

**Quality Control Plan**  
**Delineation Sampling and**  
**Feasibility Study for Acid Area1**  
**Former Plum Brook Ordnance Works, Sandusky, Ohio**

**Prepared By:**

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**Submitted to:**

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**April 5, 2011**

# **Quality Control Plan**

## **Delineation Sampling and Feasibility Study for Acid Area 1 Former Plum Brook Ordnance Works, Sandusky, Ohio**

**April 5, 2011**

This Quality Control Plan (QCP) was prepared by Shaw Environmental and Infrastructure, Inc. (Shaw) in support of the activities to be conducted for the Delineation Sampling and Feasibility Study for Acid Area 1 at the former Plum Brook Ordnance Works (PBOW) in Sandusky, Ohio, under Delivery Orders DX03, IDC Number W91278-10-D-0094, for the Mobile A/E Environmental Services.

### **PROJECT OBJECTIVE AND SCOPE**

The objective of this QCP is to present the project requirements as established in the SOW and to outline how the quality will be verified throughout all phase of the Acid Area 1 delineation and feasibility study at PBOW. A feasibility study (FS) will be prepared to evaluate possible alternatives for response to contamination found in soil and groundwater. The overall objectives of the FS are to determine action levels for soil and groundwater and identify a remedy to effectively treat contamination. Soil-to-groundwater leaching will be evaluated to determine whether additional soil must be removed for the protection of groundwater.

### **PROJECT TASKS**

This QCP presents the following tasks that will need to be completed in order to support the objective of this task order. :

- Task 1.0: Preparation and Submittal of Quality Control Plan (QCP)
- Task 2.0: Preparation and Submittal of a Site-Specific Safety and Health Plan (SSHP) and Site-Specific Sample and Analysis Plan (SSAP) Addenda;
- Task 3.0: Surface Soil Delineation Sampling
- Task 4.0 Analytical Requirements
- Task 5.0: Disposal of Investigation Derived Waste (IDW);
- Task 6.0: Geographic Information System (GIS) Deliverable;
- Task 7.0: Preparation and Submittal of Draft Feasibility Study;
- Task 8.0: Preparation and Submittal of Final Feasibility Study;
- Task 9.0: Project Management;

The following presents detailed information for each of the above mentioned tasks.

**Task 1.0 – Preparation and Submittal of Quality Control Plan**

Shaw prepared this QCP based on requirements described in ER 1110-1-12, Quality Management and CEORD 1110-1-9, Quality Control. As part of the QCP development, Shaw incorporated a criteria management process to ensure standard details appropriate for the USACE requirements are developed, updated, and made available to all project stake holders and reviewers. This QCP is an addendum to the Site-Wide Sample and Analysis Plan (SWSAP, prepared under contract Number W912DR-05-0026, DX10). The review and verification process is presented in the Quality Assurance/Quality Control section of this QCP. This verification process will be implemented to ensure that the work output is acceptable and meets all requirements detailed in the SOW.

A verification statement will be included with all products submitted to the government detailed in the SOW. The statement will be signed by the independent reviewers identified in the QCP, stating that they have reviewed the applicable documents or product and that all internal comments have been resolved, and the product for release to the Government. All comments generated by reviewers of a product or document, along with their resolution, will be submitted with the verification statement.

**Task 2.0 – Preparation and Submittal of Site-Specific Safety and Health Plan and Site-Specific Sampling and Analysis Plan Addenda**

A Site-Specific Safety and Health Plan (SSHP) addendum specific to the delineation sampling and feasibility study for AA1 will be shall be prepared and submitted to CELRN-EC-E as required by 29 CFR 1910.120(b) (4). This addendum will describe the health and safety procedures, practices to be implemented and equipment utilized to protect affected personnel from the potential hazards associated with the site-specific tasks. The level of detail provided in the addendum will be tailored to the type of work, complexity of operations being accomplished, hazards anticipated and the extent new conditions or procedures affecting the need to supplement the updated *Site-Wide Safety and Health Plan*.

A Site-Specific Sampling and Analysis Plan (SSAP) addendum specific to the delineation sampling and feasibility study for AA1 will be developed using the Site-Wide Sampling and Analysis Plan (SWSAP, prepared under Contract No W912DR-05-D-0026, and DX10) as the base document. The SSAP will be prepared as an addendum to the SWSAP and will present details regarding the delineation work as described in the SOWs. The SSAP addendum will identify sampling standard operating procedures,

analytical methods and data quality objectives specific to the delineation sampling of AA 1. Additionally, it will identify sampling locations, the rationale underlying the choice of locations and any expected variations from the SWSAP.

### ***Task 3.0 – Surface Soil Delineation***

Representative soil samples will be collected using hand auger techniques from up to seventy-two (72) sampling locations from the interval of ground surface to 1 foot below ground surface (bgs). Forty-eight of the surface soil samples will be collected around former tanks and building foundations in the initial sampling event. Following review of the analytical data, up to 24 additional samples will be collected to address any data gaps identified. The analysis requested for all 72 samples will be for PCBs only. All necessary utility clearances and permits and any site clearing that may be necessary for equipment access will be coordinated with NASA.

