Final

PLAN OF OPERATIONS

INTERIM SOIL REMOVAL ACTION Continuation
Soil Excavation and Disposal
Plum Brook Ordnance Works –TNT Area B
Sandusky, Ohio

Contract No. W91237-06-C-0003

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DEFINITIONS AND ACRONYMS

BTEX	Benzene, Toluene, Ethylbenzene, Xylene
COC	Contaminant of Concern
COCs	Contaminants of Concern
DERP-FUDS	Defense Environmental Restoration Program for Formerly Used Defense Sites
DNT	Dinitrotoluene
DRO	Diesel Range Organics
EPA	Environmental Protection Agency
GSA	General Service Administration
HAZWOPER	Hazardous Waste Operations and Emergency Response
HI	Hazard Index
HTF	Hypersonic Tunnel Facility
HTRW	Hazardous, Toxic, and Radioactive Waste
HSWA	Hazardous and Solid Waste Amendments
IDW	Investigation Derived Waste
ILCR	Incremental Lifetime Cancer Risk
IQCT	Independent Quality Control Team
ISRA	Interim Soil Removal Action
IT	International Technology Corporation
MCL	Maximum Contaminant Level
MSDS	Material Safety Data Sheet
MSL	Mean Sea Level
NASA	National Aeronautics and Space Administration

DEFINITIONS AND ACRONYMS (continued)

NCP	National Contingency Plan or National Oil and Hazardous Substance Pollution Contingency Plan
NIOSH	National Institute for Occupational Safety and Health
NPDES	National Pollutant Discharge Elimination System
NTCRA	Non-Time Critical Removal Action
ORO	Oil Range Organics
OSHA	Occupational Safety & Health Administration
PAH	Polynuclear Aromatic Hydrocarbons
PBOSB	Plum Brook Operations Support Group
PBOW	Plum Brook Ordnance Works
PBS	Plum Brook Station
PCBs	Polychlorinated Biphenyls
POC	Point of Contact
PQL	Practical Quanitation Limit
PPE	Personal Protective Equipment
PRGs	Preliminary Remediation Goals
QA	Quality Assurance
QC	Quality Control
QAP	Quality Assurance Plan
QCP	Quality Control Plan
RAB	Restoration Advisory Board
RBCs	Risk Based Concentrations
RCRA	Resource Conservation and Recovery Act

DEFINITIONS AND ACRONYMS (continued)

RI/FS	Remedial Investigation/Feasibility Study
RPDs	Relative Percent Differences
SARA	Superfund Ammendments and Reauthorization Act
SMCL	Secondary Maximum Contaminant Level
SOW	Scope of Work
SSHO	Site Safety and Health Officer
SSHP	Site-Specific Safety and Health Plan
SVOCs	Semi-Volatile Organic Compounds
TAL	Target Analyte List
TCLP	Toxicity Characteristic Leaching Procedure
TDS	Total Dissolved Solids
TNB	Trinitrobenzene
TNT	Trinitrotoluene
TOC	Total Organic Carbon
TPH	Total Petroleum Hydrocarbons
TSDF	Treatment, Storage, and Disposal Facility
TSS	Total Suspended Solids
UCL	Upper Confidence Limit
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
VOCs	Volatile Organic Compounds

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1.0 PROJECT DESCRIPTION

1.1 Background and Purpose

The purpose of the project is to the continuation of a Non-Time Critical Removal Action (NTCRA) within the former trinitrotoluene manufacturing Area B (TNT B) of Plum Brook Ordnance Works (PBOW) located in Sandusky, Ohio. The United States Army Corps of Engineers (USACE) is the responsible authority under the Defense Environmental Restoration Program (DERP) at the former TNT B. Based on the results of the completed *TNT B Remedial Investigation, Former Plum Brook Ordnance Works, Sandusky, Ohio, Volume I – Final Report of Findings*, (IT Corporation, USACE, August 2000) and *Volume IV – Final Feasibility Study*, (IT Corporation, USACE, July 2001) and *Interim Soil Removal Action* (ISRA) (WTI 2006), the USACE will continue a NTCRA at TNT B. The removal action will be taken to minimize threats to, and provide adequate protection to, human health and the environment from exposure to soil at TNT B containing any of the thirteen contaminants of concern (COCs) at concentrations that exceed preliminary remediation goals (PRGs) as identified in *Final Action Memorandum for the TNT B Interim Removal Action* (USACE, 2003).

The removal action will consist of the excavation of 5 areas totaling approximately 6,718 cubic yards of material, backfilling of the excavation pits with clean material and off-site disposal of waste. Based on the analytical results from the test pits excavated within the contaminated limits, it is assumed that the soil removed will not be hazardous and will not require stabilization, treatment or hazardous waste disposal and can be disposed of at a non-hazardous waste landfill. However, if the levels of contamination in the soil render it unacceptable to the landfill and if ex-situ stabilization of soil is required prior to disposal; a modification to the Scope of Work (SOW) and this Plan of Operations will be necessary.

1.2 Site Location and History

The former PBOW is located approximately 4 miles south of Sandusky, Ohio and 59 miles west of Cleveland, Ohio. Although the PBOW site is primarily situated in Perkins and Oxford Townships, the eastern edge of the site extends into Huron and Milan Townships. The site is bounded on the north by Bogart Road, on the south by Mason Road, on the west by County Road 43, and on the east by U.S. Highway 250. The surrounding area is mostly agricultural and residential.

The 9,009 acre PBOW site was built by the United States Army in early 1941 as a manufacturing plant for 2,4,6-TNT, DNT, and pentolite. Production of explosives at PBOW began in December 1941 and continued until 1945. It is estimated that more than 1 billion pounds of nitroaromatic explosives were manufactured during the 4 year period that the facility was in operation. Three separate explosive manufacturing areas were designated, which include TNT Area A (TNT A), TNT Area B (TNT B), and TNT Area C (TNT C). Twelve process lines were used in the manufacture of TNT, which included four lines at TNT A, three lines at TNT B, and five lines at TNT C. The work to be performed under this project deals primarily with the TNT B area.

The TNT B manufacturing site consisted of widely scattered buildings of wood frame construction with asbestos and sheet metal coverings. It also included a series of buried and/or overhead flumes and pipes used to transport various liquids associated with the manufacturing process. After plant operations ceased, TNT B's manufacturing lines were decontaminated by the War Department in late 1945. During decontamination, all structures, equipment, and manufacturing debris were either removed and salvaged or removed and burned by the War Department in 1945. After the property was certified as decontaminated by the United States Army, the property was initially transferred to the Ordnance Department and then to the War Assets Administration.

In 1949, the PBOW was transferred to the General Services Administration (GSA). In 1955, the GSA completed further decontamination of TNT B. This effort is thought to have focused on surface contamination detected by visual inspection. It is unknown whether the underground flumes were addressed by this decontamination effort.

NASA acquired the property on March 15, 1963 and currently utilizes the site. The GSA performed further decontamination efforts during the 1963 transfer. The decontamination process included removing contaminated surface soils above the drain tiles, flumes, etc., destruction of all buildings by fire, and the removal of all soil, debris, sumps, and concrete foundations. All materials, including the soil in those areas, were flashed. The area was then rough graded. The decontamination process also included the burning of excavated nitroaromatic filled flumes.

NASA currently operates the Plum Brook Station (PBS) of the John Glenn Research Center at Lewis Field. Most of the aerospace testing facilities built at the site in the 1960's are in standby or inactive status. On April 18, 1978, NASA declared approximately 2,152 acres of PBOW as excess. The Perkins Township Board of Education acquired 46 acres of the excess acreage and uses this area as a bus transportation area. The remaining excess acreage in the Southwest area was sold to various private concerns. NASA currently controls approximately 6,400 acres of land which includes approximately 5,400 acres within the fence line. Of the acreage inside the fence line, NASA has a use agreement with the Ohio National Guard for 604 acres and the remainder is utilized for aerospace research as a satellite operation of the Glenn Research Center. The acreage outside the fence remains part of the test facility exclusion zone and is leased to various farmers and the Erie County Conservations League.

The PBOW TNT B consists of an area containing approximately 55 acres at the south-central portion of PBOW immediately north of West Sheid Road. Significant evidence of former

PBOW facilities exists at TNT B in the form of roads, hydrants, and ditches. All of the buildings that existed during explosives manufacturing were demolished and removed. Two NASA facilities are located at the TNT B site and are currently active. These facilities include the Hypersonic Tunnel Facility (HTF) and the Nitrogen Dewar Tanks. The HTF is located in the northwest portion of TNT B and consists of a single building, above and below ground piping and utilities, and paved parking areas. The Nitrogen Dewar Tanks are located in the center of TNT B with aboveground piping and underground utilities leading to the northwest towards the HTF and to the northeast offsite.

1.3 Overview of Remedy and Proposed Action

The results of the Remedial Investigation/Feasibility Study (RI/FS) and resulting *Final Action Memorandum for the TNT B Interim Removal Action* (USACE, 2003) provided the basis for taking initial action at this site. The proposed approach for a remedy at TNT B was to excavate, stabilize, remove, and dispose of contaminated soil from the 13 former building locations.

To provide a basis for taking further action at this site, an ISRA was conducted by WTI to address the extent of contamination at TNT B. The ISRA report addressed each of the 13 areas identified in the RI/FS as requiring excavation. Results from the initial ISRA showed that the excavation limits identified at TNT B by the RI/FS were grossly underestimated and additional excavation was necessary. However, due to funding constraints, complete excavation of the contaminated areas was not possible. To date, the contamination has been completely removed from only 8 of the 13 former building locations. Currently, due to additional funding for this fiscal year, USACE has been able to fund the 5 remaining areas for additional excavation and disposal. Proposed excavations for these areas are based on the horizontal / vertical contamination limits identified during the trenching / test pitting investigation efforts conducted by WTI after the initial ISRA was completed. The findings for each of the 13 areas are detailed in the *Final ISRA TNT B* (WTI May 2006). This report should be used in conjunction with this Plan of Operations for the 5 remaining former building locations.

The proposed approach for this continued ISRA is to excavate the 5 former building locations (Buildings 412, 452, 456, 463 and North East Nail House) to the limits identified in the *Final ISRA TNT B* (WTI May 2006). Excavation to these limits will remove the soil that contains concentrations of the COCs that exceed the PRGs identified in the *Final Action Memorandum for the TNT B Interim Removal Action* (USACE, 2003). Refer to Section 3.1, Table 1 for a list of the COCs and established PRGs.

The estimated volume of contaminated soil to be removed from these areas is 6,718 cubic yards. Once these excavations are complete, the 5 former building locations will be assumed "clean", based upon confirmation sampling from test pit and trenching activities, and will not require additional excavation. The volumes for these areas were calculated based on the establishment of a perimeter by using test pits and sampling (from both field screening and lab confirmation) to confirm when vertical and horizontal contamination limits were reached. Based on the analytical results from test pits excavated within the contaminated limits, it is assumed that the soil being removed will not be hazardous and therefore, not require stabilization, treatment or hazardous disposal, but can be disposed of at a non-hazardous landfill. In addition, analytical results from previous excavation indicate that the soil may possibly be used for daily cover at the landfill.

Once the soil has been excavated, it will be stockpiled in the same area used during the initial ISRA efforts and sampled (based on the landfill requirements of 1 sample per every 500 tons) for disposal. Refer to Table 4 Section 5.3 for sampling requirements. The stockpiled soil will be placed on a 6-mil plastic liner so as not to allow possible migration of contaminants into the ground. The stockpile will also be covered completely with 6-mil plastic liner to eliminate rain-fall run-off issues that may allow for migration of contaminants.

Field screening efforts will be used to verify the "clean" limits of the 5 former building locations as well as prior to sampling of the stockpiled soil. Although the "clean" limits have been established in the initial ISRA report, field screening for nitroaromatics will aid in verifying the excavated walls are still "clean". If field screening results are "dirty" (results above the PRG's), a confirmation sample will be taken and submitted to the laboratory for analysis. If the results from the analysis of the confirmation sample confirm levels of nitroaromatic contamination above the PRG's.

The former building location excavations will be backfilled with clean fill material and graded as necessary to achieve proper drainage, and reseeded. Backfill material will be aquired from an off site source and sampled prior to use. Refer to Section 5.1 Table 2 for sampling requirements.

1.4 Overview of Tasks

McTech will provide all equipment, labor, materials and supervision necessary for the ISRA as described by the SOW at TNT B. A copy of the SOW can be found in Appendix A. Activities generally consist of excavation, sampling and disposal of contaminated soil, backfilling with clean material and site restoration. Stabilization of soil, if necessary, will be accomplished with an Addendum to the Plan of Operations, pursuant to a modification of the SOW.

It should be noted that regarding Tasks 1-3, that although plans for the initial ISRA were submitted and approved, due to the change in McTech Corp, a full set of new plans rather than addendums as noted in the SOW are required.

The following tasks are required to be performed under this SOW:

Task 1 Preparation and submission of a Site Specific Safety and Health Plan.

Task 2 Preparation and submission of a Quality Control Plan.

Task 3 Preparation and submission of a Plan of Operations, which will include information on the disposal of Investigation Derived Waste, Erosion Control, Spill Containment, Sampling and Analysis, Environmental Protection and Materials Handling.

Task 4 Notification/ scheduling of field activities and coordination of utility marking with NASA officials prior to site mobilization.

Task 5 Site surveying is necessary for identifying limits of excavation.

Task 6 Excavation of contaminated material.

Task 7 Disposal of Investigation Derived Waste (IDW).

Task 8 Removed per USACE POC.

Task 9 Preparation and submission of the Draft and Final ISRA Report.

Task 10 Public meeting support will be provided to the USACE for the work defined by this delivery order.

The tasks outlined in Section 2.0 are described in detail in the following sections of this SOW. This work will be conducted by McTech in an environmentally acceptable manner conforming to existing federal, state, and local regulations under USACE Huntington District (CELRH) supervision.

1.4.1 (Task 1) Preparation and Submission of an ISRA Site-Specific Safety and Health Plan (SSHP)

McTech Corp will prepare a SSHP that covers the field activities planned for the 5 areas. As always, the plan will comply with the requirements of the U.S. Army Corps of Engineers, Safety and Health Requirements Manual, EM 385-1-1, latest version, and the Department of Labor, Occupational Safety and Health Administration (OSHA) as presented in Title 29 of the Code of Federal Regulations, Part 1910.120. At a minimum, McTech SSHP will address the following items:

- Cover sheet. Identify company name, contract number, project location, signed and dated by plan developer.
- Responsibilities and lines of authority.
- Employee qualifications. Physical fitness, job competence, special skills, equipment operation.
- Employee training. First aid, CPR, back injury prevention.
- Safety meetings. "Tool box" meetings.
- Job Hazard Analysis. Preparation and revision, discussion with employees.
- Emergency response plan. Emergency number, means of communication, route to nearest medical facility.
- Accident reporting and Project Manager responsibility. Report all accidents immediately to the Contracting Officer and submit ENG Form 3394 within two (2) working days.
- First aid kits.
- Personal protection equipment. As a minimum, employees must wear long-legged trousers, sleeved-shirt, and steel-toes shoes. Safety glasses with side shields and hard hats may also be appropriate, depending on activity.
- Hearing protection.
- Vehicles and equipment.
- Public safety.
- Fire safety.
- Environmental hazards.
- Housekeeping.
- Standard operating procedures.

McTech will read and conform to the SSHP when conducting this work. Documentation to this effect will be furnished to the Government POC prior to initiation of any work. The plan will also include the names, and qualifications of the SSHO, including education, training and work experience.

1.4.2 (Task 2) Preparation and Submission of an ISRA QCP

McTech Corp will prepare the QCP that covers field activities planned for the 5 areas. The QCP will apply to all tasks/activities and products contained in this SOW. The QCP will be prepared according to the applicable ISO 9000 processes as identified at www.lrh.usace.army.mil/ct/quality developed for this type of work.

The QCP will define the responsibilities and roles of each member on the Independent Quality Control Team (IQCT), along with those preparing or performing the tasks/activities in this SOW. The QCP will also detail the methods and procedures for inspection of work, identifying and correcting deficiencies, maintenance of records, list of authorized Quality Control Inspectors, list of authorized McTech Corp representatives, and security measures.

The draft and final versions of the various plans will include a separate QC appendix that includes an activity review checklist (appropriate checks on those activities that were performed/reviewed) for the specific product, along with a signed sheet which designates the name, date and official work title of those persons performing/conducting the QC activities. All comments and responses, from both McTech's QC review and USACE's QC review, as well as contract compliance review comments of the plans will be included in the QC appendix of the final plans.

1.4.3 (Task 3) Preparation and Submission of an ISRA Plan of Operations

McTech Corp will prepare a Plan of Operations that covers the office and field activities planned for the 5 former building locations. McTech will also include in the Plan of Operations a Sampling and Analysis Plan that will outline the sampling and analysis required for disposal of the contaminated soil. This has been included in Section 5.0 of this Plan of Operations.

For all borrow sites (whether onsite or off-site), McTech will sample the borrow material to ensure that it is not contaminated. Sampling will be for volatile organic compounds (VOC)s (Method 8260A), semi-volatile organic compounds (SVOC)s (Methods3540C/8270), TAL Metals (3050B/6010B/7471A) and PCBs (8082/3540B) including Pesticides / Herbicides if from farmland. These were the same sampling parameters used in the Remedial Investigation. The sampling and analysis will be done in accordance with current USEPA SW-846 protocol.

McTech will collect the waste from the excavation efforts, used PPE, decontamination liquids, and all waste generated from these activities. This media will be containerized in sealable drums and placed in a secured area on the site until the results of the soil analyses are known. All drums will be labeled as to project name, contents, boring number and date of collection, and secured to prevent public access. The drums will be secured with tarps, ropes and pallets. Waste from different sites will not be mixed.

McTech Corp will also include in the Plan of Operations an Investigative Derived Waste Plan (IDWP) for this project. Requirements for this plan can be found in Under Task 7, Section 3.7. Please reference this section for all IDW requirements.

1.4.4 (Task 4) Field Activities/Utilities

Field Activities The site is currently owned by NASA Plum Brook Station (PBS), however, rights of entry are not required for this removal action. Coordination with PBS personnel will be conducted by USACE to ensure that McTech is allowed access to/from the site to perform all activities during this removal action. McTech will be required to enter/exit through the PBS security gate, therefore, he will follow all rules set forth by PBS security. McTech will coordinate his field activities with all appropriate authorities and agencies as required. No field work will be started until the QCP and SSHP have been approved by USACE and the Notice to Proceed has been given by the USACE Contracting Officer. McTech will prepare and submit to USACE a written response to all comments. McTech will also be responsible for providing (with the notification) an up-to-date, detailed time schedule for the field work to be performed.

Utilities An excavation permit has been acquired and coordinated with the Plum Brook Operation Support Group (PBOSG) for the TNT B area as well as additional excavation areas discovered through the trenching and test pit efforts. The excavation permit was submitted by McTech Corp on June 19, 2006 and approved during the preconstruction meeting with PBOW NASA and PBOSG on July 10, 2006.

1.4.5 (Task 5) Site Survey

The Final ISRA Report for TNT B, dated May 2006 identifies the surveyed limits for the proposed excavation limits for the 5 areas. McTech will utilize this report in obtaining information concerning each of these 5 areas as well as survey and stake the limits prior to excavation. These areas will also be surveyed once excavation is complete so as to get final quantities removed as well as obtain coordinates for preparation of final mapping.

1.4.6 (Task 6) Excavation of Contaminated Material.

McTech will excavate approximately 6,718 cubic yards of contaminated material from the following 5 areas: buildings 412 (647 CY), 452 (2,054 CY), 456 (1,109 CY), 463 (2,658 CY) and North East Nail House (250 CY). Contaminants, levels of cleanup and excavation limits have already been identified in the Final ISRA Report, dated May 2006 as well as the Remedial Design and Feasibility Study phase of this project. All findings and recommendations have been verified and approved by Ohio EPA and are therefore to be used during this construction effort. This material will be excavated in a safe manner and activities will adhere to all environmental and safety laws, regulations and ordinances. During excavation efforts, McTech will stop excavation of that particular area when encountering bedrock or groundwater. Any water generated during the excavation will be containerized, sampled and disposed of in accordance with local, state and federal regulations. McTech will decontaminate all equipment that comes in contact with the soil before moving to another area. Before excavation will begin McTech will submit a plan (within the Plan of Operations) showing the proposed limits of excavation as they are given within the Final ISRA TNT B Report, dated May 2006.

The following paragraphs detail these 5 different locations within the TNT Area B.

Building 412 Sweating and Graining House. The Building 412 location included 3 areas designated by USACE as Areas A, B and C. Buildings 412C and 412B (both 10' x 10' x 6') were excavated to the original limits as outlined in the Final RI/FS. Approximately 44 CY of soil was excavated. Water was encountered at the 6' depth in both areas. Therefore, McTech will take precautions when excavating so as not to create water disposal issues. The areas were lined w/ 6-mil plastic and backfilled with clean soil. Area 412C was found to be clean (contamination limits below PRG values), however, 412B was not and required test pits to establish additional excavation limits. Excavation of the Building 412A (50' x 20' x 6') began, however due to funding shortage was not completed. Test pits were used to establish the additional limits of contamination. Since the excavation activities did not result in clean samples from areas 412A and 412B, test pits were excavated and the walls sampled to determine the additional area requiring excavation for clean closure. Confirmation sampling resulted in levels of nitroaromatics, lead, PAHs and PCBs all below the PRGs established in the RI/FS. Based on test pit activities, an additional 647 CY of soil will require excavation to reach clean closure status. McTech will also take note that during test pit activities, these areas contained large amounts of concrete walls/debris that may take additional time during excavation activities. The concrete can be left on site if possible.

Building 452 Bi-Tri House. The building 452 location included 2 areas designated by USACE as Areas A (25' x 45' x 10') and B (15' x 15' x 10'). These areas were excavated to the horizontal and vertical limits established in the Final RI/FS and were lined with 6-mil plastic and backfilled with clean soil. Over-excavation of these areas due to nitroaromatic contamination resulted in the removal of common walls between Areas A and B which resulted in one large area. Confirmation sampling of the outer walls found this one large area to still be above the RGO levels established in the RI/FS and would therefore require additional excavation prior to clean closure. Test pits were used to establish the additional limits of contamination. The test pit walls were sampled to determine the additional area requiring excavation for clean closure. Confirmation sampling resulted in levels of nitroaromatics, lead, PAHs and PCBs all below the RGO levels established in the RI/FS. Based on test pit activities, an additional 2,054 CY of soil will require excavation to reach clean closure status. McTech will utilize the Final ISRA Report for TNT B, dated May 2006 to obtain the information (i.e., location, survey coordinates, etc.) required to complete the additional excavation efforts necessary to obtain clean closure. McTech will be sure to decontaminate all equipment prior to moving to the next area.

Building 456 Wash House. Building 456 consists of areas A – G. Areas A through G (excluding B) were excavated until levels below the PRG were reached, therefore, they are now considered clean. Area B was excavated to the original limits (24' x 24" x 4") as established by the Final RI/FS, except on the west side where shale was encountered at approximately 3' depth. Water was encountered at depth of 4'. The excavation was lined with 6-mil plastic and backfilled with clean soil. The excavation activities did not result in clean samples, therefore, test pits were excavated to establish the additional limits of contamination. Confirmation sampling resulted in levels of nitroaromatics, lead, PAHs and PCBs all below the PRGs established in the RI/FS. Based on test pit activities, an additional 1,109 CY of soil will require excavation to reach clean closure status. McTech will utilize the Final ISRA Report for TNT B, dated May 2006 to obtain the information (i.e., location, survey coordinates, etc.) required to

complete the additional excavation efforts necessary to obtain clean closure. McTech will be sure to decontaminate all equipment prior to moving to the next area.

Northeast Nail House. The NE Nail House was excavated to the original limits (15' x 15' x 8') as established by the Final RI/FS. The excavation area was lined with 6-mil plastic and backfilled with clean soil. The excavation activities did not result in clean samples from the area, therefore, test pits were excavated and the walls sampled to determine the additional area requiring excavation for clean closure. Confirmation sampling resulted in levels of nitroaromatics, lead, PAHs and PCBs all well below the PRGs established in the RI/FS. Based on test pit activities, an additional 250 CY of soil will require excavation to reach clean closure status. McTech will utilize the Final ISRA Report for TNT B, dated May 2006 to obtain the information (i.e., location, survey coordinates, etc.) required to complete the additional excavation efforts necessary to obtain clean closure. McTech will be sure to decontaminate all equipment prior to moving to the next area.

Building 463 Fortifier House. Building 463 was excavated to the original limits (40' x 20' x 10') as established by the Final RI/FS. The excavation area was lined with 6-mil plastic and backfilled with clean soil. The excavation activities did not result in clean samples from the area, therefore, test pits were excavated and the walls sampled to determine the additional area requiring excavation for clean closure. Confirmation sampling resulted in levels of nitroaromatics, lead, PAHs and PCBs all well below the PRGs established in the RI/FS. Based on test pit activities, an additional 2,658 CY of soil will require excavation to reach clean closure status. McTech will utilize the Final ISRA Report for TNT B, dated May 2006 to obtain the information (i.e., location, survey coordinates, etc.) required to complete the additional excavation efforts necessary to obtain clean closure. It should be noted that groundwater was encountered in this pit, therefore, McTech will be extremely careful as to not excavate beyond groundwater elevations which would create a water disposal issue. McTech will be sure to decontaminate all equipment prior to moving to the next area.

1.4.7 (Task 7) Disposal/Investigative Derived Waste

McTech will arrange for sampling and analysis, transportation and disposal of material excavated from these areas. Based on discussions with the local landfill, McTech Corp will perform Full TCLP, pH and paint filter testing of the stockpiled material per their disposal requirements. Due to the minimal IDW expected to be generated, an IDW Plan is not a separate Plan but rather is included as a distinct section, Section 6.0 within the Plan of Operations.

The IDW Plan will contain, at a minimum: analytical methods; management and containerization methods; and proposed disposal facilities. The IDW Plan will address IDW generated on the sites. Actual disposal of IDW will not occur until the test results are known and the IDW Plan has been approved by USACE. If analyses of the samples taken from the sites indicate that regulated concentrations of hazardous contaminants are present, then McTech will test the IDW material. If analyses of the IDW material indicate that regulated concentrations of hazardous contaminants are present, then McTech will dispose of the IDW material collected from the sampling activities in accordance with local, state and federal regulations as outlined in the IDW Plan.

McTech will immediately provide the lab analyses along with a letter stating which contaminants were found if the material has been designated as contaminated. McTech will send this letter with results to the USACE Technical POC. The letter will be included in the final IDW Plan. Once received, McTech will use this information to properly dispose of the IDW/waste according to applicable state, federal and local regulations. McTech will be responsible for laboratory analyses and proper disposal of IDW. Actual disposal of the IDW will not occur until the test results are known. If the material is determined not to be a regulated waste, McTech will dispose of the material in accordance with the IDW Plan, at no additional cost to the Government.

