet operational, environmental, and quality objectives.

6.6.1 Process Control

Process control activities may be documented by instructions, procedures, drawings, checklists, or other appropriate means. These means ensure that process parameters are monitored and controlled and that specified environmental conditions are maintained.

6.6.2 Control of Auxiliaries and Services

When the quality of systems operation is directly affected, auxiliary materials, utilities, and consumables (e.g., water, compressed air, electric power, and chemical feed stocks) should be controlled and verified periodically to ensure uniformity of their effect on the systems involved in accordance with established procedures. Only qualified and accepted services or items and consumables should be used during the operation of systems.

6.6.3 Control of Operational Status

The status of the operating system is controlled to ensure conformance with the approved operating procedures and specifications. Status indicators with tolerance limitations should be provided to display the operating status of systems and components of systems as described in the design and operating instructions and guides. The use of status indicators will help to prevent inadvertent operation or removal from operation of systems or components when such actions would adversely affect performance of the systems, constitute an operational safety or environmental hazard, or violate statutory/regulatory compliance requirements. (Note: Such

situations include the loss of data that are difficult or impossible to reproduce and may result in the unplanned release of pollutants in excess of established limits.)

6.7 INSPECTION AND TESTING

Basic Quality Principle
The O&M organization should establish and maintain documented procedures for receiving, in-process, and final inspection and testing in order to verify that specifications are achieved. Provided in this section are inspection and testing specifications for engineering applications.

Areas of inspection include:

- equipment, parts, spare parts, system components, hardware, software, and supplies;
- process feed/inputs;
- other processing materials; and
- treated materials and products/by-products.

6.7.1 Qualifications of Inspection and Test Personnel

Each person who verifies conformance of O&M activities for the purpose of acceptance should be qualified to perform the assigned inspection task. Inspections by persons during on-the-job training for qualification should be performed under the direct observation and supervision of qualified personnel.

6.7.2 Inspection and Testing Specifications

A. Planning for Inspection and Testing

Inspection is not a separate QA function. It is a line implementation function and test planning should be performed and documented. This includes:

- identification of the item to be tested or the treatment processes/operations where inspections are necessary;
- identification of the test specifications or the characteristics to be inspected and the identification of when, during the treatment process, inspections are to be performed;
- identification of the testing, inspection, or process monitoring methods to be employed;
- identification of acceptance criteria, including the desired levels of precision and accuracy (when statistical sampling is to be used to verify the acceptability of the subject items or materials, the statistical sampling method should be based upon recognized standard practices);

- identification of sampling activities;
- methods to record inspection or test results;
- selection and identification of the measuring and testing equipment to be used to perform the test or inspection;
- the process used to ensure that the equipment being utilized for inspection or testing is calibrated and is of the proper type, range, accuracy, and tolerance to accomplish the intended function;
- provisions for ensuring that prerequisites for the given test or inspection have been met, including hardware and software needs, personnel training and qualification, and suitably controlled environmental conditions; and
- any mandatory hold points.

B. Receiving or Hold Point Inspection and Testing

The O&M staff should ensure that incoming materials or products are not used or processed until they have been inspected or otherwise verified as conforming to specifications. Verification of the specifications should be performed in accordance with the project-specific quality plan and/or documented procedures. When incoming material or product is released for urgent treatment/processing purposes prior to verification, it should be positively identified and recorded in order to permit immediate recall and re-treatment in the event of nonconformity to specifications.

Hold points are used to control work or activities that are not to proceed without the specific consent of the designated representative or organization placing the hold point. The specific hold points should be specified in appropriate documents. Only the organization or representative responsible for the hold point may waive the hold point inspection requirement. Consent to waive specified hold points is recorded prior to continuation of work beyond the designated hold point.

C. In-Process Inspection and Testing

Items or materials in process are inspected and/or tested as necessary to verify quality. If inspection of processed items is impossible or disadvantageous, indirect control by monitoring of processing/treatment methods, equipment, and personnel should be provided. When a combination of inspection and process monitoring methods is used, monitoring should be performed systematically to ensure that the specifications for control of the process and the quality of items are met throughout the duration of the treatment process.

D. Final Inspection and Testing

Final inspections include a review of the results and verification of the resolution of all non-conformities identified by earlier inspections. Treated materials are inspected and tested for completeness or other characteristics as required to verify the quality and conformance of the materials to the applicable specifications. Reprocessing or further treatment of the treated

materials subsequent to final inspection normally entails reinspection or retesting, as appropriate, to verify acceptability.

E. In-Service Inspection and Testing

In-service inspection or surveillance of structures, systems, or components of the environmental technology should be planned and executed by or for the organization responsible for their operation. Inspection and testing methods should be established and executed to verify that the characteristics of the subject material continue to remain within specified limits. Inspection and testing methods include evaluations of performance capability of key equipment, verification of calibration and integrity of instruments and instrument systems, and verification of maintenance, as appropriate.

F. Inspection and Test Documentation

The O&M staff should establish and maintain records that provide evidence that the components and processes of the environmental technology and the materials involved, including the feed matrices, treatment chemicals and supplies, and the treated residuals, have been inspected and/or tested. These records should clearly indicate whether the subject item has passed or failed the inspections and/or tests according to defined acceptance criteria. Inspection and test results are then evaluated by qualified individuals within the O&M organization to ensure that all test and inspection specifications have been satisfied. When the item fails to pass any inspection and/or test, the procedure for control and replacement of the nonconforming item would apply. Inspection and test documentation should identify:

- items or materials inspected and/or tested;
- the date of inspection and/or test;
- the name or unique identifier of the inspector/tester who documented, evaluated, and determined acceptability;
- the method of inspection and/or the applicable test specifications, plans, and procedures, including revisions;
- the inspection and/or test criteria, sampling plan, or reference documents (including revision designation) used to determine acceptance;
- the results;
- the identification of the measurement and testing equipment used during the inspection and/or test, including the identification number and the calibration due date; and
- reference to any information on actions taken in connection with nonconformities, as applicable.

6.7.3 Inspection and Test Status

The inspection and test status of an item should be identified by suitable means, which indicates the conformance of the item with regard to inspection and tests performed. The

identification of inspection and test status should also be maintained, as defined in the project-specific quality plan and/or documented procedures, throughout the O&M of the treatment process in order to ensure that only items and materials that have passed the inspections are used, installed, or dispatched.

6.8 HANDLING, STORAGE, PACKAGING, PRESERVATION, AND DELIVERY

Basic Quality Principle
Documented procedures should be established and maintained for handling, storage, packaging, preservation, and delivery of product.

Additional QA-related O&M aspects include the following:

Handling – The O&M organization should provide safe and proven methods for handling products in order to prevent damage or deterioration.

Storage – Designated storage areas or stock rooms are used to prevent damage or deterioration of product, pending use or delivery.

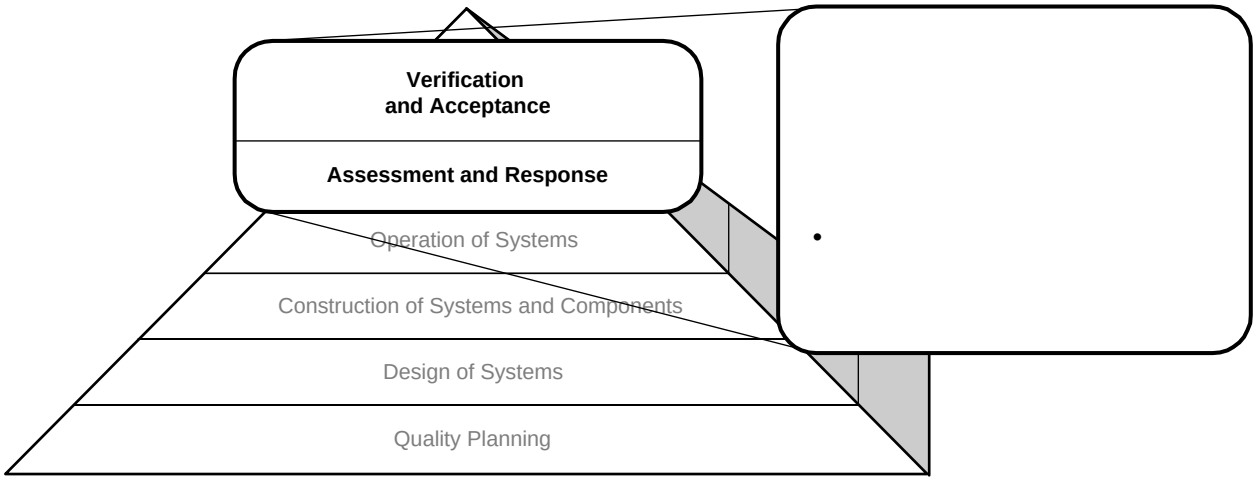
Packaging – Packing, packaging, and marking processes (including material use) should be controlled to the extent necessary to ensure conformance to specifications.

Preservation – Appropriate methods for preservation of products should be applied.

Delivery – The O&M staff should be responsible for the protection of the quality of product after final inspection and testing.

CHAPTER 7

ASSESSMENT AND VERIFICATION



7.1 MANAGEMENT/TECHNICAL ASSESSMENT AND RESPONSE

Basic Quality Principle
Assessment provides the basic program structure to ensure that quality specifications are maintained.

This section summarizes the role of assessments in environmental technology projects and how the results of assessments are used. For more information on how to conduct technical audits and assessments, see *Guidance on Technical Audits and Related Assessments (EPA QA/G-7)* (U.S. EPA, 2000c).

7.1.1 Types of Assessments

Work performed during the design, construction, and operation of environmental technology that affects quality should be assessed regularly to ensure that approved planning steps, design specifications, and operating guides are being implemented as prescribed. When acceptance criteria are not met, deficiencies are normally resolved and reassessments conducted as necessary. Appropriate corrective actions are taken and their adequacy confirmed and documented in response to deficiencies or nonconformities. Under most circumstances the organization performing assessments has sufficient authority and freedom from the activities being assessed to carry out its responsibilities. Persons conducting external or third-party assessments should also be technically qualified and knowledgeable of the items and activities being assessed. In addition, the owner/developer may have a need to conduct internal or first-party assessments.

The types and frequencies of independent assessments are usually based upon the relevant control levels assigned to the items and activities under the cognizance of the organization. In addition, the participant organizations responsible for the performance of activities important to compliance application, waste characterization, or the isolation of waste within the disposal/treatment system should implement a program of surveillance and audits. The program is then planned and documented and should include both routine surveillance of those activities and audits to establish compliance with all aspects of the project-specific QA plan to determine its adequacy and effectiveness.

Periodic assessments or audits may also be desirable throughout the process life cycle. Audit timing should be addressed. Is a process audited only once at the beginning, periodically throughout its life cycle, or perhaps when changes in operation or personnel occur? Selecting qualified personnel for audits is important to the success of the audit. Personnel should be chosen based on two primary factors: (1) the expertise appropriate to review the process or operation being audited and (2) experience in performing audits. Often a team approach is appropriate to provide these qualifications. In many instances a technical expert and QA auditor can work together to provide the combined expertise suitable for the audit. This is particularly useful during technology operation or evaluation. This approach would usually be applied as part of a technical systems audit conducted early in the operation life cycle. Technical experts can provide invaluable expertise in evaluating design, construction, and operation of environmental technologies. The technical expert provides the knowledge and experience adequate to address all parts of the process audited, while the QA auditor provides the understanding of the audit process, helping to focus the audit on those activities that are most critical. The QA auditor can also provide leadership in terms of how to frame questions, what type of follow-up questions might be appropriate, and how to couch audit findings so as to maximize management support.

Audit procedures and checklists should be developed and reviewed by the team before beginning the audit. Thought should be put into the process flow (beginning with receipt, testing, and acceptance of materials, through operational aspects, and ultimately ending with the finished product or completed project). Audit questions should be clear, concise, and nonjudgmental. Potential follow-up questions should be anticipated and, where appropriate, decision trees applied. Another important aspect of audit planning is addressing the issue of responsibility or authority to suspend work if audit findings show that the process is out of compliance with regulatory or QA criteria. Should the process be halted or operational changes evaluated if deficiencies are noted during the course of an audit? Serious findings may be identified. How are they reported? How are they brought to the attention of appropriate personnel? When should work be suspended for reassessment?

Basic assessments include quality control or technical assessments and management audits. These assessments are designed to provide a review of project performance that is unbiased by the pressures of meeting construction schedules and budgets. An example of a quality control assessment is the **technical systems audit**. This is an audit of design, construction, or operational systems to ensure that procedures defined in planning documents are

being carried out properly. The project planning document should be used as a guide when performing these assessments.

Management audits and assessments, on the other hand, are evaluations of program or project management quality. These are performed by managers, or designated internal or external experts, to periodically assess the performance of their organizations. The results of these audits should be used to implement corrective measures, where necessary, and as input into the organization's continuous improvement process. In many cases, such assessments are an integral part of management review.

Surveillances are observations of a specific technical activity on an extended basis. The surveillance process consists of monitoring or observing to determine whether an item, activity, system, or process conforms to specifications. Surveillances are intended to accomplish the following:

- monitor work in process,
- document compliance or noncompliance with established specifications and procedures,
- identify actual and potential conditions adverse to quality,
- obtain timely corrective action commitment from cognizant managers for identified conditions adverse to quality,
- provide notification to responsible managers of the status and performance of work under surveillance, and
- confirm timely implementation of corrective action.

Assessments should be performed using the written procedures related to the activity being assessed. Elements that have been selected for assessment are then evaluated against specifications. Objective evidence is obtained to determine if those elements are being implemented effectively. Conditions requiring prompt corrective action should be reported immediately to management of the monitored organization. Conditions adverse to quality should also be documented and corrected according to the discussion in Section 7.1.3 below.

7.1.2 Control of Nonconforming Items

Documented procedures should be established and maintained in order to ensure that items and materials that do not conform to specifications are prevented from unintended use, installation, or release. This control should provide for identification, documentation, evaluation, segregation (when practical), and disposition of nonconforming products, and notification to the functions concerned.

Identification of nonconforming items by marking, tagging, or other methods should not adversely affect the end use of the item. The identification should be legible and easily recognizable. If identification of each nonconforming item is not practical, the container, package, or segregated storage area, as appropriate, is then identified.

Nonconforming items should be segregated, when practical, by placing them in a clearly identified and designated hold area until properly dispositioned. When segregation is impractical or impossible due to physical conditions, such as size, weight, or access limitations, other precautions should be employed to preclude inadvertent use of a nonconforming item.

Nonconforming item characteristics are to be reviewed, and recommended dispositions of nonconforming items should be proposed and approved in accordance with documented procedures. Further processing, delivery, installation, or use of a nonconforming item is then controlled pending an evaluation and an approved disposition by authorized personnel.

The responsibility for review and authority for the disposition of nonconforming product should be defined. Personnel performing evaluations to determine a disposition should have demonstrated competence in the specific area they are evaluating, have an adequate understanding of the specifications, and have access to pertinent background information.

Disposition of nonconforming product and the technical justification for the disposition should be identified and documented. Nonconformity of an item may be disposed through:

- reworking or retreating to meet the specifications,
- accepting with or without repair or remedy by concession,
- regrading for alternative treatment or applications, or
- rejecting or scrapping.

The description of the nonconformity that has been accepted and the description of the repair or remedy is then recorded to denote the actual condition. Repaired, reworked, and/or retreated product should be reinspected, retested, and/or reassessed in accordance with the project-specific quality plan and/or documented procedures.