No raw explosive material is expected to be encountered during soil sampling activities. Should sampling personnel encounter raw explosives, all sampling activities will cease and the CELRN will be contacted to discuss procedures for disposal of the raw explosive material.

All boring locations will be surveyed to the nearest 1 foot and referenced to the State Plane Coordinate System; land elevations will be surveyed to within  $\pm 0.01$  foot referenced to the National Geodetic Vertical Datum of 1929. The survey will occur prior to sampling to locate the historical points and those new sampling locations included under this proposal.

### ***Task 4.0 – Analytical Requirements***

A total of 135 samples will be collected for laboratory analysis as described in the previous sections. In addition, the following quality assurance/quality control (QA/QC) samples will be collected and analyzed (relative quantities in parentheses):

- Equipment rinsates ( $\leq 5\%$ )
- Source water (1)
- Blind duplicates ( $\leq 10\%$ )
- Split samples ( $\leq 10\%$ )
- Matrix spike/matrix spike duplicate samples ( $\leq 10\%$ ).

All details of sampling shall conform to the CELRN-EC-E approved SWSAP, and to applicable USEPA (SW-846) and USACE requirements (ER 1110-1-263, 1 April 1996).

Details include sample volumes, composition and size of containers, methods of preservation, identification and labeling, packing, transportation and shipment.

Laboratory performance will be verified and documented that the work on this project is compliant with Department of Defense Quality Systems Manual (DOD QSM) Revision 4.1. The most recently promulgated methods from EPA's SW-846 *Test Methods for Evaluating Solid Wastes (SW-846)* will be used with the exception of SW-846 method 8330 for nitroaromatics. For comparability purposes, multi incremental sampling will not be required.

Shaw is responsible for collecting, packaging, coordinating and shipping QA samples to the quality assurance laboratory in accordance with the procedures found in the Site-Wide SAP. All shipments will include a temperature blank. The primary samples will have project-specific QC that will be used only for this project. When sample shipments arrive at the laboratory a cooler receipt form will be completed and signed by the sample custodian. Copies of the completed chain of custody and cooler receipt forms will be included in the Site Delineation Report.

Analytical data generated by the laboratory will be extensively reviewed prior to report generation to assure the validity of the reported data. The data from all site samples, with the exception of water quality parameters, total organic carbon, and IDW samples, will be validated by qualified Shaw personnel who have no responsibility for sample collection or analysis. Validation will follow the logic and review sections included in the US Environmental Protection Agency Contract Laboratory Program - National Functional Guidelines for Superfund Organic Methods Data Review, June 2008 (EPA 540/R-08/01) and the US Environmental Protection Agency Contract Laboratory Program National Functional Guidelines for Superfund Inorganic Data Review, January 2010 (EPA 540/R-10/011).

Shaw will report all data reduction procedures including the methods or equations of concentration calculations, reporting units of concentration; moisture related data and the procedures used for calculating PARCC parameters. The data will be reported in a "CLP like" format and will be of sufficient quality for a Chemical Quality Assurance Report to be submitted. Shaw will provide CLP-like data packages consisting of all elements required in CLP definitive level data deliverables. Shaw will also provide an additional electronic data deliverable for the chemical data, consisting of a SEDD as defined in the USEPA Contract Laboratory Program requirements. Shaw will prepare a table which

relates all QA samples to their corresponding field and QC samples sent to the primary laboratory.

**Task 5.0 – Investigative –Derive Waste**

After receiving characterization data for the IDW, Shaw will review and prepare a letter proposing an appropriate disposal option. Shaw will arrange for disposal of the IDW through a subcontractor in accordance with all local, state and federal laws regulatory standards.

**Task 6.0 – Geographic Information System Deliverable**

Information collected during this investigation will be added to the database developed during previous investigations. This database includes information related to the installation of groundwater monitoring wells (both overburden and bedrock wells) by Morrison Knudsen Corporation, Dames & Moore, and IT Corporation. This database also includes analytical (chemical) results obtained from the previous investigation of soil and groundwater collected by Dames & Moore and IT Corporation. The deliverable package, including Metadata, will be formatted as specified in the previously provided Data Standard for Corps of Engineers Environmental Restoration Sites and the Tri Services Spatial Data Standards (TSSDS). The TSSDS are available at the following link: <http://fwgcom.wes.army.mil/projects/standards/tssds/>. Shaw will be responsible for correcting any added files with transcription errors.

The information collected during this investigation will be entered into a Geographic Information System (GIS) Data Base. The GIS data will be too transferred to the Huntington District Corps of Engineers (CELRH), coordinating with CELRH (Rick Meadows) as to the appropriate data and supporting documentation formats.

**Task 7.0 – Preparation and Submittal of Draft Feasibility Study**

The Feasibility Study (FS) report will be prepared for the protection of soil and groundwater associated with AA1. The FS report will address only those contaminants that have impacted the media being evaluated to the extent that it does not meet human health risk-based criteria or ARARs. The FS report will be prepared using USEPA and USACE guidance documents. The soil and groundwater FS report will be issued as two separate volumes. The following discussion of the necessary components of the FS applies equally to both the soil and groundwater reports.