For IDW, McTech will collect the waste, any used PPE, decontamination liquids, and all waste generated from the construction activities. This media will be containerized and placed in a secured area on the site until the results of the analyses are known. All containers will be labeled as to project name, contents, and date of collection, and secured to prevent tampering. If drums are used, they will be secured with tarps, ropes and pallets. Waste from different sites will not be mixed.

1.4.8 (Task 8) REMOVED PER USACE POC

1.4.9 (Task 9) Preparation and Submission of Draft and Final ISRA Report

McTech will prepare an Interim Soil Removal Action Report, which details the complete efforts during all activities in the SOW. This report will follow the same format that was used for the Final ISRA for TNT B, dated May 2006. This format was generated because there was so much information to include in the report. After Ohio EPA, NASA and the TAPP McTech Corp reviewed this report, they each commented on the easibility to which they were able to review it. Therefore, in keeping with the regulators thoughts, McTech will use the format from the previous ISRA report as a guide in preparation for this Draft and Final ISRA Report. Once the draft report has been generated, McTech will submit it to USACE for review. Any comments arising from this review will be incorporated by McTech into the final report. See Section 3.2 of the SOW for QC review and documentation requirements. See Section 4.3 of the SOW for reporting requirements.

1.4.10 (Task 10) Meeting Support

McTech will support USACE project manager or Technical Coordinator during meetings necessary to discuss the work defined by this work order. It is assumed a maximum of 1 meeting outside of field activities time will be held to discuss the proposed work. This meeting will be held at a location in the Sandusky Ohio area. McTech will be responsible for preparing slides, handouts, and coordinating this meeting. McTech will place a notice in the local newspaper announcing the meeting and inviting the public to attend. McTech will document the meeting minutes and supply these to the USACE project manager or technical coordinator. If necessary McTech will plan to give a presentation highlighting the requirements of this work.

2.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

The collection of quality data and the completion of any given project are strongly affected by the project organization. A project that is properly organized with personnel responsibilities well-delineated results in a successful project conclusion. A listing of functional areas and qualified personnel are given for this project.

A. Government Technical POC —This is the technical POC representing the USACE who will serve as a liaison between the USACE and McTech.

USACE POC		Phone Number
Lisa Humphreys		(304) 399-5953
	Cellular	(304) 360-2558

B. NASA Technical POC— These are the technical POCs representing NASA.

NASA POC	Phone Number
Robert Lallier	(419) 621-3234

NASA PBOSG POC	Phone Number
Gary R. Ponikvar	(419) 621-3342

C. McTech Corp's Project Manager – McTech Corp's Project Manager provides technical insight and provides supervision for the project. The Project Manager has overall responsibility to see that the project is completed in accordance with the Scope of Work.

McTech Corp Project Manager		Phone Number
Kimberlie Chambers		(216) 391-7700
	Cellular	(304) 215-0099
	Alternate	(218) 330-6436

D. On-site Project Manager—The On-site Project Manager will be in charge of field activities in coordination with McTech's Project Manager.

C&K Insustrial Services, Inc. On-site Project Manager		Phone Number
Gary Cooper		(216) 642-0055
	Cellular phone	(216) 956-9253

E. Site Safety and Health Officer (SSHO) – The SSHO is responsible for safety on site. This person has the authority to stop work if unsafe conditions warrant.

C&K Industrial Services, Inc. SSHO		Phone Number
Gary Cooper		(216) 642-0055
	Cellular	(216) 956-9253

F. Quality Control Officer (QCO)—This person is responsible for QC at the site. This person has the authority to stop the work if QC is not being met. The QCO is an employee of McTech. and is trained in QC.

Mc Tech Corp QCO		Phone Number
Mike Malloy		(216) 391-7700
	Cellular	(216) 857-4517

G. **Field Personnel** – These personnel are responsible for assisting the Project Managers in completing the tasks required under this contract.

McTech Corp Field Personnel	Phone Number
Dan Cashbaugh	(216) 391-7700
Mike Piunno	
James B. Russell	

H. **McTech Corp Independent Quality Control Team–** An internal quality control team will independently review the work plans and reports to ensure that they meet requirements of the Scope of Work.

McTech Corp Independent Quality Control Team	Phone Number
Mark Perkins	(216) 391-7700
George Karas	(216) 642-0055

I. **REIC Laboratory**–Samples will be sent to the following USACE certified laboratory. REIC Laboratory is located in Beaver, West Virginia.

REIC Laboratory Contact	Phone Number
Grant Wilton	(800) 999-0105

J. **Erie County Landfill**— Non-hazardous soil removed from the site will be disposed of at the Erie County Landfill.

Erie County Landfill Contact	Phone Number
Fred Dobbert	(419) 433-3624

K. **Molnar Construction, Inc.**—This company will be used for the transportation of any non-hazardous materials removed from the site. Additionally, this company will provide and transport clean backfill material to the site from their facility.

Molnar Construction Contact		Phone Number
Matt Molnar		(419) 732-2763
	Cellular	(419) 656-3423

L. **Mountain State**—Personnel from Mountain State will perform a survey of the areas to be excavated.

Mountain State Contact	Phone Number
Jim Young	(304) 949-4762

M. **C&K Industrial Services, Inc.**—Non-hazardous IDW containing liquids will be managed by EnviroServe located in Cleveland, Ohio.

C&K Industrial Services Inc.		Phone Number
Scott Dean		(216) 642-0055
	Cellular	(216) 952-1375

3.0 APPLICABLE or RELEVANT AND APPROPRIATE REQUIREMENTS

Characterization activities at the PBOW TNT B site have indicated soil contamination resulting from United States Department of Defense activities including the manufacture of 2,4,6-TNT, DNT, and pentolite at the site. The *Final Action Memorandum for the TNT B Interim Removal Action* (USACE, 2003) identified soil remediation goals for thirteen COCs. The COCs were identified in surface and subsurface soils which include nitroaromatics.

The *Final Action Memorandum for the TNT B Interim Removal Action* (USACE, 2003) addressed soil contamination only. WTI was contracted to perform the ISRA for the soil contamination. The elements of the selected remedy(s) are presented in *Final Action Memorandum for the TNT B Interim Removal Action* (USACE, 2003). The overall objective of the ISRA for the PBOW site is to minimize threats to, and provide adequate protection to, human health and the environment from exposure to contaminants in soil. Successfully meeting the soil remedial objectives would sufficiently address the principal threats at this site, which are nitroaromatics in the soil.

3.1 Remedial Investigation/Feasibility Study and Final Action Memorandum

Based on the results of the completed RI/FS, *TNT B Remedial Investigation, Former Plum Brook Ordnance Works, Sandusky, Ohio, Volume I – Final Report of Findings*, (IT Corporation, USACE, August 2000) and *Volume IV – Final Feasibility Study*, (IT Corporation, USACE, July 2001) and Interim Soil Removal Action (ISRA) (WTI 2006), the USACE will continue a NTCRA at TNT B.. Thirteen COCs were identified in surface and subsurface soil. Corresponding Risk Based Concentrations (RBCs) were assigned. These are chemical- and receptor-specific risk based remedial criteria that capture all the exposure assumptions and toxicological data used in the risk assessment. Based on the results of the human health risk assessment, it was determined that remedial actions were to be taken to prevent human exposure via any exposure route (ingestion, inhalation, or dermal contact). Clean up criteria or PRGs were then identified in *Final Action Memorandum for the TNT B Interim Removal Action* (USACE, 2003). Refer to Table 1 on the following page for a list of the COCs and corresponding PRGs.

Table 1--Contaminants of Concern

Contaminants of Concern	PRGs (mg/kg)[1]
Nitroaromatics	
2-amino-4,6-DNT	0.40
4-amino-2,6-DNT	0.40
2,4-DNT	7.50
2,6-DNT	2.75
2-nitrotoluene	74
2,4,6-TNT	3.36
PCBs	
Aroclor 1254	0.16
Aroclor 1260	2.87
PAHs	
Benzo (a) anthracene	5.43
Benzo (a) pyrene	0.54
Benzo (a) fluoranthene	5.43
Dibenz (a,h) anthracene	0.65
Indeno (1,2,3-cd) pyrene	5.43

[1] mg/kg is equal to parts per million (ppm)

3.2 Resource Conservation And Recovery Act

Subtitle C of the Federal Resource Conservation and Recovery Act (RCRA), as amended by the Hazardous and Solid Waste Amendments (HSWA) of 1984, authorizes EPA to regulate the management of hazardous wastes. The designation of a waste as hazardous subjects all those charged with managing that waste to the stringent "cradle-to-grave" requirements of RCRA Subtitle C. It is crucial, therefore, for all those managing wastes to properly identify them and determine whether or not those wastes are in fact "hazardous". There are four kinds of hazardous wastes as defined by Subtitle C of RCRA:

- Solid wastes, which exhibit hazardous characteristics (i.e., ignitability, corrosivity, reactivity, or toxicity).
- Solid wastes specifically listed by the Agency as being hazardous.
- A waste that is considered a declared waste.
- A waste mixed with a known hazardous waste.

The toxicity characteristic identifies wastes that are likely to leach hazardous concentrations of certain toxic contaminants into groundwater under improper storage conditions. The toxicity of a waste can be determined by applying the toxicity characteristic leaching procedure (TCLP), a test designed to simulate the leaching of toxic constituents. Full TCLP analysis (volatiles, semi-volatiles, metals, herbicides, and pesticides) will be performed on all soil and IDW that is to be removed from the project site. Because the requirements of the EPA and RCRA apply to all wastes generated from PBOW, analytical data from the TCLP analysis will be compared to the RCRA regulatory levels for TCLP constituents.

4.0 FIELD ACTIVITIES

4.1 Borrow Area

McTech will mobilize to the borrow site to collect samples of the borrow material for analysis. There are two separate borrow sites that will be used, Kalahari Water Park and Corsos Nursery. Neither borrow site is not located at NASA PBS but is located in close proximity; therefore, access to the NASA PBS site will not be necessary for this sampling event. The borrow areas will be sampled and analyzed to ensure that the borrow material is not contaminated. One sample per 1000 cubic yards of material needed will be collected. It is anticipated that approximately 6,800 cubic yards of borrow soil will be needed to fill the five excavations; therefore, a total of 7 samples will be collected and analyzed. Based upon soil available at each borrow site, 3 samples will be collected from the Kalahari Water Park site and 4 will be collected from the Corsos Nursery site. The samples will be 5 point composite samples, collected using dedicated disposable sampling equipment. The borrow material will be considered appropriate for use in backfill of excavated pits if all chemical constituents are below the PRGs listed in Table 1, Section 3.1 of this plan. Refer to Table 2 in Section 5.1 of this plan for the analytical requirements for the borrow material.

4.2 Storage/Staging Area Preparation

McTech will notify the USACE POC and receive approval of the planned project schedule prior to mobilizing to the NASA PBS site. McTech will set up an office trailer on site to be used by McTech and USACE project personnel throughout the duration of the project.

McTech will begin clearing/grubbing activities for the staging/storage areas. Material grubbed from the staging/storage area will be placed in windrows for wildlife habitat if approved by NASA and USACE. McTech proposes to use two areas for storage/staging. One area is proposed for the storage of clean backfill material and one area is proposed as staging area for nitroaromatic contaminated soils. The storage/staging areas will be constructed using earthen berms, and/or haybales and 6-mil plastic. An excavator and/or backhoe will be used to prepare the storage/staging areas with a minor depression to prevent possible problems with run-off from the areas. After the ground is prepared, 6-mil plastic will be laid down and eathern berms and/or haybales will surround the area with an opening in the front to allow for equipment access. Soils will be covered with plastic, as necessary, to prevent water from storms coming into contact with the stored soils.

Upon confirmation that the borrow soil is appropriate for use, McTech proposes to transport approximately 6800 cubic yards of borrow soil into the site and store it for future use. It is anticipated that it will take five to six days to transport all of the borrow material to the site. Upon completion of the project, all soils will be removed (contaminated soils will be disposed and the backfill material will be placed in the excavations) from the areas and they will be seeded and mulched. The same storage areas will be used during this ISRA as in the initial ISRA.

4.3 Excavation and Disposal of Contaminated Soil

McTech applied for the digging and excavation permit on June 19, 2006. This permits was subsequently approved and issued on July 10, 2006. McTech will use an excavator to remove contaminated soils. As the nitroaromatic contaminated soil is removed, it will be transported to the stockpile area where it will be sampled for waste characterization purposes and stored until full toxicity characteristic leaching procedure (TCLP) analytical data is obtained. Non-hazardous nitroaromatic contaminated soil will be transported to the Erie County Landfill for disposal.

It is not expected that any of the excavated soil will be hazardous; however, if analysis of stockpiled soil indicates hazardous levels, a modification to the SOW will be necessary since it currently does not cover transportation, disposal, stabilization or bioremediation of any hazardous waste soils. McTech would propose to dispose of hazardous soils at a hazardous landfill unless USACE and/or NASA chooses on site stabilization or bioremedation. The selection and procedures for a remediation process cannot be included in this Plan of Operations but, rather in an Addendum, in response to a modification of the SOW.

Refer to Section 5.3 for the parameters to be analyzed for the disposal of the excavated soil. McTech will collect 1-5 point composite sample for waste characterization purposes per 500 tons of excavated contaminated soil. It is anticipated that a total of 33 soil samples will be collected for characterization purposes prior to disposal.

5.0 ANALYTICAL REQUIREMENTS

McTech will use Research Environmental and Industrial Consultants Laboratory of Beaver, West Virginia to perform the analytical testing for the confirmation and waste characterization samples associated with this project. REIC is a USACE certified laboratory. REIC's detection and quanitation limits are based upon their minimum detection limit (MDL) studies and are specific for each media and the instrumentation that is being used. The laboratory will follow the most currently promulgated EPA methods.

5.1 Borrow Area

McTech will collect representative samples of the borrow material and have it analyzed for the parameters listed in Table 2 on the following page. The borrow material will be considered appropriate for use in backfill of excavated pits if all chemical constituents are below the PRGs listed in Table 1, Section 3.1 of this plan.

Table 2—Chemical Analyses of Borrow Material

Analytical Parameter	Number of Samples	Method	Size & Container Type	Preservative	Maximum Holding Time
Target analyte list (TAL) metals	7	SW846/3050B, 6010B, 7471A	1 9-ounce glass	Ice 4°C	28 days for mercury, 6 months for other metals
Herbicides	7	SW846/8081	1 9-ounce glass	Ice 4°C	7 days until extraction, analyze within 40 days of extraction
Pesticides	7	SW846/8151	1 9-ounce glass	Ice 4°C	7 days until extraction, analyze within 40 days of extraction
Volatiles	7	SW846/5035	3 glass vials	2-Sodium Bisulfate; 1-Methanol	14 days
Semi-volatiles	7	SW846/8270C	1 9-ounce glass	Ice 4°C	7 days until extraction, analyze within 40 days of extraction
Polychlorinated biphenyls (PCBs)	7	SW846/8082A	1 4-ounce glass	Cool to 4°C	7 days until extraction; analyze within 40 days of extraction
Total Nitroaromatics	7	SW-846/8330	1 9-ounce glass	Ice 4°C	Extract 7 days Analyze 40 days

5.2 Confirmation Sampling of Excavated Areas

McTech will excavate the five former building locations to the horizontal and vertical limits described in Task 6 of the SOW and reiterated in Section 2.1 of this plan. Once these limits have been reached, the excavation will be considered clean for closure. Confirmation samples are not required as they were taken during the test pit and trench investigation following the intial ISRA. Results and a complete summary can be found in the *Final ISRA TNT B* (WTI, May 2006).

5.3 Waste Characterization

Waste characterization for disposal of the contaminated soil and the investigation derived waste (PPE, field test kit waste, and so forth) is required. TCLP methods will be utilized to characterize the waste from this site. Manifests must be signed by NASA (Bob Lallier for haz or non-haz manifests) or a NASA Representative (i.e., PBOSG, Gary Ponikvar for non-haz only). Holding times for the samples will not be exceeded. Pursuant to the SOW, one sample per 500 tons of contaminated soil will be collected for waste characterization analysis. The table on the following page specifies the analytical method, sample containers, preservation procedure, and holding time requirements for samples collected for this project.

Table 4—Chemical Analysis for Waste Characterization Purposes

Analytical Parameter	*Number of Samples	**Number of QC Samples	Method	Size & Container Type	Preservative	Maximum Holding Time
Contaminated Soil						
Toxicity Characteristic Leaching Procedure (TCLP) metals	33	4	SW846/1311, 6010B, 7471A	250 grams/glass	Ice 4°C	28 days for mercury, 6 months for other metals
TCLP volatiles	33	4	SW846/1311, 8260B	250 grams/glass	Ice 4°C,	14 days
TCLP semi-volatiles	33	4	SW846/1311, 8270C	250 grams/glass	Ice 4°C	7 days until extraction, analyze within 40 days of extraction
TCLP herbicides and pesticides	33	4	SW846/1311, 8081, 8151	250 grams/glass	Ice 4°C	7 days until extraction, analyze within 40 days of extraction
Flashpoint	33	4	SW846/1030	250 grams/glass	Ice 4°C	7 days
pH	33	4	SW846/9045C	250 grams/glass	None required	7 days
Paint Filter	33	4	SW846/9095A	250 grams/glass	None required	7 days
Investigation Derived Waste						
Toxicity Characteristic Leaching Procedure (TCLP) metals	2	0	SW846/1311, 6010B, 7471A	250 grams/glass	Ice 4°C	28 days for mercury, 6 months for other metals
TCLP volatiles	2	0	SW846/1311, 8260B	250 grams/glass	Ice 4°C, no headspace	14 days
TCLP semi-volatiles	2	0	SW846/1311, 8270C	250 grams/glass	Ice 4°C	7 days until extraction, analyze within 40 days of extraction
TCLP herbicides and pesticides	2	0	SW846/1311, 8081, 8151	250 grams/glass	Ice 4°C	7 days until extraction, analyze within 40 days of extraction
Flashpoint	2	0	SW846/1030	250 grams/glass	Ice 4°C	7 days
PH	2	0	SW846/9045C	250 grams/glass	None required	7 days

*The number of samples was estimated based on one sample per every 500 ton excavated. The number of IDW samples was estimated based upon IDW generation from the initial ISRA. **The number of QC samples is approximately 10% of total number of samples.

6.0 EQUIPMENT DECONTAMINATION

Stainless steel sampling spoons/trowels, a stainless steel mixing bowl, and a backhoe bucket will be used for sampling. Laboratory equipment (pipets, cuvettes, beakers, and so forth), as appropriate, associated with the field screening will be decontaminated. Also, the stainless steel sampling spoons/trowels, mixing bowl, and backhoe bucket will require decontamination. Stainless steel or disposable sampling spoons/trowels will be used to collect samples from the backhoe bucket for the field screening tests and the confirmation sampling.

All non-disposable sampling equipment will be thoroughly cleaned. Decontamination of all of the sampling equipment will be accomplished prior to and between sampling. All decontamination activities for the backhoe bucket will be set up at a temporary decontamination pad. The steps of the decontamination process for the backhoe bucket will be as follows:

- Brush off the backhoe bucket to remove gross contamination
- Wash equipment with soap and water

- Rinse equipment with distilled water

Refer to Table 5 for general decontamination procedures for sampling equipment that will be reused at the site.

Table 6--Decontamination Procedures

Parameter[1]	Detergent Wash	Tap Water Rinse	Inorganic Desorbing Agents	Tap Water Rinse	Organic Desorbing Agents	Deionized Water Rinse	Air Dry
Nitroaromatics	yes	yes	no	no	Hexane	yes	yes

1 No inorganic desorbing agents (hydrochloric acid or nitric acid) will be used for the Total/TCLP metals since we are not looking for trace levels and we will use stainless steel or disposable sampling equipment.

In cases of gross contamination on sampling equipment, a tap water wash may first be performed to remove clumps of dirt in order to make the detergent wash more effective. The detergent wash will be a non-phosphate detergent solution, which will be used with brushing or circulating techniques to remove gross contamination. Potable tap water will be used as a rinse for the equipment. A solvent rinse using hexane will be used as an organic desorbing agent. The analytical laboratory performing the analysis will be consulted prior to sampling to ensure that decontamination procedures do not affect the subsequent analysis. It is recommended that all solvent rinses be made from an appropriate grade of chemical, such as pesticide or purge-and-trap grade quality. A triple rinse with deionized organic-free water will follow all other decontamination reagents.

All rinsates will be collected and properly disposed. Collection will occur in one of the designated decontamination areas. There will be one main decontamination area located by the stockpile area. It will be constructed using and earthen berm and lined with plastic. A second decontamination area will be transportable (kiddie swimming pool or equivelant) between office trailer site and each excavation area as necessary. Drums, buckets, water, detergent, and brushes will be located in the work area. Drums will be available for containerizing the decontamination waste. A pump will be available to transfer decontamination liquids to the drums.

6.1 Investigation Derived Waste

Investigation Derived Waste (IDW) (PPE, decontamination liquids, waste from field test kits, and all waste/media generated from the investigation activities) from the site will be disposed in accordance with this Plan of Operations and in compliance with EPA's off-site disposal policy, RCRA regulations including the RCRA land disposal restrictions for on-site and off-site waste disposal, and the Department of Transportation's (DOT) regulations. McTech will arrange for all services necessary for transport and disposal of the waste at an appropriate disposal facility. Analysis of the waste will be performed to identify potential hazardous constituents prior to disposal. Personnel will adhere to the safety procedures as outlined in the Site-Specific Safety and Health Plan. Personnel will wear, at a minimum, Level D PPE when performing waste sampling activities. Representative samples of the IDW will be collected for characterization prior to disposal and analyzed for the parameters shown in Table 4 of Section 5.3 of this plan.

Flammable or other known hazardous waste will be segregated and stored seperately. Waste will not be stored on site longer than 90 consecutive days. Waste from this site will not be combined with waste from another site. All waste will be transported in containers meeting DOT specifications. All drums/containers will be labeled with the project name, contents, and collection start date.

Non-hazardous liquid waste will be managed by C&K Industrial Services, Inc. and non-hazardous solid waste may be disposed at Erie County Landfill. All hazardous IDW will be transported to an appropriate disposal facility (EQ Environmental in Michigan) by Enviroserve, a licensed hazardous waste transporter.

McTech will be responsible for laboratory analyses and proper disposal of the IDW in accordance with applicable state and federal laws. Prior to disposal, manifests must be signed by NASA (Bob Lallier for haz or non-haz manifests) or a NASA Representative (i.e., PBOSG, Gary Ponikvar for non-haz only). McTech will provide the USACE with the following documentation concerning the disposal of all IDW from the site:

- Laboratory analysis
- Copies of waste profiles which include land disposal restriction notifications
- Signed manifests (hazardous and non-hazardous)
- Weigh slips for bulk transport

7. 0 FIELD DOCUMENTATION PROCEDURES

The following sections outline the standard practices and procedures for proper documentation of activities for this project. Standard documentation required on all USACE projects, including daily reports and field logs will be completed by the Project Manager.

7.1 Field Logbook/Field Activity Forms

A bound notebook will be maintained by the field crew to provide daily records of significant events, observations, and measurements during field investigations. In addition, field records will be maintained regarding the various aspects of the sampling. All pertinent information regarding the site and sampling procedures must be documented in indelible ink. Notations should be made in logbook fashion, noting the time and date of all entries. The field records should include the following information:

- Site Location
- Project Number or Work Order Authorization
- Name and title of author
- Names and responsibilities of field personnel on site
- Names and titles of site visitors
- Sampling location and number of samples taken
- Sample description (color, odor etc.)
- Sample collection method and sample preservation methods
- Sample ID numbers

- Dates and times
- Matrix of sample
- Photograph logs
- Sampling changes, modifications or change orders
- Weather conditions
- Other applicable comments

7.2 Photographs

Photographs will be taken of all site activities. For each photograph taken, the following items should be noted in the field logbook:

- Date and time
- Photographer (signature)
- Name of site/Project number
- General direction faced and description of the subject taken

7.3 Sample Identification Labeling

All sampling will be done in accordance with USEPA protocol. Sample labels are required to properly identify the samples. All samples will be labeled in the field and care will be taken to assure that each sample container is properly labeled. The samples will be placed in sealed plastic bags to prevent the labels from soaking off or becoming illegible from exposure to water during transport to the laboratory. Labels will contain the following information:

- Site location and project number
- Sample Identification number assigned sequentially as described below
- Description of the sample
- Time and date sample was taken
- Notation of whether preservatives were added to the sample and type of preservative
- Type of sample (such as a grab or composite)
- Type of analysis requested

All field documentation should be done in indelible ink. Errors in field sampling documents will be corrected by drawing a single line through the error, writing in the correction, and initialing and dating. Sample numbers should be assigned sequentially and include the project number and former building location number from which the soil was excavated. For example: 200609M412-001, 200609M412-002 and 200609MNENH-001, 200609MNENH-002 and so on.

7.4 Chain-of-Custody

Chain-of-custody procedures provide documentation of the handling of each sample from the time it is collected until analysis is completed. Chain-of-custody procedures are implemented so that a record of sample collection, transfer of samples between personnel, sample shipping, and receipt by laboratory that will analyze the sample is maintained. The chain-of-custody record serves as a legal record of possession of the sample. To simplify records and eliminate potential litigation problems, as few people as possible should handle the samples during the

investigation. A sample is considered to be under custody if one or more of the following criteria are met:

- The sample is in the sampler's possession.
- The sample is in the sampler's view after being in possession.
- The sample was in the sampler's possession and then was locked up to prevent tampering.
- The sample is in a designated secure area.

A chain-of-custody should be filled out on-site and will include the following information:

- Project number
- Project manager
- Site location
- Client contact
- Description of the sample
- Time and date sample was taken
- Notation of whether preservatives were added to the sample
- Type of preservative
- Type of sample such as a grab or composite
- Matrix of sample
- Amount of sample being transported to the laboratory
- Sample number or ID assigned in the field
- The appropriate analytical parameters to be tested
- Seals will be placed on each sample container (except VOCs)
- Any other information that the sampler feels is pertinent to the analysis of the sample(s).

The sampler must sign the chain-of-custody and all sample containers will be transported with a chain-of-custody form. Shipping containers will be sealed for shipment to the laboratory. The original chain-of-custody form will accompany the shipment and McTech will retain copies. A sample chain-of-custody form is located in Appendix C.

7.5 Corrections to Documentation

All original data recorded in field logbooks, on sample labels, and chain-of-custody records are to be written in indelible ink. If an error is made on any document related to this project, corrections should be made by drawing a single line through the error and entering the correct information. The erroneous information will not be obliterated. Any error discovered on a document should be corrected by the person who made the entry. All corrections will be initialed and dated.

8.0 SAMPLE PACKING AND TRANSPORTATION

The following are procedures for packaging and shipping of samples for this project:

- All containers, except the VOC vials, will be taped shut.
- All samples will be chilled immediately after collection.

