Final Quality Control Plan

Phase II Groundwater Remedial Investigation (RI), Site Characterization Report, Human Health Risk Assessment, and Ecological Screening-Level Assessment
Waste Water Treatment Plants 1&3 and Ash Pits 1&3
Former Plum Brook Ordnance Works, Sandusky, Ohio

Prepared By:

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Revision 0

Delivery Order DX02
IDT Contract W912QR-08-D-0013
Shaw Project Number 132457

September 16, 2008

SIGNATURE PAGE

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Phase II Groundwater Remedial
Investigation (RI), Site Characterization
Report Human Health Risk Assessment, and
Ecological Screening-Level Assessment
Waste Water Treatment Plants 1and3 and
Ash Pits 1 and 3
Former Plum Brook Ordnance Works (PBOW), Sandusky, Ohio

Delivery Order DX02
IDT Contract W912QR-08-D-0013
Shaw Project Number 132457

Submitted By:

Steven T. Downey — 9-16-08

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Project Manager
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Date

Accepted By:

Kathy McClanahan — 16 Sep 2008

Kathy McClanahan Environmental Restoration Branch
Technical Coordinator, ~~Technical Management Section~~
U.S. Army Engineer District, Nashville

Date

16 Sept 2008

Doug Mullendore
Chief, Environmental Restoration Branch
U.S. Army Engineer District, Nashville

Date

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PROJECT OBJECTIVE AND TASKS

This Final Quality Control Plan (QCP) has been prepared by Shaw Environmental, Inc. (Shaw) in support of Phase II Groundwater Remedial Investigation (RI) Site Characterization Report, Human Health Risk Assessment and Ecological Screening-Level Assessment Waste Water Treatment Plants 1 and 3 and Ash Pits 1 and 3 at the former Plum Brook Ordnance Works (PBOW) in Sandusky, Ohio, under Delivery Order (DO) DX02 of IDT Contract W912QR-08-D-0013

The most recent environmental investigations concerning WWTP 1 & 3 and Ash Pits 1 & 3 were presented by the U.S. Corps of Engineers, Louisville District in ***Limited Site Investigation for the former Plum Brook Ordnance Works Waste Water Treatment Plants No. 1 and 3*, July 2000a, and *Limited Site Investigation for the former Plum Brook Ordnance Works Ash Pits No. 1 and 3*, July 2000b.** Based on the findings of the SI, the performance of an RI is recommended for WWTP 1&3 and Ash Pits 1&3. Sampling and evaluation of soils, sediment, surface water, and a preliminary sampling and evaluation of groundwater piezometers was scoped in a 6 May 2008 Scope of Work to be performed under Contract No. W912DR-05-D-0026, DX10. In support of the Statement of Work (SOW), based on the findings of the piezometer samples conducted under the aforementioned contract, Shaw will install and sample monitoring wells. Shaw will also collect additional surface water and sediment samples as part of the RI. Shaw will also perform a baseline Human health risk assessment (BHHRA) and a screening level ecological risk assessment (SLERA).

Additionally, tasks to be completed for this project include preparation of a Site-Specific Health and Safety Plan (SSHP) and a Site-Specific Sampling and Analysis Plan (SSAP). Shaw will also participate in meetings associated with these tasks, as per the SOW.

Specific tasks to accomplish under this project include:

Task 1 – Preparation and Submittal of an Updated Quality Control Plan.

Shaw will prepare and submit a Quality Control Plan (QCP) for the work to be conducted at PBOW. The QCP will be prepared in accordance with requirements of ER 1110-1-12, Quality Management, and CEORD 1110-1-9, Quality Control. As part of the QCP development, Shaw will develop a criteria management process to ensure design criteria and standard design details appropriate for the U.S. Army Corps of Engineers (USACE) requirements are developed, updated, and made available to the designers and reviewers involved in this project. The QCP shall clearly define the quality verification activities for specific professional disciplines. This design verification process will be implemented to ensure that the designer produces an acceptable design.

An independent review of the designer's work shall be performed to verify that an acceptable design has been provided for this work but is not intended to be a detailed check of the designer's work.

A verification statement shall be included with all products submitted to the Government under this project. The statement will be signed by the independent reviewers identified in the QCP, stating that they have reviewed the applicable document or product and that all internal comments have been resolved, thus completing the product for release to the Government. All comments generated by reviewers of a product or document, along with their resolution, shall be submitted with the verification statement. Should the design or independent review be conducted by individuals not identified for that activity by the QCP, an explanation of the variance and how quality was maintained despite the variation from the approved QCP will be provided with the verification statement.