The Draft FS will be submitted in two versions: An internal draft and a subsequent external draft. The internal draft will be distributed for USACE review only and will be

reviewed by CELRN, CELRH, USAPHC (Prov), and CEHNC-CX. Shaw will respond to USACE comments on the internal draft and submit responses to these comments. Once all comments on the internal Draft FS are addressed to the satisfaction of CELRN, Shaw will incorporate the responses to comments into a revised Draft FS which will be sent to the entire distribution list for review.

Prior to finalizing the FS, Shaw will respond to all comments on the Draft FS. Once all comments are resolved to the satisfaction of the CELRN, the Shaw will incorporate all responses into the Final FS which will be submitted to the entire distribution list and submitted to the public.

### ***Identification of Applicable or Relevant and Appropriate Requirements***

The appropriate federal, state, and local ARARs will be determined on a site-specific basis under this task. ARARs will be identified at several points in the remedy selection process and will be categorized under the following:

- ***Action-Specific ARARs.*** These are technology or activity based requirements or limitations on actions taken with respect to hazardous wastes and are triggered by the particular remedial activities that are selected to accomplish a remedy.
- ***Chemical-Specific ARARs.*** These are based on acceptable exposure levels for human health and risk values for specific chemicals of concern, not a mixture of chemicals that may restrict or control the use of a particular treatment option. If a specific chemical has multiple ARARs, the most stringent ARAR will be used.
- ***Location-Specific ARARs.*** Restrictions placed on the concentrations of hazardous substances or the conduct of activities solely because they are in a specific location.

### ***Development of Remedial Action Objectives***

Remedial Action Objectives (RAOs) will be developed for soil and groundwater. They will consist of medium-specific goals for protection human health and the environment and for the attainment of identified ARARs. The RAOs will be developed to include the evaluation of soil as the potential continuing source of groundwater contamination. This evaluation will determine if remediation of soil in excess of that already targeted for remediation in the soil FS report (i.e. for the protection of direct contact) is required to protect groundwater.

### ***Identification of Volumes or Areas of Impacted Media***

A determination will be made during the development of alternatives regarding the areas or volumes of each media (e.g., soil, sediment and groundwater) to which general

response actions might be applied. The initial determination will be made for each medium of interest and will be based upon results of the analytical sampling data that have been collected during previous phases of investigative work at the site. Defining areas or volumes of media will include a consideration of exposure routes and receptors, site conditions, and the nature and extent of contamination.

### ***Initial Process Option Identification***

The initial process option identification takes into consideration eight (8) technology process options within the general response action for the site contents will be screened for soil and groundwater. These options include the “*no further action*” alternative as required by federal regulations.

### ***Identification of Remedial Technologies Types and Process Options***

The identification of technology types and process options will be conducted by investigating the available sources including, but not limited to the following: references developed for application to Superfund Sites; standard engineering texts not specifically directed toward hazardous waste sites; and vendor literature. Potential technology types and process options that could successfully treat the waste as well as innovative technologies will also be considered.

### ***Screening of Remedial Technologies and Process Options***

The number of potentially applicable technology types and process options will be reduced by evaluating the options with respect to technical implementability. Those technologies that are considered ineffective for remediation will be eliminated from further consideration. Documentation will be provided as to why these technologies were eliminated.

### ***Preparation of Computer Aided Drafting and Design (CADD) Flow Diagrams, Plans, and Schematics***

Technical drawings, flow diagrams, plans, schematics, etc., will be prepared under this task in support of the two FS reports (soil and groundwater), and will be prepared in a format compatible with USACE equipment. It is assumed that the following drawings will be required to support the soil and groundwater FS reports:

- One general drawing for each alternative in the screening phase
- Two detailed drawings for each alternative evaluated
- Two plan drawings showing locations, aerial extent, and expected volume of waste for each site area to be evaluated.

A compatible electronic file will be provided to the USACE including a three-dimensional, 2-foot topographic contour map of the site. This map will also coincide with the existing State Plane Coordinate Grid System.

### ***Evaluation of Process Options***

Technology types considered implementable for soil and groundwater will be evaluated in greater detail before selecting one process to represent each technology type. The purpose of selecting one representative process for each technology type is to simplify development and evaluation of alternatives. Process options will be evaluated based on effectiveness and implementability.

***Effectiveness.*** An effectiveness evaluation will be conducted to determine whether a process option is capable of handling a certain volume of media while meeting RAOs; potential impacts to human health and the environment due to construction of implementation of remediation; and whether the technology is proven. Innovative technologies may be evaluated during this process.

***Implementability.*** Potential technologies will be evaluated to determine their implementability. This will be based on both technical and administrative factors. Some of these issues include the ability to obtain necessary permits, the availability of treatment, storage, and disposal services (including capacity), and the availability of necessary equipment and skilled workers to implement the technology.