- Each sample container will be placed in a separate plastic bag and sealed. As much air, as possible will be squeezed from the bag prior to sealing. Sample containers and bags will be sealed with evidence tape or custody seals.
- A picnic cooler will be used as the shipping container. In preparation for shipping samples, the drain plug on the cooler will be taped shut from the inside and outside, and a large plastic bag will be used as a liner for the cooler. Inert packing material will be placed in the bottom of the liner.
- The sample containers will be placed upright in the lined picnic cooler in such a way that they do not touch and will not touch during shipping.
- All samples will be shipped to the laboratory on ice and chilled to 4 °C.
- Plastic ice packs or ice placed in double plastic bags will be placed around, among, and on top of the sample containers.
- The paperwork going to the laboratory will be placed inside a sealed plastic bag, which will be taped to the inside lid of the cooler.
- The cooler will be taped shut with strapping tape.
- At least two signed custody seals will be placed on the cooler lid (one in front, the other on the side).

9.0 MCTECH CORP CHEMICAL QUALITY CONTROL

9.1 Data Quality Objectives

The process of generating useful chemical data of acceptable quality begins with determining what the objectives of collecting the data are, and what decisions will be made based on the data that is generated. Next, the actual type of data that is required to meet these objectives is determined, along with the appropriate data collection methodologies and quality control procedures. The methodologies for collecting quality data must be consistent with accepted practices and standard operating procedures that have been developed for the specific type of data collection to insure quality chemical data. Generally, these steps have been predetermined by the USACE for this project and are delineated in the SOW.

Quality controls are incorporated into both the sample collection and analytical procedures. Quality controls utilized in sample collection include, but are not limited to, following the approved plans and procedures for sample collection, proper documentation of sample collection activities and site conditions, reporting and resolving any problems during sampling activities, and proper handling, preserving, packaging, and shipment of samples. In addition, quality control samples (duplicates and trip blanks) are collected to check the accuracy, completeness, precision, and comparability of the actual field samples. The contract analytical laboratory will follow its internal quality control procedures to insure analytical data quality. The laboratory will use the precision, accuracy, representativeness, completeness, comparability, and sensitivity (PARCCS) defined below to insure that their internal quality control objectives have been successfully met.

After the samples have been analyzed and the data reports have been generated, the resulting data will be reviewed, and compared. To assess the quality of the field activities, quality control samples (i.e. duplicates, trip blanks, matrix spikes) will be evaluated for completeness and duplicate relative percent differences (RPDs). The calculation of RPDs from field sample and

field duplicate sample data indicates the precision of the sampling efforts as well as the sample media. RPDs are calculated by the following equation:

$$RPD = (C_f - C_d)/\{(C_f + C_d)/2\} X\ 100$$

Where C_f is the concentration of the compound found in the field sample and C_d is the concentration of the compound found in the field duplicate (QC) sample. The RPDs should equal 35% or lower for soils to indicate homogeneity of the sample and the reproducibility of the analytical data (a measure of precision). If the data does not meet the desired RPDs it may be necessary to re-analyze the samples in question, or re-sample if problems cannot be resolved. Decisions to re-analyze or to re-sample will be made with the joint input of the USACE, McTech, and the contract laboratory. In this process the PARCCS of the data will be evaluated and a joint determination of the data quality will be made accordingly.

Once all data has been received and analyzed in accordance with the above requirements, the results and recommendations will be forwarded onto USACE. The USACE will then use this information to make decisions regarding specific properties as they relate to project implementation.

The laboratory will use the following PARCCS to insure that their internal quality control objectives have been successfully met.

- Accuracy: This is the degree to which a measurement agrees with the actual value. The accuracy of an analytical procedure is determined by addition of a known amount of spike standard to a field sample matrix or a laboratory control matrix.

- Precision: This is a measure of the degree of reproducibility of an analytical value and it is used as a check of the quality of the sampling and analytical procedures. Precision is determined by analyzing replicate samples. Duplicate samples will be collected in the field for this project.

- Completeness: Completeness is a measure of the amount of the data obtained from a measurement system compared to the amount that was expected to be obtained under normal conditions. The minimum level of completeness expected is 95% for each analytical method requested. This level is met in the laboratory by ensuring proper sample extraction procedures. This level is met in the field by collecting enough sample that the laboratory has an ample amount in case they need to reanalyze the sample.

- Representativeness: Representativeness expresses the degree to which sample data accurately and precisely represents actual conditions. Representativeness is a qualitative determination. The representativeness objective of the quality assurance program is to eliminate conditions that may result in non-representative data.

Maintaining sample integrity is of the utmost importance.

- Comparability: Comparability is the confidence with which one data set can be compared with another. When traceable standards and standard methodology are used, the analytical results can be compared to other laboratories with similar operating procedures. Quality Assurance samples will not be collected for this project.

All field activities will be performed in accordance with the protocols outlined in this Plan of Operations. Samples will be kept in ice filled coolers until they are shipped via overnight express or hand delivered to the laboratory.

9.2 Lab Quality Assurance for Chemical Data Measurement

The overall Quality Assurance (QA) objective is to ensure that data of known and acceptable quality is generated from both field and laboratory activities. REIC will be responsible for ensuring that their personnel adhere to their laboratory Quality Assurance Plan (QAP). The number and types of internal QC checks for each analytical method are defined in the laboratory's QAP, which is contained in Appendix D. The laboratory must follow the quality objectives for precision, accuracy, representativeness, comparability, completeness, and method detection limits as set forth in their laboratory QAP.

All data generated from the chemical analysis will be reported in accordance with the Scope of Work. Any sample failing the method or laboratory quality control limit may be re-analyzed. The analytical laboratory, McTech, and the USACE will jointly make the decision regarding re-analysis. Internal QC results should include information about agreement between replicate analyses, spike and surrogate recoveries.

The Remedial Action Summary Report will include analytical results and a Level 2 Quality Control data report from the laboratory. The Level 2 data package will include the following:

- Case Narrative-Information should include number and type of samples received, analysis of those samples, any problems that occurred, whether quality control was within acceptable limits, etc.
- Analytical Report-Summary of all sample analysis information including surrogates for organic methods. Detection limits/reporting limits will be included
- Chain-of-custody
- Summary of Quality Control-A summary will be included of all quality control specific to the project. This may include method reagent blanks, midlevel calibration checks, spike and spike duplicates. All QC will include acceptance criteria and relative percent data where applicable.

9.3 Field Quality Control for Chemical Data Measurement

Field quality control is as vital to a project as is quality control within the laboratory. Proper execution of each project task is needed in order to yield consistent reliable information that is representative of the media and conditions being measured. The overall quality assurance

objective is to ensure that data of known quality is generated so that it will be useful in meeting the intended project objectives. The On-site Project Manager will be responsible for seeing that field personnel (McTech and subcontractors) adhere to McTech's QCP.

QC field oversight checklists to be used for field activities are provided in Appendix C as well as in the QCP. The field oversight checklists should be completed for each project site. The On-site Project Manager will provide an explanation on the QC field oversight sheets for any items that he marks were not completed. The On-site Project Manager will review the following items with the field crew prior to beginning on-site operations.

- Scope of Work
- Contents of this Plan of Operations
- Contents of Site-Specific Safety and Health Plan
- Contents of Quality Control Plan
- Field equipment to be used at project sites
- Sample collection equipment
- Labeling for sample containers
- Chain-of-custody forms
- Laboratory information
- Proper preservation methods for samples
- Proper packaging and shipping procedures for samples
- Proper equipment decontamination procedures
- Proper use of field screening and/or field monitoring equipment

10.0 DAILY QUALITY CONTROL REPORTS

During the field investigation and excavation activities, daily Quality Control Reports (QCR) will be prepared daily, dated, and signed by the On-site Project Manager or the QC Officer. McTech will utilize the USACE QCR Report Form (see Appendix C). The following information will be recorded on the QCR:

- Weather information
- Field instrument measurements
- Departures from the approved plans (any deviation that may affect data quality objectives must be conveyed to the USACE immediately)
- Personnel on-site and their job activities
- Any problems encountered
- Instructions from government personnel
- Field photo descriptions

11.0 CORRECTIVE ACTION

Corrective action measures may be required to be taken in the event a discrepancy is discovered in the field, during an audit, and/or the laboratory discovers a discrepancy or problem.

Laboratory discrepancies, unrelated to field procedures, will be addressed by the laboratory's personnel and will be corrected in accordance with their QAP.

Any deviations from the approved plans will be fully documented. The USACE Contracting Officer's Representative (COR) will be notified if deviations from the approved plans are necessary. The USACE COR must approve the deviation prior to proceeding with the deviation. Deviations from the plans that compromise data quality or personnel safety will not be allowed.

12.0 SPILL PREVENTION, CONTAINMENT, AND COUNTERMEASURE

Although a formal Spill Prevention, Containment and Countermeasue (SPCC) Plan is not required for the ISRA McTech is performing on this site, it is important to ensure that the area is secured and that the situation is assessed quickly. Ventilation, vapor suppression, and dust suppression may be required prior to cleaning up a site. Trained personnel will clean up spills quickly unless safety reasons prevent it. All of McTech's personnel on-site have been trained in emergency response and clean-up operations. The Project Manager will immediately inform the USACE and NASA POCs of any spills, regardless of the spill location. Additionally, it may be appropriate to contact the Ohio EPA, Northeast District Office (330-963-1200) and the National Response Center after contacting the USACE and NASA POCs.

12.1 Potential Spills

Potential sources for spills on this project are:

- Spills or leaks of decontamination liquids from equipment decontamination activities.
- Spills or leaks of decontamination liquids from personnel decontamination activities.
- Petroleum leaks from trucks or heavy equipment used at the site.
- Spills of chemicals (acetone, nitric acid, Tornado-50 cleaner, hexane) used on site. It should be noted that only small amounts (1-2 gallons each) of acetone, nitric acid, Tornado-50 cleaner, and hexane will be used on-site.

Material Data Safety Sheets (MSDS) for the products that may be brought onsite will be posted at the site. Chemicals/petroleum products will not be stored onsite without a current MSDS being provided and kept onsite. At this time, McTech does not intend to store diesel, motor oil, antifreeze, or any other petroleum product on-site. The following is a list of the materials anticipated to be stored on-site.

- Acetone
- Tornado-50 cleaner
- Hexane
- Dilute nitric acid
- PPE and small amounts of lab waste (less than 5 gallons of lab waste)

12.2 Spill Prevention

This plan represents a written commitment by McTech to supply the manpower, equipment, and materials required to expeditiously control and remove any potential harmful spills that may occur at the NASA PBS site due to project activities. The following are spill prevention procedures that will be implemented at the site:

- All drums used to store liquids that would be harmful to the environment if spilled will be checked on a weekly basis. The drums should be stored on a pallet for ease of transportation. The On-site Project Manager will perform the weekly inspections.
- Heavy equipment (trucks, excavators, etc.) will be inspected weekly prior to use to ensure that they are not leaking. A copy of the inspection form can be found in Appendix C of the SSHP.
- A secure area will be used for the storage of decontamination fluids.
- Personnel will be instructed as to their particular requirements as described in this Spill Control Plan

12.3 Spill Response

In the event of a spill or a leak, site personnel will:

- Inform the Project Manager, Kimberlie Chambers immediately. Ms. Chambers will then immediately inform the USACE of any spills, regardless of the spill location and/or amount. In the event that the Project Manager is not on-site the On-site Project Manager will be informed of any spills.
- All nonessential personnel will be cleared from the area. Personnel trained in emergency response and spill control measures will be utilized to contain any spillage of materials.
- Personnel will isolate the area.
- If spill occurs outside of the exclusion (hot) zone, then personnel must designate the spill area as an exclusion zone to limit potential exposure to onsite personnel.
- Trained personnel will attempt to locate the source of the spillage and stop the flow if it can be done safely.
- Trained personnel will begin containment and recovery of the spilled materials.
- PPE required during spill response for this project will at a minimum be Level D PPE. Level C or higher PPE may be used if spill conditions so warrant.
- Spill clean up will be performed only by personnel who are trained with spill response procedures.
- Material safety data sheets (MSDS) will be posted for any potential hazardous materials that are expected to be encountered or used.
- Spills will be reported to the USACE and NASA POCs. If the spilled material reaches any navigable body of water, the Ohio EPA, Northeast District Office (330) 963-1200 and the National Response Center (800) 424-8802 may be notified.
- Fire extinguishers will be available on-site and ready for use.
- Eye wash will be available on-site and ready for use.
- This Spill Control Plan will be posted at the site

12.4 Spill Containment

Spill containment equipment will be located on-site. Materials used for cleanup will be placed in drums for proper disposal according to appropriate state and federal regulations. Spill containment material that will be on-site is:

- Absorbent pads, booms, or rolls (sufficient number to absorb a minimum of 200 gallons of spilled liquids).
- Drums containing IDW waste or other materials will be stored within in a lined dike area capable of containing any spills or leaks.
- Fluorescent marking tape and/or orange construction fence.

The following are requirements for handling drummed materials on-site:

- All drums and containers used will meet DOT, OSHA, and EPA regulations for the waste that they contain.
- Drums and containers will be inspected and their integrity assured prior to being moved. Drums or containers that cannot be inspected before being moved because of storage conditions, will be positioned in an accessible location and inspected prior to further handling.
- Operations for the site will be organized so as to minimize the amount of drum or container movement.
- Employees involved in the drum container operations will be warned of the hazards associated with the containers.
- Where spills, leaks or ruptures may occur, adequate quantities of spill containment equipment (absorbent, pillows, etc.) will be stationed in the immediate area.
- Drums or containers that cannot be moved without failure will be emptied into a structurally sound container.

12.5 Spill Reporting

McTech personnel are to immediately report any imminent or actual spills to the McTech Project Manager and/or On-site Project Manager. The Project Manager/On-site Project Manager will then report immediately to the USACE POC and NASA POC. The USACE POC will report the information to any regulatory agencies or authorize the Project Manager to do so if the spill amount is reportable. If appropriate, the Ohio EPA, Northeast District Office (330) 963-1200 and the National Response Center (800) 424-8802 may be notified. Reportable Quantities of spilled material will be posted in the office trailer. It is of great importance for personnel to gather the following information if they encounter an imminent or actual spill.

- The location of the release or imminent release.
- The name and quantity of the material involved, to the extent known.
- The possible source or cause of the release.
- The date and time of the release.
- A description of any emergency response actions taken or currently being taken by others.

After the cleanup of a spill, the Project Manager will investigate to determine the possible cause of the spill. The Project Manager will implement corrective actions to prevent a reoccurrence of the spill.

12.6 Contingency

In the event that on-site field personnel cannot handle the spill, NASA and McTech will dispatch their Emergency Response Teams. The Emergency Response Teams have been trained and have sufficient equipment to perform spill clean up for this project.

13.0 PROTECTION OF RIVERS, STREAMS, AND IMPOUNDMENTS

13.1 Erosion and Silt Control

McTech will exercise every reasonable precaution throughout the life of the project to prevent silting of ditches and streams at the site. Erosion and silt control measures will include, but are not limited to, the following:

- Prior to suspension of excavation operations for any appreciable length of time, McTech will shape the top of earthwork in such a manner as to permit the runoff of rainwater and construct earth berms along the top edges of embankments to intercept runoff water. The berm construction will not be permitted to decrease the stability of the embankment section. In addition, silt fence and straw bales may also be used to prevent erosion from runoff water.
- Preventive measures taken to adequately control any run-off or run-on of water to excavation areas or to the storage/staging areas. Should such preventive measures fail and an appreciable amount of material begins to erode into a waterway, McTech will act immediately to bring the silt under control.
- All excavated soil will be deposited in stockpile areas to prevent any contamination from migrating to waterways or washing away by high water or runoff.
- Diversion ditches will be constructed around areas where running or standing water is present.

14.0 AIR EMISSION CONTROLS

If necessary, water will be used for dust control in areas of excavation and on haul roads. A water truck will remain on site for the duration of the project. The Project Manager/On-site Project Manager and the QC Officer will make visual observations of dust levels to determine if water suppression is necessary and/or working.

15.0 PROJECT SCHEDULE

McTech will furnish originals and copies of the work plans and response to comments in the quantities below. A written response to all comments will also be prepared by McTech and included in the final submittal document. Submittals are as follows:

- Draft and Final Addendums to the QCP, SSHP and Plan of Operations – 7 draft and 7 final copies of each plan to USACE
- Draft and Final Interim Soil Removal Action Report – 7 draft and 7 final copies to USACE

Addresses for submittals:

U.S. Army Corps of Engineers
Huntington District
502 Eighth Street
Huntington, WV 25701-2070
ATTN: CELRH-EC-CE (Lisa A. Humphreys)

Due Dates, McTech Corp Submittals and Action Items

McTech Corp Submittals / Action Items	No. Days
Notice to Proceed	0
Submission of Draft QCP, SSHP and Plan of Operations	20 Days after NTP
Submission of Final QCP, SSHP and Plan of Operations	30 Days after NTP
Submission of Draft ISRA Report	120 days after NTP
Submission of Final ISRA Report	30 days following receipt of comments to Draft ISRA

16.0 REFERENCES

The following reference materials were used in compiling the information contained in this Plan of Operations and/or will be used in other documents associated with this project.

EM-200-1-3, "*Requirements for the Preparation of Sampling and Analysis Plans,*" U.S. Army Corps of Engineers, February 2001

EM-200-1-6, "*Chemical Quality Assurance for Hazardous, Toxic and Radioactive Waste Projects (HTRW),*" U.S. Army Corps of Engineers, October 1997

ER-1110-1-263, "*Chemical Data Quality Management for Hazardous Waste Remedial Activities,*" U.S. Army Corps of Engineers, April 1998

CELRHR 5-2-7, "*Quality Management Plan,*" U.S. Army Corps of Engineers, May, 1999

ER 385-1-92, "*Safety and Health Document Requirements,*" U.S. Army Corps of Engineers, March 1994

EM 385-1-1, "*Safety and Health Requirements Manual,*" U.S. Army Corps of Engineers, September 1996

EM 200-1-2, "*Technical Project Planning Process*," U.S. Army Corps of Engineers, August 1998

EM 200-1-1, "*Validation of Analytical Chemistry Labs*," U.S. Army Corps of Engineers, July 1994

ER 1165-2-132, "*HTRW Guidance for Civil Works Projects*," U.S. Army Corps of Engineers, June 1992

TNT Area B Remedial Investigation, Former Plum Brook Ordnance Works, Sandusky, Ohio, Volume I – Final Report of Findings, IT Corporation, USACE, August 2000.

TNT Area B Remedial Investigation, Former Plum Brook Ordnance Works, Sandusky, Ohio, Volume IV – Final Feasibility Study, IT Corporation, USACE, July 2001.

Final TNT Area B Action Memorandum, Former Plum Brook Ordnance Works, Sandusky, Ohio, USACE, 2003

Final Interim Soil Removal Action Report, Former Plum Brook Ordnance Works, Sandusky, Ohio, WTI, May 2006

Appendix A Scope of Work

Revised Final Scope of Work for the
Interim Soil Removal Action Continuation
Plum Brook Ordnance Works - TNT Area B
Sandusky, Ohio
Contract No. W91237-05-D-0015, Work Order No._8
March 2006

1.0 Introduction.

The purpose of this Scope of Work is for the continuation of a Non-time Critical Removal Action within TNT Area B of the Plum Brook Ordnance Works (PBOW) Project. The United States Army Corps of Engineers (USACE) is the responsible authority under the Defense Environmental Restoration Program (DERP) at the former TNTB. Based on the results of the completed Remedial Investigation/Feasibility Study (RI/FS) for soils, the USACE will continue a Non-Time Critical Removal Action (NTCRA) in TNT Area B. The removal action will be taken to prevent human exposure to site soil containing any of the 12 constituents of concern (COCs) at concentrations that exceed remediation goals. The remediation goals are chemical- and receptor-specific risk based remedial criteria that capture all the exposure assumptions and toxicological data used in the risk assessment. The removal action will consist of the excavation of 5 areas totaling approximately 6,718 cubic yards of material, backfilling of the excavation pit with clean material, ex-situ stabilization of the excavated material (if needed), and off-site disposal of stabilized waste.

1.1 Site History and Location.

The site of the former Plum Brook Ordnance Works (PBOW) is located approximately 4 miles south of Sandusky, Ohio and 59 miles west of Cleveland, Ohio. Although primarily in Perkins and Oxford Townships, the eastern edge of the site extends into Huron and Milan Townships. PBOW is bounded on the north by Bogart Road, on the south by Mason Road, on the west by County Road 43, and on the east by U.S. Highway 250. The surrounding area is mostly agricultural and residential.

The 9,009-acre PBOW site was built in early 1941 as a manufacturing plant for 2,4,6-trinitrotoluene (TNT), dinitrotoluene (DNT), and pentolite. Production of explosives at PBOW began in December 1941 and continued until 1945. It is estimated that more than 1 billion pounds of nitroaromatic explosives were manufactured during the 4-year operating period. The three explosive manufacturing areas were designated TNT Area A (TNTA), TNT Area B (TNTB), and TNT Area C (TNTC). Twelve process lines were used in the manufacture of TNT, four lines at TNTA, three lines at TNTB, and five lines at TNTC. This SOW deals primarily with the TNTB area.

The TNTB manufacturing site consisted of widely scattered buildings of wood frame construction with asbestos and sheet metal coverings. It also included a series of buried

and/or overhead flumes and pipes used to transport various liquids associated with the manufacturing process.

After plant operations ceased, TNTB's manufacturing lines were decontaminated by the War Department in late 1945. During decontamination, all structures, equipment, and manufacturing debris were either removed and salvaged or removed and burned. After decontamination the property was initially transferred to the Ordnance Department, then to the War Assets Administration after it was certified by the U.S. Army to be decontaminated. In 1949, PBOW was transferred to the General Services Administration (GSA). In 1955, GSA completed further decontamination of TNTB. This effort supposedly focused on surface contamination detected by visual inspection. It is unknown whether the underground flumes were addressed by this decontamination effort.

The National Aeronautics and Space Administration (NASA) acquired the property on March 15, 1963 and currently utilizes the site. GSA performed further decontamination efforts during 1963 to facilitate this transfer. The decontamination process included removing contaminated surface soils above the drain tiles, flumes, etc., destruction of all buildings by fire, then removal of all soil, debris, sumps, and concrete foundations. All materials, including the soil in those areas, were flashed; the area was then rough graded. The decontamination process also included the burning of excavated nitroaromatic-filled flumes.

NASA currently operates the Plum Brook Station (PBS) of the John Glenn Research Center at Lewis Field. Most of the aerospace testing facilities built in the 1960s at the site are in standby or inactive status. On April 18, 1978, NASA declared approximately 2,152 acres of PBOW as excess. The Perkins Township Board of Education acquired 46 acres of the excess acreage and uses this area as a bus transportation area. GSA retains ownership of the remaining excessed acreage and currently has a use agreement with the Ohio National Guard for 604 acres of this land. NASA presently controls approximately 6,400 acres and is using the site to conduct space research as a satellite operation of the John Glenn Research Center at Lewis Field in Cleveland, Ohio. The details of land transactions are listed in the site management plan (ICI, 1995) and can be found at the NASA PBS.

TNTB consists of an area of approximately 55 acres at the south-central portion of PBOW immediately north of West Scheid Road. Significant evidence of former PBOW facilities exist at TNTB in the form of roads, hydrants, and ditches; all buildings and structures associated with the manufacturing process have been demolished and removed. Two NASA facilities are present at the site and are currently active for research purposes, the Hypersonic Tunnel Facility (HTF) and Nitrogen Dewar Tanks. The HTF is located in the northwest portion of TNTB and consists of a single building, above and below ground piping and utilities, and paved parking areas. The Nitrogen Dewar Tanks are located in the center of TNTB with aboveground piping and underground utilities leading to the northwest, toward HTF, and to the northeast, offsite.

To date, 8 of the 13 areas proposed for soil removal have been completed. However, due to the extensive contamination found beyond the Feasibility Study limits, complete soil removal of the remaining 5 areas were not possible due to funding constraints. Currently, funding has become available to complete the remaining 5 areas and that is what this Work Order will cover.

1.2 Proposed Action Description

To provide a basis for taking further action at this site, an initial Interim Soil Removal Action (ISRA) was conducted by WTI to address the 13 areas identified. This report addressed each of the 13 areas identified in the TNT B RI/FS as requiring excavation, possible stabilization and final disposal. Results from the initial ISRA showed that the excavation limits identified in the TNT B FS were greatly exceeded on a majority of the areas. Therefore, due to funding constraints, complete excavation of the contaminated areas was not possible. To date, only 8 of the 13 areas have been completed. Currently, due to additional funding constraints for this fiscal year, USACE has been able to fund the 5 remaining areas for additional excavation and disposal. Excavations for these areas are based on the horizontal / vertical contamination limits identified during the trenching / test pitting investigation efforts conducted by WTI after the initial ISRA was completed. The findings for each of the 13 areas are detailed in the Final ISRA for TNT B, dated February 2006. This report should be used in conjunction with the continued ISRA for the 5 remaining areas.

The proposed approach for this continued ISRA is to excavate the 5 areas (buildings 412, 452, 456, 463 and North East Nail House) to the limits identified in the Final ISRA TNT B dated February 2006. These limits will excavate the soil that contains concentrations of the COCs that exceed the PRGs identified in the RI/FS. The estimated volume of contaminated soil from these areas is 6,718 cubic yards. Once these excavations are complete, these 5 areas will be assumed "clean" and not require additional excavation. The volumes for these areas were made based on the test pits and sampling (from both field screening and lab confirmation) to confirm when vertical and horizontal contamination limits below the COCs were reached. Based on the analytical results from test pits excavated within the contaminated limits, it is assumed that the soil being removed will not be hazardous and therefore, not require stabilization / treatment nor hazardous disposal, but can be disposed of at a non-hazardous landfill. Based on previous excavations, the soil may possibly be used for daily cover at the landfill. Once the soil has been excavated, it will be stockpiled in the area used during the initial ISRA efforts and sampled (based on the landfill requirements of 1 sample per every 500 CYs) for disposal. The stockpiled soil shall be placed on a 6-mil plastic liner so as not to allow possible migration of contaminants into the ground. The stockpile shall also be covered completely with 6-mil plastic liner to eliminate rain-fall run-off issues that may allow for migration of contaminants.

Field screening efforts shall be used to verify the "clean" limits of the 5 areas as well as prior to sampling of the stockpiled soil. Although the "clean" limits have been established in the initial ISRA report, use of field screening tests will aid in verifying the

excavated walls are still "clean" as well as aiding the laboratory to determine a "hot" sample from the stockpiled material is not being submitted.