7.1.3 Corrective and Preventive Action

The participant organization should establish and maintain documented procedures for implementing a corrective and preventive action program. Any corrective or preventive actions taken to eliminate the causes of actual or potential nonconformities are to be appropriate to the magnitude of the problems and commensurate with the risks encountered. The responsible organization should implement and record any changes to the documented procedures resulting from corrective and preventive action.

The procedures for corrective action should include:

- effective handling of client, customer or regulatory complaints, and reports of product nonconformities;
- investigation of the cause of nonconformities relating to product, process, and quality system, and recording the results of the investigation;

- determination of corrective action that will eliminate the cause of nonconformities; and
- application of controls to ensure that corrective action is taken and that it is effective.

The procedures for preventive action should include:

- the use of appropriate sources of information, such as processes and work operations that affect product quality, concessions, audit results, quality records, service reports, and customer complaints to detect, analyze, and eliminate potential causes of nonconformities;
- determination of the steps to be taken to deal with any problems requiring preventive action;
- initiation of preventive action and application of controls to ensure that it is effective; and
- confirmation that relevant information on actions taken is submitted for management review.

Refer to U.S. EPA, 2000c for more information on corrective and preventive actions.

7.2 VERIFICATION AND ACCEPTANCE

Basic Quality Principle
Verification is confirmation by examination and provision of objective evidence that specified requirements have been fulfilled. Though it is related to the concept of assessment, verification is usually considered an ongoing line management responsibility, rather than as independent oversight.

7.2.1 Verification Tools

Verification involves identifying what goals should be met at various stages of operation or evaluation and whether these goals are still achievable. In some instances, for example, re-evaluation of the process being used or evaluated may merit consideration. Updating of QC specifications during the course of operation, changes in operation or construction activities, or re-evaluation of set standards may be called for if operation does not proceed as planned. If re-evaluation shows that initial QC specifications are not adequate, then the implementation plan should identify a process for ensuring that appropriate changes can be incorporated and that appropriate procedures for approval are followed. Who reviews the process? Who approves changes? How many steps of review are involved? Review processes are included at different stages of design, construction, and operation. These can be conducted prior to initiation of operational start-up, subsequently as periodic reviews, or after major events, such as operational maintenance.

Verification reviews provide a basic means of assessing the conformance to specifications of any process or operation. Appropriate **technical reviews** conducted within the project ensure that project objectives are being or have been met. The key to conducting successful reviews is to incorporate personnel who have the appropriate expertise to review the portion of the project in question. Qualifications of those being solicited should be assessed by line management before dedicating the resources for the review.

Peer reviews can be similar to technical reviews. They are conducted by someone who was not involved previously in the planning process, but who has suitable qualifications to provide valuable, previously unsolicited information.

Document/records reviews should be performed to assess whether appropriate and complete records are being maintained. Records to be reviewed should include draft and final reports, plans, procedures, and specifications; technical and peer review comments; steps taken to incorporate comments; technical drawings and specifications; and any inspection or audit reports.

Management oversight typically involves informal inspections and observation of processes. Project managers may perform such oversight as a way of observing day-to-day activities and ensuring that the system is operating as called for in specified procedures. The observer may not use any formal checklist, but rather may use his/her experience with similar operations and knowledge of operating procedures to identify any obvious problems or failures to operate the system as planned

Results of the verification review process are recommendations reported to project management, whose responsibility is to determine if review recommendations should be implemented. Contentious issues may be discussed with all personnel, but ultimate responsibility to make organizational or project improvements resides with project management.

7.2.2 Reconciliation of As-Designed and As-Constructed Projects

In constructed projects, discrepancies may develop between the contract documents and the as-constructed project. Such discrepancies are a consequence of field conditions that are different from those envisioned during design or construction problems whose resolutions result in a contract change. Reconciliation of as-designed and as-constructed conditions may involve the development and implementation of a procedure to determine compliance with design documents by the material supplier, fabricator, erector, constructor, etc., and the review and approval of any necessary changes.

7.2.3 Validation

Depending on the scale and sensitivity of the project, there may be a separate validation step in addition to verification. Validation is normally performed under defined operating conditions and on the final product, but may be appropriate in earlier stages prior to product

completion. Validation activities are used to demonstrate that the designed product is an acceptable representation of the process or the system for which it is intended, and that the product performs within defined limits for each applicable parameter.

In contrast to verification, validation is typically performed by an independent third party. Project methods, test data (including any software-generated results), and conclusions should be documented in a form that can be understood by an independent individual technically competent to understand the particular item under study. The documentation is then reviewed to assess the correctness of the documentation in meeting the validation test specifications.

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APPENDIX A

TERMS AND DEFINITIONS

Activity – An all-inclusive term describing a specific set of operations or related tasks to be performed, either serially or in parallel (e.g., research and development, field sampling, analytical operations, equipment fabrication), that in total result in a product or service.

Assessment – The evaluation process used to measure the performance or effectiveness of a system and its elements. As used here, assessment is an all-inclusive term used to denote any of the following: audit, performance evaluation, management systems review, peer review, inspection, or surveillance.

Audit – The systematic, independent, and documented process for obtaining audit evidence and evaluating it objectively to determine the extent to which audit criteria are fulfilled **[ISO 9000]**.

Auditee – The organization being audited.

Auditor – A person qualified to perform audits.

Authenticate – The act of establishing an item as genuine, valid, or authoritative.

Calibration – Comparison of a measurement standard, instrument, or item with a standard or instrument of higher accuracy to detect and quantify inaccuracies and to report or eliminate those inaccuracies by adjustments.

Characteristic – Any property or attribute of a datum, item, process, or service that is distinct, describable, and/or measurable.

Confidentiality procedure – A procedure used to protect confidential business information (including proprietary data and personnel records) from unauthorized access.

Configuration – The functional, physical, and procedural characteristics of an item, experiment, or document.

Conformity – The fulfillment of requirements **[ISO 9000]**.

Consensus standard – A standard established by a group representing a cross section of a particular industry or trade, or a part thereof.

Constructor – The party assigned by the developer in charge of technology construction. The constructor's role should be specifically defined in the developer/constructor contract.

Contractor – Any organization or individual that contracts to furnish services or items or perform work.

Corrective action – Action to eliminate the causes of a detected nonconformity or other undesirable situation **[ISO 9000]**.

Client – Any individual or organization for whom items or services are furnished or work performed in response to defined requirements and expectations. See also Participant and User.

Deficiency – An unauthorized deviation from acceptable procedures or practices, or a defect in an item.

Demonstrated capability – The capability to meet procurement technical and quality specifications through evidence presented by the supplier to substantiate its claims and in a manner defined by the customer.

Design – Specifications, drawings, design criteria, and performance requirements. Also the result of deliberate planning, analysis, mathematical manipulations, and design processes.

Design change – Any revision or alteration of an approved and issued design.

Design review – A documented evaluation by a team, including personnel such as the responsible designers, the client for the work or product being designed, and a QA representative, but other than the original designers, to determine if a proposed design will meet the established design criteria and perform as expected when implemented.

Design team – The parties responsible for the design of an environmental technology application. Depending on the scope of the project, this may consist of one or more professionals employed by the developer, or it may include representatives of various contractors and subcontractors as well.

Developer – The organization(s) responsible for site development and technology construction/implementation. The developer may be a single organization, as in the case of a site-specific treatability study for which the technology developer is also the site developer. In other cases, additional parties are involved, especially in the case of a large-scale technology implementation.

Document – Information and its supporting medium **[ISO 9000]**.

NOTE: A document may be any written, electronic, or pictorial information describing, defining, specifying, reporting, or certifying activities, requirements, procedures, or results.

Entity – That which can be individually described and considered, such as a process, product, item, organization, or combination thereof.

Environmental data – Any measurements or information that describe environmental processes, locations, or conditions; ecological or health effects and consequences; or the performance of environmental technology. For EPA, environmental data include information collected directly from measurements, produced from models, and compiled from other sources such as data bases or the literature.

Environmental data operations – Work performed to obtain, use, or report information pertaining to environmental processes and conditions.

Environmental programs – Activities involving the environment, including but not limited to characterization of environmental processes and conditions; environmental monitoring; environmental research and development; laboratory operations on environmental samples; and the design, construction, and operation of environmental technologies.

Evidentiary records – Records identified as part of litigation and subject to restricted access, custody, use, and disposal.

Expedited change – An abbreviated method of revising a document at the work location where the document is used when the normal change process would cause unnecessary or intolerable delay in the work.

Extramural agreement – A legal agreement between EPA and an organization outside EPA for items or services to be provided. Such agreements include contracts, work assignments, delivery orders, cooperative agreements, research grants, state and local grants, and EPA-funded interagency agreements.

Financial assistance – The process by which funds are provided by one organization (usually government) to another organization for the purpose of performing work or furnishing services or items. Financial assistance mechanisms include grants, cooperative agreements, and government interagency agreements.

Finding – An assessment conclusion that identifies a condition having a significant effect on an item or activity. An assessment finding may be positive or negative and is normally accompanied by specific examples of the observed condition.

Good engineering principles/practices – A broad set of QA, conservation, and safety activities, techniques, and approaches that are commonly accepted throughout the engineering profession.

Grade – The category or rank given to entities having the same functional use but different requirements for quality.

Graded approach – The process of basing the level of application of managerial controls applied to an item or work according to the intended use of the results and the degree of confidence needed in the quality of the results.

Guideline – Conformity evaluation by observation and judgement accompanied as appropriate by measurement, testing, or gauging **[ISO 9000]**.

Independent assessment – An assessment performed by a qualified individual, group, or organization that is not a part of the organization directly performing and accountable for the work being assessed.

Inspection – Examination or measurement of an item or activity to verify conformance to specific requirements.

NOTE: Inspection may include activity such as measuring, examining, testing, or gauging one or more characteristics of an entity and comparing the results with specified requirements in order to establish whether conformity is achieved for each characteristic.

Item – An all-inclusive term used in place of the following: appurtenance, facility, sample, assembly, component, equipment, material, module, part, product, structure, subassembly, subsystem, system, unit, documented concepts, or data.

Management – Those individuals directly responsible and accountable for planning, implementing, and assessing work.

Management system – A system to establish policy and objectives and to achieve those objectives **[ISO 9000]**.

May – Denotes permission but not a requirement.

Measurement and testing equipment – Measuring instrument, software, measurement standard, referenced material or auxiliary equipment or combination thereof to realize a measurement process **[ISO 9000]**.

NOTE: Such equipment may include tools, gauges, instruments, sampling devices or systems used to calibrate, measure, test, or inspect in order to control or acquire data to verify conformity with specified requirements.

Method – A body of procedures and techniques for performing an activity (e.g., sampling, chemical analysis, quantification) systematically presented in the order in which they are to be executed.

Must – Denotes a requirement that has to be met.

Nonconformity – Non-fulfillment of a requirement **[ISO 9000]**.

NOTE: A nonconformity may include a deficiency in characteristic, documentation, or procedure that renders the quality of an item or activity unacceptable or indeterminate.

Objective evidence – Data supporting the existence or variety of something **[ISO 9000]**.

NOTE: Objective evidence may include any documented statement of fact, other information, or record, either quantitative or qualitative, pertaining to the quality of an item or activity, based on observations, measurements, or tests which can be verified.

Observation – An assessment conclusion that identifies a condition (either positive or negative) which does not represent a significant impact on an item or activity. An observation may identify a condition which does not yet cause a degradation of quality.

Organization – A company, corporation, firm, enterprise, or institution, or part thereof, whether incorporated or not, public or private, that has its own functions and administration.

Organizational structure – The responsibilities, authorities, and relationships, arranged in a pattern, through which an organization performs its functions.

Owner – The company or organization that has the lead role in the development of the project and implementation of the environmental technology in question. The owner can be a private firm that actually owns the property, or it can be a site developer or architectural and engineering design firm that has been hired by the owner to manage the environmental technology installation from beginning to end, or it may be the private- or public-sector organization responsible for clean-up.

Participant – When used in the context of environmental programs, an organization, group, or individual that takes part in the planning and design process and provides special knowledge or skills to enable the planning and design process to meet its objective.

Peer review – A documented critical review of work generally beyond the state of the art or characterized by the existence of potential uncertainty. The peer review is conducted by qualified individuals (or organizations) who are independent of those who performed the work, but are collectively equivalent in technical expertise (i.e., peers) to those who performed the original work. The peer review is conducted to ensure that activities are technically adequate, competently performed, properly documented, and satisfy established technical and quality requirements. The peer review is an in-depth assessment of the assumptions, calculations, extrapolations, alternate interpretations, methodology, acceptance criteria, and conclusions

pertaining to specific work and of the documentation that supports them. Peer reviews provide an evaluation of a subject where quantitative methods of analysis or measures of success are unavailable or undefined, such as in research and development.

Performance evaluation – A type of audit in which the quantitative data generated in a measurement system are obtained independently and compared with routinely obtained data to evaluate the proficiency of an analyst or laboratory.

Pollution prevention (P2) – An organized, comprehensive effort to systematically reduce or eliminate pollutants or contaminants prior to their generation or their release or discharge to the environment.

Procedure – A specified way to carry out an activity or process **[ISO 9000]**.

Process – A set of interrelated or interacting activities which transforms inputs into outputs **[ISO 9000]**.

NOTE: Examples of processes include analysis, design, data collection, operation, fabrication, and calculation.

Project – unique process consisting of a set of coordinated and controlled activities with start and finish dates, undertaken to achieve an objective conforming to specific requirements including constraints of time, cost, and resources **[ISO 9000]**.

Project team – The parties involved in the construction and/or operation of an environmental technology application. Depending on the scope of the project, this may consist of one or more professionals employed by the developer, or it may include representatives of various contractors and subcontractors as well.

Responsible party – An individual or organization that has contributed to contamination problems at a site or has assumed site responsibility and is therefore a participant in the environmental technology application.

Qualified services – An indication that suppliers providing services have been evaluated and determined to meet the technical and quality requirements of the client as provided by approved procurement documents and demonstrated by the supplier to the client's satisfaction.

Quality – The degree to which a set of inherent characteristics fulfills requirements **[ISO 9000]**.

NOTE: Quality may relate to a product or service regarding its ability to meet the stated or implied needs and expectations of the user.

Quality assurance – Part of quality management focused on providing confidence that quality requirements will be fulfilled **[ISO 9000]**.

NOTE: Quality assurance may include management activities involving planning, implementation, assessment, reporting, and quality improvement to ensure that a process, item, or service is of the type and quality needed and expected by the customer.

Quality assurance manager – The individual designated as the principal manager within the organization having management oversight and responsibilities for planning, coordinating, and assessing the effectiveness of the quality system for the organization.

Quality assurance project plan – A formal document describing in comprehensive detail the necessary QA, QC, and other technical activities that must be implemented to ensure that the results of the work performed will satisfy the stated performance criteria.

Quality control – Part of quality management focused on fulfilling quality requirements **[ISO 9000]**.

NOTE: Quality control includes technical activities that measure the attributes and performance of a process, item, or service against defined standards to verify that they meet the stated requirements established by the customer.

Quality improvement – Coordinated activities to direct and control an organization with regard to quality **[ISO 9000]**.

NOTE: Quality improvement is a management program for improving the quality of operations. Such management programs generally entail a formal mechanism for encouraging worker recommendations with timely management evaluation and feedback or implementation.

Quality indicators – Measurable attributes of the attainment of the necessary quality for a particular environmental decision. Indicators of quality include precision, bias, completeness, representativeness, reproducibility, comparability, and statistical confidence.

Quality management – That aspect of the overall management system of the organization that determines and implements the quality policy. Quality management includes strategic planning, allocation of resources, and other systematic activities (e.g., planning, implementation, and assessment) pertaining to the quality system.