### ***Assemble Alternatives***

The FS will include a description of each alternative and a rationale for its selection based on the results of the initial process option identification. General response actions will be combined using different technologies and volumes of media to assemble alternatives. More than one response may be applied to each medium assuming that eight general response sections will be evaluated for soil and groundwater.

### ***Screening of Alternative Technology Types***

Technology process options will be defined with respect to their effectiveness, implementability, and costs such that differences among the selected process option alternatives from the various technology types can be identified. The following information will be investigated and reported, as appropriate, for the various technology processes available for an alternative.

- ***Size and Configuration of Treatment System.*** The size and configuration of on-site treatment systems including the rates or flows of treatment.

- **Time Frame for Treatment.** The time frame in which treatment can be implemented and the removal goals obtained.
- **Spatial Requirements.** Spatial requirements for constructing treatment systems or for staging construction.
- **Permits.** Information regarding the required permits for off-site actions and imposed limitations pretreatment and emission control requirements; coordination with local agencies and the public; as well as other legal considerations.

### **Screening Evaluations**

Defined technology type alternatives will be evaluated against the short- and long-term aspects of three broad criteria: effectiveness, implementability, and costs. The purpose of the screening evaluation is to reduce the number of alternatives that will undergo a more thorough and extensive analysis. The alternatives will be evaluated more generally in this phase than during the detailed analysis. Evaluations at this stage will be sufficiently detailed to distinguish among process option alternatives. The entire alternative will be evaluated during alternative screening as to its effectiveness, implementability, and costs as described below.

**Effectiveness Evaluation.** Each technology type alternative will be evaluated as to its effectiveness in providing protection and reduction in toxicity, mobility, or volume that it can achieve. Both short- and long-term components of effectiveness will be evaluated.

**Implementability Evaluation.** Each technology type alternative will be evaluated as a measure of both the technical and administrative feasibility of constructing, operating, and maintaining a remedial action alternative. The following items, at a minimum, will be addressed during the implementability evaluation:

- Operation and Maintenance
  - Downtime
  - Operator License Requirements
- Requirements for Monitoring, Analyses, and Record Keeping
- Availability
  - Equipment, Materials, and Personnel
  - Off-site Treatment, Storage, and Disposal Capacity
- Post Remediation Site Control
- Potential for Failure of Alternative
- Need for Replacement
- Description of Potential Threats from Such Failure or Replacement

- Reliability of Engineered Components
- Reliability of Non-Engineered Components.

**Cost Evaluation** The costs associated with each alternative will be comparatively estimated with relative accuracy so that costs decisions among alternatives will be sustained as the accuracy of cost estimates improves beyond the screening process. Cost estimates will be detailed to a level commensurate with the design and will include appropriate design contingencies. Costs that will be evaluated for each remedial alternative include the following: Capital costs, operation and maintenance costs, present worth analysis, base year costs, and life cycle costs.

### ***Innovative Technologies***

Technologies are classified as innovative if they are fully developed but lack sufficient costs or performance data for routine use. The FS reports will consider innovative technologies for soil and groundwater, as appropriate.

### ***Detailed Analysis of Alternatives***

The detailed analysis of alternatives will consider costs as well as other aspects of the technologies being evaluated. This includes compliance with ARARs, reduction in toxicity, mobility, or volume by treatment, as well as effectiveness and implementability assuming that eight process options will be evaluated in detail. Detailed lists of cost components considered in the preparation for each alternative evaluation are provided in the SOW.

### ***Compliance with ARARs***

All alternatives will be evaluated to determine whether state and federal ARARs, as defined in CERCLA Section 121, will be achieved. The detailed analysis will summarize which requirements are applicable or relevant and appropriate to the alternative and will describe how the alternative meets these requirements. When an ARAR is not achieved, then the basis for justifying one of the six waivers permitted under CERCLA will be discussed. The following items will be addressed for each alternative during the detailed analysis of ARARs.

- ***Compliance with Chemical-Specific ARARs.*** This factor discusses whether these ARARs can be met, and, if not, whether a waiver is appropriate and/or justified.
- ***Compliance with Location-Specific ARARs.*** This factor discusses whether these ARARs can be met, and, if not, whether a waiver is appropriate and/or justified.

- **Verification of Action-Specific ARARs.** The action-specific ARARs developed during the combination of process options will be more definitive as the alternatives become better defined. At the conclusion of the screening phase, sufficient information will be available on the technologies and the most probable configuration of technologies so that action-specific ARARs can be confirmed. Action-specific ARARs will include all federal requirements and any state requirements that are either more stringent than federal ARARs or specify requirements where no federal ARARs exist.

### ***Long-Term Effectiveness***

The evaluation of alternatives under this criterion addresses how the technologies achieve reduction of risk and what risks may be present after the response objectives have been met. This focuses primarily on the extent and effectiveness of the controls that may be required to manage the risk posed by treatment residuals and/or untreated wastes. The following components will be addressed for each alternative.

