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 Modification to Include Sewer Line from TNTB to WWTP1 in the WWTP1 RI Former Plum Brook Ordnance Works, Sandusky, Ohio

Prepared By:

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Post Office Box 1070
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Revision 0

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

June 9, 2009

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SIGNATURE PAGE

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 1and3 and
Ash Pits 1 and 3
Modification to Include Sewer Line from TNTB
to WWTP1 in the WWTP1 RI
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, P. E., PMP
Project Manager
Shaw Environmental & Infrastructure, Inc.

Date

Accepted By:

_____ _____

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

Date

_____ _____

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

Date

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 and 3 and Ash Pits 1 and 3
Modification to Include Sewer Line from
TNTB to WWTP1 in the WWTP1 RI
Former Plum Brook Ordnance Works, Sandusky, Ohio**

June 9, 2009

PROJECT OBJECTIVE AND TASKS

This Draft Quality Control Plan (QCP) has been prepared by Shaw Environmental and Infrastructure, 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 the Modification of Delivery Order (DO) DX02 of IDT Contract W912QR-08-D-0013

The purpose of the original task order was to perform a remedial investigation (RI) along the sewer lines extending from TNT Area A (TNTA) to Waste Water Treatment Plant 1 (WWTP1). This modification expands the RI for WWTP1 to include the sewer line that ran from TNT Area B (TNTB) to WWTP1.

The objective of this modification is to delineate the traces of the TNTB to WWTP1 Sewer Line and to investigate potential nitroaromatics contamination which may have affected soil and groundwater along these traces. Analytical data associated with this investigation will also be used to complete a characterization report and perform a baseline human health risk assessment (BHHRA) and a screening level ecological risk assessment (SLERA) for the TNTB to WWTP1 Sewer Lines. The characterization report, BHHRA and SLERA are included under the original DX02 contract for WWTP1 and under DX03 for the TNTA to WWTP1 Sewer Lines.

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 15.0 – Preparation and Submittal of an Updated Quality Control Plan.

Shaw has 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 has 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 involved in this project. This QCP is an addendum to the SWSAP which defines the quality verification activities for specific professional disciplines including data quality objectives, field work activities, and laboratory analysis. This verification process will be implemented to ensure that the work output is acceptable and meets all requirements detailed in the SOW.

An independent review of documents and submittals, as well as other tasks presented in this QCP, shall be performed to verify that work is conducted in an acceptable manner and meets all the requirements detailed in the SOW.

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 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.

As part of the QCP development, Shaw has incorporated the criteria management process as described in the SWSAP.

Task 16.0 – 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 the TNTB to WWTP1 Sewer Line. The SSAP will be prepared as an addendum to the updated Site-Wide Sampling and Analysis Plan (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 TNTB to WWTP1 Sewer Line. In addition, it will identify sampling locations for TNTB to WWTP1 Sewer Line rationale underlying the choice of locations and any expected variations from the SWSAP.

Task 17.0 – Soil Trenching Remedial Investigation.

A soil investigation will be conducted using the phased approach similar to that performed in previous investigations at the TNTA to WWTP1 Sewer Line. A total of 34 test pits will be excavated along the sewer line and the location of the sewer will be based on as built drawings from the site. The trace of the sewer line is estimated to be approximately 3 ft to 5 ft bgs based on visual observations of trace evidence during previous investigations. Soil samples will be collected within each test pit at a location immediately below the sewer line, or interpreted to be below the former sewer line in areas where it has been removed. The analysis requested for all 34 samples will be nitroaromatics only. Shaw will obtain all necessary utility clearances and permits from NASA.

All test pit locations will be sketched and surveyed to the nearest 1 foot; land elevations will be surveyed to within ± 0.01 foot referenced to the National Geodetic Vertical Datum of 1929. Any site clearing that may by necessary for equipment access will be coordinated with NASA.

Task 18.0 – Direct-Push Soil and Initial Groundwater Remedial Investigation

Direct-push soil and groundwater remedial investigation will be conducted in a phased approach. Based on the analytical results from the initial 34 samples collected from the test pit trenching (Task 17.0), 16 borings will be advanced using direct-push technology. The boring locations will be determined base upon the areas found to exhibit the highest

concentration of nitroaromatics from the analytical results on the initial test pit soil analytical results. Six (6) soil boring will be completed to determine the lateral extent of contamination based on the soil trenching analytical data. Soil samples from these six (6) boring will be collected from 8-12 ft bgs and analyzed for nitroaromatics only.