Quality management plan – A formal document that describes the quality system in terms of the organizational structure, functional responsibilities of management and staff, lines of authority, and required interfaces for those planning, implementing, and assessing all activities conducted.

Quality system – A structured and documented management system describing the policies, objectives, principles, organizational authority, responsibilities, accountability, and

implementation plan of an organization for ensuring quality in its work processes, products (items), and services. The quality system provides the framework for planning, implementing, and assessing work performed by the organization and for carrying out required QA and QC.

Readiness review – A systematic, documented review of the readiness for the start-up or continued use of a facility, process, or activity. Readiness reviews are typically conducted before proceeding beyond project milestones and prior to initiation of a major phase of work.

Record (quality) – document stating results achieved or providing evidence of activities performed **[ISO 9000]**.

NOTE: A record is a document that furnishes objective evidence of the quality of items or activities and that has been verified and authenticated as technically complete and correct. Records may include photographs, drawings, magnetic tape, and other data recording media.

Reproducibility – The precision, usually expressed as variance, that measures the variability among the results of measurements of the same sample at different laboratories.

Research development/demonstration – Systematic use of the knowledge and understanding gained from research and directed toward the production of useful materials, devices, systems, or methods, including prototypes and processes.

Self-assessment – An assessment of work conducted by individuals, groups, or organizations directly responsible for overseeing and/or performing the work.

Service – The result generated by activities at the interface between the supplier and the customer, and by supplier internal activities to meet customer needs. Such activities in environmental programs include design, inspection, laboratory and /or field analysis, repair, and installation.

Should – Denotes a guideline or recommendation whenever noncompliance with the specification is permissible.

Significant condition – Any state, status, incident, or situation of an environmental process or condition, or environmental technology in which the work being performed will be adversely affected sufficiently to require corrective action to satisfy quality objectives or specifications and safety requirements.

Specification – A document stating requirements **[ISO 9000]**.

NOTE: A specification is a document stating requirements and which refers to or includes drawings or other relevant documents. Specifications should indicate the means and the criteria for determining conformity.

Source reduction – Any practice that reduces the quantity of hazardous substances, contaminants, or pollutants.

Standard operating procedure (SOP) – A written document that details the method for an operation, analysis, or action with thoroughly prescribed techniques and steps, and that is officially approved as the method for performing certain routine or repetitive tasks.

Supplier – An organization or person that provides a product **[ISO 9000]**.

NOTE: A supplier includes any individual or organization furnishing items or services or performing work according to an agreement between two parties, such as a contract or financial assistance agreement. This is an all-inclusive term used in place of any of the following: vendor, seller, contractor, subcontractor, fabricator, or consultant.

Surveillance (quality) – Continual or frequent monitoring and verification of the status of an entity and the analysis of records to ensure that specified requirements are being fulfilled.

Technical review – A documented critical review of work that has been performed within the state of the art. The review is accomplished by one or more qualified reviewers who are independent of those who performed the work, but are collectively equivalent in technical expertise to those who performed the original work. The review is an in-depth analysis and evaluation of documents, activities, material, data, or items that require technical verification or validation for applicability, correctness, adequacy, completeness, and assurance that established requirements are satisfied.

Technical systems audit – A thorough, systematic, onsite, qualitative audit of facilities, equipment, personnel, training, procedures, record keeping, data validation, data management, and reporting aspects of a system.

Traceability – The ability to trace the history, application, or location of that which is under consideration **[ISO 9000]**.

NOTE: In a calibration sense, traceability relates measuring equipment to national or international standards, primary standards, basic physical constants or properties, or reference materials.

User – When used in the context of environmental programs, an organization, group, or individual that utilizes the results or products from environmental programs. A user may also be the client for whom the results or products were collected or created.

Validation – Confirmation, through provision of objective evidence that the requirements for a specific intended use or application have been fulfilled **[ISO 9000]**.

NOTE: For example, environmental data may be validated as having satisfied specific precision and bias objectives.

Verification – Confirmation, through provision of objective evidence that specified requirements have been fulfilled **[ISO 9000]**.

NOTE: For example, environmental data claiming to satisfy specific precision and bias objectives may be verified if the claim is true.

Work – the process of performing a defined task or activity

NOTE: Work may include, but not be limited to, research and development, field sampling, analytical operations, and equipment fabrication.

APPENDIX B

GOOD ENGINEERING PRINCIPLES/PRACTICES APPLICABLE TO ENVIRONMENTAL TECHNOLOGY

DESIGN

- Fail-safe/intrinsically safe design of procedures, processes, equipment, structures, and facilities (e.g. alarms, gauges, relief valves, cut-off switches)
- Flexible built-in designed procedures, processes, equipment, structures, and facilities
- Design of self-correcting procedures and processes

RESOURCE UTILIZATION

- Reuse of materials required for technology operation or development
- Reduced use of virgin materials, wastes generated, energy sources, and human resources
- Recycling/recovery of materials, utilities, and energy sources
- Conservation of materials and energy sources
- Analysis of availability and interchangeability of all resources, such as materials, personnel, and equipment
- Substitution of materials and energy sources with cleaner, better, cheaper, more reliable, and more readily available alternatives

PROCESS OPERATIONS

- Use of commercially available and tested materials, products, processes, equipment, and supplies
- Computerized/remote control of unit operations and processes
- Site surveys, including topographical, geological, hydrogeological, hydrological, seismic, wind and weather patterns, as well as social and economic factors

PROCESS INTEGRATION

- Automatic communication/notification procedures and processes among all team members involved in technology implementation
- Integration of planning, design, purchasing/procurement, fabrication, construction/installation processes, and operation and maintenance procedures and requirements
- Integration/optimization of human, material, energy, and economic resources as well as logistical, political, social, environmental, and technical factors during each critical phase of the project
- Modeling and simulation of technical, logistical, economic, social, environmental and political systems prior to, during, and after installation/implementation

PROJECT MANAGEMENT

- Sound project management principles/practices—for example, those outlined by the Project Management Institute (PMI) in *A Guide to the Project Management Body of Knowledge* (PMI, 2000)

WORKER TRAINING

- Worker training/retraining, including hands-on training during technology construction and operation
- Worker registration/certification
- Certification/permitting of work procedures, processes, equipment, and environment

SAFETY CONTROL MEASURES

- Automatic shutdown of systems, equipment, and processes
- Use of automatic safety/corrective action triggers in technical, logistical, political, social, environmental, and economic situations
- Use of interlocks as safety measures
- Use of lockout/tagout procedures and equipment during systems fabrication/installation and operations
- Prevention of calamities, such as spills, leaks, runaway reactions, and explosions/implosions through process hazard analysis, hazardous operations analysis, failure mode and effects analysis, fault tree analysis, and incident investigations

DOCUMENTATION CONTROL

- Backup/duplicate copies of documentation
- Maintaining/archiving electronic and/or paper copies
- Distribution/delivery/circulation list for control documents
- Document/records authentication and verification

VERIFICATION PROCEDURES

- Document approval procedures
- Reviews—peer, project level, program level, organization, and legal
- Routine/periodic inspections, testing, and compliance audits of systems, procedures, processes, equipment, etc.

APPENDIX D

QUALITY ASSURANCE PROJECT PLAN

Perch Lake Landing Design and Product Acquisition

Prepared for:

Noel Vargas, Project Assistance & Oversight Section
U.S. EPA - Great Lakes National Program Office
77 W. Jackson Blvd., G-9J
Chicago, IL 60604
EPA Grant number: GL00E02356

Prepared by:
Cliff Knettel, Assistant Manager, Parks and Recreation
City of Duluth
411 W. First Street
Duluth, MN 55802

Version 4
November 13, 2024

SECTION A – PROJECT MANAGEMENT

A.1 Title of Plan and Approval Quality Assurance Project Plan
Perch Lake Landing Design and Product Acquisition

Prepared by:
City of Duluth

_____ Date: 11/13/24
Cliff Knettel, City of Duluth Project Manager

_____ Date: 11/13/24
Jim Shoberg, City of Duluth Construction Manager

_____ Date: 11/12/24
Allison Brooks, City of Duluth Quality Assurance Manager

Melissa Sjolund Digitally signed by Melissa Sjolund Date: 2024.11.14 07:34:02 -06'00' Date: _____
Melissa Sjolund, Minnesota Department of Natural Resources Project Manager

NOEL VARGAS Digitally signed by NOEL VARGAS Date: 2024.11.14 09:10:05 -06'00' Date: _____
Noel Vargas, USEPA, Project Officer

_____ Date: 11/14/2024
Blake Spitz, USEPA-GLNPO Quality Assurance Manager

A.2 Table of Contents

List of Tables

List of Figures

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Luke Sydow, SAS+ Associates, Landscape Architect Design	mail@saslandarch.com
Heidi Bringman, LHB, wetland delineation	heidi.bringman@lhbcorp.com

A.4 Project/Task Organization

This Quality Assurance Project Plan describes the design of recreational amenities at Perch Lake Landing, as well as the acquisition of products including recreational amenities and structures, signs, and products to be used in future construction, outside of this grant scope and timeline.

Noel Vargas is the US Environmental Protection agency (USEPA) Project Officer (PO) for this project and will provide technical oversight and coordination throughout the project, including review and approval of the QAPP.

Kendra Kozak is the USEPA Grants Specialist and will oversee all aspects of this award.

Blake Spitz is the USEPA GLNPO QA Manager. Mr. Spitz will review and approve the QAPP for this project.

Cliff Knettel is the Assistant Manager of the City of Duluth Parks and Recreation division and serves as Project Manager for all tasks funded under this award.

Allison Brooks is a Project Coordinator with the City of Duluth Parks and Recreation division and will oversee tasks associated with grant administration, contracting, reporting, and procurement. Allison Brooks will be the QA coordinator for the project and is independent of the contractors and construction oversight.

Jim Shoberg is a Landscape Architect/Senior Park Planner for the City of Duluth Property and Facilities Management Division and will lead all aspects of design, including coordination of consultants on pre-design activities through final design.

Melissa Sjolund is the MNDNR's Project Manager as identified on Grant No. GL00E02356 and will oversee the City of Duluth subgrant, compile and submit all progress reports to the USEPA, and act as the primary liaison between the MNDNR and USEPA.

Leslie Tannahill is a Grant Specialist for MNDNR's Division of Fish and Wildlife and will assist with all aspects of grant management. She works closely with MNDNR staff to ensure they adhere to USEPA's grant requirements and progress reporting guidelines.

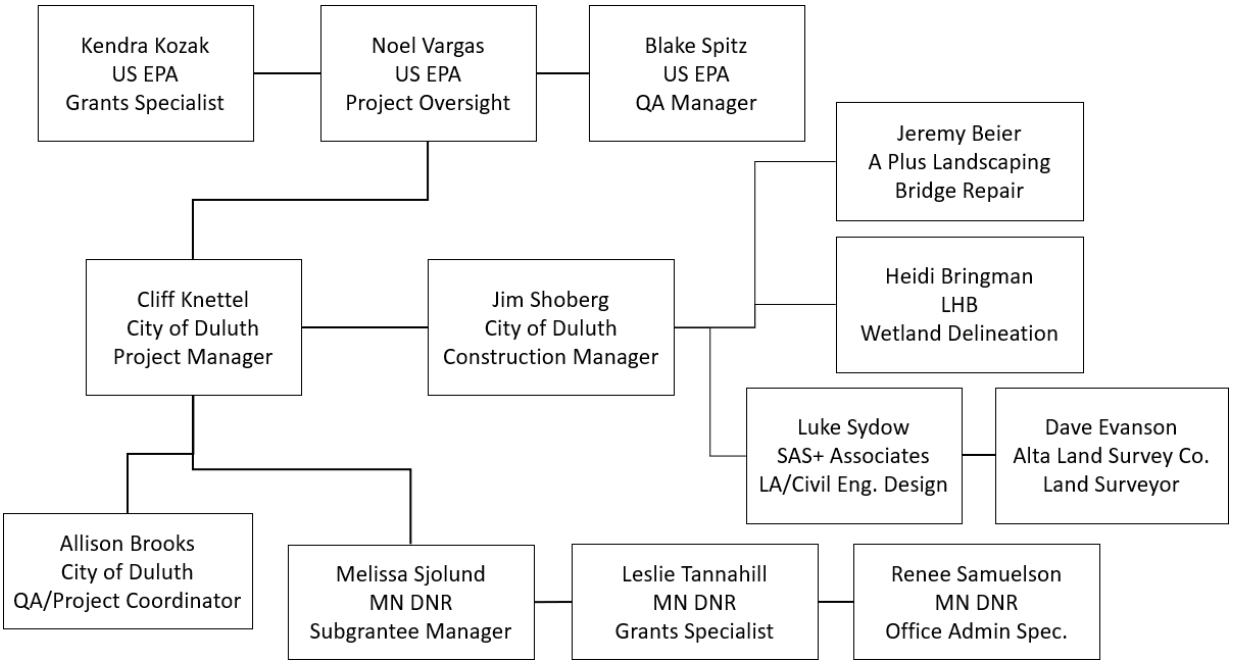
Renée Samuelson is an Office and Administrative Specialist (OAS) for MNDNR Fisheries and will complete tasks associated with budget reporting, data management and other project-related tasks.

Luke Sydow is the project manager for SAS+ Associates and will oversee the Landscape Architecture/Engineering design process, including their internal Quality Assurance and Control Program for the data and deliverables. Dave Evanson of Alta Land Survey Company is a subcontractor for SAS+ Associates and is the licensed Land Surveyor (Minnesota, Registration #49505) that will complete the topographic land survey for the design process.

Heidi Bringman, certified Minnesota Wetland Professional (CMWP ID# 1196), of LHB is the consultant that will perform wetland delineation for the design process.

Jeremy Beier is the project manager for A Plus Landscaping LLC and will oversee the bridge repair process, including their internal Quality Assurance and Control Program for their crew.

Figure 1. Organization Chart



A.5 Problem Definition/Background

The neighborhoods surrounding Perch Lake (Gary-New Duluth and Fond du Lac) have been disproportionately impacted by legacy pollution and habitat alterations. Socioeconomic data accessed through EPA's EJScreen tool indicate that these communities are low income and have higher rates of unemployment. The Gary New-Duluth neighborhood is the location of the former U.S. Steel plant and current Superfund site.

Improving the physical environment by restoring habitat improves conditions that lead to better health for humans, plants, and animals. As the environment improves at these locations, people's desire to recreate there will increase. The City of Duluth's Parks and Recreation Division engages closely with impacted communities as they develop plans for access and recreation along the St. Louis River corridor. Based on community input and existing uses, the City has prioritized Perch Lake landing for improvements to access and recreation. Perch Lake landing is uniquely suited to providing access to recreational opportunities such as: canoeing and kayaking, bicycling, walking, shore and boat fishing, picnicking, birding, spiritual reflection, nature appreciation, and subsistence gathering of plants. Many of these opportunities are low or no cost. Since health behaviors account for 30% of what makes us healthy, improved access to a cleaner environmental will be an important determinant of health.

A.6 Project/Task Description

Restoring fish and wildlife habitat at Perch Lake brings new opportunities for recreation within Perch Lake, in the adjacent St. Louis River estuary, and on the river's shoreline. Perch Lake is located adjacent to two important recreational features: the St. Louis River Estuary National Water Trail and Waabizheshikana: The Marten Trail. Significant recent efforts by the St. Louis River Alliance and the City of Duluth have contributed to establishing these trails to promote the ongoing and future success of the AOC program and address environmental justice by connecting the community to the restored public resources.