***Magnitude of Residual Risk.*** This factor assesses the residual risk remaining from untreated waste or treatment residuals at the conclusion of the remedial activities. The potential risk may be measured by numerical standards such as increased cancer risk levels or the volume or concentrations of contaminants in waste, media, or treatment residuals remaining on site. The characteristics of the residuals will be considered to the degree that they remain hazardous, considering their volume, toxicity, mobility, and propensity for bioaccumulation.

***Adequacy and Reliability of Controls.*** This factor assesses the adequacy and suitability of controls, if any, that are used to manage treatment residuals or untreated wastes remaining on-site. This may include an assessment of containment systems and institutional controls to determine whether these sufficiently ensure that exposure to human and environmental receptors remain within the protective range. This factor also addresses the long-term reliability of management controls for providing continued protection from residuals, including an assessment of the potential need to replace components of the alternative as well as the potential exposure pathway(s) and the associated risk should the RA require replacement.

### ***Reduction of Toxicity, Mobility, or Volume by Treatment***

This criterion addresses the statutory preference for selecting remedial alternatives that employ treatment technologies. These technologies are intended to permanently and significantly reduce toxicity, mobility, or volume of hazardous substances as their principal element. These technologies include the following:

- The treatment processes the remedy will employ and the materials they will treat
- The quantity of hazardous materials that will be destroyed or treated, including how the principal threat(s) will be addressed
- The degree of expected reduction in toxicity, mobility, or volume measured as a percentage of reduction
- The degree to which the treatment will be irreversible
- The type and quantity of treatment residuals that will remain following treatment
- Whether the alternative satisfies the statutory preference for treatment as a principal element.

A discussion will be provided as to how the technologies considered in the detailed analysis will or will not result in a reduction of toxicity, mobility, or volume by treatment.

### ***Short-Term Effectiveness***

This evaluation will address the effects of the alternative during the construction and implementation phase until remedial response objectives are achieved. Alternatives will be evaluated with respect to their potential adverse effects on human health and the environment during implementation of the remedial alternative. The following will be considered:

- Protection of the community associated with implementation of the remedial action
- Protection of workers during implementation of the remedial action
- Protection of the environment from potential impacts associated with the remedial action.

### ***Implementability***

This criterion addresses the technical and administrative feasibility of implementing an alternative and the availability of various services and materials required during implementation. This includes the following:

- Technical Feasibility
  - 1) Construction and operation including technical difficulties, reliability issues, and uncertainties associated with the construction or operation
  - 2) Ease of undertaking additional RA, including a discussion of what, if any, future RA may be undertaken and the difficulty associated with implementation of such additional actions

- 3) Monitoring considerations, to address the ability to monitor the effectiveness of the remedy and including an assessment of the risks of exposure should monitoring be insufficient to detect system failure.
- Administrative Feasibility
  - Availability of Services and Materials
    - 1) Availability of adequate off-site treatment, storage, capacity, and disposal services
    - 2) Availability of necessary equipment and specialists, as well as provisions to ensure availability of any necessary additional resources
    - 3) Availability of services and materials, including the potential for obtaining competitive bids
    - 4) Availability of prospective technologies.

### ***Comparative Analysis***

This analysis evaluates the relative performance of each alternative to specific evaluation criteria in order to identify the advantages and disadvantages of each alternative as compared to one another.

### ***Unselected Alternatives***

Unselected alternatives may be reconsidered at a later step in the detailed analysis if similar retained alternatives continue to be favorably evaluated or if information is developed that identifies an advantage not previously presented.

### ***Report Preparation and Submittal***

Separate draft FS reports will be submitted for review for soil and groundwater. The formal response to the comments will be submitted in writing. The draft report will be revised as necessary to address these comments and reissued as the final report.

### ***Task 8.0 – Preparation and Submittal of Final Feasibility Study***

Shaw will prepare responses to comments received for the Draft AA1 FS and submit to the USACE for review. The responses will be revised as necessary based on USACE review. Following resolution of the comments, the draft FS will be revised as necessary and submitted as the Final AA1 Feasibility Study. The final FS will be issued as two separate volumes for soil and groundwater

### ***Task 9.0 – Project Management***

Shaw will prepare responses to comments received for the Draft AA1 FS and submit to the USACE for review. The responses will be revised as necessary based on USACE

review. Following resolution of the comments, the draft FS will be revised as necessary and submitted as the Final AA1 Feasibility Study. The final FS will be issued as two separate volumes for soil and groundwater

### **PROJECT SCHEDULE AND MILESTONES**

The project schedule and milestones are presented in Figure 1.

### **KEY SHAW PROJECT PERSONNEL**

- **Project Manager** - Mr. Steven T. Downey will serve as Shaw's Project Manager.
- **Technical Lead** - Mr. Michael Gunderson will serve as the Technical Lead.
- **QA Manager** - Mr. Kenneth Martinez will serve as the Project QA Manager.
- **H&S Officer** – Mr. Doug Russell will serve as Shaw's H&S Officer
- **Project Chemist** -Mr. Eddie Weaver will serve as the Project Chemist.