Ten (10) additional soil borings will be completed along the sewer line trace to determine if surface soil contamination is present and also determine the depth of soil contamination. These ten (10) borings will be located at the areas of the highest soil contamination and will be completed as temporary piezometers. Two samples will be collected from each boring to support risk evaluation: one from the surface (0-1 ft bgs) and one from a depth of 8-10 ft bgs. These 20 boring samples will be analyzed for nitroaromatics, SVOC, TAL metals, and PCBs. Additionally one surface soil sample will be analyzed for total organic carbon. Each boring will be continuously logged to bedrock (i.e. competent shale or limestone) during installation. If bedrock is encountered at less than 5 ft and the borehole is dry, then the piezometer will not be installed and an alternative location will be sought along the TNTB to WWTP1 Sewer Line. Piezometers that do not produce sufficient groundwater that is representative of the formation water may inappropriately influence contaminant evaluations. If such conditions are encountered, Shaw will propose to CELRN how they intend to proceed.

Water levels will be measured and recorded for all piezometers involved in this investigation before any of the piezometers are sampled. The piezometer will be purged with clean, non-contaminating equipment and a portion of the purge water will be tested for pH, turbidity, specific conductance, dissolved oxygen, and temperature using flow-through measurement cells. The results of the tests will be recorded and maintained as project records. A reduction-oxidation potential test will be performed once the relevant parameters have stabilized (as defined by EM-200-1-3, page C-17) and three consecutive turbidity readings are measured less than 100 nepholometric turbidity units (NTUs). If relevant parameters do not stabilize and the water level cannot be maintained, Shaw will propose to CELRN how they intend to proceed to ensure that sampling is of quality to fulfill one or more of the project objectives.

Piezometer groundwater samples will be collected using low-flow technology with a peristaltic pump and PTFE tubing (i.e. Teflon®) unless this technology is not appropriate and a variation is approved by OEPA and USACE. These 10 piezometer groundwater samples will be analyzed for nitroaromatics only.

Task 19.0 – Monitoring Well Installations

Shaw will install a total of three overburden/shale monitoring wells and three limestone wells along the TNTB to WWTP1 Sewer Line. The specific location of each well will be determined based on the analytical results of the piezometer samples.

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 (*Site-Wide Sampling and Analysis Plan , Plum Brook Works Ordnance, Sandusky, Ohio, July 2008)*, 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. All scheduling and coordination of the underground utility locations in the vicinity of the borehole will be conducted by Shaw prior to drilling activities.

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 20.0 – Monitoring Well Development

Shaw will develop each of the three overburden/shale wells and the three limestone bedrock monitoring wells 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 NTUs. If this criterion can not be met, Shaw will propose to CELRN how they intend to proceed.

Task 21.0 – Monitoring Well Sampling.

Shaw will collect groundwater samples from each of the six new monitoring wells. Each of these samples will be analyzed for nitroaromatics only. 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. 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, 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 22.0 – Analytical Requirements.

A total of 60 soil samples, 10 groundwater piezometers and 12 groundwater monitoring well samples (includes two sampling rounds) will be collected for laboratory analysis as described in previous sections. 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 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 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 Site Characterization 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 23.0 –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 24.0 – Inclusion of TNTB to WWTP1 Waste Water Sewer Line in the Site Characterization Report

After the analytical results for the soil, groundwater piezometers, and groundwater monitoring well samples have been validated, Shaw will incorporate this data in the Site Characterization Report (Volume I and the RI) scoped in DO DX02. 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 Limits of Detection (LOD) 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 per agency comments. Shaw will respond to all comments by the USACE and the OPEA and will submit official response to comments to CELRN.

Task 25.0 – Preparation and Submittal of Baseline Human Health Risk Assessment.

Shaw will prepare a Baseline Human Health Risk Assessment (BHHRA) Work Plan and Report for the TNTB to WWTP1 Sewer Lines which 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 from 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 WWTP1 Sewer Line media.

The BHHRA will evaluate the risks associated with exposure to contaminants in WWTP1 Sewer Line soil and groundwater. 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 will be submitted to all reviewing parties, including OEPA, CEHNC-CX, and CHPPM. Shaw will respond to all comments by the USACE and OEPA and will submit official response to comments to CELRN. Shaw will revise the draft work plan and report per agency comments.

Task 26.0 – Preparation and Submittal of Screening Level Ecological Risk Assessment.