MNDNR proposed and US EPA agreed to an amendment to Grant No. #GL00E02356 that will fund certain elements of the City of Duluth's Perch Lake Landing Project. Enhancing public access and recreation opportunities in this portion of the AOC is a high priority for the state, the City, and the community, as it greatly benefits underserved neighborhoods and populations and completes the vision of "restoration to revitalization."

With this amendment, $156,600 was subawarded to the City of Duluth Parks and Recreation Department to complete the following elements of the Perch Lake Landing Project (dollar amounts are estimated, spending will reflect actual costs):

- Professional service contracts as needed to collect baseline data and complete engineering designs and specifications ($50,000).
- Repairs to the existing pedestrian bridge located on the causeway between Perch Lake and the St. Louis River ($10,000)
- Gravel necessary to resurface the existing pedestrian trail and/or parking areas ($7,500)
- An accessible kayak dock, providing paddling access to both Perch Lake and the St. Louis River ($75,000)
- Park entrance sign ($5,000)
- Bike rack ($850)
- A contingency budget ($8,250)

<u>TABLE 1: Project Schedule Timeline</u>
September 15, 2024: Finalize grant agreement
September 30, 2024: In adherence with City and EPA procurement policy, order gravel, sign, accessible kayak dock, and bike rack.
October 1, 2024: Select Design Consultant and Bridge Repair Contractor
October 15: Survey and wetland delineation completed
December 1, 2024: Complete Bridge Repairs

December 1, 2024: Complete Site Design
December 15, 2024: Receive all equipment/materials
December 31, 2024: Complete project closeout

A.7 Quality Objectives & Criteria for Measurement Data

Federal funding received by the City of Duluth from the USEPA for this Project will be focused on design and specifications for the improvements to Perch Lake Landing. The design will include survey and wetland delineation.

The objective for survey data will be to determine the existing site contours with greater than 95% confidence. All new data points will be horizontally and vertically accurate and precise to within 0.10 feet, and will be evaluated by a MN licensed professional engineer. The completeness objective for new data collection is 100% as there are no known obstacles to collecting survey points across the entire site.

The topographic survey of existing conditions will be an "on-the-ground" survey noting site elevations and significant features of the project site. Survey grade GPS equipment will be utilized during the course of this survey with expected vertical and horizontal observations of within 0.10 feet. The selected licensed surveyor will utilize Trimble GPS equipment, GPS Model R12i, and Trimble TSC7 data collectors. The GPS equipment will be calibrated to a published, high accuracy National Geodetic Survey control point "Carlson" each day surveying is conducted. GPS equipment is inspected daily with software updates installed frequently and when necessary. Carlson Software with AutoCAD will be the data processing and drafting tool. Format of measurements will be NAD 1983 (2011) State Plane Minnesota North FIPS 2201 for XY coordinates and NAVD88 Datum for elevations.

The site will be designed by a licensed Landscape Architect (LA), procured by the City of Duluth Project team to meet all City and USEPA procurement requirements, whichever is stricter. The selected LA will include on its project team a MN Licensed Civil Engineer for design of parking lot, trail, accessible kayak dock abutments, and stormwater management.

Scope of work for the bridge repair is preventative maintenance. Bridge passed last safety and structural integrity inspection. Work scope is based on the previously completed inspection results. No additional engineering services will be secured to support the design and/or construction administration. The maintenance will be contracted. The objectives for the bridge repair will include:

- repairing a known break in the weld on the railing corner; (approximately 0.5 linear foot of weld)
- the addition of intermediate steel bar railings on each side for the length of the structure to match the existing railings to ensure that gaps between railings do not allow a 4-inch sphere to pass through; (add approximately up to 240 linear foot of steel bar to complete scope)
- temporary removal of the end grates to access the grade beam footings and allow removal/cleaning of built-up soil and vegetation atop the timber footings on both bridge abutment ends
- repair or replacement of bridge sub-deck grate clips to re-secure the grates to the bridge; (approximate quantity of 24 clips)
- adding rough sawn copper naphthenate treated 2x12 lumber wood decking over the existing steel mesh surface for compliant Universal accessible surface; (approximately 210 square foot).

The bridge repair contractor activities will be overseen by Jim Shoberg, including site inspection to confirm the steel bar railings and wood decking that are installed meet the above indicated objectives, and visual inspection of welds and wood decking to confirm satisfactory completion.

The site design shall include a vegetation plan to consist of seed mixes conducive to growth and survival in the surrounding plant hardiness zone, and the mixes shall not intentionally include plant species identified as invasive by the MNDNR or MN Board of Soil and Water Resources (MNBWSR). The MNBWSR provides seed mixes best suited for different regions of the state and a list of substitute species. The project team will also consult local experts to identify plants that will be best suited to changing conditions due to climate change. The City's intent is to minimize the amount of manicured lawn area in favor of promoting natural vegetative cover consistent with this shoreland zone. The MNDNR State Climatology Office expects climate change in this region will bring more intense storms and floods and prolonged dry periods, which will result in fluctuating water levels at the site. The City of Duluth and its subcontractors will take active steps to prevent the introduction, establishment, and spread of invasive species during all site visits performed during the project. Staff and contractors are expected to clean equipment, including vehicles, gear, and clothing, before arriving to the project site to limit the addition of invasive species.

A.8 Special Training Requirements or Certifications

All engineering tasks are performed under the lead of a MN licensed professional engineer. A State of Minnesota Board of AELSLAGID land surveyor will be subcontracted by the engineering/design firm to complete surveys for this project. A MN Certified Wetland Delineator will complete the wetland delineation.

A.9 Documents and Records

Cliff Knettel, the City of Duluth Project Manager, will develop and use a QAPP email list. The final QAPP for this award will be sent to all parties on the list, including all QAPP signees.

All survey data, wetland delineation report, plan sets, and environmental review documents will be retained in perpetuity by the City of Duluth.

SECTION B – DATA GENERATION & AQCUISITION

B.1 Sampling/Measurement Design

All engineering tasks are performed under the lead of a MN licensed professional engineer. A Land Surveyor licensed by the state of Minnesota Board of AELSLAGID will be subcontracted by the Engineering/design firm to complete the topographic survey of existing conditions for this project. The survey process will include site visits with redundancy to ensure accuracy of data collection.

Wetland delineation will be completed by a Certified Minnesota Wetland Professional. Wetland information was based on a Level 1 desktop delineation using the available data listed below, and in accordance with Part IV Method B of the 1987 COE Manual for preliminary data gathering and synthesis as well as methods described in the Northcentral and Northeast Regional Supplements (USACE 2012). Rationale for determining wetland boundaries mapping for wetland polygons were based on aerial imagery signature, hydrology, and landscape position, as well as use of National Wetlands Inventory

mapping and one foot contour information. A Level 1 delineation method was previously approved by the Local Government Unit (LGU) since the wetland's position is sandwiched tightly between the St. Louis River and Highway 23 right-of-way and consists of a partially man-made lagoon. An on-site field visit with the Technical Evaluation Panel (TEP) occurred in late October to review and approve the delineation.

There will be no sediment, geotechnical, or other physical sample collection as part of this award.

B.2 Field Data Collection and Sampling Method Requirements

Not applicable

B.3 Sample Handling & Custody Requirements

Not applicable

B.4 Laboratory Analytical Methods Requirements

Not applicable

B.5 Quality Control Requirements

Not applicable

B.6 Instrument/Equipment Testing, Inspection, and Maintenance

Survey equipment used will be owned and operated by the subcontractor. That equipment will be maintained and inspected in accordance with protocols of the respective agencies or companies completing the survey data collection. Survey grade GPS equipment will be utilized during the course of this survey with expected vertical and horizontal observations of within 0.10 feet. The selected licensed surveyor will utilize Trimble GPS equipment, GPS Model R12i, and Trimble TSC7 data collectors. Survey equipment is maintained according to the manufacturers' specifications. The GPS equipment will be calibrated to a published, high accuracy National Geodetic Survey control point "Carlson" each day surveying is conducted. GPS equipment is inspected daily with software updates installed frequently and when necessary. Carlson Software with AutoCAD will be the data processing and drafting tool. Format of measurements will be NAD 1983 (2011) State Plane Minnesota North FIPS 2201 for XY coordinates and NAVD88 Datum for elevations.

B.7 Instrument Calibration and Frequency

Survey equipment will be owned and operated by a subcontractor. That equipment will be maintained and inspected in accordance with protocols of the respective agencies and companies completing the survey work. Survey equipment will be calibrated according to the manufactures' specifications. Control points will be evaluated daily during the survey process to assess equipment accuracy is within the project's need of $1/10^{th}$ of a foot.

The selected licensed surveyor will utilize Trimble GPS equipment, GPS Model R12i, and Trimble TSC7 data collectors. Survey equipment is maintained according to the manufacturers' specifications. The GPS equipment will be calibrated to a published, high accuracy National Geodetic Survey control point

"Carlson" each day surveying is conducted. GPS equipment is inspected daily with software updates installed frequently and when necessary.

B.8 Inspection/Acceptance for Supplies

Aside from the site design, this award will fund the acquisition of products and equipment that will be installed or constructed a later time, outside of the timeline and scope of this award. Therefore, there is no need for inspections of construction activities or related work. When items are purchased under this award, they will be inspected by project staff and consultants to ensure they meet our specifications. These items will be safely secured and stored until they are installed. There are no future phases of this award anticipated, as construction and installation will be financed by other sources at a later time.

B.9 Data Acquisition Requirements for Non-Direct Measurements

There are four data sets that may be used during data review and validation. All data sets were collected in a compatible coordinate system. LIDAR elevation data was collected in 2012 and is provided to the City. The data set was developed to a standard intended for use in planning and scientific analysis by the MNDNR. Aerial imagery collected was collected in 2023 and is available on the St. Louis County Land Explorer. It is the most recent aerial imagery for the area. Soil survey data generated from the USDA Web Soil Survey was used for reference of soils typical in the region. National Wetlands Inventory Mapping was used for reference of any potential wetlands in the area.

B.10 Data Management

Pre-design data collection will consist of survey data and wetland delineation. Topography and survey data to be collected will use electronic survey equipment. Data is downloaded as a CSV file and saved in that format. No paper forms are used to collect topographic survey data. However, final documents and supporting information will be generated in the form of a construction plan set, construction project manual, construction bid package, environmental assessment worksheet, and permits. The City of Duluth will retain all of these pieces of information.

SECTION C – ASSESSMENT AND OVERSIGHT

C.1 Management Assessment and Oversight

The City of Duluth Project Manager will have overall responsibility for completion of tasks associated with design of the Project, environmental review, and procurement of products and equipment. The City of Duluth Project Manager will inform all City of Duluth and subcontractor staff assigned responsibility for specific project tasks of the requirements described in the QAPP.

C.2 Reports to Management

The City of Duluth Project Manager and Project Coordinator will submit semi-annual progress reports to the MNNDR Project Manager no later than November 15 and April 15. Progress reports will include brief information on each of the following areas:
1) A comparison of actual accomplishments to the outputs/outcomes established in the assistance agreement work plan for the period.
2) The reasons why established outputs/outcomes were not met.

3) Additional pertinent information, including, when appropriate, analysis and explanation of cost overruns or high-unit costs.

The MNDNR Project Manager will submit the semi-annual progress report to the USEPA Project Officer. The MNDNR Project Manager will inform USEPA as soon as problems, delays, or adverse conditions which will materially impair the ability to meet the outputs/outcomes specified in the assistance agreement work plan are known.

SECTION D – DATA VALIDATION AND USABILITY

D.1-3 Data Review, Verification, Validation, and Reconciliation with Data Quality

All data collected will be verified and validated by the City of Duluth, to determine if it lies within the data quality objectives defined in in A.7. The QA Manager will oversee pre-design data collection to ensure survey and wetland delineation are completed according to the WCA requirements and compliant with USACE wetland delineation manual, and consistent with Board of AELSLAGID standards.

LIDAR data and Aerial Pictometry will be used to validate any data points with unexpected elevations. Additional validation by the licensed Land Surveyor will be completed on site as necessary with GPS verification.

Final project designs will be developed by a team of people from the City of Duluth and their consultants. These designs will then be applied to the completion of environmental review, permitting and construction contracting, although these aspects do not fall under the scope of this award. The City of Duluth Project Manager will be responsible for final review of the final project design documents.

Figure 2. Conceptual Design

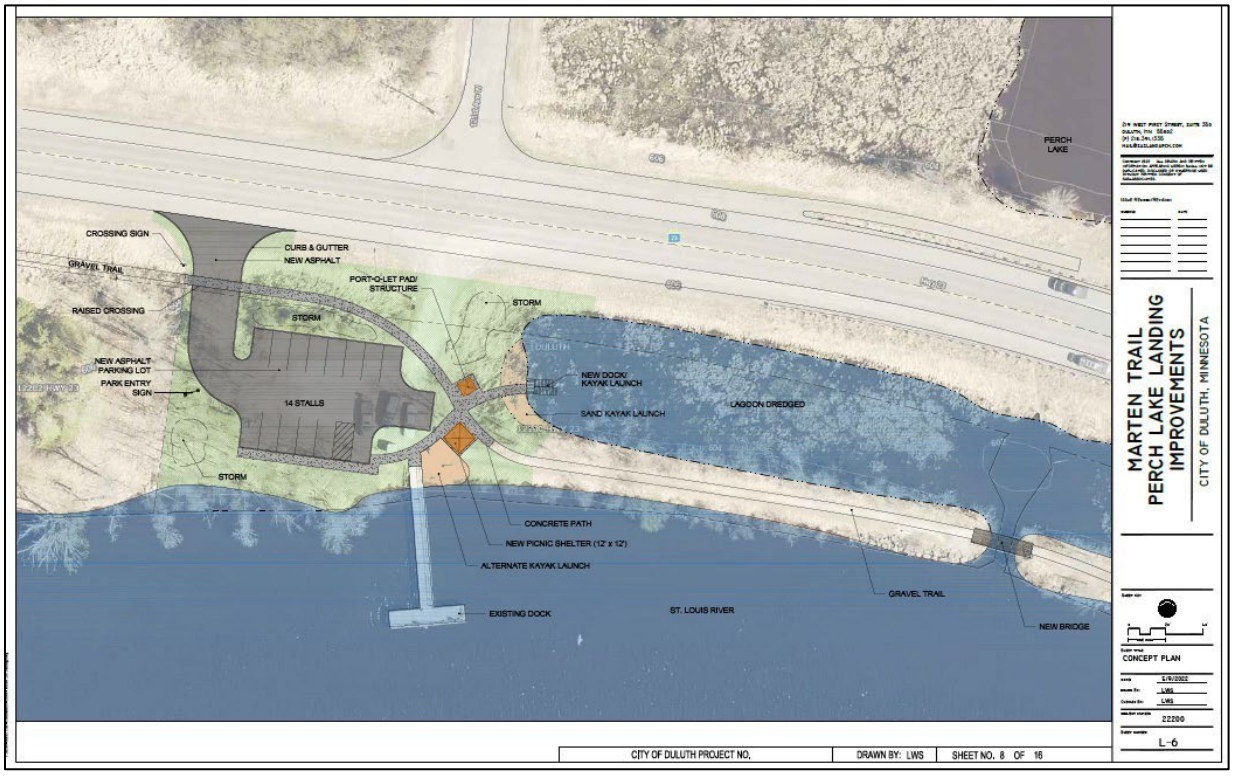


Figure 3. Aerial image

Figure 4. Location Map

★ Project Location

APPENDIX E

BYRD ANTI-LOBBYING AMENDMENT CERTIFICATION
(To be submitted with each bid or offer exceeding $100,000)

The undersigned, [Company] _____ certifies, to the best of his or her knowledge, that:

1. No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of an agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

2. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form - LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

3. The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by 31, U.S.C. § 1352 (as amended by the Lobbying Disclosure Act of 1995). Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

The Contractor, [Company] _____, certifies or affirms the truthfulness and accuracy of each statement of its certification and disclosure, if any. In addition, the Contractor understands and agrees that the provisions of 31 U.S.C. § 3801 *et seq*., apply to this certification and disclosure, if any.