Task 2 – Preparation and Submittal of Site-Specific Safety and Health Plan and Site-Specific Sampling and Analysis Plan Addenda.

Shaw will develop and submit a Site-Specific Safety and Health Plan (SSHP) addendum

specific to the investigation of Waste Water Treatment Plants (WWTP) 1 and 3 and Ash Pits 1 and 3. The SSHP addenda required by 29 CFR 1910.120(b)(4) shall be prepared and submitted to CELRN-EC-R. This addendum will describe the health and safety procedures, practices, and equipment to be implemented and utilized to protect affected personnel from the potential hazards associated with the *site-specific* tasks to be performed. The level of detail provided in the addendum will be tailored to the type of work, complexity of operations to be accomplished, hazards anticipated and to the extent that new conditions or procedures affect the need to supplement the updated *Site-Wide Safety and Health Plan*.

Shaw will develop and submit a Site-Specific Sampling and Analysis Plan (SSAP) addendum specific to the investigation of WWTP 1 & 3 and Ash Pits 1 & 3. The updated Site-Wide Sampling and Analysis Plan (SWSAP) that is being prepared under Contract No. W912DR-05-D-0026, DX10 will be used as the base document which will be updated to include site-specific information. The SSAP will be prepared as an addendum to the SWSAP and it will present details concerning the investigative work as described in the SOW. The SSAP addendum will identify sampling standard operating procedures, analytical methods and data quality objectives specific for the investigation of the four WWTP and ash pits sites. In addition, it will identify sampling locations for these four sites, rationale underlying the choice of locations and any expected variations from the SWSAP.

Task 3.0 – Monitoring Well Installations.

Shaw will install a total of 12 overburden/shale monitoring wells and 12 limestone wells. This includes three overburden/shale wells and three limestone wells at each of the four sites (WWTP 1&3 and ash pits 1&3). The specific location of each well will be determined based on the analytical results of the piezometer samples installed under a previous scope. Shaw will be responsible for the scheduling and coordination of all underground utility locating and clearance in the vicinity of the borehole site prior to drilling activities.

A qualified geologist or geotechnical engineer will be on site for all drilling, installation, development, and testing operations. Well installation and drilling methods will be in accordance with the procedures and requirements described in EM 1110-1-4000, *Monitor Well Design, Installation, and Documentation at Hazardous and/or Toxic Waste Sites*,

and applicable State regulations and requirements. Where necessary, Shaw will use "double casing" as described in Section 3-10 of EM 1110-1-4000 to install a well through a contaminated upper zone. If a plan for meeting applicable procedures and requirements is not covered in the approved Site-Wide SAP (developed under Contract No. W912DR-05-D-0026, DX10), it will be included in the SAP Addendum. Variation from the 1998 November EM 1110-1-4000 guidelines will be proposed for approval in the SSAP Addendum.

Shaw will establish coordinates and elevations according to EM 1110-1-4000 for each new well installation. A notch will be filed into the top of the well riser pipe and marked, to serve as a vertical and horizontal measurement point. The coordinates will be to the closest 1 foot and referenced to the State Plane Coordinate System. Elevations will be surveyed to within $\pm$ 0.01 feet referenced to the National Geodetic Vertical Datum of 1929.

Task 4.0 – Monitoring Well Development.

Shaw will develop a total of 12 overburden/shale wells and 12 limestone bedrock monitoring wells among the four sites (WWTP 1&3 and ash pits 1&3). Each well will be developed in accordance with the procedures and requirements described in EM 1110-1-4000. In addition to the requirements presented in EM 1110-1-4000, development will continue until the parameters of pH, temperature, and conductivity have reached equilibrium as described in EM 200-1-3, page C-10 and maintained three consecutive turbidity readings of less than 100 nepholometric turbidity units (NTUs). If this criterion can not be met, Shaw will propose to CELRN how they intend to proceed.

Task 5.0 – Monitoring Well Sampling.