Here are the PRG levels that were approved for project clean-up:

Chemical of Concern	PRGs (mg/kg)
Nitroaromatics	
2-amino-4,6-DNT	0.40
4-amino-2,6-DNT	0.40
2,4-DNT	7.50
2,6-DNT	2.75
2-Nitrotoluene	74
2,4,6-TNT	3.36
Polychlorinated Biphenyls	
Aroclor 1254	0.16
Aroclor 1260	2.87
Polynuclear Aromatic Hydrocarbons	
Benzo(a)anthracene	5.43
Benzo(a)pyrene	0.54
Benzo(a)fluoranthene	5.43
Dibenz(a,h)anthracene	0.65
Indeno(1,2,3-cd)pyrene	5.43

Once the areas have been excavated, clean fill material will be placed in the excavation pits, rough graded as necessary to achieve proper drainage, and reseeded.

2.0 Objectives.

The Contractor shall provide all equipment, labor, materials and supervision necessary for the remediation of the TNT Area B site. Remediation activities consist of excavation, stabilization (if necessary) and disposal of contaminated soil and backfill with clean material. Overall, this work shall consist of the following tasks:

Task 1	Preparation/Submittal of an Addendum to the original ISRA Site-Specific Safety and Health Plan (SSHP)
Task 2	Preparation/Submittal of an Addendum to the original ISRA Quality Control Plan (QCP)
Task 3	Preparation/Submission of an Addendum to the original ISRA Plan of Operations
Task 4	Field Activities/Utilities

Task 5	Site Survey
Task 6	Excavation
Task 7	Disposal/IDW
Task 8	Confirmation by Field Screening Tests
Task 9	Preparation/Submission of Draft and Final ISRA Report
Task 10	Meeting Support

3.0 Tasks. The tasks outlined in Section 2.0 are described in detail in the following sections of this Scope of Work (SOW). This work shall be conducted by the Contractor in an environmentally acceptable manner conforming to existing federal, state, and local regulations under US Army Corps of Engineers (USACE)/Huntington District (CELRH) supervision.

3.1 (Task 1) Preparation and Submission of an Addendum to the original ISRA Safety and Health Plan (SSHP)

An SSHP has already been approved for the original ISRA efforts as well as the trenching / test pit activities that followed. Therefore, the Contractor shall prepare an Addendum to the SSHP that covers / updates the field activities planned for the 3 areas. As always, the plan shall comply with the requirements of the U.S. Army Corps of Engineers, Safety and Health Requirements Manual, EM 385-1-1, latest version, and the Department of Labor, Occupational Safety and Health Administration (OSHA) as presented in Title 29 of the Code of Federal Regulations, Part 1910.120. As a minimum, the contractor SSHP shall address the following items:

- Cover sheet. Identify company name, contract number, project location, signed and dated by plan developer.
- Responsibilities and lines of authority.
- Employee qualifications. Physical fitness, job competence, special skills, equipment operation.
- Employee training. First aid, CPR, back injury prevention.
- Safety meetings. "Tool box" meetings.
- Job Hazard Analysis. Preparation and revision, discussion with employees.
- Emergency response plan. Emergency number, means of communication, route to nearest medical facility.
- Accident reporting and supervisor responsibility. Report all accidents immediately to the Contracting Officer and submit ENG Form 3394 within two (2) working days.
- First aid kits.
- Personal protection equipment. As a minimum, employees must wear long-legged trousers, sleeved-shirt, and steel-toes shoes. Safety glasses with side shields and hard hats may also be appropriate, depending on activity.

- Hearing Protection
- Vehicles and equipment.
- Public safety.
- Fire safety.
- Environmental hazards.
- Housekeeping.
- Standard operating procedures.

The contractor shall read and conform to the SSHP when conducting this work. Documentation to this effect shall be furnished to the Government POC prior to initiation of any work. The plan shall also include the names, and qualifications of the Site Safety and Health Officer, including education, training and work experience.

3.2 (Task 2) Preparation and Submission of an Addendum to the original ISRA Quality Control Plan (QCP)

A QCP has already been approved for the original ISRA efforts as well as the trenching / test pit activities that followed. Therefore, the Contractor shall prepare an Addendum to the QCP that covers / updates the office / field activities planned for the 5 areas. The QCP shall apply to all tasks/activities and products contained in this SOW. The QCP shall be prepared according to the applicable ISO 9000 processes as identified at www.lrh.usace.army.mil/ct/quality developed for this type of work.

The QCP shall define the responsibilities and roles of each member on the Independent Quality Control Team (IQCT), along with those preparing or performing the tasks/activities in this SOW.

The QC Plan shall also detail the methods and procedures for inspection of work, identifying and correcting deficiencies, maintenance of records, list of authorized Quality Control Inspectors, list of authorized Contractor representatives, and security measures.

The draft and final versions of the various plans shall include a separate QC appendix that includes an activity review checklist (appropriate checks on those activities that were performed/reviewed) for the specific product, along with a signed sheet which designates the name, date and official work title of those persons performing/conducting the QC activities. All comments and responses, from both the Contractor's QC review and USACE's QA/QC review, as well as contract compliance review comments of the plans shall be included in the QC appendix of the final plans.

3.3 (Task 3) Preparation and Submission of an Addendum to the original ISRA Plan of Operations

A Plan of Operations has already been approved for the original ISRA efforts as well as the trenching / test pit activities that followed. Therefore, the Contractor shall prepare an Addendum to the Plan of Operations that covers / updates the office and field activities

planned for the 5 areas. This addendum shall be submitted and approved by USACE prior to start-up of construction field activities.

The Plan of Operations Addendum shall follow the original ISRA Plan of Operations outline and include any information that is in addition to the work previously performed.

The Contractor shall also include in the Plan of Operations a Sampling and Analysis Plan that will outline the sampling and analysis required for disposal of the contaminated soil as well as that required for confirmation/field screening efforts once excavation has been completed.

For all borrow sites (whether onsite or off-site), the Contractor shall sample the borrow material to ensure that it is not contaminated. Sampling shall be for VOCs (Method 8260A), SVOCs (Methods3540C/8270), TAL Metals (3050B/6010B/7471A) and PCBs (8082/3540B) including Pesticides / Herbicides if from farmland. These were the same sampling parameters used in the Remedial Investigation. The sampling and analysis shall be done in accordance with current USEPA SW-846 protocol.

The Contractor shall collect the potentially hazardous waste from the excavation efforts, used PPE, decontamination liquids, and all waste generated from these activities. This media shall be containerized in sealable drums and placed in a secured area on the site until the results of the soil analyses are known. All drums shall be labeled as to project name, contents, boring number and date of collection, and secured to prevent public access. The drums shall be secured with tarps, ropes and pallets. Waste from different sites shall not be mixed.

The Contractor shall also include in the Plan of Operations an Investigative Derived Waste Plan (IDWP) for this project. Requirements for this plan can be found in Under Task 7, Section 3.7. Please reference this section for all IDW requirements.

3.4 (Task 4) Field Activities/Utilities

3.4.1 Field Activities. The site is currently owned by NASA Plum Brook Station (PBS), however, rights of entry are not required for this removal action. Coordination with PBS personnel will be conducted by USACE to ensure that the Contractor is allowed access to/from the site to perform all activities during this removal action. The Contractor shall be required to enter/exit through the PBS security gate, therefore, he shall follow all rules set forth by PBS security. The USACE shall be notified in writing at least two (2) weeks prior to commencement of any field work. The Contractor shall coordinate his field activities with all appropriate authorities and agencies as required. No field work shall be started until the QCP, SSHP and Plan of Operations have been approved by USACE. The Contractor shall prepare and submit to USACE a written response to all comments. The Contractor shall also be responsible for providing (with the notification) an up-to-date, detailed time schedule for the field work to be performed.

3.4.2 Utilities. An excavation permit has already been acquired / coordinated w/ PBOSG for the TNT B area as well as any additional excavation areas discovered through the

trenching / test pitting efforts. Therefore, the Contractor shall coordinate with PBOW NASA and PBOSG (NASA's Contractor) to determine if the previously acquired excavation permit is still valid.

3.5 (Task 5) Site Survey

The Final ISRA for TNT B, dated February 2006 identifies the surveyed limits for the proposed excavation limits for the 5 areas. The Contractor shall utilize this report in obtaining information concerning each of these 5 areas as well as survey/stake the limits prior to excavation. These areas shall also be surveyed once excavation is complete so as to get final quantities removed as well as obtain coordinates for preparation of final mapping / as-built drawings

3.6 (Task 6) Excavation of Contaminated Material.

The Contractor shall excavate approximately 6,718 cubic yards of contaminated material from the following 5 areas: buildings 412 (647 CY), 452 (2,054 CY), 456 (1109 CY), 463 (2,658 CY) and North East Nail House (250 CY). The following paragraphs detail these 5 different locations within the TNT Area B. Contaminants, levels of cleanup and excavation limits have already been identified in the Final ISRA Report, dated February 2006 as well as the Remedial Design and Feasibility Study phase of this project. All findings and recommendations have been verified and approved by Ohio EPA and are therefore to be used during this construction effort. This material shall be excavated in a safe manner and activities shall adhere to all environmental and safety laws, regulations and ordinances. During excavation efforts, the Contractor shall stop excavation of that particular area when encountering bedrock or groundwater. Any water generated during the excavation shall be containerized, sampled and disposed of in accordance with local, state and federal regulations. The Contractor shall decontaminate all equipment that comes in contact with the soil before moving to another area. Before excavation shall begin the Contractor shall submit a plan (within the Plan of Operations) showing the proposed limits of excavation as they are given within the Final ISRA TNT B Report, dated February 2006.

Building 412 Sweating and Graining House. The Building 412 location included 3 areas designated by USACE as Areas A, B and C. Buildings 412C and 412B (both 10' x 10' x 6') were excavated to the original limits as outlined in the Final RI/FS. Approximately 44 CY of soil was excavated. Water was encountered at the 6' depth in both areas. Therefore, the Contractor shall take precautions when excavating so as not to create water disposal issues. The areas were lined w/ 6-mil plastic and backfilled with clean soil. Area 412C was found to be clean (contamination limits below PRG values), however, 412B was not and required test pits to establish additional excavation limits. Excavation of the Building 412A (50' x 20' x 6') began, however due to funding shortage was not completed. Test pits were used to establish the additional limits of contamination. Since the excavation activities did not result in clean samples from areas 412A and 412B, test pits were excavated and the walls sampled to determine the additional area requiring excavation for clean closure. Confirmation sampling resulted in

levels of nitroaromatics, lead, PAHs and PCBs all below the PRGs established in the RI/FS. Based on test pit activities, an additional 647 CY of soil will require excavation to reach clean closure status. The Contractor The Contractor shall also take note that during test pit activities, these areas contained large amounts of concrete walls/debris that may take additional time during excavation activities. The concrete can be left on site if possible.

Building 417 Wastewater Settling Tanks. This area was completed under the Final ISRA TNT B Report, dated February 2006.

Building 452 Bi-Tri House. The building 452 location included 2 areas designated by USACE as Areas A (25' x 45' x 10') and B (15' x 15' x 10'). These areas were excavated to the horizontal and vertical limits established in the Final RI/FS and were lined with 6-mil plastic and backfilled with clean soil. Overexcacation of these areas due to nitroaromatic contamination resulted in the removal of common walls between Areas A and B which resulted in one large area. Confirmation sampling of the outer walls found this one large area to still be above the RGO levels established in the RI/FS and would therefore require additional excavation prior to clean closure. Test pits were used to establish the additional limits of contamination. The test pit walls were sampled to determine the additional area requiring excavation for clean closure. Confirmation sampling resulted in levels of nitroaromatics, lead, PAHs and PCBs all below the RGO levels established in the RI/FS. Based on test pit activities, an additional 2,054 CY of soil will require excavation to reach clean closure status. The Contractor shall utilize the Final ISRA Report for TNT B, dated February 2006 to obtain the information (i.e., location, survey coordinates, etc.) required to complete the additional excavation efforts necessary to obtain clean closure. The Contractor shall be sure to decontaminate all equipment prior to moving to the next area.

Building 453 Fortifier House. This area was completed under the Final ISRA TNT B Report, dated February 2006.

Building 456 Wash House. Building 456 consists of areas A – G. Areas A through G (excluding B) were excavated until levels below the PRG were reached, therefore, they are now considered clean. Area B was excavated to the original limits (24' x 24" x 4") as established by the Final RI/FS, except on the west side where shale was encountered at approximately 3' depth. Water was encountered at depth of 4'. The excavation was lined with 6-mil plastic and backfilled with clean soil. The excavation activities did not result in clean samples, therefore, test pits were excavated to establish the additional limits of contamination. Confirmation sampling resulted in levels of nitroaromatics, lead, PAHs and PCBs all below the PRGs established in the RI/FS. Based on test pit activities, an additional 1,109 CY of soil will require excavation to reach clean closure status. The Contractor shall utilize the Final ISRA Report for TNT B, dated February 2006 to obtain the information (i.e., location, survey coordinates, etc.) required to complete the additional excavation efforts necessary to obtain clean closure.

The Contractor shall be sure to decontaminate all equipment prior to moving to the next area.

Northeast Nail House. The NE Nail House was excavated to the original limits (15' x 15' x 8') as established by the Final RI/FS. The excavation area was lined with 6-mil plastic and backfilled with clean soil. The excavation activities did not result in clean samples from the area, therefore, test pits were excavated and the walls sampled to determine the additional area requiring excavation for clean closure. Confirmation sampling resulted in levels of nitroaromatics, lead, PAHs and PCBs all well below the PRGs established in the RI/FS. Based on test pit activities, an additional 250 CY of soil will require excavation to reach clean closure status. The Contractor shall utilize the Final ISRA Report for TNT B, dated February 2006 to obtain the information (i.e., location, survey coordinates, etc.) required to complete the additional excavation efforts necessary to obtain clean closure. The Contractor shall be sure to decontaminate all equipment prior to moving to the next area.

Building 462 Bi-Tri House. This area was completed under the Final ISRA TNT B Report, dated February 2006.

Building 463 Fortifier House. Building 463 was excavated to the original limits (40' x 20' x 10') as established by the Final RI/FS. The excavation area was lined with 6-mil plastic and backfilled with clean soil. The excavation activities did not result in clean samples from the area, therefore, test pits were excavated and the walls sampled to determine the additional area requiring excavation for clean closure. Confirmation sampling resulted in levels of nitroaromatics, lead, PAHs and PCBs all well below the PRGs established in the RI/FS. Based on test pit activities, an additional 2,658 CY of soil will require excavation to reach clean closure status. The Contractor shall utilize the Final ISRA Report for TNT B, dated February 2006 to obtain the information (i.e., location, survey coordinates, etc.) required to complete the additional excavation efforts necessary to obtain clean closure. It should be noted that groundwater was encountered in this pit, therefore, the Contractor shall be extremely careful as to not excavate beyond groundwater elevations which would create a water disposal issue. The Contractor shall be sure to decontaminate all equipment prior to moving to the next area.

Building 466 Wash House. This area was completed under the Final ISRA TNT B Report, dated February 2006.

Northwest Nail House. This area was completed under the Final ISRA TNT B Report, dated February 2006.

Building 472 Bi-Tri House. This area was completed under the Final ISRA TNT B Report, dated February 2006.

Building 473 Fortifier House. This area was completed under the Final ISRA TNT B Report, dated February 2006.

Building 476 Wash House. This area was completed under the Final ISRA TNT B Report, dated February 2006.

3.7 (Task 7) Disposal/Investigative Derived Waste (IDW)

The Contractor shall arrange for sampling and analysis, transportation and disposal of material excavated from these areas. Based on discussions with the local landfill, the Contractor shall perform Full TCLP, pH and paint filter testing of the stockpiled material per their disposal requirements.

The IDW Plan shall contain, at a minimum: analytical methods; management and containerization methods; and proposed disposal facilities. The IDW Plan shall address IDW generated on the sites. Actual disposal of IDW shall not occur until the test results are known and the IDW Plan has been approved by USACE. If analyses of the samples taken from the sites indicate that regulated concentrations of hazardous contaminants are present, then the Contractor shall test the IDW material. If analyses of the IDW material indicate that regulated concentrations of hazardous contaminants are present, then the Contractor shall dispose of the IDW material collected from the sampling activities in accordance with local, state and federal regulations as outlined in the IDW Plan.

The Contractor shall immediately provide the lab analyses along with a letter stating which contaminants were found if the material has been designated as contaminated. The Contractor shall send this letter with results to the USACE Technical POC. The letter shall be included in the final IDW Plan. Once received, the Contractor shall use this information to properly dispose of the IDW/waste according to applicable state, federal and local regulations. The Contractor shall be responsible for laboratory analyses and proper disposal of IDW. Actual disposal of the IDW shall not occur until the test results are known. If the material is determined not to be a regulated waste, the Contractor shall dispose of the material in accordance with the IDW Plan, at no additional cost to the Government.

Quality Assurance reviews shall be conducted by the USACE on the IDW Plan. The final IDW Plan shall include, as an appendix, all USACE review comments and Contractor's responses, Independent Quality Control Team (IQCT) comments/responses, activity checklists and signed signature sheets.

For IDW, the Contractor shall collect the waste, any used PPE, decontamination liquids, and all waste generated from the construction activities. This media shall be containerized and placed in a secured area on the site until the results of the analyses are known. All containers shall be labeled as to project name, contents, and date of collection, and secured to prevent tampering. If drums are used, they shall be secured with tarps, ropes and pallets. Waste from different sites shall not be mixed.
Actual disposal of IDW shall not occur until the test results are known and the IDW Plan has been approved by USACE. If analyses of the samples taken from the sites indicate that regulated concentrations of hazardous contaminants are present, then the Contractor shall test the IDW material. If analyses of the IDW material indicate that regulated

concentrations of hazardous contaminants are present, then the Contractor shall dispose of the IDW material collected from the sampling activities in accordance with local, state and federal regulations as outlined in the IDW Plan.

The Contractor shall immediately provide the lab analyses along with a letter stating which contaminants were found if the material has been designated as contaminated. The Contractor shall send this letter with results to the USACE. The letter shall be included in the final IDW Plan. Once received, the Contractor shall use this information to properly dispose of the drums according to applicable state, federal and local regulations. The Contractor shall be responsible for laboratory analyses and proper disposal of IDW. If the material is determined not to be a regulated waste, the Contractor shall dispose of the material in accordance with the IDW Plan.

3.8 (Task 8) Confirmation by Field Screening Tests

The Contractor shall excavate to the horizontal and vertical limits outlined for each of the 5 areas (412, 452, 456, 463 and NE Nail House) in the Final ISRA Report, dated February 2006. Once these limits have been reached, the Contractor shall use field screening to verify that the cleanup levels have been reached. The levels of PCBs found were below the regulatory limit of 50ppm (highest level found was 15 ppm) and should therefore not be a concern during confirmation and disposal. All sampling shall be documented as to location and analytical result. One sample shall be taken from each of the sidewalls near the midpoint of the excavation and at the floor near the midpoint of the excavation. For those areas where the length exceeds 20', 2 samples shall be taken along the length (whether this is on a side wall or on the floor) placed equidistance along the wall / floor or where visible contamination is noted. The contractor may use the individual site descriptions to estimate the number of confirmatory samples needed. Also, depending on the landfill used, requirements for disposal may include additional testing (i.e., ignitability, reactivity, corrosivity). If the remaining soil is determined to still be contaminated, the Contractor shall contact USACE for further instruction.

3.9 (Task 9) Preparation and Submission of Draft and Final ISRA Report

The Contractor shall prepare an Interim Soil Removal Action Report, which details the complete efforts during all activities in the SOW. This report shall follow the same format that was used for the Final ISRA for TNT B, dated February 2006. This format was generated because there was so much information to include in the report. After Ohio EPA, NASA and the TAPP contractor reviewed this report, they each commented on the easibility to which they were able to review it. Therefore, in keeping with the regulators thoughts, the Contractor shall use the format from the previous ISRA report as a guide in preparation for this Draft and Final ISRA Report. Once the draft report has been generated, the Contractor shall submit it to USACE for review. Any comments arising from this review shall be incorporated by the Contractor into the final report. See Section 3.2 for QC review and documentation requirements. See Section 4.3 for reporting requirements.

3.10 (Task 10) Meeting Support

The Contractor shall support USACE project manager or Technical Coordinator during meetings necessary to discuss the work defined by this work order. It is assumed a maximum of 1 meeting outside of field activities time will be held to discuss the proposed work. This meeting will be held at a location in the Sandusky Ohio area. The Contractor shall be responsible for preparing slides, handouts, and coordinating this meeting. The Contractor shall place a notice in the local newspaper announcing the meeting and inviting the public to attend. The Contractor shall document the meeting minutes and supply these to the USACE project manager or technical coordinator. If necessary the Contractor shall plan to give a presentation highlighting the requirements of this work.

4.0 Contractor Submittals / Schedule / Reporting / Other

4.1 Contractor Submittals

The Contractor shall furnish originals and copies of the work plans and response to comments in the quantities below. A written response to all comments shall also be prepared by the Contractor and included in the final submittal document. Submittals are as follows:

Draft and Final Addendums to the QCP, SSHP and Plan of Operations – 7 draft and 7 final copies of each plan to USACE

Draft and Final Interim Soil Removal Action Report – 7 draft and 7 final copies to USACE

Addresses for submittals:

U.S. Army Corps of Engineers
Huntington District
502 Eighth Street
Huntington, WV 25701-2070
ATTN: CELRH-EC-CE (Lisa A. Humphreys)

4.2 Due Dates, Contractor Submittals and Action Items

Contractor Submittals / Action Items	No. Days
Notice to Proceed	0
Submission of Draft QCP, SSHP and Plan of Operations Addendums	20 Days after NTP
Submission of Final QCP, SSHP and Plan of Operations	30 Days after NTP

Addendums

Submission of Draft ISRA Report	120 days after NTP
Submission of Final ISRA Report	30 days following receipt of comments to Draft ISRA

4.3 Reports

All work plans presenting data, analyses, recommendations, and drawings shall be prepared in a standard format for reports, as described herein. The Contractor shall submit copies of the draft and final versions of the work plans using MS Word. A CD ROM containing the text and drawings will be submitted along with the final work plan. A decimal paragraphing system shall be used. All site drawings shall be done in English units and of engineering quality with sufficient detail to show interrelations of major features on the site map (i.e. north arrows, keys, scales, etc.). When drawings are required, data may be combined to reduce the number of drawings, however, the drawings are not to be congested to the point that sight of the detail is lost. All drawings included in the reports shall be done on Microstation newest version, conform to the current USACE CADD Standards and shall be submitted to USACE along with the final work plan. The report shall consist of 8.5" by 11" pages with drawings folded, if necessary, to this size. If the Contractor must submit large drawings (42" by 29" size) folded to 8.5" by 11", use of top loading sheet protectors for the folded drawings will be required. The Draft and Final Work Plans shall be bound in three-ring binders and clearly labeled as "Draft" and "Final", respectively. Appendices in the work plans will be identified by tabs or other approved manner. A title page shall identify the title, the Contractor, the Corps of Engineer, Huntington District, and the date. Plastic photo holder sheets are to be used when including photos in report. All photos are to be at least 35mm or digital color photos and properly labeled and put on a CD for storage. Plastic loose-leaf media files are to be used when submitting CD ROMS. Photo documentation for each of the individual sites shall be taken before and after construction activities. Contractor Quality Control Reports, Manifests, Analytical Results and any other large volume appendix may be put on CD to reduce size of report. Should this occur, the Contractor may need to put a summary of the data in the body of the report or as a cover to the appendix. The Contractor shall also put the entire report on CD or DVD and include it in the final ISRA Report submission. The entire report shall be provided in in the working files as well as .pdf format (Adobe 7 Professional) so that it can be easily incorporated into the electronic PBOW Administrative Record and Public Repository.

4.4 Other

The Contractor shall maintain a file documenting all correspondence, phone conversations, and meetings with the USACE and other elements. It shall be bound in an appropriate folder and filed in reverse chronological order. This correspondence file shall be available for inspection at any time by the USACE upon request and shall be submitted to the USACE upon the conclusion of this work order.

Additional responsibilities of the Contractor under this work order include, but are not limited to, the following items of work:

1) Depending on site conditions, the use of water may be required to control dust during construction activities. The amount of dust resulting from the construction activities shall be controlled to prevent the spread of dust to occupied areas near the construction site and to avoid creation of a nuisance in the surrounding area. Use of water shall not be allowed to result in, or create, hazardous or objectionable conditions such as flooding and pollution.
2) The Contractor is responsible for ensuring traffic safety in all work areas. Flagmen, temporary signage or other approved means shall be provided by the Contractor as needed to comply with the above requirement.
3) The use of burning at the project site for disposal of refuse and debris will not be permitted.
4) The Contractor shall be responsible for keeping the roads free from soil and other debris (i.e., swept periodically collect material (if dropped) and dispose of properly) as well as making sure the travel to/from the security gate by subcontractors (i.e., trucking requirements) as maintained to not destroy existing roads.
5) The Contractor shall have the following items on-site and available at any time: 1) SSHP, 2) QCP and 3) Plan of Operation 4) Final ISRA Report for TNT B, dated February 2006
6) The Contractor shall obtain all permits, licenses, and maintain these documents at the project site where work is to be performed and have such documents readily available. The Contractor shall insure that he meets all Federal, State and Local requirements for the safe removal, containment, hauling and disposal of materials related to the project activities.
7) Compliance with the provisions of this SOW by subcontractors will be the responsibility of the Contractor.

5.0 Payment

Construction work shall be negotiated as a lump sum to be billable periodically based on completion of activities and in accordance with the payments clause. This will include provision of backup documentation prior to payment as well as inspection of site for verification of activities performed. Upon construction completion, if it is determined that certain activities have not been performed or constructed, then costs for those shall not be billed by the Contractor. A final modification will be issued / negotiated to reflect actual work items and the work order will be reduced / modified to reflect work not completed.

6.0 Public Affairs

The Contractor shall not make available to the news media or publicly disclose any data generated or reviewed under this contract. When approached by the news media, the Contractor shall refer them to the USACE Contracting Officer (CO) for response. Reports and data generated under this contract shall become the property of the Government and distribution to any other source by the Contractor, unless authorized by the CO is prohibited.

7.0 Point of Contact

The Contractor shall supply USACE a point-of-contact to facilitate communications. USACE's point-of-contact for the work is:

USACE, Huntington District
502 8th Street
Huntington, WV 25701-2070
Attn: CELRH-EC-CE, Lisa Humphreys
(304) 399-5953
304-360-2558 (cell)

8.0 Reference Documents

8.1 TNT Area B Remedial Investigation, Former Plum Brook Ordnance Works, Sandusky, Ohio, Volume I – Final Report of Findings, IT Corporation, USACE, August 2000.

8.2 TNT Area B Remedial Investigation, Former Plum Brook Ordnance Works, Sandusky, Ohio, Volume IV – Final Feasibility Study, IT Corporation, USACE, July 2001.