Shaw will prepare a Screening Level Ecological Risk Assessment (SLERA) Work Plan and Report for the TNTB Sewer Line to WWTP1 which 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.

Task 28.0 – 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 29.0 – Project Mangement

Project management includes labor necessary to manage the project and includes home office support services such as procurement, contracting, invoicing, and coordination.

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.
- **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 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
Modification to Include Sewer Line form TNTB to WWTP1 in the WWTP1 RI
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 Chemist	Tom Siard Zach Parham	Risk Assessor Environmental Scientist	Steven Downey Michael Gunderson Ken Martinez	Engineer Geologist QA Manager
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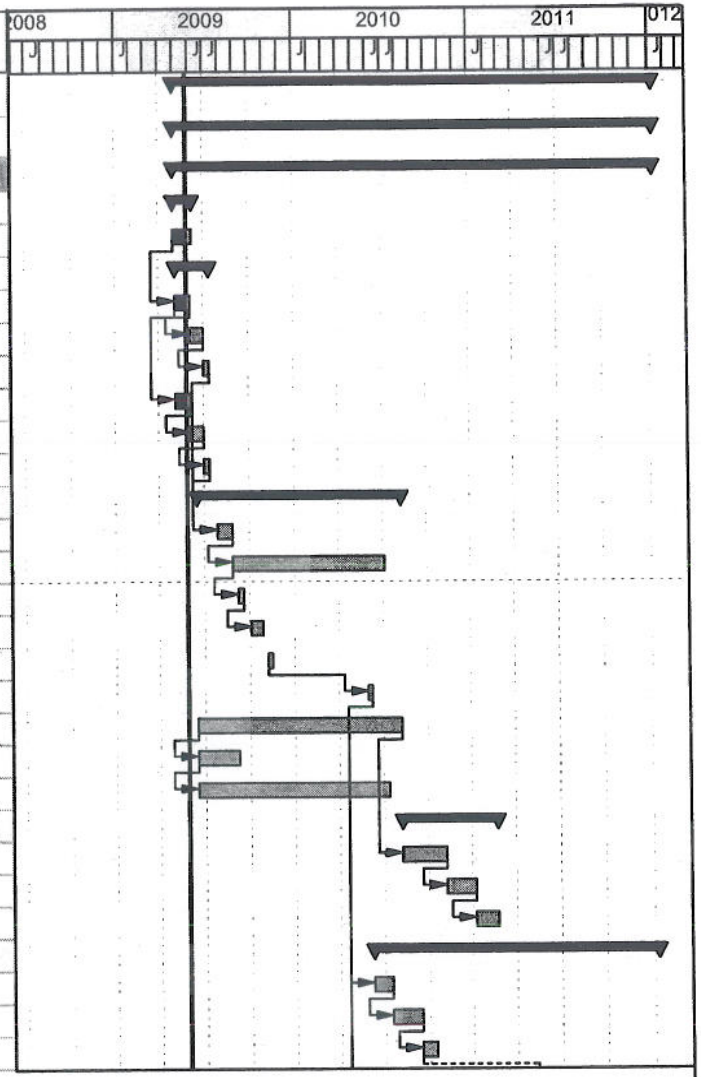
NOTE: Where multiple authors are identified, one or more of those identified may be involved in the document preparation depending on availability. Should replacements be necessary, personnel of comparable experience and qualifications will be utilized.