Shaw will collect groundwater samples from each of the 24 new monitoring wells in two successive rounds; one in the spring and one in the fall. Each of these samples will be analyzed for TCL volatile organic compounds (VOC), semivolatile organic compounds (SVOC), TAL Metals (filtered and unfiltered), nitroaromatics, and water quality parameters. In addition to the primary water samples, certain field control samples will be prepared as described in succeeding paragraphs. Shaw will coordinate with the primary and QA laboratories as to the volumes of sample necessary to satisfy all internal laboratory QC requirements. Any laboratory performing work for the USACE will comply with ISO/IEC Guide 25, *General Requirements for the Competence of*

Calibration and Testing Laboratories, 1990 Edition and Updates. All samples will be collected and analyzed in conformance with applicable EPA and USACE requirements, using techniques and equipment described in the approved SSAP Addendum or Site-Wide SAP.

Each sample location will be purged and the samples collected in accordance with the requirements set forth in EM 1110-1-4000 and EM 200-1-3. The water level will be measured and recorded for each well prior to collecting a water sample. If applicable, water level measurements will be measured and recorded from associated nested wells. Following the collection of water level data, a CELRN approved low-flow purge and sample procedure will be used and the well will be purged with clean, non-contaminating equipment. During the purging process, a portion of the purged water will be periodically tested for pH, turbidity, specific conductance, dissolved oxygen, and temperature. Shaw will record these measurements on the well sampling form along with other appropriate sampling information pertaining to the sampling event. Once the relevant parameters have stabilized (as defined by EM 200-1-3, page C-10) and three consecutive turbidity readings indicate less than 100 NTUs, the Shaw will measure and record the reduction-oxidation potential of the groundwater and the sample may be collected. If the relevant parameters do not stabilize and the water level cannot be maintained, Shaw will propose to CELRN how they intend to proceed.

If the well does not recharge fast enough to permit even low-flow purging, Shaw will propose to CELRN how they intend to proceed. Flexible delivery tubing required for low-flow sampling will be constructed of a PTFE material such as Teflon. The groundwater sampling equipment will be dedicated or thoroughly cleaned between each well use to prevent cross-contamination. Low-flow sampling is the only sampling method that will be used unless the well does not contain enough water volume to allow for low flow sampling, in which case a bailer will be used. If samples are obtained using a bailer, the bailer will be a bottom emptying device constructed of Teflon, PVC, or stainless steel. Tipping the bailer to obtain a sample from the top will not be permitted. The Shaw risk assessor will be advised if any groundwater samples are collected using a method other than low flow sampling.

Task 6.0 – Surface Water and Sediment Sampling

Shaw will conduct a surface water and sediment sampling effort to supplement that

which was performed during the respective WWTP and Ash Pit Limited SI sampling effort. The following provides a summary for the sampling effort to be conducted during this RI.

Waste Water Treatment Plant Areas 1 & 3

Shaw shall collect sediment samples from approximately the same locations as those collected during the Limited SI and analyze these samples as outlined below. Shaw shall also attempt to collect surface water samples at these same locations where only sediment was previously present. Additionally, Shaw shall collect sediment samples and, if present surface water samples, from a third WWTP 3 location exhibiting surface water. Thus, Shaw shall collect sediment and surface water samples from (approximately) the same six locations, plus one additional WWTP 3 location. Samples will be analyzed as follows:

- WWTP 1 - Four sediment samples (three for PCBs only; one for PCBs and total organic carbon) and four surface water samples (nitroaromatics, TAL metals, and SVOCs)
- WWTP 3 - Three sediment samples (two for PCBs only; one for nitroaromatics, TAL metals, SVOCs, PCBs, and total organic carbon) and three surface water samples (nitroaromatics, TAL metals, and SVOCs)

If water is not present in sufficient quantity at these locations, Shaw will consult with the USACE to identify appropriate alternative locations.

Ash Pits 1 & 3

Shaw shall collect sediment samples from approximately the same locations as in the Limited SI. The analysis requested for these samples is listed below. This includes the Ash Pit 3 location at which only surface water was collected during the Limited SI. Shaw shall also collect an additional collocated sediment/surface water sample pair at Ash Pit1. Thus, Shaw shall collect samples from (approximately) the same four locations, plus one additional Ash Pit 1 location as identified in the Limited SI. Samples shall be analyzed as follows:

- Ash Pit 1 – Two sediment samples (one for nitroaromatics, PCBs, and one for nitroaromatics, TAL metals, SVOCs, PCBs, total organic carbon) and two surface water samples (one for nitroaromatics only; and one for nitroaromatics, TAL metals, and SVOCs)
- Ash Pit 3 – Three sediment samples (two nitroaromatics, PCBs; One for nitroaromatics, TAL metals, SVOCs, PCBs, total organic carbon) and three surface water samples (nitroaromatic compounds only).