8.3 Draft TNT Area B Action Memorandum, Former Plum Brook Ordnance Works, Sandusky, Ohio, USACE, March 2002.

8.4 Final Interim Soil Removal Action Report, Former Plum Brook Ordnance Works, Sandusky, Ohio, USACE, February 2006

Appendix B Site Map

LEGEND:

COLOR	DESCRIPTION	TOTAL VOLUME (C.Y.)
	PROPOSED EXCAVATION (ORIGINAL)	2961.00
	ACTUAL EXCAVATION	5216.84
	FUTURE EXCAVATION	6716.42

100 0 100
SCALE: 1"=100'

US ARMY CORPS OF ENGINEERS
HUNTINGTON DISTRICT

FORMER PLUM BROOK ORDNANCE WORKS
NASA PLUM BROOK STATION
TNT AREA B GENERAL SITE FEATURES MAP

ORIGINAL PROPOSED, ACTUAL & FUTURE EXCAVATION, STABILIZATION AND DISPOSAL OF CONTAMINATED SOIL

PREPARED BY:
Mountain State Company
P.O. BOX O • CEDAR GROVE, WV 25039
2318 E. DuPONT AVE • BELLE, WEST VIRGINIA
PHONE (304) 949-4782 FAX (304) 949-4764

SANDUSKY-TOTAL_EXCAVATION

DATE PREPARED: OCTOBER 2005
DATE REVISED:

Appendix C Field Activity Forms

CHAIN OF CUSTODY RECORD NO. 135146

REI Consultants, Inc.
225 Industrial Park Rd.
P.O. Box 286, Beaver, WV 25813
Phone: 304-255-2500 or 800-999-0105
FAX: 304-255-2572
e-mail: rlabs@reiclabs.com

CLIENT: _____ CONTACT PERSON: _____
ADDRESS: _____ TELEPHONE #: _____
CITY/STATE/ZIP: _____ FAX #: _____
BILL TO: _____ E-MAIL ADDRESS: _____
CITY/STATE/ZIP: _____ SITE ID & STATE: _____
PURCHASE ORDER # _____ PROJECT ID: _____
QUOTE # _____ SAMPLER: _____

SAMPLE LOG AND ANALYSIS REQUEST

TURNAROUND TIME REQUIREMENTS
REGULAR: ___
*RUSH: ___ 5-Day
___ 3-Day
___ 2-Day
___ 1-Day
*Rush work needs prior Laboratory approval and will include surcharges

PRESERVATIVES
0 No Preservative
1 Hydrochloric Acid
2 Nitric Acid
3 Sulfuric Acid
4 Sodium Thiosulfate
5 Sodium Hydroxide
6 Zinc Acetate
7 EDTA

PRESERVATIVE CODES
NOTE PRESERVATIVES →

SAMPLE ID	NO. & TYPE OF CONTAINERS	SAMPLING DATE / TIME	MATRIX	SAMPLE COMP / GRAB	ANALYSIS REQUESTED & METHOD															COMMENTS

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Date/Time	Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Date/Time
Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Date/Time	Temperature Upon Arrival °C		☐ FAX Results	☐ Email Results

SAFETY INSPECTION CHECKLIST FOR CRAWLER TRACTORS, DOZERS, SCRAPERS, MOTOR GRADERS, BACKHOES, HEAVY HAULAGE UNITS

U.S. Army Engineers, Huntington District

INSTRUCTIONS

SECTION 1 -- GENERAL INFORMATION:

a. *Date*: enter month, day and year of Safety Inspection.

b. *Owner/User*: Enter designated ownership of equipment (Corps, Corps leased or Contractor by name).

c. *Contract Number*: Contractors enter the respective contract number

d. *Type of Equipment* : Enter *Ford 515 Backhoe, ID 450 Bulldozer,* etc.

e. *Number*: Enter equipment number which Contractor has issued on large scale operations.

f. *Inspected By*: Enter signature and title of Corps or Contractor inspector (Corps inspector may be a maintenance leader, maintenance mechanic or operator and a Contractor inspector may be a mechanic, operator or service person).

g. *Reviewed By*: Enter signature and title of Corps or Contractor reviewer (Corps reviewer may be the mechanic, shift leader, foreman or superintendent). Before a signature and title of Corps or Contractor reviewer is entered, the checklist must be reviewed by the next level of direct supervision and the equipment spot checked unannounced to insure inspections are performed.

SECTION 2 -- SAFETY INSPECTION CHECKLIST: Check **YES, NO** *or* **N/A** *if question or statement does not apply.*

SECTION 3 -- RECEIPT OF ACKNOWLEDGMENT: Sign, provide title and date checklist. If Corps personnel was the inspector and reviewer, a Corps manager, supervisor or responsible employee will sign the receipt of acknowledgment. If a Contractor personnel was the inspector and reviewer the checklist becomes a part of the official project file and a copy is furnished to the Contracting Officer Representative (COR). The COR will then sign the receipt of acknowledgment. The COR may request a copy of the checklist at any time. The COR or a representative may perform an unannounced spot check inspection to ensure compliance of safety inspection requirements. To determine if inspector and reviewer are Corps or Contractor personnel, see SECTION 1, Items f. and g.

SECTION 1	**GENERAL INFORMATION**	
a. Date	b. Owner/User	c. Contract Number
d. Type of Equipment		e. Number
f. Inspected by (*signature*) (*title*)	g. Reviewed by: (*signature*) (*title*)	

SECTION 2 **SAFETY INSPECTION CHECKLIST**

NOTE: Reference USACE Manual EM 385-1-1, April 1981, as revised. Equipment must be in full compliance with checklist and contract requirements.

1. Is protection (grills, screen, canopies) provided to shield the operator from falling or flying objects?			
2. Are adequate rollover protection and seat belts provided?			
3. Is a safe means of 3 point contact access to cab or operator's compartment provided -- steps, grab bars, non-slip surfaces, etc.?			
4 Are required head and tail lights, flashing lights and slow moving vehicle signs provided and properly positioned?			
5 Is the parking and service brake system capable of holding the equipment fully loaded on the grade of operation?			
6 Does the unit have an emergency brake system?			

SECTION 2, Cont.	YES	NO	NA
7. Does the emergency brake system work automatically when regular breaks fail?			
8. Can the emergency brake system be activated form the cab or operator's position?			
9. Are fuel tanks located so that spills or overflows do not run on the engine or electrical systems?			
10. Is the reverse alarm signal operable?			
11. Are cabs equipped with distortion free, shatterproof or safety glass?			
12. Are exhausts located so that discharges do not endanger or obstruct the view of the operator?			
13. Are moving parts, shafts, pulleys and belts adequately guarded?			
14. Are any of the units structural members bent, cracked or otherwise showing signs of physical damage?			
15. Are track rails, grousers, truck rollers, idlers and sprockets in good condition free from excessive wear, cracks, loose bolts or pins?			
16. Are hydraulic lines and cylinders adequately guarded and free of physical damage?			
17. Are tires on tire-mounted equipment free from excessive wear, breaks and of proper and equal size?			
18. Is the manufacturer-recommended tire inflation pressure maintained?			
19. Are all towing devices properly mounted and in good condition?			
20. Does the equipment have at least one dry chemical or CO2 fire extinguisher with minimal rating of 5 b:C available? (Corps owned or leased equipment must have extinguisher installed on the equipment)			
21. Is a 16 unit (minimum) first aid kit readily available in the equipment or on the job sit? Corps owned or leased equipment must have first aid kits installed.			
22. Are all instruments, ammeters, pressure gauges, temperature gauges, tachometers or other critical systems operable and in good condition?			
23. Are all operating levers, pedals, etc., in good operating condition?			
24. Do all modifications, replacement parts and/or repairs to the equipment maintain the same safety factor as originally designed and manufactured?			
25. Is the equipment equipped with outriggers or leveling devices and are they in operable condition?			
26. Is the equipment operations manual available to the operator?			

27. Remarks:

SECTION 3 **RECEIPT OF ACKNOWLEDGMENT**

Receipt Acknowledged by: *(Signature)* *(Title)* *(Date)*

VISITOR LOG

Everyone entering the exclusion zone and the contamination reduction zone shall meet the training and medical requirements of 29 CFR 1910.120. Visitors not meeting these requirements are only allowed in the support/clean zone. All visitors to the project site are required to adhere to the Site Specific Health and Safety Plan.

Compliance Agreement

I have read and understand this Site Specific Health and Safety Plan. I will comply with the provisions contained herein.

Project Site: _____

Name (Printed)	Signature	Date

Daily Safety Meeting

Project: _____ Date: _____

Discussion of work conditions and task expected to be completed today:

Topics to be discussed: (list below) **Task related to Safety Topic:** (list below)

Comments from Project Manager or SSHO concerning the meeting:

Notes concerning any safety related incidents that occurred:

Safety Meeting attendance:

I have attended the daily safety meeting. I have been briefed on today's job tasks and fully understand the safety issues associated with each task.

Name (printed)	**Signature**	**Date**

PPE CHECKLIST

All personnel shall perform an inspection of their PPE prior to performing activities on-site. The following items shall be checked.

____ Determine that the clothing material is that which has been designated for this project.

____ Visually inspect clothing for: imperfect seams, non-uniform coatings, tears, malfunctioning closures

____ Hold up to light and check for pinholes

____ Flex product and make observations for cracks or other signs of shelf deterioration

____ If the product has been used before, inspect inside and out for signs of chemical attack, discoloration, swelling, or stiffness.

____ Visually inspect gloves for imperfect seams, tears, and non-uniform coating

____ Pressurize gloves with air; listen for pinhole leaks

____ Check hardhat for cracks or other signs of stress

____ Check the suspension of your hardhat. Look for loose or torn cradle straps, loose rivets, broken sewing lines or other defects.

____ If using earmuffs, check the muffs for cracks, cuts or missing gaskets.

____ If using earplugs, check the plugs for cracks and or cuts.

____ Check safety glasses for scratches

____ If using a respirator, check for holes in filters

____ If using a respirator, check for cracks or scratches on the face piece

____ If using a respirator, check for loss of elasticity or tears in straps

____ If using a respirator, check for general cleanliness

____ If using an air purifying respirator, check for proper fit by performing the positive-pressure and negative pressure tests

SAFETY EQUIPMENT CHECKLIST

_____ Fire Extinguisher (in office trailer)

_____Fire Extinguisher (on heavy equipment)

_____16-unit first aid kit

_____Eye wash bottle

_____Cellular phone

CONTRACTOR'S QUALITY CONTROL REPORT (QCR) (ER 1180-1-6)

DATE:_____ REPORT NO._____

CONTRACT NUMBER AND NAME OF CONTRACTOR_____

_____

DESCRIPTION AND LOCATION OF THE WORK:_____

WEATHER CLASSIFICATION:_____

CLASS A No interruptions of any kind from weather conditions occurring on this or previous shifts.
CLASS B Weather occurred during this shift that caused a complete stoppage of all work.
CLASS C Weather occurred during this shift that caused a partial stoppage of work.
CLASS D Weather overhead excellent or suitable during shift. Work completely stopped due to results of previous adverse weather.
CLASS E Weather overhead excellent or suitable during shift but work partially stopped due to previous adverse manner.
OTHER Explain. CLASSIFICATION:

CLASS _____

TEMPERATURE:

MAX ___ MIN ___

PRECIPITATION:

INCHES _____

CONTRACTOR/SUBCONTRACTORS AND AREA OF RESPONSIBILITY FOR WORK PERFORMED TODAY: (Attach list of items of equipment either idle or working as appropriate.)

a._____

_____

b._____

_____

c._____

_____

d._____

_____

e._____

_____

f._____

_____

g._____

_____

1. WORK PERFORMED TODAY: (Indicate location and description of work performed. Refer to work performed by prime and /or subcontractors by letter in Table above.)

2. TYPE AND RESULTS OF INSPECTION: (Indicate whether: P-Preparatory, I-Initial, or F-Follow-up and include satisfactory work completed or deficiencies with action to be taken.)

3. TESTS REQUIRED BY PLANS AND/OR SPECIFICATIONS PERFORMED AND RESULTS OF TESTS:

4. VERBAL INSTRUCTIONS RECEIVED: (List any instructions given by Government personnel on construction deficiencies, retesting required, etc., with action to be taken.)

5. REMARKS: (Cover any conflicts in plans, specifications or instructions: acceptability of incoming materials; offsite surveillance activities; progress of work, delays, causes and extent thereof; days of no work with reasons for same.)

6. SAFETY: (Include any infractions of approved safety plan, safety manual or instructions from Government personnel. Specify corrective actions taken.)

_____

INSPECTOR

CONTRACTOR'S CERTIFICATION: I certify that the above report is complete and correct and that all material and equipment used, work performed and tests conducted during this reporting period were in strict compliance with the contract plans and specifications except as noted above.

_____

CONTRACTOR'S APPROVED AUTHORIZED REPRESENTATIVE

Quality Control Field Oversight Checklist
General Procedures

The following checklist is provided for use in the field to assure that general QC procedures are followed. The Project Manager or his designee should complete and sign a checklist for the project site.

Project Site _____

Date: _____
Personnel on-site:

_____

_____

_____

Signature: _____

		Yes	No	N/A
1.	Did the Field Supervisor or Project Manager discuss the following items with the field crew prior to beginning field activities?			
	Site Security issues	____	____	____
	Contents of the Plan of Operations	____	____	____
	Contents of Site-Specific Safety and Health Plan	____	____	____
	Contents of Quality Control Plan	____	____	____
2.	Was the USACE notified in writing 2 weeks prior to mobilizing to the site?	____	____	____
3.	Was the USACE provided a time schedule for field work?	____	____	____
4.	Were digging permits obtained from NASA prior to mobilizing to the site for excavation activities?	____	____	____
5.	Did Waste Ron personnel and subcontractors view the safety/orientation video prior to beginning work?	____	____	____

	Yes	No	N/A
6. Were digging permits limits strictly adhered to?	_____	_____	_____
7. Were excavation limits survey by a qualified surveyor prior to performing excavation activities?	_____	_____	_____
8. Were all drawings done in English units and of engineering quality with sufficient detail to show interrelations of major features on t he site map (i.e. north arrows, keys, scales, etc.)?	_____	_____	_____
9. Were all drawings done in Microstation 95 (or the newest version) and in conformance with the current USACE CADD standards?	_____	_____	_____
10. If drawings are larger than 8.5" by 11" were they folded to 8.5" x 11" size?	_____	_____	_____
11. At a minimum, photos shall be taken of the following site activities.			
A. Surveying	_____	_____	_____
B. Sites prior to excavation (including Borrow Area)	_____	_____	_____
C. Excavation	_____	_____	_____
D. Stabilization of soil	_____	_____	_____
E. Loading of soil for transportation	_____	_____	_____
F. Sampling activities	_____	_____	_____
G. Decontamination activities	_____	_____	_____
H. Storage/handling of IDW	_____	_____	_____
I. Backfilling of the excavation pits	_____	_____	_____
J. Seed and mulching of all disturbed areas	_____	_____	_____
12. If water was generated during excavation, was it properly containerized, sampled, analyzed, and disposed in accordance with state and federal regulations?	_____	_____	_____
13. Prior to disposal, were excavated and stabilized soils properly stored until analytical results were available?	_____	_____	_____
14. Was clean fill material placed in the excavation pits? (Note: Borrow materials must be tested prior to use as fill)	_____	_____	_____
15. Were excavation areas rough graded as necessary to achieve proper drainage and reseeded/mulched?	_____	_____	_____
16. Was all IDW containerized and sampled?	_____	_____	_____

Quality Control Field Oversight Checklist
HTRW Sampling Procedures
Continued

		Yes	No	N/A
9.	Were the following packing and shipping procedures performed?			
	All containers, except the volatile organic analysis (VOA) vials, are to be taped shut.	____	____	____
	Was the drain plug taped shut on the picnic cooler from the inside and outside, and a large plastic bag used as a liner for the cooler?	____	____	____
	Was inert packing material placed in the bottom of the liner?	____	____	____
	Were the sample containers placed upright in the lined picnic cooler in such a way that they do not touch and will not touch during shipping?	____	____	____
	Were plastic ice packs or ice placed in double plastic bags placed around, among, and on top of the sample bottles?	____	____	____
	Was the paperwork going to the laboratory placed inside a sealed plastic bag, which was taped to the inside lid of the cooler?	____	____	____
	Was the cooler taped shut with strapping tape?	____	____	____
	Was at least two signed custody seals placed on the cooler (one in front, the other on the side)?	____	____	____
10.	Was the proper sampling procedure followed as outlined in the Sampling and Analysis Section of the Plan of Operations?	____	____	____
11.	Was sampling equipment properly decontaminated between samples?	____	____	____
12.	Was a decontamination area located where the cleaning activities would not cross-contaminate clean and/or drying equipment?	____	____	____

Quality Control Field Oversight Checklist
HTRW Sampling Procedures
Continued

		Yes	No	N/A
13.	Was cleaned equipment properly stored?	_____	_____	_____
14.	Were the cleaning and decontamination procedures conducted in accordance with the project plans?	_____	_____	_____
15.	Were sampling locations properly selected?	_____	_____	_____
16.	Were photographs taken of sampling/decon activities?	_____	_____	_____
17.	Was sampling equipment constructed of Teflon, polyethylene, glass, or stainless steel?	_____	_____	_____
18.	Were samples collected in proper order? (least suspected contamination to most contaminated?)	_____	_____	_____
19.	Were clean disposable latex or vinyl gloves worn during sampling and field screening tests?	_____	_____	_____
20.	Were gloves changed between sampling events and screening tests?	_____	_____	_____
21..	Were equipment rinse blanks collected after field cleaning?	_____	_____	_____
22.	Were proper sample containers used for samples?	_____	_____	_____
23.	Were duplicate and split samples collected?	_____	_____	_____
24.	Were samples properly field preserved?	_____	_____	_____
25.	Were field and/or trip blanks utilized?	_____	_____	_____
29.	Were field screening tests utilized for nitroaromatics and lead (where appropriate) prior to collection of the excavation pit confirmation samples?	_____	_____	_____
30.	Were the procedures for the field test kits, as described in the Plan of Operations followed?	_____	_____	_____
31.	Was all information generated during the field screening activities recorded in accordance with the Plan of Operations requirements?	_____	_____	_____

Appendix D Laboratory QA Plan

REIC's QA Plan

REI Consultants, Inc.

Comprehensive Quality Assurance Plan

Revision: 21

Effective Date: June 2006

REI Consultants

Approved Signatories

Clarence Haile, PhD General Manager	30 Jun 2006 Date
Claude Scott Laboratory Operations Director	6-30-06 Date
Ray Erickson Laboratory Operations Director	6-30-06 Date
Joe Robertson Organic Laboratory Manager	6-30-06 Date
Ivan Leef Inorganic Laboratory Manager	6-30-06 Date
Angela Leef Quality Manager	6-30-06 Date
Erica Seay Roanoke Analytical Supervisor	7.7.06 Date
Grant Wilton Project Manager	6/30/06 Date
Joy Mullins Project Manager	6/30/06 Date
Kathy Lough Project Coordinator	6-30-06 Date
Rock Bortell Project Coordinator	6-30-06 Date
Beth Johnson Project Coordinator	6-30-06 Date

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1.0 Quality Assurance Policies

1.1 **Quality Assurance Policy Statement:** This is a comprehensive quality assurance plan (CompQAP) for Research, Environmental and Industrial Consultants, Inc. (REIC). This document describes REIC's quality assurance program as a consulting and analytical services laboratory. A well conceived QA program enables REIC to provide a sound framework for generation of field and laboratory data that is valid, comparable, representative and defensible. Specifically, these objectives are routinely achieved by:

- Assessing the quality of each analytical system, including precision, accuracy, and sensitivity sufficient for requirements of each project;
- Ensuring early identification of conditions which might affect quality of data of each project;
- Requiring sufficient documentation to verify the quality of data generated for each project; and
- Validating and evaluating field information and analytical results to ensure data usability.

REIC emphasizes the application of sound quality assurance (QA) and quality control (QC) principles starting from the project initiation, through all laboratory activities and finally, to the production of the final project analytical report. This document is designed to provide not only a uniform set of procedures, but also a means to measure the quality of data generated.

The validity and reliability of the information generated is assured and enhanced by the adherence to documented quality control procedures and quality assurance protocols.

1.2 **Code of Ethics:** Every effort must be made to ensure that all business decisions, products, and interactions are initiated and completed in a manner characteristic of honest, responsible and equitable actions. REIC's Code of Ethics is established to protect REIC, our clients, and our employees from actual or potential conflicts of interest and unlawful acts, and to ensure that only the highest of professional ethics are incorporated in all facets of work. A copy of REIC's Code of Ethics agreement is included as ***Appendix A*** of this CompQAP.

1.3 **Scope of the QA Program:** Understanding the scope of the QA program requires discerning the differences between QC and QA. Quality control refers to specific actions (procedures) designed to ensure that system performance is consistent with established acceptance criteria (limits). It is these specific actions that will ensure data accuracy, precision, and comparability. When the system performance is consistent with the established limits, we say that the data has been generated under in-control conditions. When not consistent, data is considered generated under out-of-control system conditions.

Quality assurance refers to the system whereby an organization, such as REIC, provides assurance to its clients that monitoring of quality-related activities has occurred (or is occurring). Implementation of the QA program, described in this CompQAP, is designed to ensure that data generated by REIC is collected under in-control conditions and sufficient documentation is available to support the data.

1.4 **Application:** This Comprehensive QA Plan describes REIC's QA program as it applies to field and laboratory activities, which generate analytical chemical data. This includes field activities, which may affect chemical integrity of samples, as well as chemical laboratory activities. Air sampling, biological sampling, toxicological studies, geotechnical parameter measurements, while not directly addressed in this plan, are sufficiently

supported by the general principles described herein. Specific procedures and requirements are provided for sampling and analysis of:

- Domestic and industrial solid waste and wastewater sampling
- Soil and sediment sampling
- Non-potable water
- Potable water
- Surface water sampling (ponds, streams, rivers)
- Monitoring wells sampling
- Air screening/monitoring
- Method development to support toxicological studies (acute and/or chronic effects).

Note: REIC is not responsible for field activities conducted by the client(s).

Analytical methodologies to which this CompQAP will support include:

- Gas chromatography
- Gas chromatography/Mass spectrometry
- Liquid chromatography
- Atomic absorption/emission
- Inductively Coupled Plasma Atomic Emission Spectroscopy (ICP/AES)
- Inductively Coupled Plasma/Mass Spectroscopy (ICP/MS)
- Wet chemistry analysis
- Ion chromatography
- UV-VIS spectroscopy
- Combustion UV/Wet Oxidation analysis for TOC
- Material characterization
- Hydrocarbon characterization
- Infrared characterization
- Aquatic Biology evaluations
- TCLP extractions and evaluations

(Please note that a comprehensive listing of equipment and instrumentation is covered in **Appendix E** of this CompQAP.)

1.5 **Document Updates:** This CompQAP shall be reviewed and updated on a periodic basis as personnel and equipment are changed or added. Also, as new quality control procedures for field and laboratory work are developed and approved, they will be introduced to provide additional statistical information. Date and revision number will document all changes.

1.6 **Quality Assurance Project Plans:** A site specific Quality Assurance Project Plan may be prepared for a specific project based on this CompQAP. The site-specific requirements of a project as specified in the project scope of work (or work plan) are incorporated into the Quality Assurance Project Plan (QAPP). A typical project description will include the following information:

- Project background, site description, overall project objectives, intended use of acquired data and project schedule (this information will be presented in section 1.0 of the QAPP and will be adapted from Section 1.0 of this CompQAP).
- List of measurement parameters, including the acceptance criteria (precision/ accuracy) of control analytes and the detection limits for the full list of the project analytes (adapted from section 3.0 of this CompQAP).
- Tables for the number of samples to be collected and field QC samples, map of sampling locations, and types of samples to be collected i.e. surface water, groundwater, soil, sediment, and/or sludge will be included in Section 4.0.

Proficiency Test Program: REIC participates in at least three major USEPA supported Federal and State proficiency testing programs. These include the Water Supply Study

(WS Series), Water Pollution Study (WP Series), and the DMRQA Study for the NPDES Program. These programs are performed at a minimum of once per year utilizing NIST-approved PT providers for the analytes established by the EPA for drinking water and non-potable water. REIC also performs studies to comply with NELAP and the USACE HTRW accreditation programs. The specific analytes and matrices are based on the scope of laboratory services.

1.7 **Review of Requests for the Acceptance of New Work:** The General Manager is responsible for deciding whether or not to accept new work. The technical and service requirements of all requests to provide analyses are thoroughly evaluated before commitments are made to accept the work. This evaluation includes a review of facilities and instrumentation, staffing, and any special QC or reporting requirements to ensure that analyses can be performed to meet the goals of the client. Upon accepting the project, the General Manager, Laboratory Operations Directors, and/or the assigned Project Manager/Coordinator meet with the Laboratory Managers, Supervisors, and Quality Manager and distribute pertinent documentation with all project requirements and the projected time frame for completion of the analyses.

2.0 Organization and Responsibilities

-See Organizational Chart on Next Page-

2.1 **Project Director:** REIC's General Manager is the project director for all field and laboratory projects. The project director is responsible for all contractual obligations of the proposed work and direct corporate efforts as needed to achieve the project goals of schedule, cost, and technical performance. The Project Director's responsibilities include: Appointing the Project Manager/Coordinator for field project operations, the Laboratory Operations Directors and Laboratory Managers (Inorganic and Organic) for laboratory operations, supervising these individuals in performance of project duties, approving all field and laboratory QC procedures, allocating manpower, reviewing and approving new contracts and contract changes.