### **QUALITY ASSURANCE/QUALITY CONTROL (QA/QC) REVIEW**

This section of the QCP summarizes the Shaw internal technical and external peer review. The Shaw QA program provides controls for the formal verification (checking) of documents such as calculations and the presentation of information in the form of drawings, logs, and tables. Review and necessary approvals are also cited for quality-related documents; however, during the course of a project or proposal, verification of technical decisions and concepts (such as interpretation of data and evaluation of results) is required in order that the project or proposal can proceed on a sound conceptual basis. The review approach may be needed to address the following questions:

- During the project planning stage, have appropriate steps been implemented to satisfy the goals and objectives of the project?
- Are data of sufficient quality and properly interpreted so that conclusions can be justified and demonstrated?
- Are design parameters reasonable for the computations performed? What is the effect of variations of the assumptions upon the results?
- Do the results presented by Shaw in the form of a report, or other document, adequately represent the work performed and the conclusions reached? Do the results fulfill the objectives of the project?

The internal technical review (ITR) process is used to verify these steps. Documents to be written during a project and indicated in the proposal will be subjected to peer review. The Shaw

PM will complete a matrix of these documents on a delivery order basis and use it to obtain the required reviews.

A technical reviewer is selected based upon the following criteria:

- The reviewer must be independent of the project. The reviewer must be sufficiently informed regarding the project, but should not be making decisions that determine or affect the course of the project. The peer review process is an “outside” review of the project.
- The reviewer must be a person knowledgeable in the specific area of work, preferably a senior technical associate. Technical reviewers will be part of the Shaw organization.

At the conclusion of a technical peer review, the reviewer(s) will prepare written review comments, sign off on the Discipline Sign-Off Review form (Figure 2) and forward to the PM; a copy of these review documents will also be placed in the project files. Technical review comments will be resolved and incorporated into the document as appropriate. ITR comments are available for USACE inspection upon request.

External peer review will be performed on all draft project deliverables prior to issuance as final documents. It is anticipated that the external peer review will be performed, as a minimum, by the USACE and the OEPA. A formal response to peer review comments will be issued to all reviewing parties, documenting revisions made where appropriate to the draft deliverables; this does NOT apply to the Report of Finding prepared under this delivery order. All responses to the peer review comments will be coordinated with the USACE for their concurrence prior to incorporation. Final deliverables will be submitted after incorporating any pertinent comments that arise from peer review of the draft documents. Table 1 summarizes the preparation and review process for the required project deliverables.

### **FIELD ACTIVITY QA REQUIREMENTS**

Field investigation activities will follow the procedures specified in the SSAP to ensure that project quality requirements are satisfied. Field activity QA will be implemented by performing project-specific training; properly preparing for field work before mobilization; issuing variances, nonconformance reports, and corrective action reports; and documenting field quality control in the investigation reports.

Field team members, including Shaw personnel and subcontractor personnel, will receive project-specific training before mobilization to the job site by reading the applicable work plans and procedures. Upon mobilization to the site, but prior to commencing field activities, all site personnel will attend the project kickoff meeting, which will consist of a review of all project requirements and objectives to ensure that the project team is fully aware of the goals of the

PBOW investigations. Before initiating each days field work, all team members will participate in a tailgate safety meeting (TSM) conducted by the Shaw Field Coordinator to address safety and quality issues pertinent to the activities to be performed. The TSM will be documented and all personnel will sign the attendance record. Worker training will follow the requirements specified in Shaw SOPs.

Prior to mobilization to the site, the Shaw PM, assisted by the Shaw Field Coordinator and the Shaw Analytical Coordinator, will examine project field work preparation requirements to ensure that all necessary arrangements, including personnel assignments, work plans, site entry/drilling permits, training, schedule, equipment rentals, supplies, subcontractors, have been accomplished for execution of the field effort in an efficient and effective manner. The Shaw PM and QAM must approve the project preparation prior to mobilization.

Changes or variances to the SAP, SSHP, QAPP, and/or site-specific work plans may be initiated either in the office or in the field as may be necessary. All variances will be noted on the Field Activity Daily Log (FADL) and will be formally recorded on the Variance Log. Variances will be approved by the Shaw QAM and the Shaw PM prior to implementation of the change. Variances that will affect the project scope, cost, or schedule will be submitted to the USACE for approval prior to implementation.

Nonconforming equipment, items, activities, conditions, and unusual incidents that could affect compliance with project requirements will be identified, controlled, and reported in a timely manner. A nonconformance is defined as a malfunction, failure, deficiency, or deviation that renders the quality of any item unacceptable or indeterminate. The originator (any Shaw employee) of a nonconformance report will describe the finding on the Nonconformance Report provided for this purpose and will notify the Shaw PM and QAM. Each nonconformance will be reviewed and a disposition will be issued for the item, activity, or condition. The disposition of a nonconformance will be documented and approved by the Shaw organization responsible for issuing the nonconformance. The QAM will concur with the disposition of the nonconformance prior to closure of the Nonconformance Report.

In addition, the Shaw PM will notify the USACE Technical Coordinator within 48 hours of significant nonconformances that could impact the project cost, schedule, or scope of work and will indicate the corrective action taken or planned.