If water is not present in sufficient quantity at these locations, Shaw will consult with the USACE to identify appropriate alternative locations.

All samples will be collected and analyzed in conformance with applicable EPA and USACE requirements, using techniques and equipment described in the approved SSAP or SWSAP.

Task 7.0 – Analytical Requirements.

A total of 12 sediment samples, 12 surface water samples and 48 groundwater monitoring samples (includes the two sampling rounds) will be collected for laboratory analysis as described in Sections 5 and 6, respectively. Additionally, the following quality assurance/quality control (QA/QC) samples will be collected and analyzed (relative quantities in parentheses):

- Equipment rinsates (5%)
- Source water (1)
- Blind duplicates (10%)
- Trip Blanks (5%; VOCs only)
- Split samples (10%)
- Matrix spike/matrix spike duplicate samples (10%).

All details of sampling shall conform to the CELRN approved Site-Wide SAP, 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.

Shaw will document to verify that the laboratory performing work on this project is compliant with Department of Defense Quality Systems Manual (DOD QSM) Revision 3. 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 will be responsible for collecting, packaging, coordinating and shipping QA samples to the quality assurance laboratory. 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 filled out and signed by the sample custodian. Copies of the completed chain of custody

and cooler receipt forms will be included in the RI 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 Organic Data Review, October 1999 (EPA 540/R-94/012) and the US Environmental Protection Agency Contract Laboratory Program National Functional Guidelines for Inorganic Data Review, February 1994 (EPA 540/R-94/-13).

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 8.0 –Investigation Derived Wastes Disposal

Shaw will collect investigation derived wastes (IDW), including soil cuttings, decontamination fluids, and personal protective equipment (PPE) which can not be decontaminated and place them in properly labeled, sealed drums. IDW will be segregated by type and origin; there will be no intermixing of media. All IDW drums will be stored on pallets in a bermed area to prevent release of the material to the soil in the event of drum failure. The SSAP will include procedures for IDW management (e.g., drumming, labeling, storage, inspection, and disposal).

After receiving characterization data for the IDW, Shaw will review the data and prepare a letter proposing an appropriate disposal option. Shaw will arrange for disposal of the IDW through a subcontractor. All IDW generated during groundwater sampling efforts

will be disposed of off-site within the mandated 90-day time frame.

Task 9.0 – Geographic Information System Deliverable

Shaw will incorporate information collected during this investigation 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 *http://fwgcom.wes.army.mil/projects/standards/tssds/*. Shaw will be responsible for correcting any added files with transcription errors.

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

Task 10.0 – Preparation and Submittal of the Site Characterization Report

After the analytical results for the sediment, surface water, and groundwater monitoring wells have been validated, Shaw will prepare a Site Characterization Report (Volume I of the RI). The Site Characterization Report will also include soil and piezometer groundwater analytical data collected under Contract No. W912DR-05-D-0026, DX 10 and analytical results reported in the Limited SI. Data summaries for each medium will include a data summary of all sample identification, sample locations, sample dates, detected chemical concentrations, method detection limits, qualifiers, maximum detected concentration column, background screening value (if applicable) and risk-based screening values. At this phase, screening values are not considered judicial or regulatory limits, but are included to provide perspective to the data. The screening levels will be the same levels used in a data screening portion of a human health risk assessment; unless subsequently updated prior to the risk assessment. Shaw will present the investigation results in a report, which includes a narrative detailing the nature of the work performed during the

investigation, problems encountered, and conclusions and recommendations. Shaw will identify in the report when Method Detection Limits (MDLs) for individual analytes and sample location exceeded the appropriate screening value.

Shaw will prepare figures listing sampling locations (including depths) for each sample collected. Additionally, Shaw will prepare figures for sampling results indicating which values that exceed screening level criteria as well as "*for reference purposes only*", and a table listing PBOW background concentrations of inorganic analytes.

The Site Characterization Report will be submitted as *Volume I* of *the RI Report*. Shaw will submit draft and final versions of the *Site Characterization Report*. A draft version will be submitted to all reviewing parties, including OEPA, CEHNC-CX, and CHPPM. Shaw will revise the report as per agency comments. Shaw will respond to all comments and will submit official response to comments to CELRN.

Task 11.0 – Preparation and Submittal of Baseline Human Health Risk Assessment.