Activity ID	Activity Name	Remaining Duration	Start	Finish
Louisville AE Contract #W912OQ-08-D-0013 DX02		956	01-May-09 A	11-Jan-12
WWTP 1 & 3, AP 1&3 Phase II GW RI, BHHRA, & SL...		956	01-May-09 A	11-Jan-12
Mod 1 - TNTB Sewerline		956	01-May-09 A	11-Jan-12
QCP		10	01-May-09 A	08-Jun-09
A2360	Prepare & Submit QCP	10	01-May-09 A	08-Jun-09
Work Plans		45	06-May-09 A	13-Jul-09
A2370	Prepare & Submit Draft SSHP Addendum	8	06-May-09 A	06-Jun-09
A2380	Review Draft SSHP Addendum	26	07-Jun-09	02-Jul-09
A2390	Prepare & Submit Final SSHP Addendum	11	03-Jul-09	13-Jul-09
A2400	Prepare & Submit Draft SSAP Addendum	8	06-May-09 A	06-Jun-09
A2410	Review Draft SSAP Addendum	26	07-Jun-09	02-Jul-09
A2420	Prepare & Submit Final SSAP Addendum	11	03-Jul-09	13-Jul-09
Fieldwork		417	18-Jun-09	09-Aug-10
A2430	Soil Remedial Investigation	30	28-Jul-09	26-Aug-09
A2440	GW Remedial Investigation	314	27-Aug-09	06-Jul-10
A2450	Install & Sample Piezometers	14	08-Sep-09	21-Sep-09
A2460	Install Wells	22	06-Oct-09	27-Oct-09
A2470	Sample Wells - Round #1	7	09-Nov-09	16-Nov-09
A2480	Sample Wells - Round #2	7	31-May-10	07-Jun-10
A2490	Analytical	417	18-Jun-09	09-Aug-10
A2500	IDW	81	18-Jun-09	07-Sep-09
A2510	GIS	388	18-Jun-09	11-Jul-10
Site Characterization Report		195	09-Aug-10	20-Feb-11
A2520	Prepare & Submit Draft Site Characterization Report Add...	90	09-Aug-10	07-Nov-10
A2530	Review Draft Site Characterization Report Addendum	60	07-Nov-10	06-Jan-11
A2540	Prepare & Submit Final Site Characterization Report Add...	45	06-Jan-11	20-Feb-11
Baseline Human Health Risk Assessment		582	07-Jun-10	11-Jan-12
A2550	Prepare & Submit Draft HHRA Work Plan	40	07-Jun-10	17-Jul-10
A2560	Review Draft HHR Work Plan	60	17-Jul-10	15-Sep-10
A2570	Prepare & Submit Final HHRA Work Plan	30	15-Sep-10	15-Oct-10



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

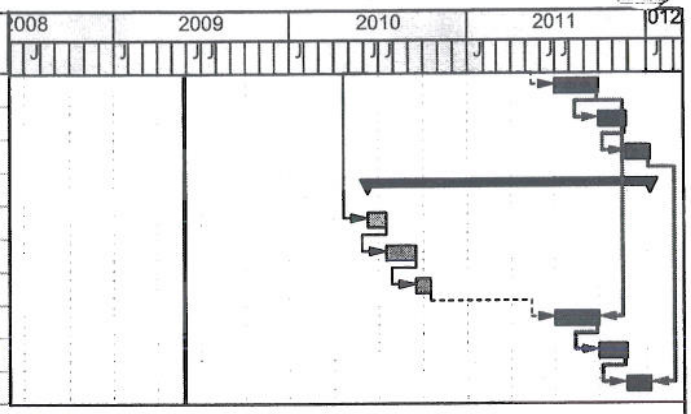
Figure 1

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

TNTB Sewerline

Shaw Environmental & Infrastructure Project Schedule

Activity ID	Activity Name	Remaining Duration	Start	Finish
A2580	Prepare & Submit Draft HHRA Report	90	30-Jun-11	28-Sep-11
A2590	Review Draft HHRA Report	60	28-Sep-11	27-Nov-11
A2600	Preapre & Submit Final HHRA Report	45	27-Nov-11	11-Jan-12
Ecological Risk Assessment		582	07-Jun-10	11-Jan-12
A2610	Prepare & Submit Draft Ecological RA Work Plan	40	07-Jun-10	17-Jul-10
A2620	Review Draft Ecological RA Work Plan	60	17-Jul-10	15-Sep-10
A2630	Prepare & Submit Final Ecological Work Plan	30	15-Sep-10	15-Oct-10
A2640	Prepare & Submit Draft Ecological RA Report	90	30-Jun-11	28-Sep-11
A2650	Review Draft Ecological RA Report	60	28-Sep-11	27-Nov-11
A2660	Prepare & Submit Final Ecological RA Report	45	27-Nov-11	11-Jan-12



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

TNTB Sewerline

Shaw Environmental & Infrastructure Project Schedule

Shaw™

Shaw Environmental & Infrastructure, Inc.

DISCIPLINE SIGN-OFF REVIEW

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

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, Modification to Include Sewer Line from TNTB to WWTP1 in the WWTP1 RI 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

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- ☐ SHP, SSAP, CDAP, or QAPP _____
- ☐ Report _____
- ☐ Risk Assessment / Evaluation _____
- ☐ Specifications & Plans _____
- ☐ Design Calculations _____
- ☐ Tables _____
- ☐ Drawings / Figures
- ☐ Other:

Document Origin

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ject Manager			

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FIGURE 2