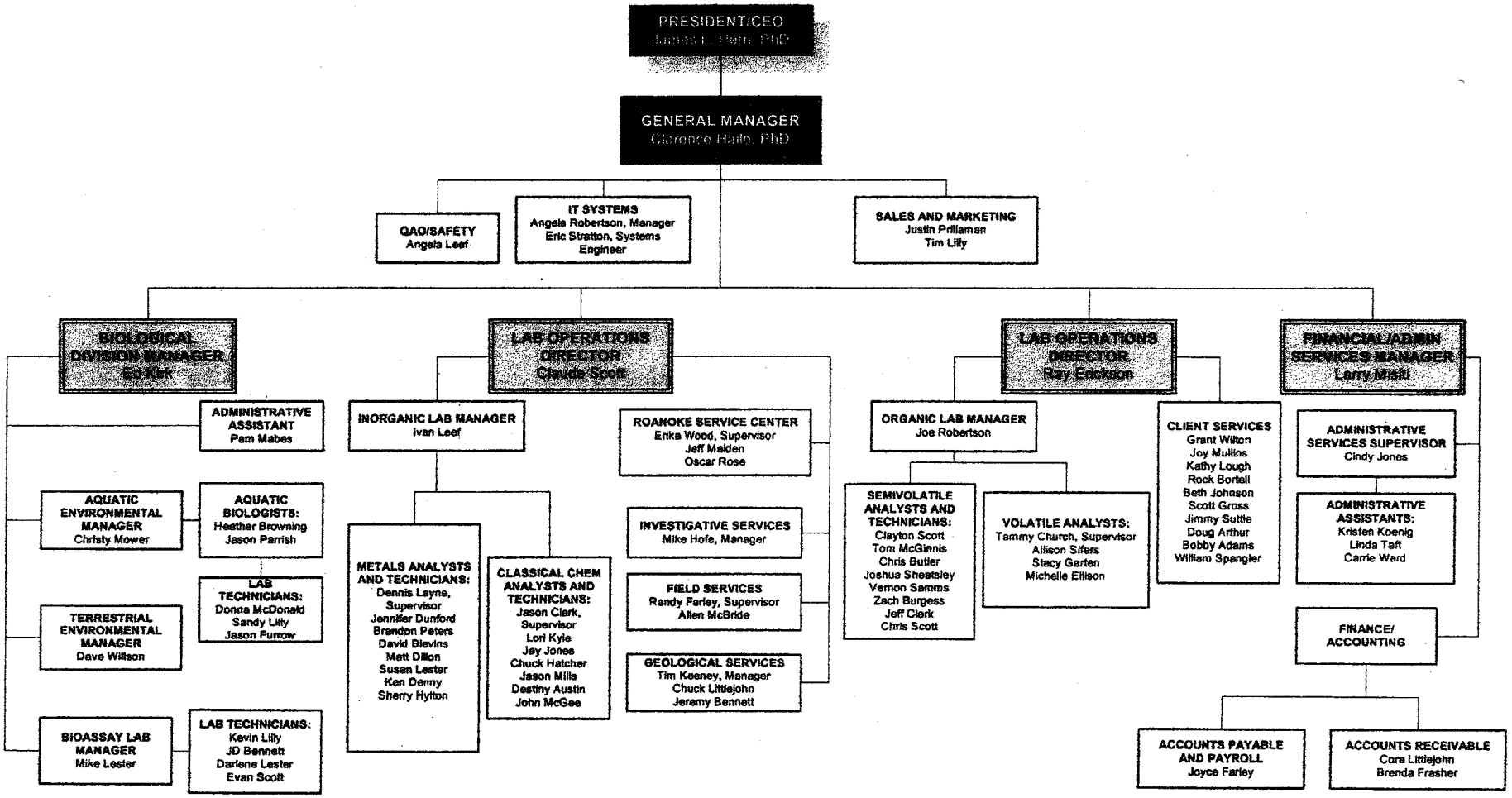
2.2 **Laboratory Operations:**

2.2.1 **General Manager** – The General Manager is responsible for management oversight and direction for all laboratory, field, financial, and administrative operations of REIC.

2.2.2 **Laboratory Operations Directors** – Laboratory Operations Directors are responsible for management oversight and direction of assigned laboratory and field operations. This includes ensuring that all personnel under their direction understand and conduct all work in compliance with this Quality Manual. Responsibilities also include ensuring that all results are properly validated prior to release to clients.

2.2.3 **Laboratory Manager** - Laboratory Managers are under the direct supervision of the Laboratory Operations Directors. The Laboratory Managers are responsible for providing consistent and accurate laboratory data produced by the analysts for compliance with precision, accuracy, and completeness objectives before final report generation. Other responsibilities include the review of any QC deficiencies reported by the analyst and/or project Quality Manager.

REI Consultants, Inc. Organizational Chart



Last Updated: April 26, 2006

2.2.4 **Laboratory Supervisor** – It is the responsibility of the Supervisors to assist the Laboratory Managers in providing consistent and accurate laboratory data produced by the analysts for compliance with precision, accuracy, and completeness objectives before final report generation. This includes assisting the Laboratory Managers in the review of any QC deficiencies reported by the analyst and/or project Quality Manager.

2.2.5 **Laboratory Analyst/Technician** - It is the responsibility of the Analysts to perform instrument calibrations, calibration verifications, and preliminary QC checks to ensure that each batch of data being generated is compliant with all method and quality program criteria. The Analyst is responsible for incorporating any data changes, resulting from the review by the Quality Manager and/or the Project Chemist, into the respective job file folder and LIMS.

2.2.6 **Project Manager/Coordinator** – Duties and responsibilities of which include serving as the point of contact for assigned clients, reviewing the *Statement of Work* for each project and verifying compatibility with laboratory capabilities, communicating project requirements to lab department managers and analysts, and reviewing project invoices and reports for completeness and compatibility with project requirements.

2.2.7 **Field Team Leader:** The Project Manager/Coordinator is responsible for effective day-to-day management of the project as well as direct communication and liaison with the client and the Laboratory Operations Directors and General Manager. The Project Manager/Coordinator has the ultimate responsibility of ensuring that all project quality control (QC) procedures are followed by the field team in the performance of the project. The Project Manager may appoint the field team leader (sampling team project leader). The field team leader is responsible to the Project Manager for ensuring that all QC and technical field procedures are followed, and that all field activities are documented properly. The field team leader and field team members must bring any unusual observations or problems to the immediate attention of the Project Manager/Coordinator and/or the Quality Manager.

2.2.8 **LIMS Administrator** - The LIMS Administrator reports to the General Manager and is responsible for managing the day-to-day operations of REIC's LIMS and computer network. These duties include all training of new personnel utilizing LIMS and any training required for new LIMS procedures. The LIMS Administrator maintains a current inventory of all hardware and software for damages/defects, troubleshooting problems and arranging for repair or replacement of all network and LIMS computers and associated equipment. The LIMS Administrator serves as the primary technical resource for LIMS and network users. The Administrator also develops, implements, and maintains policies, procedures, and SOPs for use of the network and LIMS. All security, privacy, and licensing issues are set and monitored by the Administrator. These duties also include any customization of the network and/or LIMS tests and any detailed programming as deemed necessary by the General Manager and/or Laboratory Operations Directors.

2.3 **Quality Assurance Program** - REIC's General Manager appoints the Quality Manager and is responsible for supervising the Quality Manager in the performance of his/her project duties. The Quality Manager maintains the overall company QA program and interacts with the Laboratory Operations Directors, Laboratory Managers, Project Managers/Coordinators, Laboratory Supervisors, and client QA/QC personnel to correct problem situations as necessary. The REIC Quality Manager has direct responsibility for assessing QC performance, determining if QA objectives are being met, recommending

corrective actions, and keeping the General Manager and Laboratory Operations Directors informed of all relevant QA/QC information. The Quality Manager is independent of the project team and answers directly to the General Manager. The Quality Manager is specifically responsible for the following:

- Assessing that approved QA/QC procedures are being applied to a project;
- Conducting both performance and systems audits of laboratory and field operations to ensure compliance with the requirements of the company QA program (stated in SOPs, CompQAP and/or QAPP);
- Identifying any QC deficiencies on project activities and notifying the General Manager and/or the Laboratory Operations Directors of any QC deficiencies discovered during audits;
- Providing an independent review of field information and analytical data packages to ensure the quality of all deliverables from the project team to the client;
- Interacting and communicating with client Quality Manager to resolve QA/QC problems specific to a project;
- Reporting to the General Manager as needed on the QA status of on-going projects and on the findings from formal audits;
- Monitoring the QA and QC activities of the laboratory to ensure conformance with approved company policies, procedures, sound practices, and recommend improvements as necessary;
- Ensure that sampling is conducted in a manner consistent with the CompQAP or QAPP;
- Periodically conduct field audits to inspect sampling activities; and
- Periodically audit sampling documentation and procedures to ensure that samples are labeled, preserved, stored, and transported according to approved chain-of-custody procedures.

2.4 **Training** – All personnel are trained in new methods utilizing a mentoring process. New staff members (or staff members learning new methodologies) are assigned to their immediate supervisor or an experienced staff member. Each employee must read, understand, and use the latest version of the laboratory's SOPs, which relates to the new methodology as well as the associated reference material. The development and training associated with new analytical methods is discussed in section 10.3 (Demonstration of Method Capability).

The mentoring process occurs as follows:

- The staff member is familiarized with the method by observation of an experienced staff member;
- Supervised practice of the method, with review by the trainer and supervisor;
- Unsupervised practice of the method, with review, this may include a blind spike sample or other blind unknown;
- Unsupervised performance of the method.

Completion of these steps is documented on a training checklist signed by the supervisor/laboratory manager of the department. For newly trained employees, work is reviewed daily by the supervisor until the supervisor is satisfied the employee is competent in the procedure. All analytical data produced by the new staff member is also reviewed and signed off by the laboratory supervisor.

Each employee demonstrates continued proficiency by acceptable performance on in-house laboratory control spikes, blind samples, and/or inter-laboratory comparison exercises. Training records (to include continuing education, participation in vendor or industry training classes) are kept in the personnel training records maintained by the laboratory managers and the personnel office.

2.5 **Laboratory Capabilities** – The professional staff of REIC consists of over sixty trained, undergraduate and graduate scientists whose knowledge and experience span the disciplines of analytical chemistry, environmental chemistry, biochemistry, chemical engineering, geology, and biology. All work is based on methodologies and approaches established by the US EPA, State agencies, industrial standards, and professional codes, and are enforced by a stringent QA/QC program. A more complete listing of REIC's qualifications can be found in REIC's "Statement of Qualifications" document. A complete listing of REIC's instrumentation can be found in **Appendix E**. A copy of REIC's "Data Integrity and Ethics Policy" is also included in **Appendix A**

2.6 **Laboratory Minimum Level of Qualifications** – Employment in the laboratory must meet the following criteria at a minimum:

1. **Technician** – High school graduate or GED.
2. **Analyst** – Above criteria plus experience or additional training in a laboratory.
3. **Biologist/Chemist/Engineer** – College degree.
4. **Laboratory Manager** – College courses and/or degree plus items (1) and (2) above.

2.7 **Laboratory Transfer of Ownership or Closure** – If the ownership of the laboratory is transferred or the laboratory is closed existing clients will be notified immediately. A letter will be provided to all clients detailing re-organization conditions and an explanation of any effects or changes in laboratory operations. In case of laboratory closure, clients may not be ready to terminate contact by the closing date. Sufficient time will be allowed for clients needing additional analyses to transfer samples to other laboratories. All existing clients will be provided referral options. New clients will be referred upon contact. The relocation of client records will be considered carefully. While some clients will have copies of their analytical records transferred to another laboratory, the original client records will either be returned upon request at their expense or destroyed. A signed release of information form will be obtained before transferring records.

3.0 Quality Assurance Objectives for Data Measurements

The overall quality assurance objective is to ensure that data of known and acceptable quality is generated. The quality of data is measured through qualitative and quantitative parameters. These parameters include accuracy, precision, completeness, representativeness, and comparability. Proper execution of each project task is needed in order to yield consistent information, results that are representative of the media and conditions being measured, and ultimately be useful for meeting the intended project objectives. REIC will calculate and report data in units consistent with those of other organizations and agencies to allow comparability of databases. REIC performs analyses for specified compounds using the standardized methods. In the process, baseline data is applied to establishing control limits for daily analyses. These control limits, which include precision, accuracy, and reporting limits, may therefore be considered for typical performance.

3.1 **Comparability** - Comparability is the confidence with which one data set can be compared with another. These data sets include data generated by different laboratories performed under the same work plan, data generated by laboratories in previous years, or data generated using differing techniques or analytical protocols. The comparability objectives of REIC are as follows:

- Demonstrate traceability of standards to the National Institute of Standards and Technology (NIST) or EPA approved sources,
- Use standard methodology,
- Report results from similar matrices in standard units,
- Apply appropriate levels of QC within the context of the laboratory QA program, and

- Participate in inter-laboratory studies to document laboratory performance.

When traceable standards and standard methodology are used, the analytical results can be compared to other similarly operating laboratories.

3.2 **Representativeness** - Representativeness expresses the degree to which sample data accurately and precisely represents actual conditions. Representativeness is a qualitative determination. The representativeness objective of REIC's quality assurance program is to eliminate conditions that may result in non-representative data. In the laboratory proper temperature, extraction, and sample holding times are closely observed to ensure that sample integrity is maintained. Also, blank samples are examined for cross contamination.

3.3 **Completeness** – Completeness is a measure of the amount of the data obtained from a measurement system compared to the amount that is expected to be obtained under correct normal conditions. The minimum level of completeness expected is 95 percent for each analytical method requested. This is expected to be achieved by ensuring proper sample extraction procedures. Also, for each sample received by the laboratory, especially those shipped in fragile containers, a backup sample is to be made available in case breakages occur, or when the analyses criteria are not initially met.

3.4 **Accuracy** - Accuracy is the degree to which a measurement agrees with the actual value, i.e. amount of measurement bias. Accuracy is expressed as a percent recovery of a concentration of reference material (or laboratory standard). The accuracy of an analytical procedure is determined by addition of a known amount of spike standard to a field sample matrix or a laboratory control matrix. A control matrix is made of distilled (or deionized) water or sterile, clean soil (with known physical and chemical properties). The field sample matrix is described as all components of the sample mixture except the analyte (compound being measured). A method for the determination of accuracy values, which is routinely used in the laboratory, is described in section 12.0 of this CompQAP. Examples of accuracy acceptance criteria for control analytes and associated method reporting limits can be provided to clients upon request.

3.5 **Precision** - Precision is a measure of the degree of reproducibility of an analytical value and it is used as a check of the quality of the sampling and analytical procedures. Precision is determined by analyzing replicate samples. The significance of a precision measurement depends on whether the sample is a field duplicate, laboratory control matrix duplicate, or a matrix spike duplicate. Laboratory determination of precision is discussed in section 12.0 of this CompQAP. Examples of current precision acceptance criteria for control analytes along with associated method reporting limits and method detection limits can be provided to clients upon request.

3.6 **Detection Limits** – REIC references two types of reporting limits: Method Detection Limits (MDLs) and Practical Quantitation Limits (PQLs).

MDLs are determined for all analytes as specified in 40CFR 136 Appendix B[1] and as described in the NELAC standards. The MDL is defined as the minimum concentration of an analyte that can be measured by the method and reported with 99% confidence that the analyte concentration is greater than zero and is determined from analysis of a sample in a given matrix containing the analyte. All MDLs are determined for each test and matrix according to US EPA requirements as part of an initial demonstration of capability. MDLs are determined on for each method and sample matrix unless stated otherwise by the determinative method.

[1] Appendix B to Part 136 – Definition and Procedure for the Determination of the Method Detection Limit. Revision 1.11 (40CFR Chapter 1-Part 136).

PQLs are defined as the lowest standard of the initial calibration curve for the inorganic and organic assays. This standard is typically between 5 to 10 times the MDL. The PQL is confirmed by analyzing a laboratory control sample spiked at this level with an expected recovery that is dependent upon the analytical method.

REIC references PQLs as the default reporting limits for all clients who do not specify reporting limit requirements. Data are flagged between the PQL and the MDL when clients request reporting to MDLs. The MDLs and PQLs are compiled by the Laboratory Supervisors and Quality Manager. See **Appendix C** for more detailed information.

4.0 Sampling Procedures and Sample Handling

4.1 Field Sampling Operations: Prior to any field operations, the Field Services Supervisor and field team personnel will review the project work plan and the associated QAPP. These documents should be referenced for specific information concerning equipment, supplies, and sampling procedures. The field sampling procedures included in these documents and REIC's field sampling standard operating procedures include: documentation requirements, sample collection, preservation, packaging, shipping, and equipment decontamination.

4.2 Sample Handling

4.2.1 Sample Containers/Preservation/Holding Times - Standard sampling kits are used. The kits are prepared according to the type of analysis requested ***(See Appendix D)***. All sample kits are prepared by the sample custodian and made ready for walk-in clients, delivery by REIC courier, or shipment by bonded courier. All kit supplies are stored in REIC's kit preparation room to avoid cross contamination. Unless specified, all sample containers used are pre-cleaned commercially. They are purchased from commercial vendors as pre-cleaned containers. Sample containers used at REIC laboratory are disposable; therefore, washing is not necessary before sample kits are prepared for clients or REIC field personnel. All sample kits are transported in coolers to the field. A Chain-of-Custody (COC) sheet is enclosed. The sample identification labels on the containers must always match those on the sample COCs. Sample kits can be delivered by a REIC courier, picked up by the client, or shipped by bonded carrier (i.e. UPS, Federal Express). Clients are encouraged to transport samples to the laboratory as soon as possible so that holding times ***(see Appendix D)*** will not be exceeded. ***Although REIC will give advice on sample shipping and packing, it is the sampler's ultimate responsibility to representatively sample, pack, and ship the samples to REIC Laboratory.*** The types of preservatives used are provided in ***Appendix D***. Clients or REIC field personnel may receive sample containers pre-preserved. The laboratory will supply additional preservatives in suitable containers for sample preservation in the field.

4.2.2 Sample Dispatch to the Laboratory: Field documentation will consist of (at a minimum): field notes, sample labels, and COC forms (or sample transmittal forms). Samples will be packed such that they are segregated by site, sampling location or sample analysis type. VOC samples from different locations may be placed in the same coolers with materials (i.e. bubble wrapped and sealed in a Ziploc-type bag) to avoid breakage. Shipping containers will be insulated (if cooling is required) and will be sealed with tape or locked to avoid tampering. Reusable refrigerant packs (not dry ice) or a water ice bath will be used in cooling samples to 4°C. Packed samples will be delivered to the laboratory by the sampling team or via a common carrier.

4.2.3 **Field Reagents and Waste Handling:** All chemicals transported to the field will be stored in appropriate containers, labeled, and will be packed to avoid breakage. Chemicals will be segregated from sample containers so as to avoid accidental contamination. All reagents must be reagent grade or higher.

4.2.4 **Field Waste Disposal:** All field-generated wastes will be segregated and contained for proper disposal by a commercial contractor. Associated cost may be negotiated with clients in advance of the project initiation. All non-chlorinated solvents (isopropanol, hexane, and acetone) will be collected and returned to the laboratory to be disposed of or recycled by a commercial contractor. Acids and bases will be diluted or neutralized and can be flushed into a sanitary sewer or will be disposed of commercially. Contaminated purge waters will be contained and disposed of commercially or will be allowed to evaporate on an impermeable surface. Calibration standards for field meters will be diluted and flushed into the community treatment sewer.

5.0 Test Methods and Standard Operating Procedures

REIC maintains Standard Operating Procedures (SOPs) for all laboratory methods, field activities, and general operations. The SOPs are based on the guidance as published by EPA (QA/G-6 Guidance for the preparation of Standard Operating Procedures and other pertinent industry references[2]. The SOPs describe the equipment and actual procedures used in the laboratory. Copies of the SOPs are readily available to all personnel. Each SOP indicates the effective date and the revision number. Any calculations that are performed external to an instrument or in its automation software are documented in the SOP.

SOPs are used to ensure consistency and to save time and effort. Any deviations from the established procedure during an analysis are documented. All SOPs are reviewed on a yearly basis and as changes become necessary (incorporating advances in instrumentation/technology and/or EPA approved methodology updates) under the direction of the laboratory managers and Quality Manager.

6.0 Sample Custody and Integrity

Sample custody is a vital aspect of an environmental measurement program. Some environmental study programs generate data that may be used as evidence in a court of law. The samples must be traceable from the time of sample collection until the data is introduced as evidence in enforcement proceedings. A sample is said to be in someone's custody if it meets the following criteria:

- It is in someone's physical possession,
- It is in one's view, after being in one's physical possession,
- It is in one's physical possession and then locked or sealed so that tampering will be evident, or
- It is kept in a secure area, restricted to authorized personnel only.

6.1 **Field Sampling Operations:** The chain-of-custody (COC) record is initiated at the time the sample containers are dispatched to the field sampling team. The field sampling team may be the client's or REIC's field sampling personnel. A formal sample custody record ***(See REIC's COC on the following page)*** accompanies each set of containers. The form ensures that a system is made available by which sample information is logged

[2] Other SOP references include Good Laboratory Practices (40 CFR Part 160) and the USACE's Shell for Analytical Chemistry Requirements.

from the point of sampling through each change of custody until the samples arrive at the laboratory. Although the laboratory can give advice to the client on sample packaging and shipping procedures, it is the client's ultimate responsibility to provide proper and adequate documentation until the samples are relinquished. A Chain-of-Custody (COC) is used by the field team to record sample identification and the following information: sample description, collection date and time, sampling location, preservation, analyses required, samplers' names, comments concerning the samples, client name, and the signature of the person relinquishing the samples to the bonded carrier or REIC personnel. Errors in all field sampling documents are deleted with one line through the error, initialed and dated.

6.2 Laboratory Operations:

6.2.1 Receiving Samples - Samples may be shipped to the laboratory or picked up by a REIC courier (when locality allows). In all cases, a REIC representative will sign, date, and record the time on appropriate custody forms as receiving the sample cooler. At the laboratory, the sample custodian will immediately initiate the following steps:

- Check samples for breakage or leakage,
- Check the temperature of the ice bath,
- Verify the number of samples received and confirm that all container designations agree with information provided on the Chain-of-Custody.
- Record any breakage of sample bottle seals, which may have occurred during transport to the laboratory.
- The sample custodian notes the condition of the samples and coolers on the accompanying Chain-of-Custody forms and
- Then proceeds to log the samples into a Laboratory Information Management System (LIMS).
- Upon finding any sample preservation or documentation discrepancies (broken sample containers, cooler damage) or any suspicious findings which might indicate that sample integrity has been compromised, the client is notified immediately and the matter is resolved before the samples are approved and actually accepted for analysis.
- A copy of the custody form is returned to the client with the sample analysis deliverable report and another copy is kept on project file at the laboratory.
- If the scope of the project should change after the samples have been received in the lab, this is documented on the Chain-of-Custody.

6.2.2 Bill of Lading - A bill of lading (bus bill or air bill) documents receipt of the samples by the carrier. It is not possible for the carrier's representative to sign the custody form since it is sealed in the sample cooler. Bills of lading are kept on project files at REIC.

6.2.3 Tracking of Samples - Proceeding with log-in, the sample custodian enters sample identifications (IDs) and other associated information such as: Lab sample IDs, sampling date, client IDs, etc., into a computerized sample tracking system -- ***Laboratory Information Management System (LIMS)***. The tracking system consists of a customized program having the ability to search and locate individual samples in the laboratory. All data within the computer system is copied (backed-up) on magnetic tape and secured at the end of each working day. Hard copies of sample tracking worksheets are maintained and copies placed in sample file folders along with Chain-of-Custody forms. These tracking documents, as well as the LIMS, help to coordinate the analyses required. Sample handling, preparation, and analysis are documented on tracking

worksheets throughout their analysis period in the laboratory. The tracking worksheets include such information as the Lab sample IDs, clients IDs, storage, preservation, actions, sample date, extraction date, analysis date, etc.

6.3 **Maintaining Sample Integrity** - Upon receiving samples from the field, improper conditions for each sample will be documented on the chain of custody and will be reported to the Project Manager/Coordinator and the client. The Project Manager/Coordinator will then make a decision after consulting with the General Manager, Laboratory Operations Directors, and/or client Project Officer on whether to reject the sample. REIC maintains walk-in environmental chambers, which are specific for various types of sample analyses. They are maintained in a manner such that internal contamination is minimized. The chambers are monitored and their environmental conditions are recorded continuously. Additionally, the chambers have both audible and electronic notification alarm systems to warn if ambient conditions drastically change due to chamber malfunctions. Upon conclusion of the appropriate analysis, any additional sample materials are stored for a period of two weeks after formal notification of results being submitted to the client. At that time, the samples are disposed of in an environmentally friendly manner or returned to the client. All sample disposal is carried out in accordance with Federal and State regulations.

7.0 Calibration Procedures and Frequency

The quality assurance objective of instrument calibration is to ensure that the instrument employed is capable of producing acceptable quantitative data. Initial calibration is designed to indicate that the instrument is capable of acceptable performance at the beginning of the sample analysis sequence. Continuing calibration verification is necessary in order to demonstrate satisfactory instrument performance (calibration accuracy) over the duration of sample analysis.

7.1 Field Instruments:

7.1.1 **pH Meter** - Standardize the pH meter immediately before taking any measurements. The calibrating solutions must bracket the sample analyses - either pH 7.0 and pH 4.0 or pH 7.0 and pH 10.0. Use the following procedure to standardize the meter:

- Place the probe in the pH 7.0 and adjust the knob to achieve a reading of 7.0.
- Place the probe in the second solution (whether 4.0 or 10.0) and adjust the knob to achieve the reading of 4.0 or 10.0, accordingly.
- Repeat those steps until adjustment is no longer needed. Clean the probe with distilled water and clean tissue. ***Note: Store the probe in distilled water when not in use.***

7.1.2 **Temperature** - No calibration is required in the field for the temperature probe. See laboratory thermometer comparison with the NIST certified thermometer ***(Section 7.3.8 "Temperature Monitoring").***

7.1.3 **Conductivity** - Use a KCl solution to check the (K) constant daily. Maintain a record (log book) of each check. Clean the probe with distilled water and tissues. Measure conductivity of the sample in a Teflon or plastic bottle.

7.1.4 **Dissolved Oxygen (DO)** - The oxygen meter to be used in the field will be calibrated in the laboratory. A record for calibration must be reviewed by the field technician before taking the instrument to the field.

CHAIN OF CUSTODY RECORD NO. 148237

REI Consultants, Inc.
225 Industrial Park Rd.
P.O. Box 286, Beaver, WV 25813
Phone: 304-255-2500 or 800-999-0105
FAX: 304-255-2572
e-mail: rlabs@reiclabs.com

CLIENT: _____ CONTACT PERSON: _____
ADDRESS: _____ TELEPHONE #: _____
CITY/STATE/ZIP: _____ FAX #: _____
BILL TO: _____ E-MAIL ADDRESS: _____
CITY/STATE/ZIP: _____ SITE ID & STATE: _____
PURCHASE ORDER # _____ PROJECT ID: _____
QUOTE # _____ SAMPLER: _____

SAMPLE LOG AND ANALYSIS REQUEST

TURNAROUND TIME REQUIREMENTS
REGULAR: ___
*RUSH: ___ 5-Day ___ 3-Day ___ 2-Day ___ 1-Day
*Rush work needs prior Laboratory approval and will include surcharges

PRESERVATIVES
0 No Preservative
1 Hydrochloric Acid
2 Nitric Acid
3 Sulfuric Acid
4 Sodium Thiosulfate
5 Sodium Hydroxide
6 Zinc Acetate
7 EDTA

PRESERVATIVE CODES — NOTE PRESERVATIVES →

ANALYSIS REQUESTED & METHOD

SAMPLE ID	NO. & TYPE OF CONTAINERS	SAMPLING DATE / TIME	MATRIX	SAMPLE COMP / GRAB														COMMENTS

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Date/Time	Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Date/Time
Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Date/Time	Temperature Upon Arrival °C		☐ FAX Results	☐ Email Results

7.2 **Standard Receipt and Traceability of Calibrations:** All calibrations and working standards are prepared from pure or commercially available materials. Upon receipt, standards are dated and all information concerning these standards including LOT#, supplier, concentration, and purity is filed. If the standard has an expiration date, the date is circled in ink to ensure the analyst does not use expired standard. As the standards expire, each is disposed of in an environmentally safe manner. All other information concerning these chemicals can be obtained through the information in the purchase order book/REIC's inventory system and/or the supplier of chemicals as necessary. Working standards are prepared either directly from the stock standard or an intermediate standard is prepared and the working standards are prepared from the intermediate standard. **A standards preparation log is maintained for analytical sections.** The daily working standards are entered as prepared in a standards logbook. All stock and intermediate standards are prepared either in Class A volumetric glassware or serially diluted from standards prepared in Class A volumetric glassware. Laboratory equipment such as balances, ovens, refrigerators, freezers, incubators, water baths, temperature measuring devices and volumetric dispensing devices are documented as follows:

- Records are kept of all activities such as maintenance and service calls.
- Calibrations are documented per method and/or manufacturers instructions, using NIST traceable references where available over the entire range of use.