### **SUBCONTRACTOR QA/QC REVIEW**

Shaw has assigned personnel to monitor and review work performed by subcontractors in conjunction with this investigation. Mr. Steven T. Downey will serve as the principal point-of-contact (POC).

The selection of qualified subcontractors, as required, will be accomplished in accordance with Shaw procurement and quality assurance (QA) procedures. Subcontractors such as drillers, geophysical specialists, surveyors, and environmental monitoring specialists, must satisfy predefined qualifications developed by the PM and Shaw that is defined in the procurement bid packages. Each subcontractor bid submittal is reviewed by technical personnel, purchasing, and QA personnel to verify that the bidders are technically qualified and can satisfy the project objectives. Before starting work, Shaw will perform a quality check to ensure that the subcontractor(s) has fulfilled the procurement requirements necessary to begin activities. Subcontractors involved in environmental measurements will be monitored by the Shaw Field Coordinator to verify the use of calibrated equipment and qualified operators.

**CUSTOMER INVOLVEMENT**

Customer involvement will be ongoing throughout the duration of this investigation, and Shaw personnel will be available as needed for question, consultation, etc. Project personnel may be reached at the following telephone numbers:

Mr. Steven T. Downey Project Manager	(865) 694-7496	Fax (225) 987-3034
Mr. Michael Gunderson Technical Lead	(865) 694-7446	Fax (865) 690-3626
Mr. Kenneth Martinez Quality Assurance Manager	(865) 670-2656	Fax (865) 690-3626
Doug Russell H&S Officer	(865)-692-3584	Fax (865) 690-3626
Mr. Eddie Weaver Project Chemist	(865) 560-5274	Fax (865) 693-4944

Each work plan or other deliverable to be prepared in more than draft form will be submitted to the USACE Nashville District as specified in the SOW for review and comment. All review comments will be addressed and incorporated into the final submittals, if appropriate.

**DOCUMENTATION OF PROJECT DECISIONS AND RECORDS MANAGEMENT**

The Shaw Project Records Clerk is responsible for maintaining control and retention for project-related records. Record control includes receipt from external and internal sources, transmittal, and transfer to storage, and indication of record status. Retention includes receipt at storage areas, indexing and filing, storage and maintenance, and retrieval. Shaw will maintain the project repositories at 312 Directors Drive in Knoxville, Tennessee, for all project records,

including correspondence. Records will be controlled and retained, as appropriate, in the office central files or laboratory files. The Project Records Clerk will assign control numbers to all outgoing documents and is responsible for properly filing the controlled records (except for those related to accounting, purchasing, and drafting, which are retained in the respective department files). Shaw will also provide the USACE Nashville District with a copy of all telephone memos, written correspondence, and meeting minutes regarding information related to the project within ten (10) days of the event. Copies of all records will be retained by Shaw for a minimum of seven (7) years after the end of the contract period. In addition, project records deemed to be of importance by the USACE will be turned over to the USACE at the time of project close-out.

### **PROJECT CLOSE-OUT**

At the completion of this investigation, a project close-out meeting will be conducted. This will be at a time and place to be determined by Nashville District personnel, and may take the form of a teleconference. The purpose of this meeting will be to exchange feedback, discuss lessons learned, and conduct a final product verification.



Shaw Environmental & Infrastructure, Inc.

**Table 1**

**Delineation Sampling and  
Feasibility Study for Acid Area 1  
Former Plum Brook Ordnance Works, Sandusky, Ohio**

Submittal Description/ Title	Document Preparation and Review Process					
	Principal Author(s)	Discipline	Peer Review	Discipline	Project Review	Discipline
SSAP	Jonathan Reagan Eddie Weaver	Env. Scientist Chemist	Eric Weaver David Kessler Tom Siard	Geologist Geologist Risk Assessor	Michael Gunderson Steve Downey Ken Martinez	Geologist Engineer QA Specialist
SSHP	Doug Russell	H&S Coordinator	Eric Weaver David Kessler	Geologist Geologist	Steven Downey Michael Gunderson Ken Martinez	Engineer Geologist QA Specialist
Feasibility Study	Bill Anderson	Engineer	Eric Weaver Tom Siard	Geologist Risk Assessor	Steven Downey Michael Gunderson Ken Martinez	Engineer Geologist QA Specialist

NOTE: Where multiple authors are identified, one or more of those identified may be involved in the document preparation depending on availability. Should replacements be necessary, personnel of comparable experience and qualifications will be utilized.