Shaw will prepare a Baseline Human Health Risk Assessment (BHHRA) Work Plan and Report that are consistent with current USEPA, USACE, and OEPA guidance, and are also consistent with the standard practice used in the other BHHRA work plans and reports prepared for other PBOW sites. Shaw will use work plans and reports form these other sites (e.g., TNT Areas A and C and Acid Areas 2 and 3) as templates. Additionally, Shaw recognizes the emphasis of CELRN and the project team regarding consistency in risk assessment.

The BHHRA work plan will summarize information regarding the PBOW site background, history, and characteristics. The work plan will provide a detailed approach in completing a BHHRA that satisfies regulatory and USACE requirements and covers the risk scenarios for current and potential future receptors. The work plan will include detailed methodology and algorithms for human health risk assessment including, but not limited to, data evaluation, selection of chemicals of potential concern, exposure assessment, toxicity assessment, risk characterization, uncertainty analysis, preliminary risk-based remediation goals derivation, and findings reporting. The work plan will be comprehensive enough for the WWTP and ash pit site media.

The BHHRA will evaluate the risks associated with exposure to contaminants in soil,

sediment, surface water, and groundwater for each of the four WWTP and ash pit sites. It will include a site conceptual exposure model, selection of chemicals of potential concern (COPC), exposure assessment, toxicity assessment, risk characterization, uncertainty analysis, risk-based remediation goals, and recommendations/conclusions. The BHHRA report will be submitted as *Volume II* of *the RI Report*.

Shaw will submit draft and final versions of the BHHRA work plan and report. The draft version of each plan and report will be submitted to all reviewing parties, including OEPA, CEHNC-CX, and CHPPM. Shaw will respond to all comments and will submit official response to comments to CELRN. Shaw will revise the draft work plan and report per agency comments.

Task 12.0 – Preparation and Submittal of Screening Level Ecological Risk Assessment.

Shaw will prepare a Screening Level Ecological Risk Assessment (SLERA) Work Plan and Report that are consistent with current USEPA, USACE, and OEPA guidance, and are also consistent with the standard practice used in the other SLERA work plans and reports prepared for other PBOW sites. Shaw will use work plans and reports form these other sites (e.g., TNT Areas A and C and Acid Areas 2 and 3) as templates. Additionally, Shaw recognizes the emphasis of CELRN and the project team regarding consistency in risk assessment.

The SLERA work plan will summarize information regarding the PBOW site background, history, and characteristics. The work plan will provide a detailed approach in completing a SLERA that satisfies regulatory and USACE requirements and covers the exposure pathways for ecological receptors. The work plan will include detailed methodology and algorithms for subtasks of the SLERA and will be comprehensive enough for the four WWTP and ash pit site media.

The SLERA will evaluate the risks associated with exposure to contaminants in soil, sediment, and surface water (including surface expressions of groundwater if present) for each of the four WWTP and ash pit sites. The SLERA will include an ecological problem formulation, exposure assessment, effects evaluation and development of toxicity reference values, risk characterization, uncertainty analysis, and provide summary/conclusions/recommendations. The SLERA report will be submitted as *Volume*

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 concept, or approach, may be needed for the following:

- 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 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 it to the PM;

a copy of these review documents will also be placed in the project files. Technical review comments will be responded to in writing by the preparer of the document, incorporated into the document as appropriate, and submitted with the document to the USACE.

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 QAO 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 QAO 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 QAO. 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 QAO 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 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 are 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
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, 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

Preparation and Review Process for Required Project Deliverables
Phase II Remedial Investigation (RI), Site Characterization Report, Human Health Risk Assessment, and Ecological Screen-Level Assessment
Waste Water Treatment Plants 1 and 3, and Ash Pits 1 and 3
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/SCR	David Kessler Eddie Weaver	Geologist Scientist Chemist	Tom Siard Zach Parham	Risk Assessor Scientist	Steven Downey Michael Gunderson Ken Martinez	Engineer Geologist QA Manager
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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.

Shaw Environmental & Infrastructure, Inc.