_____
Signature of Contractor's Authorized Official

_____
Name and Title of Contractor's Authorized Official

_____
Date

APPENDIX F

PROFESSIONAL LANDSCAPE ARCHITECTURAL SERVICES AGREEMENT

ARCHITECT & CITY OF DULUTH

THIS AGREEMENT, effective as of the date of attestation by the City Clerk, is made by and between the City of Duluth, Minnesota hereinafter referred to as the "City" and:

Name: Click or tap here to enter text.
Address: Click or tap here to enter text.

hereinafter referred to as the "Landscape Architect", in consideration of the mutual promises contained herein.

Payments as described in Section V shall be made from Funding Click or tap here to enter text.;

The professional landscape architectural services obtained by the City under this agreement concern the following described project hereinafter referred to as the "Project":

Project Name: Click or tap here to enter text.
Project Budget: Click or tap here to enter text.
Project Description: Click or tap here to enter text.

The professional landscape architectural services to be provided under this agreement consist of those phases A through I checked below. A more particular description of each phase is contained in Section II, "Basic Services", of the agreement.

	Phase	Description
☐	A.	Study and Report Phase
☐	B.	Preliminary Survey Phase
☐	C.	Public Input Phase
☐	D.	Schematic Design Phase
☐	E.	Design Development Phase
☐	F.	Construction Document Phase
☐	G.	Bidding Phase
☐	H.	Construction Survey and Layout Phase
☐	I.	Construction Administration and Inspection Phase

SECTION I. GENERAL

A. LANDSCAPE ARCHITECT

The Landscape Architect shall provide professional landscape architectural services for the City in all phases of the Project to which this agreement applies including complete architectural services and complete structural, mechanical, electrical and civil engineering services, and such other services as may be necessary to assist the City in the design and construction of each authorized Phase of the Project, serve as the City's professional

architectural representative for the Project as set forth below and shall give professional architectural consultation and advice to the City during the performance of services hereunder. Landscape Architect's services shall include all services set forth in Landscape Architect's Proposal attached hereto as Exhibit B except that to the extent that the provisions of Exhibit B are contrary to any provisions of this Agreement, this Agreement shall be deemed to be controlling. All services provided hereunder shall be performed by the Landscape Architect in accordance with generally accepted Architectural standards to the satisfaction of the City.

B. NOTICE TO PROCEED

The Landscape Architect shall only begin performance of each Phase of work required hereunder upon receipt of a written Notice to Proceed by City representative with that Phase.

C. TIME

The Landscape Architect shall begin work on each successive phase promptly after receipt of the Notice to Proceed and shall devote such personnel and materials to the Project so as to complete each phase in an expeditious manner within the time limits set forth in Section II. Time is of the essence to this agreement.

D. CITY'S REPRESENTATIVE

The City's representative to the Landscape Architect shall be the Director of Property Parks and Libraries or his or her designees (the "Director") assigned in writing.

E. PROJECT BUDGET

Landscape Architect shall design the Project in such a manner as to meet the City's goals and objectives for the Project at a cost for design and construction which does not exceed the City's Project Budget; provided that the Director may, from time to time, increase or decrease the Project Budget, which increase or decrease shall be communicated to the Landscape Architect in writing as provided for in Section VII below.

F. SUBCONSULTANTS

Landscape Architect may contract for the services of sub-consultants to assist Landscape Architect in the performance of the services to be provided by Landscape Architect hereunder, but the selection of any sub-consultant to perform such services shall be subject to the prior written approval of the Director. Landscape Architect shall remain responsible for all aspects of any services provided by such sub-consultants to City under this Agreement. City shall reimburse Landscape Architect for sub-consultant services under the categories of services to be provided by Landscape Architect under Phases A through I, as applicable.

G. COORDINATION WITH OTHER CITY CONSULTANTS

☐ If this box is checked, the City has contracted with or will contract with one or more other design professionals to perform design services on projects related to or which need

to interface with the Project. Attached to this Agreement as Exhibit __ is a document entitled "Coordinated Work Plan" which sets forth in detail the manner of coordination between Landscape Architect and such other design professional(s) which will be required of Landscape Architect and such other design professional(s) in designing the Project and said related projects. Landscape Architect agrees to use its best efforts to implement the Coordinated Work Plan in designing the Project and to design the Project in such a manner so that the resulting combination of the Project and the related projects result in an integrated whole which achieves the City's goals and objectives for the Project and the related projects.

SECTION II. BASIC SERVICES

A. STUDY AND REPORT PHASE

☐ Included in this Agreement
☐ Not included in this Agreement

The Landscape Architect shall:

1) City's Requirements
Review available data and consult with the City to clarify and define the City's requirements for the Project.

2) Advise Regarding Additional Data
Advise the City as to the necessity of the City's providing or obtaining from others data or services in order to evaluate or complete the Project and, if directed by the Director, act on behalf of the City in obtaining other data or services.

3) Technical Analysis
Provide analysis of the City's needs, planning surveys, site evaluations, and comparative studies of prospective sites and solutions.

4) Economic Analysis
Provide a general economic analysis of various alternatives based on economic parameters and assumptions provided by the City.

5) Report Preparation
Prepare a report containing schematic layouts, sketches and conceptual design criteria with appropriate exhibits to indicate clearly the considerations involved and the alternative solutions available to the City and setting forth the Landscape Architect's findings and recommendations with opinions of probable total costs for the Project, including construction cost, contingencies, allowances for charges of all professionals and consultants, allowances for the cost of land and rights-of-way, compensation for or damages to properties and interest and financing charges (all of which are hereinafter called "Project Costs").

6) Report Presentation

Furnish three copies of the report and present and review the report in person with the City as the City Representative shall direct.

7) Supplementary Duties

The duties and responsibilities of Landscape Architect during the Study and Report Phase shall also include any additional duties and responsibilities to be provided pursuant to the Landscape Architect's proposal attached as Exhibit B.

8) Completion Time

The Study and Report Phase shall be completed and report submitted by Click or tap here to enter text..

B. PRELIMINARY SURVEY PHASE

☐ Included in this Agreement
☐ Not included in this Agreement

After written authorization by the Director to proceed with the preliminary survey phase, the Landscape Architect shall:

1) General

☐ If checked, perform topographic survey as necessary to prepare the design and to identify environmental conditions which will affect the design of the Project and provide Construction Survey and Layout as described in Section II.H

2) Boundary Survey

☐ If checked, perform boundary survey.

3) Document Presentation

☐ If checked, furnish a CAD file of the survey base map to the City. Files shall be in the software specified by the Director.

4) Preliminary Design

Prepare the Preliminary Design Studies and submit to the Director a digital copy of drawings and other documents, in a file type approved by the Director, which illustrate the scale and relationship of the Project components. Landscape Architect shall submit outline specifications for all major elements of construction including but not limited to: structural, mechanical and electrical systems, special equipment.

5) Probable Cost

Landscape Architect shall submit to City a Statement of Probable Construction Cost based on current area, volume or other unit costs in a form acceptable to the Director.

6) Supplementary Duties

The duties and responsibilities of the Landscape Architect during the preliminary survey phase shall also include any additional duties and responsibilities to be provided pursuant to the Landscape Architect's proposal attached as Exhibit B.

7) Completion Time

The preliminary survey phase shall be completed and submitted by Click or tap here to enter text..

C. PUBLIC INPUT PHASE

☐ Included in this Agreement
☐ Not included in this Agreement

After written authorization by the Director to proceed with the Public Input Phase, the Landscape Architect shall:

1) Advertisement

The City will take primary responsibility for advertising the public input phase of the project. Landscape Architect shall assist the City with advertising the project for public input by providing information on the nature, scope and timing of the proposed Project, and any other information necessary for a successful public engagement process. Any content created by the Landscape Architect shall be made available in a format that meets the needs of public media and the City website.

2) Stakeholder Meetings

Hold and moderate a minimum of ____ meetings with stakeholders as identified by the Director at sites approved by the Director in writing at which the Project is explained and at which meeting attendees are invited to provide input and feedback. Stakeholders may provide input by way of input at the meeting or written comment immediately thereafter.

3) Public Meetings

Hold and moderate a minimum of ___ public meetings at sites approved by the Director in writing at which the Project is explained and at which members of the public are invited to comment. Provide a public comment period, the duration of which is not less than two weeks, to help inform the final concept.

4) Public Meeting Summary

Within five (5) days of the last of such meeting, present to City a summary of all public comments received, both from the hearings and from written communications. Summary shall be organized in a manner that is easy to read and understand and shareable with stakeholders, governing boards and commissions, and the public.

5) Supplementary Duties

The duties and responsibilities of the Landscape Architect during the public input and inspection phase shall also include any additional duties and responsibilities to be provided pursuant to the Landscape Architect's proposal attached as Exhibit B.

6) Completion Time

The Public Comment Phase shall be completed and report or plan submitted by Click or tap here to enter text.

D. SCHEMATIC DESIGN PHASE

☐ Included in this Agreement

☐ Not included in this Agreement

After written authorization by the Director to proceed with the Schematic Design Phase, the Landscape Architect shall:

1) Schematic Design Documents

Prepare schematic design documents consisting of final design criteria, preliminary drawings and outline specifications, taking into account any public comment received during a Public Input Phase, if that phase is included.

2) Revised Project Costs

Based on the information contained in the preliminary design documents, submit a revised opinion of probable Project costs.

3) Preparation of Grants; Environmental Statements

Preparation of applications and supporting documents for governmental grants, loans or advances, if any, in connection with the Project, preparation or review of environmental assessments and impact statements; review and evaluation of the effect on the design requirements of the Project of any such statements and documentation prepared by others; and assistance in obtaining approvals of authorities having jurisdiction over the anticipated environmental impact of the Project.

4) Renderings and Models

Providing renderings or models for the City's use.

5) Economic Analysis

Investigations involving detailed consideration of operations, maintenance and overhead expenses; providing value engineering during the course of design; the preparation of feasibility studies, cash flow and economic evaluations, rate schedules and appraisals; assistance in obtaining financing for the Project; evaluating processes available for licensing and assisting the City in obtaining licensing; detailed quantity surveys of material, equipment and labor; and audits of inventories required in connection with construction performed by the City.

6) Document Presentation

Furnish one digital copy of the above schematic design documents in a form acceptable

to the Director, and present and review such documents in person with the City as the Director may direct.

7) Revised Probable Costs

Landscape Architect shall submit to Director a Revised Statement of Probable Construction Cost in a form acceptable to the Director. Any variance in the estimated construction costs that will adversely affect the established Project Budget will be submitted to the Director with appropriate comments and recommendations prior to beginning the Construction Documents Phase.

8) Supplementary Duties

The duties and responsibilities of the Landscape Architect during the Schematic Design Phase shall also include any additional duties and responsibilities to be provided pursuant to the Landscape Architect's proposal attached as Exhibit B.

9) Completion Time

The Schematic Design Phase shall be completed and report or plan submitted by Click or tap here to enter text..

E. DESIGN DEVELOPMENT PHASE

☐ Included in this Agreement
☐ Not included in this Agreement

1) Drawings and Specifications

On the basis of the accepted schematic design documents and the revised opinion of probable Project costs, Landscape Architect shall prepare Design Development Documents based on the approved Schematic Design Documents to include adequate Specifications for elements of the Project for consideration and approval by the Director. A sufficient number of copies (as determined by the Director) of the Design Development Documents will be submitted to the Director for distribution, each copy consisting of drawings and other documents to fix and describe the size, cross sections and character of the Project as to architectural, structural, mechanical and electrical systems, materials, and such other essentials as may be necessary and appropriate.

2) Revised Probable Cost

Landscape Architect shall submit to City a Revised Statement of Probable Construction Cost in a form acceptable to the Director. Any variance in the estimated construction costs that will adversely affect the established Project Budget will be submitted to the Director with appropriate comments and recommendations prior to beginning the Construction Documents Phase.

3) Completion Time

The Design Development Phase shall be completed and report or plan submitted by Click or tap here to enter text..

F. CONSTRUCTION DOCUMENT PHASE

☐ Included in this Agreement
☐ Not included in this Agreement

1) Drawings and Specifications
On the basis of the accepted design development documents and the revised opinion of probable Project costs, Landscape Architect shall prepare from the approved Design Development Documents, for consideration and approval by the Director, complete Working Drawings and Specifications. The Working Drawings and Specifications shall set forth in complete detail the requirements of the entire Project, including the necessary bidding information prepared in such a way to allow City, if it so desires, to advertise for the award of one or more contracts for the construction and completion of the entire Project, or any phase of the Project.

2) Approvals of Governmental Entities
Landscape Architect shall perform those services pertaining to governmental approvals and permits set forth adjacent to the checked box below:

☐ Furnish to the City such documents and design data as may be required for, and prepare the required documents so that the City may apply for approvals and permits of such governmental authorities as have jurisdiction over design criteria applicable to the Project, and assist in obtaining such approvals by participating in submissions to and negotiations with appropriate authorities.

☐ Apply for approvals and permits of such governmental authorities as have jurisdiction over design criteria applicable to the Project, and obtain such approvals by participating in submissions to and negotiations with appropriate authorities.

3) Adjusted Project Costs
Advise the City of any adjustments to the latest opinion of probable Project costs, identify cause of change and furnish a revised opinion of probable Project cost based on the drawings and specifications.

4) Contract Document Preparation
Prepare final plans and specifications for the Project, which shall include incorporation of plans and specifications prepared by subconsultants. Landscape Architect shall assist in the preparation of contract documents. Landscape Architect shall prepare all necessary project/plan review forms checklists, labor compliance requests, wage determination requests, bidding documents and other forms to assist the City with procuring Bids. Landscape Architect shall review all plans and specifications and supporting documentation and resolve any inconsistencies in said documents being incorporated into the Contract prior to bid. To the extent possible, the Landscape Architect will follow the document

format supplied by the City and use the standard terms and conditions supplied by the City in preparation of these documents.

5) Real Estate Acquisition: Legal Description

☐ If checked, based on design development documents, Landscape Architect shall furnish a legal description and recordable reproducible 8-1/2" X 11" plat of each parcel of real estate in which the City must acquire an interest in order to proceed with construction of the Project.

6) Document Presentation

Landscape Architect shall, within the agreed Performance Schedule, submit a digital file of the complete set of proposed Construction Documents, including a cost estimate, to the Director for review and official approval prior to the advertisement of bids for construction of the Project. Should paper sets of Construction Documents be required or requested by the Director, Landscape Architect will be reimbursed for the actual cost of reproduction, upon approval in advance by City.

7) Supplementary Duties

The duties and responsibilities of the Landscape Architect during the Final Design Phase shall also include any additional duties and responsibilities to be provided pursuant to the Landscape Architect's proposal attached as Exhibit B.

8) Completion Time

The Construction Document Phase shall be completed and contract documents submitted by Click or tap here to enter text..

G. BIDDING PHASE

☐ Included in this Agreement

☐ Not included in this Agreement

The Landscape Architect shall:

1) Assist in Bidding

Assist the City in obtaining bids for each separate City contract for construction, materials, equipment and services.