7.3 **Laboratory Instruments:** The major instrumentation and calibration procedures are discussed below. This is only the general overview. Detailed calibration procedures and frequency are in each method and instrument manufacturer operation manual. All calibration materials are purchased (where possible) in a pure form and are diluted to working concentration levels using standard analytical techniques.

7.3.1 **Spectrophotometric, Potentiometric, Colorimetric, Turbidimetric, Infrared (IR), and Ultraviolet Absorption -** This section applies to those inorganic and organic analyses that require the use of a standard calibration curve for calibration. The working calibration is generated by plotting the standard response for each standard versus the concentration of each standard. Quality control acceptance criteria for calibration of this group of instruments includes:

- Constructing a 3-5 point calibration curve (3-5 standards and a blank) prior to any sample analysis, as needed. Refer to the calibration instructions of the manufacturer and the specific calibration section of each EPA method. The correlation coefficient of the line must be $\geq$0.995. Failure to meet these criteria will necessitate reanalysis of the standards.
- Monitoring of the instrument's consistency response is demonstrated through the analysis of a midlevel standard or Continuing Calibration Verification (CCV) after the analysis of ten (10) samples. The response of the CCV must generally be within $\pm$10 percent of the true value. Failure to meet these criteria will necessitate reanalysis of all samples analyzed since the last acceptable CCV.
- Demonstrating system cleanliness through the analysis of a method reagent blank prior to sample analysis.
- Maintaining sample response within the response limits of the standards.

7.3.2 **pH and Ion Specific Analyzers:** Quality control acceptance criteria for the calibration of this group of instruments includes:

- Constructing a three (3) point (2 points for pH) calibration curve prior to the analysis of any sample(s).
- Verifying instrument's consistency response through the periodic analysis (after the analysis of every 10 samples) of standards.
- Demonstrating system cleanliness through the analysis of a method reagent blank prior to sample analysis.
- Maintaining sample response within the limits of the standards' response. The pH meter is calibrated with known buffer via the pH closest to the expected sample pH. A second buffer (4, 7, or 10) is used to verify that the first measurement (buffer) was correct.

7.3.3 **Trace Metals and Cyanide Analysis Calibration:**

Atomic Absorption Analysis

Volumetric dilutions are made from stock solutions to obtain intermediate standards (100, 10 and 1.0 ppm) solutions. These intermediate standards may be used directly as working standard solutions or diluted as necessary for flame analysis. However, for more sensitive graphite furnace and hydride analyses, volumetric dilutions must be prepared from the 1.0 and 10 ppm standard solutions to generate working standards. The working standard solutions must be prepared daily. The acceptance criteria for calibration of the AA are as follows:

- The instrument must be calibrated daily and each time the instrument is set up. A blank and at least three standards must be used in establishing the calibration curve. One of the standards must be at the PQL.
- The correlation coefficient of the line must be $\geq$0.995. Failure to meet this criterion will necessitate reanalysis of the standards.
- Instrument consistency is monitored through the analysis of a midlevel standard (CCV) and the calibration blank after the analysis of ten (10) samples. The response of the CCV must be within $\pm$10 percent of the true value. Failure to meet this criterion will necessitate reanalysis of all samples analyzed since the last acceptable CCV.
- System cleanliness is demonstrated through the analysis of a reagent blank prior to sample analysis.
- The sample response must be maintained within the limits of the response of the standards.

Mercury Analysis

- The instrument must be calibrated daily and each time the instrument is set up. A blank and 5 standards must be used in establishing the calibration curve.
- The correlation coefficient should be $\geq$0.995.
- Continuing calibration verification (CCV) standards are analyzed at a minimum of every 10 samples to document consistent instrument response. The CCV result must be within $\pm$10% of the true value.

Cyanide Analysis

- The instrument must be calibrated daily and each time the instrument is set up. A blank and at least three standards must be used in establishing the calibration curve.
- The correlation coefficient for the photometric calibration should be $\geq$0.995.

- Initial calibration verification (ICV) and Continuing calibration verification (CCV) standards are analyzed at a minimum of every 10 samples to document consistent instrument response. The results of ICV and CCVs for each element in the solution must be within 10% of their respective true values.

Inductively Coupled Plasma Atomic Emission Spectroscopy (ICP-AES)

Multi-element calibration standards are prepared as needed. The analyte concentrations in the standards are verified daily by observing changes in emission intensity and by analyzing known independent check standards.

- The instrument is calibrated daily and each time it is set up. A blank and at least three standards are used in establishing the analytical calibration curve.
- A Continuing calibration verification standard and a continuing calibration blank are analyzed at a minimum of every 10 samples to document consistent instrument response. The results of CCVs for each element in the CCV solution must be within 10% of their respective true values.
- A laboratory control sample (LCS) serves as a monitor of the overall performance of all steps in the analysis, including the sample preparation. All aqueous LCS results must fall within 15% or less of the true value.

Inductively Coupled Plasma-Mass Spectroscopy (ICP-MS)

Multi-element calibration standards are prepared as needed. Analyte concentrations in the standards are verified daily by analyzing known independent check standards.

- The instrument is calibrated daily and during each set up. A blank and at least two standards (generally 3) are used in establishing the analytical calibration curves.
- The continuing calibration verification (CCV) solution and a continuing calibration blank are analyzed after every 10 samples to document consistent instrument response. The results of the CCVs for each element must be within 10% of their respective true values.
- A laboratory control matrix spike (LCS) serves as a monitor of the overall performance of all steps in the analysis, including the sample preparation. All aqueous LCS results must fall within 15% or less of the true value.
- Mass and detector calibrations are performed on a weekly basis. Tuning of the instrument is performed daily.

7.3.4 Tuning and GC/MS Mass Calibration

- Refer to calibration instructions of the manufacturer and the specific calibration section of each EPA method for analysis of volatiles and semivolatiles.
- A tune must be performed during each analytical shift (every 12 hours for SW846 8260/8270 and EPA 524/525, and every 24 hours for EPA 624 and 625 Methods). For BNA analysis the instrument shall be tuned to DFTPP. For VOA analysis the instrument is tuned to BFB. Tuning is designed to assure that instrument response meets specifications. (See table on next page for examples of mass intensity specifications for DFTPP and BFB.)
- No data may be collected prior to the initial tune. For VOA analyses, the BFB tune and the initial or continuing calibration may be

performed simultaneously as long as the tune is performed before calibration. The same is true for BNA analysis.

- Generate a minimum five (5) point initial calibration for SW-846 8260/8270, a minimum six (6) point for EPA 525, and a minimum three (3) point initial calibration for EPA 624/625/524 to include all target analytes. The relative response factor (RRF) and percent relative deviation (%RSD) will be calculated for each compound.
- For all CCCs (VOA and BNA), the %RSD must be less than or equal to 30 percent according to SW-846 8260/8270, or the %RSD for all compounds must be less than or equal to 30% for EPA 524/525 (35 percent according to EPA 624/625). *Note: Other calibration approaches may be used but must follow guidelines established by the determinative method.*
- A midlevel standard from the initial calibration standards is used in daily analysis. The difference (or drift) between the average RRF of the CCCs in the daily calibration and initial calibration standards must be less than or equal to 20 percent for SW-846 8260/8270 or the difference or drift of all compounds must be less than or equal to 20 percent for EPA 625. (See EPA 624 for specific midlevel QC requirements.)

7.3.5 GC/HPLC Analysis:

- Generate a 5-point calibration curve (minimum of 3-point for drinking water and wastewater methods) for all analyzed compounds monthly or prior to any sample analysis, as needed. Refer to the calibration instructions of the manufacturer and the specific calibration section of each SW846/EPA method.
- Analyze the instruments consistency response through the analysis of a standard after every analytical shift or daily (12hours for SW846).
- Demonstrate system cleanliness through the analysis of a reagent blank prior to sample analysis.
- Maintain sample response within the limits of the response of the standards.

7.3.6 Gravimetric Methods Calibration: A set of Class 1 certified weights is used to check the calibration daily. The analytical balance is checked with at least one weight. The weight selected is to reflect the routine use of the balance. The check is performed by the first analyst to use the balance during the day. Results are recorded in the balance calibration logbook. The full set of Class 1 weights is used to check calibration on a monthly basis. All analytical balances are re-certified on an annual basis.

Tune Criteria for Volatile and Semivolatile GC/MS Analyses

BFB Key Ion Abundance Criteria [a]	
Mass	**Ion Abundance Criteria**
50	15 - 40% of mass 95
75	30 -60% of mass 95
95	base peak, 100% relative abundance
96	5 to 9% of mass 95
173	< 2% of mass 174
174	> 50% of mass 95
175	5 to 9% of mass 174
176	> 95% but < 101% of mass 174
177	5 - 9% of mass 176

DFTPP Key Ion Abundance Criteria [a]	
Mass	**Ion Abundance Criteria**
51	*30 - 60% of mass 198*
68	*< 2% of mass 69*
70	*< 2% of mass 69*
127	*40 - 60% of mass 198*
197	*< 1% of mass 198*
198	*base peak, 100% relative abundance*
199	*5 - 9% of mass 198*
275	*10 - 30% of mass 198*
365	*> 1% of mass 198*
441	*present but < mass 443*
442	*> 40% of mass 198*
443	*17 - 23% of mass 442*

[a] Test Methods for Evaluating Solid Waste, Final Updates III. Revision 4, December 1996.

7.3.7 **Titrimetric Methods Calibration:** Primary standard reference materials are purchased through a supplier. All purchased titrants and back titrants must be standardized and certified by the supplier. QC check standards of the parameter of interest will be prepared and analyzed to verify standardization and the analyst ability to discern the end point.

7.3.8 **Temperature Monitoring:** Temperatures for refrigerators, ovens and incubators are measured on a daily basis and recorded in appropriate temperature logbooks. Dedicated thermometers are checked annually against the NIST certified thermometer and documented. Walk in coolers and study chambers are fitted with wheel chart recording thermometers that monitor and record temperatures continuously on a 24 hour basis. These recording thermometers have both audible and electronic alarm systems. The temperature recordings are verified annually against the NIST certified thermometer. Equipment with out-of-control temperature findings will be adjusted to correct the temperature and it will be monitored more frequently until the temperature is in-control and steady.

7.3.9 **TOC Analysis** – An operating calibration curve is prepared daily prior to sample analysis by measuring a reagent blank and at least three organic carbon standards. A reagent blank and a standard is analyzed after every 10 sample measurements. Each check must be within 10% of the true value.

7.3.10 Ion Chromatograph:

- The ion chromatograph is calibrated daily, before sample analysis, using a calibration blank and 3-5 standards.
- The instrument's consistency response is demonstrated through the analysis of a standard after every ten (10) samples analyzed.
- System cleanliness is demonstrated through the analysis of a deionized water blank prior to sample analysis and after every 10 samples.
- Sample response is maintained within the limits of the response of the standards.

7.3.11 Adiabatic Calorimeter: A benzoic acid pellet is analyzed prior to any analysis to ensure correct operation of the calorimeter. The value of the pellet must fall within the acceptable range of 2400 cal/g ± 10 cal/g. Should the value fall out of the acceptable limits, another pellet is analyzed. If the value is still unacceptable, troubleshooting and servicing may be needed.

8.0 Analytical Procedures

8.1 **Field Analytical Procedures:** Conductivity, salinity, pH, dissolved oxygen, and temperature are the most common field parameters. These parameters are measured in the field according to EPA methods ***(see Section 3.0)*** and internal REIC SOPs.

8.2 **Laboratory Analytical Procedures:** The analytical procedures used are listed in Section 3.0. Analyses of samples will be performed in accordance with protocols and QA procedures established by the EPA.

8.2.1 Sources for Drinking Water Methods –

- Title 40 of the ***"Code of Federal Regulations"*** (40 CFR), Parts 141 and 143 National Primary and Secondary Drinking Water Regulations; Sampling, Monitoring, and Analytical Requirements;
- ***"Methods for the Determination of Organic Compounds in Drinking Water"***, EPA/600/4-88/039, Dec. 1988; Revised July 1991; appended with "Supplement I", EPA/600/4-90/020, July 1990; and "Supplement II", EPA/600/R-92/129, Aug. 1992; and "Supplement III", EPA/600/R-95/131, August 1995. U.S. EPA.
- ***"Manual for the Certification of Laboratories Analyzing Drinking Water,*** Fifth Edition", EPA 815-R-05-004. January 2005. U.S. EPA.
- ***"Methods for Chemical Analysis of Water and Wastes"***, EPA/600/4-79/020; March 1983, U.S. EPA.
- ***"Annual Book of ASTM Standards"***, Vols. 11.01 and 11.02; http://www.astm.org
- ***"18th Edition of Standard Methods for the Examination of Water and Wastewater"***, American Public Health Association, Washington, DC.

- ***"Methods for the Determination of Metals in Environmental Samples"***, EPA/600/4- 91/010, June 1991; appended with "Supplement I", EPA/600/R-94/111, May 1994; U.S. EPA.
- ***"Methods for the Determination of Inorganic Substances in Environmental Samples"***, EPA/600/R-93/100; Aug. 1993, U.S. EPA.
- ***"Technical Notes on Drinking Water Methods"***, EPA/600/R-94/173; Oct. 1994, U.S. EPA.
- ***"Microbiological Methods for Monitoring the Environment, Water and Waste"***, EPA/600/8-78/017, Dec. 1978; U.S. EPA.

8.2.2 Sources for Wastewater (NPDES) Effluent Methods –

- ***"Guidelines Establishing Test Procedures for the Analysis of Pollutants"; Title 40 "Code of Federal Regulations"*** (40 CFR), Part 136; Tables IA, IB, IC, ID, and IE; and Table II.
- ***"Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms***, Fifth Edition", EPA-821-R-02-012, October 2002; U.S. EPA.
- ***"Appendix C to Part 136 - Inductively Coupled Plasma / Atomic Emission Spectrometric Method for Trace Element Analysis of Water and Wastes, Method 200.7";*** Title 40 CFR 136.
- ***"Methods for Chemical Analysis of Water and Wastes"***, EPA/600/4-79/020; March 1983, U.S. EPA.
- ***"18th Edition of Standard Methods for the Examination of Water and Wastewater"***, American Public Health Association, Washington, DC.
- ***"Appendix A to Part 136 - Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater"***; Title 40 CFR 136, Revised as of July1, 1995.
- ***"Annual Book of ASTM Standards"***, Vols. 11.01 and 11.02; reprinted annually; American Society for Testing and Materials, Philadelphia, PA. http://www.astm.org
- ***"Microbiological Methods for Monitoring the Environment, Water and Waste"***, EPA/600/8-78/017, Dec. 1978; U.S. EPA.
- ***"Methods for the Determination of Metals in Environmental Samples"***, EPA/600/4- 91/010, June 1991; appended with "Supplement I", EPA/600/R-94/111, May 1994; U.S. EPA.
- ***"Methods for the Determination of Inorganic Substances in Environmental Samples"***, EPA/600/R-93/100; Aug. 1993, U.S. EPA.

8.2.3 Sources for Surface Water and Groundwater Methods –

- ***"Test Methods for Evaluating Solid Waste, Physical / Chemical Methods,*** Third Edition, SW-846", Nov. 1986; revised by "Revision I", Dec. 1987; amended by "Update I", July 1992; "Update IIA", Aug. 1993; and "Update IIB", Sept. 1994; "Update III", December 1996. U.S. EPA. http://www.epa.gov/epaoswer/hazwaste/test/main.htm
- ***"US EPA Contract Laboratory Program, Statement of Work for Inorganic Analysis"***; Document No. ILM 05.2, 2002. http://www.epa.gov/superfund/programs/clp
- ***"US EPA Contract Laboratory Program, Statement of Work for Organic Analysis"***; Document Nos. OLM 04.3. March 2003. http://www.epa.gov/superfund/programs/clp

- ***"Superfund Analytical Methods for Low Concentration in Water for Inorganics Analysis"***; Oct. 1991, U.S. EPA. http://www.epa.gov/superfund/programs/clp
- ***"Superfund Analytical Methods for Low Concentration in Water for Organics Analysis"***; Oct. 1992, U.S. EPA. http://www.epa.gov/superfund/programs/clp

8.2.4 Sources for Solids, Sediments, and Soil Methods –

- ***"Test Methods for Evaluating Solid Waste, Physical / Chemical Methods, Third Edition, SW-846"***, Nov. 1986; revised by "Revision I", Dec. 1987; Amended by "Update I", July 1992; "Update II", Aug. 1993; and "Update IIA", Sept. 1994; and Update IIB, Jan. 1995; "Update III", Revised December 1996. U.S. EPA. http://www.epa.gov/epaoswer/hazwaste/test/main.htm
- ***"US EPA Contract Laboratory Program, Statement of Work for Inorganic Analysis"***; Document No. ILM 05.2, 2002. http://www.epa.gov/superfund/programs/clp
- ***"US EPA Contract Laboratory Program, Statement of Work for Organic Analysis"***; Document Nos. OLM 04.3. March 2003. http://www.epa.gov/superfund/programs/clp
- ***ASTM Methods from "Annual Book of ASTM Standards", reprinted annually;*** American Society for Testing and Materials, Philadelphia, PA. http://www.astm.org
- ***"Official Methods of Analysis of the AOAC, 15th Edition"***, 1990; Association of Official Analytical Chemists, Arlington, VA.

8.2.5 Sewage Sludge (Residual) Tests for Land Use/Disposal –

- Title 40, Part 503 of the ***"Code of Federal Regulations"*** (40 CFR 503), for EPA Standards for the Use or Disposal of Sewage Sludge.
- ***"Publicly Owned Treatment Works (POTW) Sludge Sampling and Analysis Guidance Document"***, Office of Water Permits Division; 1989; U.S. EPA.
- ***"Test Methods for Evaluating Solid Waste, Physical / Chemical Methods, Third Edition, SW-846"***, Nov. 1986; revised by "Revision I", Dec. 1987; Amended by "Update I", July 1992; "Update II", Aug. 1993; and "Update IIA", Sept. 1994; and Update IIB, Jan. 1995; "Update III", Revised, December 1996. U.S. EPA. http://www.epa.gov/epaoswer/hazwaste/test/main.htm
- ***"18th Edition of Standard Methods for the Examination of Water and Wastewater"***, American Public Health Association, Washington, DC.
- ***"Methods for Chemical Analysis of Water and Wastes"***, EPA/600/4-79/020; March 1983, U.S. EPA.

8.2.6 Solid and Hazardous Waste Characterization Tests –

- ***"Test Methods for Evaluating Solid Waste, Physical / Chemical Methods, Third Edition, SW-846"***, Nov. 1986; revised by "Revision I", Dec. 1987; Amended by "Update I", July 1992; "Update II", Aug. 1993; and "Update IIA", Sept. 1994; and Update IIB, Jan. 1995; "Update III", June 1996, Revised December 1996. U.S. EPA. http://www.epa.gov/epaoswer/hazwaste/test/main.htm

- ***ASTM Methods from "Annual Book of ASTM Standards"***, reprinted annually; American Society for Testing and Materials, Philadelphia, PA. http://www.astm.org
- ***"US EPA Contract Laboratory Program, Statement of Work for Inorganic Analysis"***; Document No. ILM 05.2, 2002. http://www.epa.gov/superfund/programs/clp
- ***"US EPA Contract Laboratory Program, Statement of Work for Organic Analysis"***; Document Nos. OLM 04.3. March 2003. http://www.epa.gov/superfund/programs/clp

8.2.7 Biological Methods -

8.2.7.1 Microbiological:

- ***Title 40, Part 141, Subpart C of the "Code of Federal Regulations"*** (40 CFR 141.21), for Drinking Water Monitoring and Analytical Requirements, Coliform Sampling. USEPA, Washington, DC.
- ***Title 40, Part 136, Table IA, of the "Code of Federal Regulations"*** (40 CFR 136.3) for the List of Approved Biological Test Procedures; USEPA. Washington, DC.
- ***"Microbiological Methods for Monitoring the Environment, Water and Waste"***, EPA/600/8-78/017, Dec. 1978; U.S. EPA.
- ***"18th Edition of Standard Methods for the Examination of Water and Wastewater"***, American Public Health Association, Washington, DC.

8.2.7.2 Toxicity Characterization (Bioassay):

- ***"Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms***, Fifth Edition", EPA-821-R-02-012, October 2002; U.S. EPA.
- ***"Short-Term Methods for Estimating the Chronic Toxicity of Effluent and Receiving Waters to Freshwater Organisms, Fourth Edition"***, EPA/821-R-02-013, October 2002; U.S. EPA.

8.2.8 Modifications to Approved Methods - If a modified procedure is proposed, the client will be notified. A complete method description and associated quality control parameters (precision, accuracy, method detection limits/reporting limits) will be provided prior to or simultaneously with the sample analysis.

8.3 Laboratory Glassware Cleaning: Surface residues and soils in the glassware are removed and disposed of in the appropriate waste containers and dirty glassware is drained of solvents prior to submitting for cleaning. All laboratory glassware (volumetric flasks, separatory funnels, extraction tubes, beakers, graduated cylinders, and others) is cleaned according to the analysis/parameter group listed on the next page. Cleaned glassware is returned to the proper storage cabinets in each laboratory.

8.4 Laboratory Reagents:

- Spectroscopic Grade - stored in a cabinet designated for general storage.

- ACS Grade - stored in a secure cabinet with limited access.
- Laboratory Grade - stored in cabinets designated for storage of reactive chemicals. Each chemical is separated from any other chemical with which it can react dangerously.
- Industrial Grade - stored in the **flammables only** cabinets.
- Indicator - stored in a desiccators.
- Purity certified by supplier - stored in the non-flammable cabinets. Certified and tested to meet Standard Methods 20th Edition
- Standards - stored in vented cabinets for acid storage. Each acid stored separately.
- Purified - stored in the **flammable solvents only** cabinets.
- All chemicals are dated and initialed upon arrival at the laboratory. Chemicals are dated and initialed when opened.

Laboratory Glassware Cleaning Procedures	
Glassware Type	**Cleaning Procedure***
Bioassay	1-3, 5, 4, 16, 12
BOD	1-3, 15, 4, 16, 12
Extractable Organics (Pesticides & Herbicides)	1-4, 5 or 6, 12, 13
Microbiology	1-4, 14
Nutrients/Classics	1-4, 8, 4
Petroleum Hydrocarbons	1-4, 6, 13
Residues	1-4, 10
Trace Metals	1-4, 9, 4, 16, 12
Volatile Organics	1-4, 7, 10

Key to Cleaning Procedures	
1.	Remove all labeling from bottles and glassware.
2.	Wash with hot tap water and Alconox (Liquinox). Scrub insides of glassware and any fittings with a brush.
3.	Rinse thoroughly with hot tap water (3 times).
4.	Rinse thoroughly with deionized water.
5.	Rinse thoroughly with pesticide grade methylene chloride.
6.	Rinse thoroughly with pesticide grade hexane.
7.	Rinse with Methanol (as needed).
8.	Rinse with or soak in 1:1 HCl (as needed).
9.	Soak in 1:4 HNO3, 1:4 HCl (as needed).
10.	Bake at 180°C for 3-4 hours (as per method).
11.	After use, rinse with last solvent used.
12.	Store inverted or capped with suitable material or suitable container stopper.
13.	Rinse with solvent used in the analysis prior to use.
14.	Autoclave at 250°C for 30 minutes.
15.	Nochromix rinse.
16.	Air dry.

**Cleaning Procedures are followed in order specified.*

8.5 **Laboratory Waste Disposal:** Waste materials generated in the laboratory are disposed of promptly and properly. The following procedures are employed in the disposal of laboratory wastes:

8.5.1 **Liquid Wastes** - In general, no chemical wastes may be disposed of in the sink. Only certain dilute and neutralized acid wastes can be disposed of in the sink.

- **Disposal of Standards and Solutions** - as standards and solutions are made, the solvents, constituents, date, and initial must be placed on the container. This information must be on the containers before it is offered for disposal. Standards containing any amount of organic solvents must not be poured into the sink. Aqueous standards containing organic or inorganic (metals, etc.) compounds must be stored in the appropriate waste container/drum and disposed of by a qualified waste disposal company.

- **Disposal of Solvent Wastes** - All solvents must be disposed of into the appropriate container located in the extractions laboratory. The waste container will be emptied by designated waste disposal personnel only. Waste chloroform is segregated from other solvent wastes for recycling purposes. Each is disposed of in glass bottles then into 5-gallon containers with appropriate label on the outside. Waste from TCLP extractions is collected and stored in an acceptable manner. Solvent wastes are classified /collected in waste solvent drums and disposed of by a qualified waste disposal company.

8.5.2 **Solid Wastes** - Solvent saturated solids and soil samples are collected and stored in an acceptable manner for disposal by a qualified waste disposal company. Vials are disposed of in the incineration glass container. Unmarked containers or unknowns cannot be disposed of until they are identified.

8.5.3 **Sample Waste Return Policy** - In general, samples are disposed of or returned to the client two weeks after a final report has been submitted.

8.5.4 **Sample Waste Disposal** - The following procedures are used to dispose of excess samples that have completed all necessary testing: Samples will be disposed of in two weeks after the final report has been submitted to the client - unless longer time is authorized by the General Manager, Laboratory Operations Director, Laboratory Manager, or the Project Manager/Coordinator. Prior to disposal, a sample disposal list will be generated by the appropriate waste disposal personnel. This list will be maintained in a logbook. Non-hazardous soil samples will be bulked into a drum for offsite disposal. Non-hazardous water samples (waste water and drinking water matrices) will be disposed of by neutralization where necessary and then disposed of by the local sanitary board. All other samples are containerized and disposed of by

a qualified waste disposal company. Empty sample containers should be disposed of (after crushed) in a dumpster. Appropriate protective equipment must be worn (safety glasses, gloves, apron, etc.) when crushing empty sample containers.