DISCIPLINE SIGN-OFF REVIEW

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

Project Description: Phase II Groundwater Remedial Investigation (RI), Site Characterization Report, Human Health Risk Assessment, and Ecological Screening-Level Assessment Waste Water Treatment Plants 1 and 3 and Ash Pits 1and 3
Former Plum Brook Ordnance Works, Sandusky, Ohio

Contract No. W912QR-08-D-0013

Delivery Order No. DX02

Project No. 132457

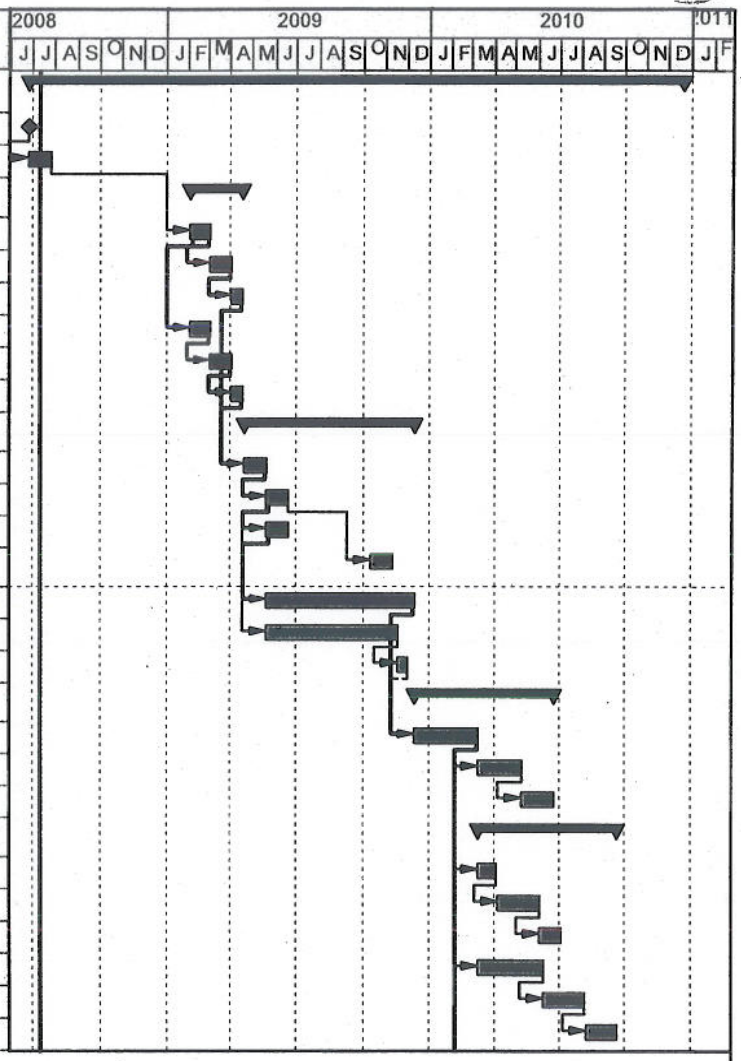
Task/Phase Number:

Document Type	Identify specific section or segment covered by this checkprint	Document Origin
☐ Technical / Cost Proposal	_____	☐ Originator Developed
☐ RFP	_____	☐ Edited Standard
☐ Contract / Subcontract	_____	☐ Client Furnished
☐ SHP, SSAP, CDAP, or QAPP	_____	
☐ Report	_____	**Document Status**
☐ Risk Assessment / Evaluation	_____	☐ Preliminary
☐ Specifications & Plans	_____	☐ Internal Draft
☐ Design Calculations	_____	☐ Draft
☐ Tables	_____	☐ Draft Final
☐ Drawings / Figures		☐ Final
☐ Other:		☐ 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.