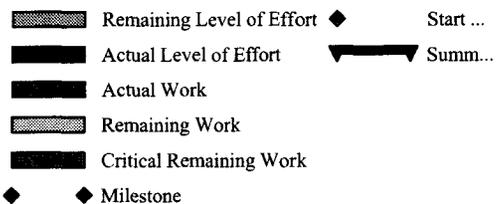
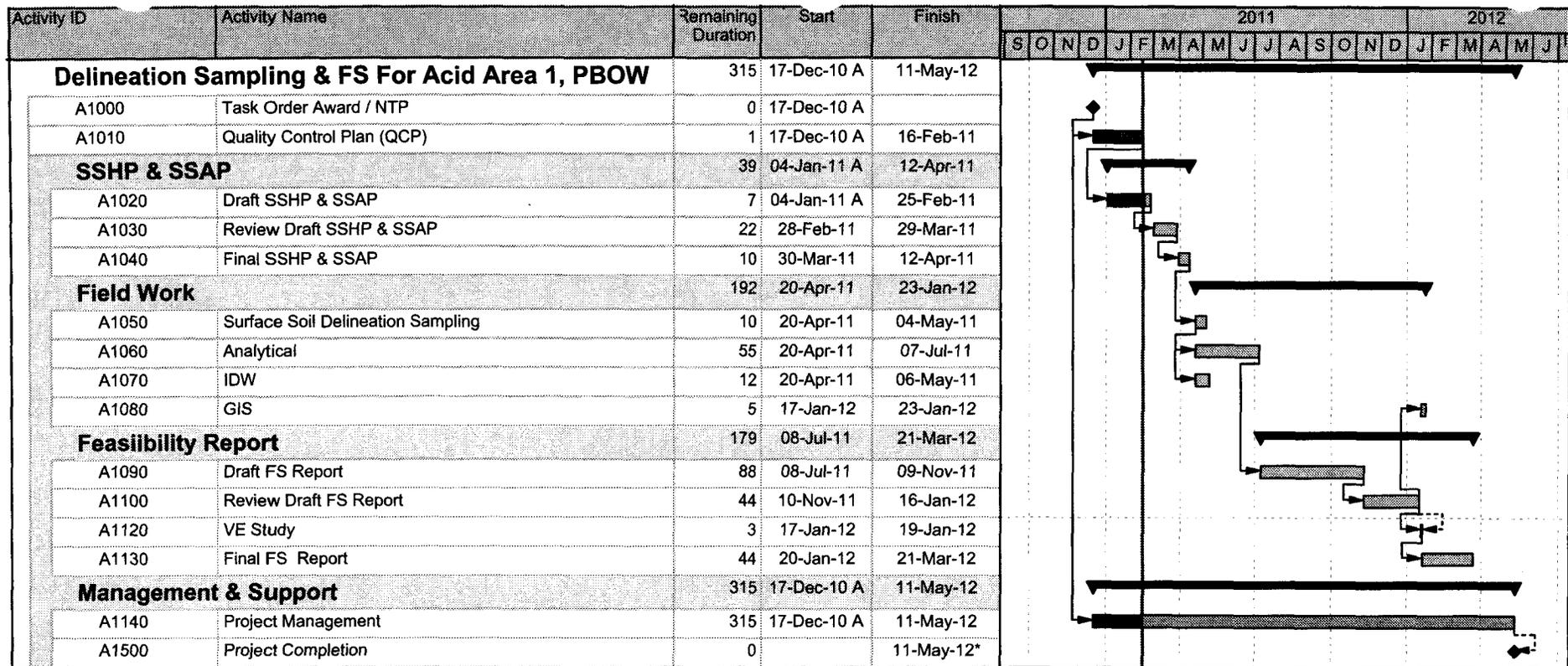


Figure 1  
 Mobile A/E Contract #W91278-10-D-0094  
 DX-03 Delineation Sampling & FS For Acid Area 1, PBOW  
 Shaw Environmental & Infrastructure Project Schedule



**Shaw Environmental & Infrastructure, Inc.**

**DISCIPLINE SIGN-OFF REVIEW**

Client Name: U.S. Army Engineer District, Nashville; CELRN-EC-E

Project Description: Delineation Sampling and Feasibility Study for Acid Area 1  
Former Plum Brook Ordnance Works, Sandusky, Ohio

Contract No. 

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Delivery Order No. 

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Project No. 

1	4	1	4	2	9
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Task/Phase Number: 

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**Document Type**

Identify specific section or segment covered by this checkprint

**Document Origin**

- Technical / Cost Proposal \_\_\_\_\_
- RFP \_\_\_\_\_
- Contract / Subcontract \_\_\_\_\_
- SHP, SSAP, CDAP, or QAPP \_\_\_\_\_
- Report \_\_\_\_\_
- Risk Assessment / Evaluation \_\_\_\_\_
- Specifications & Plans \_\_\_\_\_
- Design Calculations \_\_\_\_\_
- Tables \_\_\_\_\_
- Drawings / Figures \_\_\_\_\_
- Other: \_\_\_\_\_

- Originator Developed
- Edited Standard
- Client Furnished

**Document Status**

- Preliminary
- Internal Draft
- Draft
- Draft Final
- Final
- Other:

**Required Person**

**Signature**

**Date**

Originator	_____	_____	_____
Checker	_____	_____	_____
Peer Review (QC)	_____	_____	_____
Technical Review	_____	_____	_____
Technical Review	_____	_____	_____
Quality Assurance Mgr	_____	_____	_____
Project Manager	_____	_____	_____

**NOTICE:** By signature above, parties certify that the subject document has been prepared by and/or reviewed by them (as appropriate), that all review comments have been resolved, and that the document is ready for submittal.

**FIGURE 2**