2) Advise Regarding Contractors and Subcontractors

Consult with and advise the City as to the acceptability of subcontractors and other persons and organizations proposed by the City's contractor(s) (hereinafter called "Contractor(s)" for those portions of the work as to which such acceptability is required by the bidding documents).

3) Consult Regarding Substitutes

Consult with and advise the City as to the acceptability of substitute materials and equipment proposed by the contractor(s) when substitution prior to the award of contracts is allowed by the bidding documents.

4) Evaluation of Bids

Assist the City in evaluating bids or proposals and in assembling and awarding contracts.

5) Supplementary Duties

The duties and responsibilities of the Landscape Architect during the Bidding Phase shall also include any additional duties and responsibilities to be provided pursuant to the Landscape Architect's proposal attached as Exhibit B.

6) Completion Time

The bidding phase shall be completed by Click or tap here to enter text..

H. CONSTRUCTION SURVEY AND LAYOUT PHASE

☐ Included in this Agreement

☐ Not included in this Agreement

1) General

This phase of work may or may not be performed in conjunction with Phase I, "Construction Administration and Inspection Phase" of this agreement. Inclusion of this phase in the agreement does not imply that services identified under Phase I are to be provided unless specifically indicated in this agreement.

2) Duties

The Landscape Architect shall provide horizontal and vertical control line and grade to enable construction of the improvement as depicted in the Project plans. The number of control points to be established by the Landscape Architect shall be sufficient to permit the construction contractor to construct the improvement within the construction tolerances established in the Project specifications. In addition, the number of control points shall be consistent with standard engineering practice.

3) Accuracy

The Landscape Architect shall provide the horizontal and vertical control points within the same measurement tolerances as the construction tolerances established in the Project specifications. The Landscape Architect shall be responsible for the accuracy of the control points which are established. The Landscape Architect shall be responsible for costs which may result from errors in placement of control points. The Landscape Architect shall be required to establish control points at Landscape Architect's costs only one time. Control points which are lost, damaged, removed or otherwise moved by the Contractor or others shall be promptly replaced by the Landscape Architect and costs for such replacement shall be computed on a time and materials basis, and reimbursed by the City. The Landscape Architect shall take all reasonable and customary actions to protect the control points established by the Landscape Architect.

4) Supplementary Duties

The duties and responsibilities of the Landscape Architect during the construction survey and layout phase shall also include any additional duties and responsibilities to be provided pursuant to the Landscape Architect's proposal attached as Exhibit B.

5) Completion Time

The construction survey & layout phase shall be completed by Click or tap here to enter text..

I. CONSTRUCTION ADMINISTRATION AND INSPECTION PHASE

☐ Included in this Agreement

☐ Not included in this Agreement

1) General Duties

Consult with and advise the City and act as its representative as provided herein and in the General Conditions of the construction contract for the Project. This phase of the work may or may not be performed in conjunction with Phase H "Construction Survey and Layout Phase" of this agreement. Inclusion of this phase in the agreement does not imply that services identified under Phase H are to be provided unless specifically indicated in this agreement.

2) Construction Inspection and Reporting

Make visits to the site with sufficient frequency at the various stages of construction to observe as an experienced and qualified design professional the progress and quality of the executed work of the contractor(s) and to insure that such work is proceeding in accordance with the contract documents. During such visits and on the basis of on-site observations, the Landscape Architect shall keep the City informed of the progress of the work, shall endeavor to guard the City against defects and deficiencies in such work and may disapprove or reject work failing to conform to the contract documents.

3) Warranty Inspection

Eleven months following construction completion, conduct an inspection to document any items to be repaired by the contractor under the conditions of the construction contract warranty. Submit work to be corrected to the Contractor and the City.

4) Review of Technical and Procedural Aspects

Review and approve (or take other appropriate action in respect to Shop Drawings), the results of tests and inspections and other data which each contractor is required to submit, determine the acceptability of substitute materials and equipment proposed by the contractor(s), and receive and review (for general content as required by the specifications) maintenance and operating instructions, schedules, guarantees, bonds and certificates of inspection which are to be assembled by the contractor(s).

5) Contract Documents

Receive from each contractor and review for compliance with contract documents all required document submissions including but not limited to performance and payment bonds, certificates of insurance report forms required by any City, State or Federal law or rule or regulation and submit the forms to the City for final approval.

6) Conferences and Meetings

Attend meetings with the contractor, such as preconstruction conferences, progress

meetings, job conferences and other Project-related meetings, and prepare and circulate copies of the minutes thereof including to the City.

7) Records

a) Maintain orderly files for correspondence, reports of job conferences, shop drawings and samples, reproductions of original contract documents, including all work directive changes, addenda, change orders, field orders, additional drawings issued subsequent to the execution of the contract, the Landscape Architect's clarifications and interpretations of the contract documents, progress reports, and other Project-related documents.

b) Keep a diary or log book, recording the contractor's hours on the job site, weather conditions, data relative to questions of work directive changes, change orders, or changed conditions, list of job site visitors, daily activities, decisions, observations in general, and specific observations in more detail, as in the case of observing test procedures and send copies to the City. Take multiple photographs of the Work and keep a log and file of the photos. Specifically maintain records of acceptance and rejection of materials and workmanship.

c) Record names, addresses and telephone numbers of all the contractors, subcontractors, and major suppliers of materials and equipment.

8) Reports

a) Furnish the City periodic reports, as required, on progress of the work and of the contractor's compliance with the progress schedule and schedule of shop drawings and sample submittals.

b) Consult with the City, in advance of scheduled major tests, inspections, or start of important phases of the Work.

c) Draft proposed change orders and work directive changes, obtaining back-up material from the contractor, and make recommendations to the City regarding change orders, work directive changes and field orders.

d) Report immediately to the City upon the occurrence of any accident.

9) Contract Interpretation, Review of Quality of Work

Issue all instruction of the City to the contractor(s); issue necessary interpretations and clarifications of the contract Documents and in connection therewith prepare change orders as required, subject to the City's approval; have authority, as the Director, to require special inspection or testing of the work; act as initial interpreter of the requirements of the contract documents and judge of the acceptability of the work there under and make decisions on all claims of the contractor(s) relating to the acceptability of the work or the interpretation of the requirements of the contract documents pertaining to the execution and progress of the work.

10) Change Orders and Revisions

Prepare change orders to reflect changes in the Project requested or approved by the City, evaluate substitutions proposed by the contractor(s) and make revisions to

drawings and specifications occasioned thereby, and provide any additional services necessary as the result of significant delays, changes or price increases occurring as a direct or indirect result of material, equipment or energy shortages.

11) Review of Applications for Payment

Based on the Landscape Architect's on-site observations as an experienced and qualified design professional and on review of applications for payment and the accompanying data and schedules, determine the amount owing to the contractor(s) and recommend in writing payments to the contractor(s) in such amounts; such recommendations of payment will constitute a representation to the City, based on such observations and review, that the work has progressed to the point indicated, that, to the best of the Landscape Architect's knowledge, information and belief, the quality of such work is in accordance with the contract documents (subject to an evaluation of such work as a functioning Project upon substantial completion, to the results of any subsequent tests called for in the contract documents, and to any qualifications stated in his recommendation), and that payment of the amount recommended is due the contractor(s).

12) Determination of Substantial Completion

Conduct an inspection to determine if the Project is substantially complete and a final inspection to determine if the work has been completed in accordance with the contract documents and if each contractor has fulfilled all of his obligations there under so that the Landscape Architect may recommend, in writing, final payment to each contractor and may give written notice to the City and the contractor(s) that the work is acceptable (subject to any conditions therein expressed).

13) Authority and Responsibility

The Landscape Architect shall not guarantee the work of any contractor or subcontractor, shall have no supervision or control as to the work or persons doing the work, shall not have charge of the work, shall not be responsible for safety in, on, or about the job-site or have any control of the safety or adequacy of any equipment, building component, scaffolding, supports, forms or other work aids. If the Landscape Architect determines that there are deficiencies in materials or workmanship on the Project, or otherwise deems it to be in the best interest of the City to do so, the Landscape Architect shall be responsible to stop any contractor or subcontractor from performing work on the Project, until conditions giving rise to this need, therefore, are rectified.

14) Landscape Architect Not Responsible for Acts of Contractor

The Landscape Architect shall not be responsible for the supervision or control of the acts or omissions or construction means, methods or techniques of any contractor, or subcontractor, or any of the contractor(s)' or subcontractors' or employees or any other person (except the Landscape Architect's own employees and agents) at the site or otherwise performing any of the contractor(s) work; however, nothing contained in this paragraph shall be construed to release the Landscape Architect from liability for failure to properly perform duties undertaken by him in these contract documents or this

agreement.

15) Preparation of Record Drawings
The Landscape Architect shall cause to have been prepared a set of record drawings in accordance with generally accepted architectural standards, and shall provide at least one set to Director.

16) Manuals
The Landscape Architect shall furnish operating and maintenance manuals; protracted or extensive assistance in the utilization of any equipment or system (such as initial start-up, testing, and adjusting and balancing); and training personnel for operation and maintenance.

17) Supplementary Duties
The duties and responsibilities of the Landscape Architect during the construction administration and inspection phase shall also include any additional duties and responsibilities to be provided pursuant to the Landscape Architect's proposal attached as Exhibit B.

18) Completion Time
The construction administration and inspection phase shall be completed by Click or tap here to enter text..

SECTION III. CITY'S RESPONSIBILITIES

A. FURNISH REQUIREMENTS AND LIMITATIONS
Provide all criteria and full information as to the City's requirements for the Project, including design objectives and constraints, space, capacity and performance requirements, flexibility and expendability, economic parameters and any budgetary limitations; and furnish copies of all design and construction standards which the City will require to be included in the Drawings and Specifications.

B. FURNISH INFORMATION
Assist the Landscape Architect by placing at the Landscape Architect's disposal all available information reasonably known to and in possession of the City.

C. REVIEW DOCUMENTS
Examine all studies, reports, sketches, drawings, specifications, proposals and other documents presented by the Landscape Architect.

D. OBTAIN APPROVALS AND PERMITS
Furnish approvals and permits from all governmental authorities having jurisdiction over the Project and such approvals and consents from others as may be necessary for completion of the Project.

E. ACCOUNTING, LEGAL AND INSURANCE SERVICE

Provide such auditing service as the City may require to ascertain how or for what purpose any contractor has used the monies paid to him under the construction contract, and such inspection services as the City may require to ascertain that the contractor(s) are complying with any law, rule or regulation applicable to their performance of the work except as otherwise provided in Section II.

F. NOTIFY THE LANDSCAPE ARCHITECT OF DEFECTS OR DEVELOPMENT
Give prompt written notice to the Landscape Architect whenever the City observes or otherwise becomes aware of any development that affects the scope or timing of the Landscape Architect's services, or any defect in the work of the contractor(s).

G. COSTS OF THE CITY'S RESPONSIBILITIES
Bear all costs incidental to compliance with the requirements of this Section III.

SECTION IV. GENERAL CONSIDERATIONS

A. SUCCESSORS AND ASSIGNS
The City and the Landscape Architect each binds their respective partners, successors, executors, administrators and assigns to the other party of this agreement and to the partners, successors, executors, administrators, and assigns of such other party, in respect to all covenants of this agreement; the Landscape Architect shall not assign, sublet, or transfer their respective interests in this agreement without the written consent of the City. Nothing herein shall be construed as creating any personal liability on the part of any officer or agent of any public body which may be a party hereto, nor shall it be construed as giving any rights or benefits hereunder to anyone other than the City and the Landscape Architect.

B. OWNERSHIP OF DOCUMENTS
All drawings, specifications, reports, records, and other work product developed by the Landscape Architect in connection with this Project shall remain the property of the City whether the Project is completed or not. Reuse of any of the work product of the Landscape Architect by the City on extensions of this Project or any other Project without written permission of the Landscape Architect shall be at the City's risk and the City agrees to defend, indemnify and hold harmless the Landscape Architect from all damages and costs including attorney fees arising out of such reuse by the City or others acting through the City.

C. ESTIMATES OF COST (COST OPINION)
Estimates of construction cost provided are to be made on the basis of the Landscape Architect's experience, qualifications and the best of their professional judgment, but the Landscape Architect does not guarantee the accuracy of such estimates as compared to the contractor's bids or the Project construction cost.

D. INSURANCE
1) Landscape Architect shall provide the following minimum amounts of insurance

from insurance companies authorized to do business in the state of Minnesota:

a) Workers' compensation insurance in accordance with the laws of the State of Minnesota.

b) Commercial General and Automobile Liability Insurance with limits not less than **$1,500,000** Single Limit shall be in a company approved by the city of Duluth; and shall provide for the following: Liability for Premises, Operations, Completed Operations, Independent Contractors, and Contractual Liability. Umbrella coverage with a "form following" provision may make up the difference between the commercial general and auto liability coverage amounts and the required minimum amount stated above.

c) Professional Liability Insurance in an amount not less than **$1,500,000** Single Limit; provided further that in the event the professional liability insurance is in the form of "claims made," insurance, Landscape Architect hereby commits to provide at least 60 days' notice prior to any change to the Professional Liability Insurance policy or coverage ; and in event of any change, Landscape Architect agrees to provide the City with either evidence of new insurance coverage conforming to the provisions of this paragraph which will provide unbroken protection to the City, or, in the alternative, to purchase at its cost, extended coverage under the old policy for the period the state of repose runs; the protection to be provided by said "claims made" insurance shall remain in place until the running of the statute of repose for claims related to this Agreement.

d) **City of Duluth shall be named as Additional Insured** under the Commercial General and Automobile Liability Policies. Landscape Architect shall also provide evidence of Statutory Minnesota Workers' Compensation Insurance. Landscape Architect to provide Certificate of Insurance evidencing such coverage with notice to City of cancellation in accordance with the provisions of the underlying insurance policy included. The City of Duluth does not represent or guarantee that these types or limits of coverage are adequate to protect the Landscape Architect's interests and liabilities.

2) Certificates showing that Landscape Architect is carrying the above described insurance in the specified amounts shall be furnished to the City prior to the execution of this Agreement and a certificate showing continued maintenance of such insurance shall be on file with the City during the term of this Agreement.

3) The City shall be named as an additional insured on each liability policy other than the professional liability and the workers' compensation policies of the Landscape Architect.

4) The certificates shall provide that the policies shall not be cancelled during the life of this Agreement without advanced notice being given to the City at least equal to that provided for in the underlying policy of insurance.

5) Except as provided for in Section IV.D.1.d) above, Landscape Architect hereby commits to provide notice to City at least 30 days in advance of any change in the insurance provided pursuant to this Section IV or in advance of that provided for in the underlying insurance policy or policies whichever is longer. For the purposes of Section IV.D of this Agreement, the term, "changed", shall include cancellation of a policy of insurance provided hereunder and any modification of such policy which reduces the amount of any coverage provided thereunder below the amounts required to be provided hereunder or otherwise reduces the protections provided under such policy to City.