Activity ID	Activity Name	Remaining Duration	Start	Finish
WWTP 1 & 3, AP 1&3 Phase II GW RI, BHHRA, ...		894	26-Jun-08 A	20-Dec-10
A1010	Task Order Award	0	26-Jun-08 A	
A1020	QCP	0	26-Jun-08 A	24-Jul-08 A
Work Plans		75	02-Feb-09	17-Apr-09
A1000	Prepare & Submit Draft SSHP Addendum	29	02-Feb-09	02-Mar-09
A1030	Review Draft SSHP Addendum	30	03-Mar-09	01-Apr-09
A1040	Prepare & Submit Final SSHP Addendum	16	02-Apr-09	17-Apr-09
A1050	Prepare & Submit Draft SSAP Addendum	29	02-Feb-09	02-Mar-09
A1060	Review Draft SSAP Addendum	30	03-Mar-09	01-Apr-09
A1070	Prepare & Submit Final SSAP Addendum	16	02-Apr-09	17-Apr-09
Field Work		235	20-Apr-09	10-Dec-09
A1080	Monitoring Well Installation & Development	30	20-Apr-09	19-May-09
A1090	GW Sampling 1st Round	30	20-May-09	18-Jun-09
A1100	Surface Water & Sediment Sampling	30	20-May-09	18-Jun-09
A1105	GW Sampling 2nd Round	30	12-Oct-09	10-Nov-09
A1110	Analytical	205	20-May-09	10-Dec-09
A1120	IDW	182	20-May-09	17-Nov-09
A1130	GIS	15	18-Nov-09	02-Dec-09
Site Characterization Report		195	11-Dec-09	23-Jun-10
A1140	Prepare & Submit Draft Site Characterization Report	90	11-Dec-09	10-Mar-10
A1150	Review Draft Site Characterization Report	60	11-Mar-10	09-May-10
A1160	Prepare & Submit Final Site Characterization Report	45	10-May-10	23-Jun-10
Baseline Human Health Risk Assessment		195	11-Mar-10	21-Sep-10
A1162	Prepare & Submit Draft BLHHRA Work Plan	26	11-Mar-10	05-Apr-10
A1164	Review Draft BLHHRA Work Plan	60	06-Apr-10	04-Jun-10
A1166	Prepare & Submit Final BLHHRA Work Plan	30	05-Jun-10	04-Jul-10
A1170	Prepare & Submit Draft BLHHRA	90	11-Mar-10	08-Jun-10
A1180	Review Draft BLHHRA	60	09-Jun-10	07-Aug-10
A1190	Prepare & Submit Final BLHHRA	45	08-Aug-10	21-Sep-10



Remaining Level of Effort
Actual Level of Effort
Actual Work
Remaining Work
Critical Remaining Work
Milestone
Start ...
Summ...

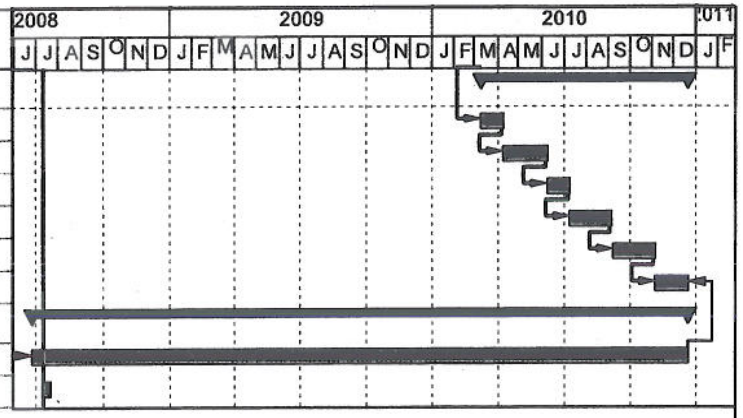
Figure 1

Louisville A/E Contract #W912QR-08-D-0013

DX02 - Waste Water Treatment Plants 1&3, Ash Pits 1&3 GW RI, BHHRA & SLERA @ PBOW

Shaw Environmental & Infrastructure Project Schedule

Activity ID	Activity Name	Remaining Duration	Start	Finish
Screening Level Ecological Risk Assessment		285	11-Mar-10	20-Dec-10
A1200	Prepare & Submit Draft Ecological RA Work Plan	30	11-Mar-10	09-Apr-10
A1210	Review Draft Ecological RA Work Plan	60	10-Apr-10	08-Jun-10
A1220	Prepare & Submit Final Ecological RA Work Plan	30	09-Jun-10	08-Jul-10
A1250	Prepare & Submit Draft Ecological RA Report	60	09-Jul-10	06-Sep-10
A1260	Review Draft Ecological RA Report	60	07-Sep-10	05-Nov-10
A1270	Prepare & Submit Final Ecological RA Report	45	06-Nov-10	20-Dec-10
Project Management		894	26-Jun-08 A	20-Dec-10
A1230	Project Management	894	26-Jun-08 A	20-Dec-10
A1240	Meetings	10	10-Jul-08	19-Jul-08



Remaining Level of Effort
Actual Level of Effort
Actual Work
Remaining Work
Critical Remaining Work
Milestone
Start ...
Summ...

Figure 1

Louisville A/E Contract #W912QR-08-D-0013

DX02 - Waste Water Treatment Plants 1&3, Ash Pits 1&3 GW RI, BHHRA & SLERA @ PBOW

Shaw Environmental & Infrastructure Project Schedule