E. HOLD HARMLESS

To the fullest extent permitted by law, Landscape Architect agrees that it shall indemnify and hold harmless the City, its officers, employees, and agents, past or present, from and against any and all claims including but not limited to claims for contribution or indemnity, demands, suits, judgments, costs, and expenses (including attorneys' fees and incurred defense costs) asserted by itself or any person or persons including agents or employees of the City of Duluth or Landscape Architect by reason of death or injury to person or persons or the loss or damage to property to the extent attributable to, or by reason of, any act, omission, operation or work of Landscape Architect or its employees while engaged in the execution or performance of services under this Agreement. Said obligations to indemnify and hold harmless shall include, but not be limited to the obligation to indemnify and hold harmless the City in all matters where claims of liability against the City arise out of, relate to, are attributable to, are passive or derivative of, or vicarious to the negligent, intentional, or wrongful acts or omissions of Landscape Architect, including but not limited to the failure to supervise, breach of warranty, the failure to warn, the failure to prevent such act or omission by Landscape Architect, its employees, or its agents, and any other source of liability. Said obligations to indemnify and hold harmless shall be triggered upon the assertion of a claim for damages against City. Landscape Architect shall not be required to indemnify City for amounts found by a fact finder to have arisen out of the sole negligent or intentional acts or omission of the City unless Landscape Architect should fail to comply with its insurance obligations in this contract to the detriment of City, in which case Landscape Architect shall indemnify, defend, and hold harmless the City for any and all amounts except amounts attributed to intentional, willful or wanton acts of the City.

This Section, in its entirety, shall survive the termination of this Agreement if any amount of work has been performed by Landscape Architect. Nothing in this provision shall affect the limitations of liability of the City as set forth in Minnesota Statutes Chapter 466.
Landscape Architect understands this provision may affect its rights and may shift liability.

Landscape Architect shall hold and save the City, its officers, employees, representatives and agents, and the Architect, harmless from liability of any nature or kind, including costs and expenses and reasonable attorney's fees and incurred defense costs to the extent attributable to Landscape Architect's intellectual property infringement of any patented or unpatented invention, process, article, or appliance manufactured or used in the performance of the Contract, including its use by the City, unless otherwise specifically

stipulated in the Technical Specifications.

Nothing herein is intended to impose an obligation on Landscape Architect that is void and unenforceable under Minnesota Statutes Section 604.21.

F. TERMINATION

1) This agreement may be terminated in whole or in part in writing by either party in the event of substantial failure by the other party to fulfill its obligation under this agreement through no fault of the terminating party; provided that no such termination may be affected unless the other party is given not less than fifteen (15) calendar days' prior written notice (delivered by certified mail, return receipt requested) of intent to terminate.

2) This agreement may be terminated in whole or in part in writing by the City for its convenience; provided that the Landscape Architect is given (1) not less than fifteen (15) calendar days' prior written notice (delivered by certified mail, return receipt requested) of intent to terminate and (2) an opportunity for consultation with the City prior to termination.

3) Upon receipt of a notice of intent to terminate from the City pursuant to this agreement, the Landscape Architect shall (1) promptly discontinue all services affected (unless the notice directs otherwise), and (2) make available to the City at any reasonable time at a location specified by the City all data, drawings, specifications, reports, estimates, summaries, and such other information and materials as may have accumulated by the Landscape Architect in performing this agreement, whether completed or in process.

4) Upon termination pursuant to this agreement, the City may take over the work and prosecute the same to completion by agreement with another party or otherwise.

G. LAWS, RULES AND REGULATIONS

The Landscape Architect agrees to observe and comply with all laws, ordinances, rules and regulations of the United States of America, State of Minnesota, the City of Duluth and their respective agencies and instrumentalities which are applicable to the work and services to be performed hereunder.

H. INDEPENDENT CONTRACTOR STATUS

Nothing contained in this agreement shall be construed to make the Landscape Architect an employee or partner of the City. The Landscape Architect shall at all times hereunder be construed to be an independent contractor.

I. FEDERAL FUNDING

If Federal Funds (i.e. HUD, FEMA, Revenue Sharing) are utilized as a source of Project funding, the Landscape Architect shall abide by the terms of all Federal requirements in the performance of duties hereunder.

J. AMENDMENT OF AGREEMENT

This agreement shall be amended or supplemented only in writing and executed by both parties hereto.

K. WAIVER OF CLAIM

The Landscape Architect waives the right to make any claim whatsoever against any officer, agent or employee of the City for, or on account of, anything done, or omitted to be done, in connection with the drafting or ratification of this contract. In addition, if it is determined that this contract was not drafted or ratified in conformity with Minnesota or federal law, or City of Duluth ordinance or charter provisions, or if the contract includes obligations that are void as to Minnesota or federal law or City of Duluth ordinance or charter provisions, the Landscape Architect agrees to raise no defense and make no claim against the City on the basis of ratification, laches, estoppel, or implied contract. **The Landscape Architect understands this provision may affect its rights and may shift liability and specifically agrees to the same.**

SECTION V. PAYMENT

A. BASIS OF BILLING

Upon completion of each phase of the work, City shall pay the Landscape Architect the percentage of the amount set forth in Section V.C as is set forth below for all services rendered under each such phase, the total of said amounts in no event to exceed the amount in Section V.C, including any and all Project-related expenses such as travel, reproduction of reports and drawings, tolls, mileage, etc.

% of Contract Amount (per section V.C)	Phase	Description
%	A	Study and Report Phase
%	B	Preliminary Survey Phase
%	C	Public Input Phase
%	D	Schematic Design Phase
%	E	Design Development Phase
%	F	Construction Document Phase
%	G	Bidding Phase
%	H	Construction Survey and Layout Phase
%	I	Construction Administration and Inspection Phase

B. PAYMENT FOR WORK COMPLETED

1) Payment terms shall be net 35 per Minnesota Statute 471.425.

2) Monthly progress payments may be requested by the Landscape Architect for work satisfactorily completed within each phase and shall be made by the City to the Landscape Architect as soon as practicable upon submission of statements requesting

payment by the Landscape Architect to the City. For the purposes of this agreement, the principals and employees of the Landscape Architect and their hourly rates are set forth in Exhibit A.

3) No payment request made pursuant to subparagraph 1 of this Section V shall exceed the estimated maximum total amount and value of the total work and services to be performed by the Landscape Architect under this agreement without the prior authorization of the City and nothing herein, including exhaustion of the funds authorized pursuant to this Agreement, shall relieve the Landscape Architect from completing all work required under this Agreement or to demand increased compensation for completing such work. These estimates have been prepared by the Landscape Architect and supplemented or accompanied by such supporting data as may be required by the City.

4) Upon satisfactory completion of the work performed hereunder, and prior to final payment under this agreement, and as a condition precedent thereto, the Landscape Architect shall execute and deliver to the City a release of all claims against the City arising under or by virtue of this agreement.

5) In the event of termination by City under Section IV.F., upon the completion of any phase of the Basic Services, progress payments due Landscape Architect for services rendered through such phase shall constitute total payment for such services. In the event of such termination by City during any phase of the Basic Services, Landscape Architect also will be reimbursed for the charges of independent professional associates and consultants employed by Landscape Architect to render Basic Services, and paid for services rendered during that phase on the basis of hourly rates defined in Exhibit A of this agreement for services rendered during that phase to date of termination by Landscape Architect's principals and employees engaged directly on the Project. In the event of any such termination, Landscape Architect will be paid for all unpaid additional services plus all termination expenses. Termination expenses mean additional expenses directly attributable to termination, which, if termination is at City's convenience, shall include an amount computed as a percentage of total compensation for basic services earned by Landscape Architect to the date of termination as follows: 10% of the difference between the amount which the Landscape Architect has earned computed as described in paragraphs A and B of this section and the maximum payment amount described in paragraph C of this section. The above applies only if termination is for reasons other than the fault of the Landscape Architect.

C. TOTAL NOT TO EXCEED:

All payments under this Contract are not to exceed Click or tap here to enter text. ($Click or tap here to enter text.).

SECTION VI. SPECIAL PROVISIONS

The following exhibits are attached to and made part of this agreement:

1) Exhibit A, Landscape Architect's Hourly Rates
2) Exhibit B**,** Landscape Architect's Proposal

In the event of a conflict between the agreement and any Exhibit, the terms of the Agreement will be controlling.

SECTION VII. NOTICES

Notices to be given by either party to the other shall be deemed to be sufficiently given if deposited in the United States Mail, postage prepaid, addressed to the notice party as follows or to such other address as the noticed party may have provided in writing from time to time to the other party:

City:	Name City of Duluth 411 West First Street, Room XX Duluth, MN 55802
Landscape Architect:	Consultant Company Address City, State, Zip

SECTON VIII. COUNTERPARTS

This Agreement may be executed in two or more counterparts, each of which shall be deemed to be an original as against any party whose signature appears thereon, but all of which together shall constitute but one and the same instrument. Signatures to this Agreement transmitted by facsimile, by electronic mail in "portable document format" (".pdf"), or by any other electronic means which preserves the original graphic and pictorial appearance of the Agreement, shall have the same effect as physical delivery of the paper document bearing the original signature.

[Remainder of this page intentionally left blank. Signature page to follow.]

IN WITNESS WHEREOF, the parties have hereunto set their hands on the date of attestation shown below.

CITY OF DULUTH-Client

By: _____
Mayor

Attest:

By: _____
City Clerk

Date: _____

Countersigned:

_____
City Auditor

Approved as to Form:

_____
City Attorney

CONSULTANT

By: _____

Its: _____
Title of Representative

Date: _____

APPENDIX G

U.S. ENVIRONMENTAL PROTECTION AGENCY Grant Agreement		DATE OF AWARD 09/21/2024
	TYPE OF ACTION New	MAILING DATE 09/25/2024
	PAYMENT METHOD: ASAP	ACH#

RECIPIENT TYPE: Municipal	Send Payment Request to: Contact EPA RTPFC at: rtpfc-grants@epa.gov
RECIPIENT:	**PAYEE:**
CITY OF DULUTH 411 W 1ST ST Duluth, MN 55802-1105 **EIN:** 41-6005105	CITY OF DULUTH 411 W 1ST ST Duluth, MN 55802-1105

PROJECT MANAGER	EPA PROJECT OFFICER	EPA GRANT SPECIALIST
Cliff Knettel 411 West 1st Street Duluth, MN 55802-1105 **Email:** cknettel@duluthmn.gov **Phone:** 218-730-4315	Bart Mosier 77 W. Jackson Blvd., G-9J Chicago, IL 60604-3507 **Email:** Mosier.Bart@epa.gov **Phone:** 312-353-4513	Jeffrey Reid Assistance Section, MA-10J 77 W. Jackson Blvd. Chicago, IL 60604-3507 **Email:** reid.jeffrey@epa.gov **Phone:** 312-886-3224

PROJECT TITLE AND DESCRIPTION

St. Louis River Estuary Public Access

See Attachment 1 for project description.

BUDGET PERIOD	PROJECT PERIOD		
10/01/2024 - 09/30/2026	10/01/2024 - 09/30/2026		

ISSUING OFFICE (GRANTS MANAGEMENT OFFICE)	AWARD APPROVAL OFFICE
ORGANIZATION / ADDRESS	**ORGANIZATION / ADDRESS**
U.S. EPA, Region 5, U.S. EPA Region 5 Mail Code MCG10J 77 West Jackson Blvd. Chicago, IL 60604-3507	U.S. EPA, Region 5, Great Lakes National Program Office R5 - Region 5 77 W. Jackson Blvd, G-9J. Chicago, IL 60604-3507

THE UNITED STATES OF AMERICA BY THE U.S. ENVIRONMENTAL PROTECTION AGENCY

Digital signature applied by EPA Award Official for Sheila Dolan - Branch Supervisor **by** Robert Fields - Award Official Delegate	**DATE** 09/21/2024

EPA Funding Information

Assistance Program (CFDA)	Statutory Authority	Regulatory Authority
66.469 - Geographic Programs - Great Lakes Restoration Initiative	Clean Water Act: Sec. 118(c) as amended by PL 114-322	2 CFR 200, 2 CFR 1500 and 40 CFR 33

Attachment 1 - Project Description

The agreement provides funding to the City of Duluth, Minnesota. Specifically, the recipient will provide public access to the newly restored St. Louis River through new and improved access at four sites adjacent to restoration project areas in the St. Louis River Estuary Area of Concern.Activities include completing design and construction for improved access sites and development and execution of programming to activate the restored spaces. Anticipated deliverables include final design and engineering plans and construction for three access sites, completion of a preliminary design for 0.6 miles of new trail, and two River Orientation community outreach events with an expected attendance of 50 people per event. Outcomes include increased and enhanced access to remediated St. Louis River Estuary sites for recreational and educational purposes; improved awareness of available river access opportunities and strategies for recreating safely through social media campaigns and information sharing to a reach of at least 5,000 people; provision of three improved access sites to low income and/or economically distressed neighborhoods with total population of 3,506 within a one-mile radius of the three sites; and provision of three new accessible features to provide recreational opportunities for people with disabilities. Intended beneficiaries include residents of the underserved communities near the sites and all those who live and recreate in the St. Louis River Estuary Area of Concern. The St. Louis River Alliance will maintain and promote the St. Louis River Estuary National Water Trail trailheads, and provide barrier-free programming to connect communities to the restored River.

Administrative Conditions

National Administrative Terms and Conditions

General Terms and Conditions

The recipient agrees to comply with the current EPA general terms and conditions available at: https://www.epa.gov/grants/epa-general-terms-and-conditions-effective-october-1-2023-or-later.

These terms and conditions are in addition to the assurances and certifications made as a part of the award and the terms, conditions, or restrictions cited throughout the award.

The EPA repository for the general terms and conditions by year can be found at: https://www.epa.gov/grants/grant-terms-and-conditions#general.

A. Correspondence Condition

The terms and conditions of this agreement require the submittal of reports, specific requests for approval, or notifications to EPA. Unless otherwise noted, all such correspondence should be sent to the following email addresses:

- Federal Financial Reports (SF-425): rtpfc-grants@epa.gov and reid.jeffrey@epa.gov
- MBE/WBE reports (EPA Form 5700-52A): region5closeouts@epa.gov and reid.jeffrey@epa.gov
- All other forms/certifications/assurances, Indirect Cost Rate Agreements, Requests for Extensions of the Budget and Project Period, Amendment Requests, Requests for other Prior Approvals, updates to recipient information (including email addresses, changes in contact information or changes in authorized representatives) and other notifications: mosier.bart@epa.gov and reid.jeffrey@epa.gov
- Payment requests (if applicable): mosier.bart@epa.gov and reid.jeffrey@epa.gov
- Quality Assurance documents, workplan revisions, equipment lists, programmatic reports and deliverables: mosier.bart@epa.gov

Programmatic Conditions

GLRI Programmatic Terms and Conditions

A. Performance Reporting and Final Performance Report

In accordance with 2 CFR 200.329, the recipient agrees to submit performance reports that include brief information on each of the following areas: 1) A comparison of actual accomplishments to the outputs/outcomes established in the assistance agreement work plan for the period; 2) The reasons why established outputs/outcomes were not met; and 3) Additional pertinent information, including, when appropriate, analysis and explanation of cost overruns or high-unit costs.

Additionally, the recipient agrees to inform EPA as soon as problems, delays, or adverse conditions which will materially impair the ability to meet the outputs/outcomes specified in the assistance agreement work plan are known.

1. **Semi-annual progress reports:** Starting with the first full reporting period after the issuance of the award, the recipient shall submit semi-annual progress reports (electronically) to the EPA Project Officer by **April 15 but no later than April 30** and **by October 15 but no later than October 30** of each year, through the life of the assistance agreement. Reporting periods shall be the 6-month periods from October 1 to March 31 and April 1 to September 30. Progress reports shall document progress in writing and in pictures, for the project during the immediately preceding reporting period and must contain sufficient information in order to ascertain that the workplan is being carried out as specified in the assistance agreement. Progress reports shall describe all of the following that apply:

(a) Work accomplished for the period, quantifying results achieved. Specify any incremental and cumulative (from October 1, 2014 on) results achieved during the reporting period for all applicable GLRI Action Plan III measures (*i.e.*, the number of responses, exercises, acres, and/or miles for measures on the list at on page 5 of the GLRI Action Plan III: https://www.epa.gov/sites/production/files/2019-10/documents/glri-action-plan-3-201910-30pp.pdf) ,in accordance with any direction provided by your EPA project officer and the GLRI Action Plan III Measures Reporting Plan as periodically updated by the EPA at http://www.epa.gov/great-lakes-funding>, particularly:

Number – Measure of Progress

1.1.1 – Areas of Concern where all management actions necessary for delisting have been implemented.

(b) Object Class Category changes;

(c) Corrective actions;

(d) Projected new work;

(e) Percent completion of scheduled work;

(f) Percent of budgeted amounts spent;

(g) Any change in principal investigator;

(h) Any change needed in project period,

(i) Date and amount of latest drawdown request; and

(j) Delays or adverse conditions which materially impair the ability to meet the outputs/outcomes specified in the assistance agreement workplan.

The EPA Project Officer must be able to determine that all mission support products, services, information or data generation and use, including technology development and verification, is performed in accordance with EPA policies and the assistance agreement. To develop your progress report you may use the outline at http://www.epa.gov/great-lakes-funding>.

2. **Final Report:** The Final Report shall incorporate all proposed project outputs and outcomes and summarize the nature and extent of the project, methodologies employed, significant events and experiences, a compilation of the data collected, and results achieved. Results shall include the cumulative results achieved during the project period for all proposed outputs and outcomes, including but not limited to all applicable GLRI Action Plan III measures described in element 1 of the Semiannual Progress Report condition above, all outputs and outcomes related to environmental justice or climate resiliency metrics and outreach, education, and stakeholder engagement. The final report shall also include analysis of the data, conclusions, and recommendations. The final report shall incorporate photo documentation of the project and environmental progress under the project at appropriate phases, and appropriate illustrations, diagrams, charts, graphs, and maps to express the data and findings. In order for the report writing costs to be eligible under the award, they must be incurred before the project end date.

Electronic versions of the **Final Report shall be submitted no later than 120 days after the end of the project period.** All work products shall carry attribution to the U.S. EPA Great Lakes Restoration Initiative for funding assistance and should also acknowledge significant contributions by others. If applicable, the Final Report shall include:

A database (Excel or similar format) of field and laboratory data including but not limited to latitude-longitude, date, time, field observations, parameter data, laboratory analysis, QA duplicates/replicates

Model files including input-output data, model code, model output, and peripheral and post-processing utilities.

3. **Subaward Performance Reporting:**

The recipient must report on its subaward monitoring activities under 2 CFR 200.332(d). Examples of items that must be reported if the pass-through entity has the information available are:

I. Summaries of results of reviews of financial and programmatic reports.

II. Summaries of findings from site visits and/or desk reviews to ensure effective subrecipient performance.

III. Environmental results the subrecipient achieved.

IV. Summaries of audit findings and related pass-through entity management decisions.

V. Actions the pass-through entity has taken to correct deficiencies such as those specified at 2 CFR 200.332(e), 2 CFR 200.208 and the 2 CFR 200.339 Remedies for Noncompliance.

Subaward Programmatic Monitoring for Grants in Support of Areas of Concern or Lakewide Action and Management Plans

In addition to subaward monitoring and reporting requirements described in the **Performance Reporting And Final Performance Report** condition of this agreement, assistance agreement recipients who are issued non-competitive grants in support of Areas of Concern (AOC) or Lakewide Action and Management Plans (LAMPs), and who include subawards in their budget, must monitor subrecipient work to ensure that it meets the objectives of the AOC or LAMP.

B. Cybersecurity Condition

Cybersecurity Grant Condition for Other Recipients, Including Intertribal Consortia

(a) The recipient agrees that when collecting and managing environmental data under this assistance agreement, it will protect the data by following all applicable State or Tribal law cybersecurity requirements.

(b) (1) EPA must ensure that any connections between the recipient's network or information system and EPA networks used by the recipient to transfer data under this agreement, are secure. For purposes of this Section, a connection is defined as a dedicated persistent interface between an Agency IT system and an external IT system for the purpose of transferring information. Transitory, user-controlled connections such as website browsing are excluded from this definition.

If the recipient's connections as defined above do not go through the Environmental Information Exchange Network or EPA's Central Data Exchange, the recipient agrees to contact the EPA Project Officer (PO) no later than 90 days after the date of this award and work with the designated Regional/Headquarters Information Security Officer to ensure that the connections meet EPA security requirements, including entering into Interconnection Service Agreements as appropriate. This condition does not apply to manual entry of data by the recipient into systems operated and used by EPA's regulatory programs for the submission of reporting and/or compliance data.

(2) The recipient agrees that any subawards it makes under this agreement will require the subrecipient to comply with the requirements in (b)(1) if the subrecipient's network or information system is connected to EPA networks to transfer data to the Agency using systems other than the Environmental Information Exchange Network or EPA's Central Data Exchange. The recipient will be in compliance with this condition: by including this requirement in subaward agreements; and during subrecipient monitoring deemed necessary by the recipient under 2 CFR 200.332(d), by inquiring whether the subrecipient has contacted the EPA Project Officer. Nothing in this condition requires the recipient to contact the EPA Project Officer on behalf of a subrecipient or to be involved in the negotiation of an Interconnection Service Agreement between the subrecipient and EPA.

C. Requesting Travel Costs

Time and travel costs along with participation in professional meetings and conferences funded under

this agreement shall be reviewed by the EPA Project Officer in advance. Although EPA may have approved this type of activity as a component of the workplan, the recipient (or its representative) seeking to attend professional meetings and conferences not covered/approved in the original scope of work, must notify the EPA Project Officer identified on the first page of this agreement.

1. Travel Narrative

Specifically, **at least 30 days** in advance, the recipient shall notify the EPA Project Officer of any travel plans not previously detailed in the approved workplan by providing the Project Officer with a description of the event, the location of the event, the event sponsor, travel dates, the recipient's role in the event, the number of travelers and an itemized travel breakdown of costs ((per diem, mileage, lodging, parking/tolls, airfare). The request should also include a justification describing why this travel is a necessary part of this assistance agreement. The recipient understands that any travel revisions contributing to a rebudgeting of funds from other cost categories exceeding 10% of the total budget, or an increase in grant funds requires a formal amendment to this agreement.

2. International Travel (see also EPA General Term and Condition titled "Foreign Travel")

The recipient must request approval for International travel not approved in the workplan by submitting a request to the Project Officer **at least 30 days** in advance of incurring foreign travel costs. The recipient understands that if it incurs international travel costs of any kind without EPA's prior approval, it does so at its own risk.

D. Signage Required

1. Signage Requirements

The recipient is required to place a sign at construction sites supported under this award displaying the EPA logo in a manner that informs the public that the project is funded in part or wholly by the EPA. The sign must be placed in a visible location that can be directly linked to the work taking place and must be maintained in good condition throughout the construction period.

Recipients are required to comply with the sign specifications provided by the EPA Office of Public Affairs (OPA) available at: https://www.epa.gov/grants/epa-logo-seal-specifications-signage-produced-epa-assistance-agreement-recipients. If the EPA logo is displayed along with the logos of other participating entities, the EPA logo must not be displayed in a manner that implies that EPA itself is conducting the project. Instead, the EPA logo must be accompanied with a statement indicating that the recipient received financial assistance from EPA for the project. As provided in the sign specifications from OPA, the EPA logo is the preferred identifier for assistance agreement projects and use of the EPA seal requires prior approval from the EPA. To obtain the appropriate EPA logo or seal graphic file, the recipient should send a request directly to OPA and include the EPA Project Officer in the communication. Instructions for contacting OPA is available at: https://www.epa.gov/stylebook/using-epa-seal-and-logo.

State agencies and agencies of political subdivisions of states must comply with 2 CFR 200.323, Procurement of recovered materials when procuring signage for projects funded by EPA assistance agreement. EPA encourages other recipients to use recycled or recovered materials when procuring signs.

Signage costs are considered an allowable cost under this assistance agreement provided that the costs associated with signage are reasonable. Additionally, to increase public awareness of projects serving communities where English is not the predominant language, recipients are encouraged to translate the language on signs (excluding the EPA logo or seal) into the appropriate non-English language(s). The costs of such translation are allowable, provided the costs are reasonable.

2. **Public or Media Events**

The Recipient agrees to notify the EPA Project Officer listed in this award document of public or media events publicizing the accomplishment of significant events related to construction projects as a result of this agreement, and provide the opportunity for attendance and participation by federal representatives with at least ten (10) working days' notice.

E. Health, Safety, and Environmental Compliance

All health, lab and field activities conducted for this project must be in accordance and compliance with all applicable health, safety and environmental laws, regulations and guidelines.

F. Management Practice

The recipient agrees to properly operate and maintain any best management practices or management practices implemented through this award in accordance with design standards and specifications. Further, when designing, implementing, and/or maintaining the project funded by this award, the recipient agrees to: 1) consider the potential impacts of climate change (e.g., increasing temperatures, higher water levels, more frequent and intense storms, greater wave energy, etc.) on the planned project; and 2) to the maximum extent feasible, incorporate resilience to the potential impacts of climate change into the design, implementation, and operations of the project.

G. Disposition of Wastes

Disposal of all wastes will be in accordance with State and Federal regulations, and is the responsibility of the recipient.

H. Timely Fiscal Expenditures

The recipient must ensure funds are expended timely commensurate to the progression of Project Activities. To ensure compliance with unliquidated obligations (ULO) policies, the recipient must **notify the EPA Project Officer** of potential drawdown delays that exceed 180 days.

I. QUALITY ASSURANCE

Please visit our Quality Assurance Resources for Great Lakes Restoration Initiative Grantees website for more information about GLRI requirements, tools, and resources.

Quality Assurance System

1. Scope:

Quality assurance (QA) applies to all agreements that involve environmental data operations, including

environmental or scientific data and information collection, production or use. Environmental data operations include the acquisition, generation, compilation or use of environmental data and technology. These terms and conditions apply to all environmental programs included in the agreement's workplan that contain environmental data operations. Definitions applicable to these terms and conditions are in the following locations: Appendix A of EPA's Quality Management Plan (QMP) Standard and Appendix B of EPA QA R-5: EPA Requirements for Quality Assurance Project Plans. Examples are included in the Example Activities Section at: Quality Specifications for non-EPA Organizations to do business with EPA.

Sub-awards will include appropriate quality requirements for the work conducted through sub-agreements with other organizations. The prime recipient is accountable for all work performed on the project or program award including any portion of the external agreement work that the recipient awards to a sub-recipient.

Authorities, in accordance with:

2 CFR 1500.12;

40 CFR 35;

Policy and Program Requirements for the Mandatory Agency-wide Quality System, May 2000 CIO 2105.0;

EPA Quality Manual for Environmental Programs, May 2000 CIO 2105-P-01-0;

EPA Quality Management Plan (QMP) Standard;

EPA QA/R-5: EPA Requirements for Quality Assurance Project Plans; and

and as described by the Office of Grants and Debarment Quality Assurance Requirements

2. Communications:

The EPA Project Officer will provide the recipient with the EPA QA contact upon EPA's award issuance or upon request by recipient for pre-submittal questions and other communications regarding QA system document(s). A list of QA managers is posted on EPA's Quality Program website. The recipient agrees to include the EPA Project Officer on all written communications with the EPA QA contact.

3. GLRI Quality Documentation Requirements:

Recipients implementing environmental programs within the scope of the assistance agreement must submit an approvable Quality Assurance Project Plan (QAPP) at least ***90*** days prior to the initiating of data collection or data compilation. In accordance with 2 CFR 1500.12, the recipient must develop and implement quality assurance and quality control procedures, specifications and documentation sufficient to produce data of adequate quality to meet project objectives. A Quality Assurance Project Plan (QAPP) provides comprehensive details about the quality assurance, quality control, and technical activities that must be implemented to ensure that project objectives are met. The QAPP should be prepared in accordance with (IAW) EPA QA/R-5: EPA Requirements for Quality Assurance Project Plans.

The recipient agrees to ensure that no environmental data collection, production, or use occurs without

QAPP approval by the EPA authorized reviewer except under circumstances requiring immediate action to protect human health and the environment or operations conducted under police powers. When substantive change is warranted, the recipient must modify the QAPP and submit the revision for EPA approval. Only after the revision has been received and approved shall the change be implemented.

Additionally, the recipient agrees to submit previously EPA-approved QAPPs proposed to ensure the collected, produced, evaluated, or used environmental information is of known and documented quality for the intended use(s). The EPA Quality Assurance Manager or designee (hereafter referred to as QAM) will notify the recipient and EPA Project Officer (PO) in writing if the previously EPA-approved QAPP is acceptable for this agreement.

When the recipient is delegating the responsibility for an environmental data collection or data compilation activity to another organization, the EPA Regional Quality Assurance Manager may allow the recipient to review and approve that organization's QAPP. The recipient must provide the approved QAPP to the EPA Project Officer. Additional information on these requirements can be found at EPA's Implementation of Quality Assurance Requirements for Organizations Receiving EPA Financial Assistance website.

Recipients with an approved Quality Management Plan (QMP) shall continue to implement and adhere to the approved QMP. The recipient must provide project-level quality documentation to the EPA Project Officer prior to the initiation of relevant work activities. Additional information on these requirements can be found at EPA's Implementation of Quality Assurance Requirements for Organizations Receiving EPA Financial Assistance website.

J. NATIONAL HISTORIC PRESERVATION ACT

Pursuant to 36 C.F.R. § 800.2(c)(4), EPA has authorized all assistance agreement recipients and applicants to initiate and carry out consultation under National Historic Preservation Act (NHPA) Section 106, 54 U.S.C. § 306108 on behalf of EPA, for all grants, cooperative agreements, interagency agreements, and other projects under GLNPO's purview, including but not limited to the Great Lakes Restoration Initiative (GLRI), 33 U.S.C. § 1268, and applicable appropriations acts and/or implementing regulations. EPA does not delegate its Tribal consultation responsibilities and will work with the recipient to carry out the appropriate actions.

While all assistance agreement recipients and applicants are authorized to initiate Section 106 consultation on behalf of EPA, EPA retains legal responsibility for findings and determinations required under the Section 106 process. In addition, when applicable, EPA will consult directly under Section 106 with Indian Tribes and Native Hawaiian organizations, pursuant to 36 C.F.R. §§ 800.2(c)(2)(ii).

Prior to conducting or engaging in any on-site activity with the potential to impact historic properties, the grantee shall consult with an EPA Project Officer/Focus Area Lead regarding potential applicability of the National Historic Preservation Act and, if applicable, shall assist EPA in complying with any requirements of the Act and implementing regulations.

K. Competency Policy

Competency of Organizations Generating Environmental Measurement Data

In accordance with Agency Policy Directive Number FEM-2012-02, Policy to Assure the Competency of

Organizations Generating Environmental Measurement Data under Agency-Funded Assistance Agreements, Recipient agrees, by entering into this agreement, that it has demonstrated competency prior to award, or alternatively, where a pre-award demonstration of competency is not practicable, Recipient agrees to demonstrate competency prior to carrying out any activities under the award involving the generation or use of environmental data. Recipient shall maintain competency for the duration of the project period of this agreement and this will be documented during the annual reporting process. A copy of the Policy is available online at https://www.epa.gov/sites/production/files/2015-03/documents/competency-policy-aaia-new.pdf or a copy may also be requested by contacting the EPA Project Officer for this award.