9.0 Data Reduction, Validation, and Reporting

9.1 **Analytical Data Reduction:** Data transfer and reduction are essential functions in summarizing information from field and laboratory measurements. It is essential that data reduction processes are performed accurately, and that accepted statistical techniques are utilized. Analysts will be responsible for calculating final data and QC data from raw data recorded in the field logbooks, laboratory bench sheets, chart recordings, instrument printouts, and computer printouts.

9.1.1 **Field Data** - Data obtained from field instruments such as pH meters, salinity and conductivity meters, and dissolved oxygen meters, is read directly from the instrument in appropriate units. Such instruments are used after calibration has been performed according to the owner's operation manual or REIC's field standard operating procedures. Data is recorded by the field analyst into the field logbooks. Data validation in the field involves making several readings to evaluate reproducibility of a measurement. The field team leader or any other member of the field team will review the field notes daily. The initials of the reviewer and date of the review will be entered on each page of the field logbook. The field data is sent to the laboratory in the field logbooks and is reported to the client in the hard copy laboratory reports.

9.1.2 **Laboratory Data** - Data that is obtained directly from instruments such as conductivity meters, pH meters, and the total carbon analyzer is entered manually onto bench worksheets. Some procedures, however, require reading graduation marks on glassware, observing color changes, and performing tests in replicates. Many methods use instrumental methods of analysis, in which the instrument is connected to a microprocessor or have microprocessor data systems as integral parts of the instrument. In such cases the calculations are internally performed once the appropriate calibration standards are entered into the instrument. The instrument analyses are calibrated in appropriate units. During the analyses, instruments coupled to computer controlled systems, convert signals to raw digital data, capture raw data, integrate, generate calibration and response factors, calculate and produce results. Results are expressed in units such as: micrograms per liter (µg/L), milligrams per liter (mg/L), milligrams per kilogram (mg/kg), etc. All data generated from spectrophotometric methods of analysis is computed according to Beer's law to produce a calibration curve based on the level of concentration of standards run during the analysis. The analyst ensures that the standards bracket the sample response, and that all data is generated from the linear portions of the calibration curve. When the analysts record data onto loose bench worksheets, or into the LIMS, they verify that all data entries and date sequences are correct. Drawing a line through the incorrect entry, followed by initials, makes correction of any worksheet error. All loose sheets are kept in bound books. Periodically the sheets are removed and filed. Bound

notebooks are also used for chronological sequence of data insertion. The pages are numbered and a table of contents is entered for referencing. All bench sheets, ring-binder books, and bound notebooks (logbooks) never leave the laboratory. These are a source of information for data transfer to appropriate report forms. LIMS files are backed-up daily and stored in case hardware failure is experienced within the computer system.

9.2 Data Validation:

9.2.1 Responsibility of the Analyst – The analyst will check the entry of data imported into the LIMS and calculations against the raw data. The initials of the analyst and date are entered on all data batches reviewed. The analyst must also review extraction, digestion, and instrument logs for correctness and completeness. Analysts are responsible for analyzing the appropriate type and quantity of quality control samples required for all analytical batches. Results must also meet pre-established control limits. If control limits are not met, the analyst is responsible for documenting and justifying data that is considered reportable. The analyst must also understand and document appropriate flagging of the final analytical results or associated quality control data. Results that are not compliant with method requirements or additional requirements of REIC's quality program must not be reported, except as described below. The Laboratory Supervisor and/or Laboratory Manager must be notified and the data reviewed. If re-analysis using a separate aliquot along with all associated quality control is not possible, the General Manager and/or Laboratory Operations Directors must be notified and written notification must be provided to the client immediately by the assigned Project Manager/Coordinator. (Further discussions of corrective actions are described in Chapter 14 of this ComQAP.) The analyst is also responsible for assembling the data file for each batch of samples, including the raw data and summary batch report, and forwarding the batch file to the assigned supervisor or designated data validator.

9.2.2 Responsibility of the Supervisor - The Laboratory Supervisor or designee is responsible for the review and validation of project data before reporting. These responsibilities include making sure that reported final data is correct and has been reviewed against the raw data. The Laboratory Supervisor will compare final data against previous values for any obvious errors in reported values and to ensure that all the supporting data including QC results is present.

9.2.3 Responsibility of the Quality Manager - The Quality Manager will review at least 2 data batches generated per month. The requirements to be checked in data validation are provided in the tables below for inorganic and organic data review parameters.

INORGANIC DATA CHECKS
Sample Chain of Custody (COC)
Extraction and analysis sample holding times
Calibration:
Initial calibration

ORGANIC DATA CHECKS
Sample Chain of Custody (COC)
Extraction & analysis sample holding times
Initial calibration
Continuing calibration verification

INORGANIC DATA CHECKS
Initial calibration verification
Continuing calibration verification
Blanks
Laboratory control sample
Quality control sample
Duplicate sample
Matrix spike sample
Field duplicates
Equipment blanks
Other method specific QC
Overall Assessment

ORGANIC DATA CHECKS
Blanks
Surrogate recoveries
Duplicate sample
Matrix spike/Matrix spike duplicate
Internal standard performance
Compound identification
Compound quantitation & reporting limits
System performance
Field duplicates
Equipment blanks
Chromatogram retention times
Mass spectrometer tuning criteria compliance
Overall Assessment

9.3 **Data Reporting** - Raw data is not normally provided in the formal report, but can be included if the client desires. Reports are reviewed and approved by the Project Managers/Coordinators who prepare a cover letter and/or case narrative explaining any details needing additional comment. Upon completion and approval, the report is sent to the client and mailing date reported in the LIMS.

9.4 **Data Archiving** -Copies of Chain-of-Custody forms, sample tracking worksheets, raw data, QC/QA materials, formal reports, and laboratory performance reports are kept on file by the laboratory for a minimum of five years. These files are available to the client or their approved representative(s) for review at any reasonable time within this period. All records are archived on-site under lock and key. Due to large volumes of paper and records generated, older records are archived on-site in a different building that is accessible by authorized personnel only. Access is also documented by a records log book maintained within the building. It should also be noted that all bench logbooks, instrument maintenance logs, and supplies record books are dated in consecutive order, filed, and kept indefinitely.

9.5 **Document Control System** – A document control system is used to ensure that all laboratory personnel have access to current policies and procedures at all times. Documents that are managed by this system include the CompQAP, SOPs, logbooks, etc. The system consists of a document review, revision and approval system, and document control and distribution. The CompQAP and SOPs are reviewed on an annual basis and as needed. All logbooks are numbered and a log is maintained in the QC Department of all logbooks issued and returned. The CompQAP and all SOPs are reviewed and approved by the Quality Manager, the Technical Director (Laboratory Manager and/or Laboratory Supervisor), Laboratory Operations Directors and/or the General Manager. All quality documents are controlled by the Quality Manager. Controlled copies are provided to applicable individuals/departments in the laboratories. The Quality Manager maintains a distribution list for controlled copies and ensures that any revisions are distributed appropriately.

9.6 **Confidentiality** - All laboratory results and associated raw data are kept in confidence to the customer who requested the analyses. REIC maintains confidentiality for all information associated with client projects. Access to

laboratory records and LIMS data is limited to laboratory personnel except with the permission of the Quality Manager, Laboratory Operations Directors, or General Manager. REIC's LIMS and network security are also controlled by REIC's Systems Administrator who reports to the General Manager. Where clients require transmission of test results by telephone, facsimile, or other electronic means, staff will ensure confidentiality is preserved.

10.0 Internal Quality Control Checks

Internal quality control (QC) checks are those procedures used during all phases of the project that are designed to control the individual processes involved in data generating activities. The QA objectives of a given project and the anticipated uses of data determine the type of QC checks needed. The QC checks apply to both field and laboratory activities. The following discussion describes the various QC checks performed for field samples and laboratory activities.

10.1 **Field Quality Control Checks:** For clients who bring sufficient volumes of samples for analysis or for projects in which REIC is responsible for field sampling, typically the field QC checks consist of equipment blanks, trip blanks (for VOAs only), and field duplicates. These field QC samples are analyzed for parameters of interest and are collected at frequencies determined by the project or according to recommendations presented in the following table. *(Although REIC will give advice on sampling, it is the sampler's ultimate responsibility to representatively sample, pack, and ship the samples to REIC Laboratory.)*

10.1.1 Travel (Trip) Blanks - Trip blanks are used to determine if any onsite atmospheric contaminants are seeping into the sample vials, or if any cross contamination of samples is occurring during shipment or storage of sample containers. Trip blanks are only analyzed for volatile organics. The trip blanks consist of sample bottles filled in the laboratory with organic-free water and any applicable preservatives. Trip blanks are sealed and placed in the ice chest. Trip blanks are sent to the sampling location with sampling kits and are returned unopened from the sampling location with the samples.

Frequency of Field QC Check Samples		
QC Samples	**Water/Liquids**	**Soil/Sediment**
Trip Blank (for VOAs only)	2 per Cooler	NR
Equipment Blank (rinsate)*	2 per Day	1 per Day
Field Duplicates: 1-4 Samples	NR	NR
5-9 Samples	5 % per Event	5 % per Event
>10 Samples	10 % per Event	10 % per Event
Split Samples**	----	----

Note: All parameters must meet QC sample type and frequency requirements. Numbers calculated from percent specifications will be rounded up to nearest whole numbers.

Abbreviations and Special Notes:

NR = Not Required.

* *For long field activities in which samples are collected daily, only samples from every other day may be analyzed. Other samples are held and analyzed only if evidence of contamination exists.*

** *The requirement for split samples (reference duplicates) has not been defined. If split samples are needed, the frequency of collection will be provided in the site-specific quality assurance plan.*

Trip blanks should originate at the facility providing the blank water and sample containers. It is not necessary to take an aqueous trip blank when a non-aqueous medium is being sampled.

FREQUENCY: One trip blank (2 trip blanks for Drinking Water VOCs) should accompany each cooler containing VOCs samples, should be stored at the laboratory with the samples, and analyzed by the laboratory.

10.1.2 Equipment Blanks - Equipment blanks are the final analyte-free water rinse from equipment cleaning collected daily during a sampling event. An equipment blank is prepared by pouring target, analyte-free (deionized) water into or over the sampling equipment (bailers, tubing, soil samplers). The rinse water is collected in a sample container, preserved, and handled in the same manner as the samples.

FREQUENCY: One equipment blank should be collected each day samples are collected. For long drawn field sampling events, only samples from every other day may be analyzed. Other samples are held and analyzed only if evidence of contamination exists.

10.1.3 Field Duplicates - A field duplicate is a replicate sample collected and analyzed to demonstrate the reproducibility of sampling technique. A field duplicate is separate from the duplicate the laboratory must run and cannot be replaced by a laboratory-generated duplicate. Field duplicates are representative of field sampling precision, whereas laboratory duplicates are a measure of analytical precision. Both pieces of information are essential in determining the quality of data generated for a project. A field duplicate is prepared at the sampling location from equal portions of sample aliquots combined to make the sample. Both the field duplicate and the sample are collected at the same time, in the same container type, preserved in the same way, and analyzed by the same laboratory as a measure of sampling precision.

FREQUENCY: Field duplicates should make up 10% of the samples collected.

10.1.4 Sample Splitting - Sample splitting is performed when two or more parties want to have a portion of the same sample. A field split or referee duplicate is prepared at the sampling location from equal portions of sample aliquots combined to make the sample. Both the field split and the sample are collected at the same time, in the same container type, preserved in the same way. The split sample is submitted to a referee laboratory for analysis to assist in evaluating inter-laboratory precision and the validation of the results.

FREQUENCY: Field splits to be determined by a client.

10.2 Laboratory Quality Control Checks

Internal laboratory control checks used by REIC are discussed in detail in each method performed. REIC will demonstrate the ability to produce acceptable results using the methods requested. The minimum QC spike requirements for organic and inorganic analyses are presented below.

Laboratory Minimum Samples Required							
	Standard Matrix		Sample Matrix				
Analysis	Blank	Spike	Spike	Spike Duplicate	Sample Duplicate	Surrogate Spike	Filter Blank
ORGANICS							
All Analyses (except TCLP)	5%	5%	5%	5%	NA	100%	5%
TCLP	5%	5%	+	5%	NA	NA	5%
INORGANICS							
pH	10%	NA	NA	NA	10%	NA	NA
Residues	10%	NA	NA	NA	10%	NA	NA
Turbidity	10%	NA	NA	NA	10%	NA	NA
Specific conductivity	10%	NA	NA	NA	10%	NA	NA
Dissolved oxygen	10%	NA	NA	NA	10%	NA	NA
TCLP	10%	10%	+	NA	NA	NA	10%
All Other Analyses	10%	10%	10%	10%	NA	NA	10%

Source: REIC. List of Abbreviations: NA = Not Applicable; + = 5% or 1 per waste type, whichever is greater

10.2.1 Holding Time - The amount of analyte in a sample can change with time due to chemical instability, degradation, volatilization, etc. If the specified holding time is exceeded the data generated may not be valid. Those analytes detected in samples analyzed past holding time requirements must be flagged as estimates.

10.2.2 Optimum Batch Size - The laboratory will determine the optimum batch size. The optimum batch size is the number of samples of similar matrix, which can be processed concurrently through the entire preparation (i.e., extraction) and analysis. (Method requirements typically designate up to either 10 or 20 samples.) After the batch size is determined the QC criteria described in the following sections are followed.

10.2.3 Calibration - All methods are calibrated prior to sample analysis ***(see Section 7.0)***. The following requirements are observed.

- **Semi-volatiles, Volatile Organics, and Pesticides/PCBs analyses,** the current EPA methods (600 series) and SW-846 methods (8000 series) shall be used; including frequency requirements, requirements for calibration check compounds (CCCs), and system performance check compounds (SPCCs).

  a. Tuning and performance criteria are established to ensure adequate mass resolution, proper identification of compounds,

and to some extent - sufficient instrument sensitivity. These criteria are not sample specific. Instrument performance is determined using standard materials. Therefore, the mass tuning criteria must be met at all times. The tuning standard for volatile organics is bromofluorobenzene (BFB) and for semivolatiles is decafluorotriphenyl-phosphine (DFTPP). If the ion abundance criteria for a method are not met, all associated data must be classified as invalid (unusable).

b. The response factor measures the instrument's response to specific chemical compounds. The response factor for method specified compounds must be equal or greater than the limit in both the initial and continuing calibrations. A value less than the specified limit indicates a serious detection and quantitation problem (poor sensitivity) and analytes in the sample will be qualified as an estimate. ***–Refer to the specific method for other appropriate guidelines.***

c. Percent RSD is computed from the initial calibration and is used to indicate the stability of the specific compound response over increasing concentration. Also, the percent recovery D is used to compare the response factor of the continuing calibration check to the mean response factor (RRF) from the initial calibration. Percent D is a measure of the instrument's daily performance. A value outside of the method specified limits indicates potential detection and quantitation errors. For these reasons all positive results are qualified as estimated. ***–Refer to the specific method for other appropriate guidelines.***

d. For the Pesticides/PCB analysis, %RSD for aldrin, endrin, DDT, and dibutychlorendate must not exceed 10%. Percent D must be within 15% on the primary quantitation column and 20% on the confirmation column. ***See specific method for other appropriate guidelines.***

- **Other Methods of Analysis**

a. At least three levels of concentration standards for each analyte shall be analyzed for initial calibration.

b. The correlation coefficient of the standard linear curve will be $\geq$ 0.995 (inorganics) and $\geq$ 0.990 (organics).

c. The midlevel calibration standard will be repeated at a frequency of 5% (organics) and 10% (inorganics) and at the end of a run.

d. Response of the control analytes must be within $\pm$ 10% (inorganics) and $\pm$20% (organics) of initial response.

e. Detection limits for each parameter will be determined and checked annually to ensure they meet limits specified for the project.

f. The calibration shall include one standard at a concentration at the level of the PQL.

g. The calibration curve shall bracket all samples in the concentration range. GC/MS Calibration shall be checked every 12 hours (or 24 hours for 624/625) of operation.

h. The laboratory shall use the calibration check acceptance criteria specified in the method.

i. If samples are outside the calibration range, the laboratory shall appropriately perform dilution to bring the samples concentrations within the calibration range.

10.2.4 Method Reagent Blanks - Quality assurance (QA) blanks, i.e., trip blanks, equipment blanks, water blanks, and method (reagent) blanks, are designed to identify any contamination which may have been introduced into the samples during field activity or sample preparation. Trip blanks measure cross-contamination of samples during shipment. Equipment blanks measure cross-contamination from the sampling equipment. Method (reagent) blanks measure laboratory contamination. If the concentration of the analyte is less than the method-quantifying limit, the analytes are qualified as non-detects. A method blank is analyzed for all methods with each sample batch.

10.2.5 Spikes and Laboratory Control Matrix Spikes (LCS) - In methods not using surrogates (metals, anions, wet chemicals), in addition to the method blank, a blank spike or a LCS are analyzed. For pesticides/PCBs methods, surrogate compounds are employed. A method blank and Laboratory Control Matrix Spike are also analyzed with each batch as separate samples. A pesticide and/or PCB are used as spiking compounds. In methods using surrogates spiked into all samples, the blank serves as both the method blank and the blank surrogate spike.

10.2.6 Second Column Confirmation – For GC and HPLC methods, confirmation techniques include analysis by GC/MS, GC or HPLC data from two different detectors or dissimilar columns. Confirmation is necessary when samples are from a site of unknown historical activity or when doubt exists over the identification of a peak on the chromatogram.

10.2.7 Surrogate Spikes - Surrogate spiking compounds are target analyte compound substitutes. The surrogates are chemically similar to the analytes of interest, and emulate their respective instrumental response. The surrogates do not interfere with the target analytes and are not naturally occurring in the environmental samples. Surrogate spikes are performed for all methods for which surrogates are a customary procedure. Surrogate spikes monitor both the performance of the analytical system and the effectiveness of the method on the type of sample matrix. The surrogate compounds are spiked into each client sample, QC sample, standard, and method blank in a batch. Samples are spiked prior to sample preparation.

10.2.8 Matrix Spike/Matrix Spike Duplicates (MS/MSD) - Spiked samples are samples that have specific concentrations of analytes of interest added. Except for all Drinking Water analyses and metals, sample-specific MS/MSD are analyzed in all methods for every 20 samples of a similar matrix (either soil or water). For metals analysis only, a matrix spike is required for every 10-20 samples of similar matrix (depending on the method). However, a matrix spike duplicate may be performed at the laboratory's discretion in lieu of a laboratory duplicate.

10.2.9 Internal Standard Performance - Internal standard (IS) performance criteria are designed to ensure that GC-MS sensitivity and response are stable during every analysis. The internal standard area count must not vary by more than a factor of 2 (50 -200%) from the associated continuing calibration standard. The retention time of the IS must not vary by more than 30 seconds from the associated continuing

calibration standard. If data is generated outside these criteria, all positive results for compounds quantitated using that IS are qualified as estimates.

10.2.10 Compound Identification - For volatiles and semivolatile organics, the compounds are identified on the GC-MS by using the analyte's relative retention time window (RRT) and by comparison to mass fragmentation patterns obtained from known standards. For the results to be a positive hit, the sample peak must be within plus or minus 0.06 RRT units of the standard compound and have a mass fragmentation pattern which has a ratio of the primary and secondary m/e intensities within 20% of that in the standard compound. For pesticides, the retention times of reported compounds must fall within the calculated retention time window for the two chromatographic columns.

10.3 Demonstration of Method Capability

An initial demonstration of capability (IDC) is performed prior to acceptance and use of any methodology. This initial demonstration of method performance is performed each time there is a significant change in instrument type, personnel, or test method. The process is described in **Appendix C**. A "Demonstration of Capability Certification Statement" is completed for each analyst and maintained by the Laboratory Managers and/or the Quality Manager. A copy of the documentation used for each demonstration is also included in **Appendix C**. For any methods or procedures that the method does not mandate an IDC or no procedure is provided (such as Turbidity, TCLP, Flash Point, etc.), the IDC will be performed by demonstrating the procedure to the Laboratory Supervisor or designee and documented with the IDC form and recorded in the personnel training records.

11.0 System and Performance Audits

11.1 **Systems Audits:** A system audit is a qualitative evaluation of all components of a project (field and/or laboratory activities) to determine if each component is properly performed. The audits are designed to assure that systems and operational capabilities are maintained, and the study methodologies and quality control measures for the project are being followed as specified in the quality assurance project plan. The Quality Manager will conduct system audits as needed to ensure proper operational capabilities. Audits of critical functions by the QA staff will include:

- Verification that standards, procedures, records, charts, data disks, etc., are properly maintained.
- Verification that the actual practice agrees with written instructions.
- Selection of methods that must include all phases of a laboratory's effort is monitored, to include but not be limited to sample logging, chain of custody, sample preparation, standard preparation, extract storage and analysis, and data reduction.
- Verification that QC/QA records are adequately filed and maintained so as to assure protection and retrievability.
- Walk-through the laboratory for general observations.

11.2 **Performance Audits:** Performance audits are quantitative evaluations of the components of a project or routine operations. Performance audits are used to

evaluate the laboratory's ability to obtain accurate results in the analyses of known check samples by specific analytical methods.

11.2.1 **Internal Performance Audits** - Internal performance audits consists of analyses of commercially purchased QC check standards and/or in-house prepared QC check standards. Commercial suppliers give the options of confidential double blind evaluations or single blind with the certified results mailed along with standards. The stock solutions used to make in-house QC check standards are different from those used for calibration standards. The QC check samples are carried through the complete analytical preparation and analysis and the calculated values are compared to the true target values. During the analytical data review, the Quality Manager pays close attention to these recoveries and must recommend corrective action in cases of repeated poor recoveries. In addition to regular measurement of the QC check sample, the Quality Manager may introduce QC check samples for analyses with other project samples; blind to the analyst. The parameter groups are selected at random by the Quality Manager. The findings will be summarized and reported to management directly following completion of laboratory analyses.

11.2.2 **Managerial Review** – At least annually, the laboratory management (General Manager, Laboratory Operations Directors, and Laboratory Managers) will conduct a review of REIC's quality system to ensure continued acceptability and effectiveness. This will include introducing any necessary changes, corrective actions, or improvements in the quality control program and overall laboratory operations. The review will consider all reports from managerial and supervisory personnel, the outcome of internal audits, assessments performed by outside auditing bodies, the results of proficiency test, any changes in the volume and type of work undertaken, feedback from clients, corrective actions and any other relevant information collected during the year in review.

11.2.3 **External Performance Audits** - Laboratory performance audits are also performed in conjunction with the performance evaluation programs and performance testing (PT) samples administered by various agencies. Examples of programs that REIC participates in that include on-site audits are the State of West Virginia DEP (Lab Number: 060); State of West Virginia DHHR (Lab Number 00412CM); State of North Carolina DENR (Lab Number: 466); State of Virginia DEQ (Lab Number: 00281); and the Florida Department of Health (NELAP Number: E87958). REIC maintains certifications via reciprocity agreements with the following state programs: the Virginia Department of General Services (Lab Number: 00281); Tennessee Department of Health (Lab Number: 02926); and Kentucky DEP (Lab Number: 90039). REIC also maintains a registration for performing analyses with the state of Pennsylvania DEP (Lab Number: 68-839.

11.3 **Memberships, Licenses, and Certifications:** The following is a list of memberships, licenses, and certifications currently held by REIC:

- American Chemical Society
- Associations of Analytical Chemists
- West Virginia Petroleum Marketers Association
- Rural Water Association
- Mining & Reclamation Association

- American Water Works Association
- The Solid Waste Association of North America
- West Virginia Manufacturers Association
- Association of West Virginia Solid Waste Authorities
- West Virginia Oil Marketers & Grocers Association
- State of West Virginia Department of Health, Office of Environmental Health Services
- State of West Virginia Department of Commerce, Labor, and Environmental Resources, Department of Environmental Protection, Water Resources Section
- Commonwealth of Virginia Department of General Services, Division of Consolidated Laboratory Services
- Commonwealth of Kentucky Natural Resources and Environmental Protection Cabinet, Department of Environmental Protection
- State of Tennessee Department of Conservation, Division of Underground Storage Tanks
- State of Tennessee Department of Health and Laboratory Services
- North Carolina DEHNR Division of Solid Waste Management
- State of Florida Health Department (NELAP)
- Pennsylvania Department of Environmental Protection, Bureau of Office System and Services

A complete listing of methods and certified parameters for the above listed programs can be provided to clients upon request. REIC's complete listing of NELAC accredited methods/parameters is summarized in **Appendix F**. A copy of REIC's compliance statement with the NELAC standards is also included in **Appendix B**.

11.4 **Audit Reports:** The Quality Manager shall provide an audit report comprised of summary findings to the General Manager and/or Laboratory Operations Coordinators on a periodic basis or as needed. Deviations will be noted and discussed by management. The audit findings, both compliance and non-compliance, must be documented, filed in a secure place, maintained as part of the QA documentation. Minimally, these reports should include: Periodic assessment of measurement quality indicators, i.e., data accuracy, precision, and completeness; Results of internal and/or external audits; Results of system audits; Significant QA problems and recommended solutions. (The Quality Manager may also provide reports to the General Manager on a weekly basis during the status meetings conducted by the Project Managers/Coordinators and Laboratory Managers/Supervisors.)

12.0 Facilities, Equipment, and Preventative Maintenance

12.1 **Facilities and Equipment** – For over eighteen years, REIC has been performing environmental services and evaluations for a multitude of highly technical and demanding projects. From its inception, REIC has addressed the major environmental testing protocols and has steadily evolved incorporating the latest analytical procedures and state-of-the-art facilities and equipment. REIC's clients have learned to expect unparalleled service with uncompromising quality on a routine daily basis. All work is approached with the highest of professional ethics, personable interactions, and professional accountability.

REIC's headquarters is located ten miles south of Beckley, WV along Interstate 64, some fifty miles to the east of Charleston, WV and ninety miles west of

Roanoke, VA. The parent facility houses its 20,000 square foot Analytical Chemistry Division at the Raleigh County Airport Industrial Park (**See floor plan on next page**). The Biological Division is operated from its 7500 square foot modern laboratory in Cool Ridge, WV. REIC also maintains a service center and laboratory in Roanoke Virginia, for microbiological analyses for Virginia clients.

12.2 **Computers and Electronic Data Security Requirements** – Electronic data security is achieved through a multi-faceted approach to data access and storage. All servers, personal computers, instrument workstations, and printers are connected via the REIC local area network (LAN). The network is a secure Microsoft Windows Server 2003 Active Directory domain. The domain controllers provide authentication services for users and supply additional authorization data, such as user group memberships. These services are used to control access to resources on the network.

Laboratory data is managed and stored in the Laboratory Information Management System (LIMS). This system is a Microsoft Access database stored on a network server and accessed by REIC personnel from client workstations. The LIMS has another level of security built in with different levels of access privileges for all REIC personnel.

Electronic data is protected from corruption via backups that are created nightly by server tape backup devices. Tapes are rotated through a two week cycle with one tape taken off-site weekly. Hard copies of raw analytical data and analytical reports are also kept on file for a period of five years.

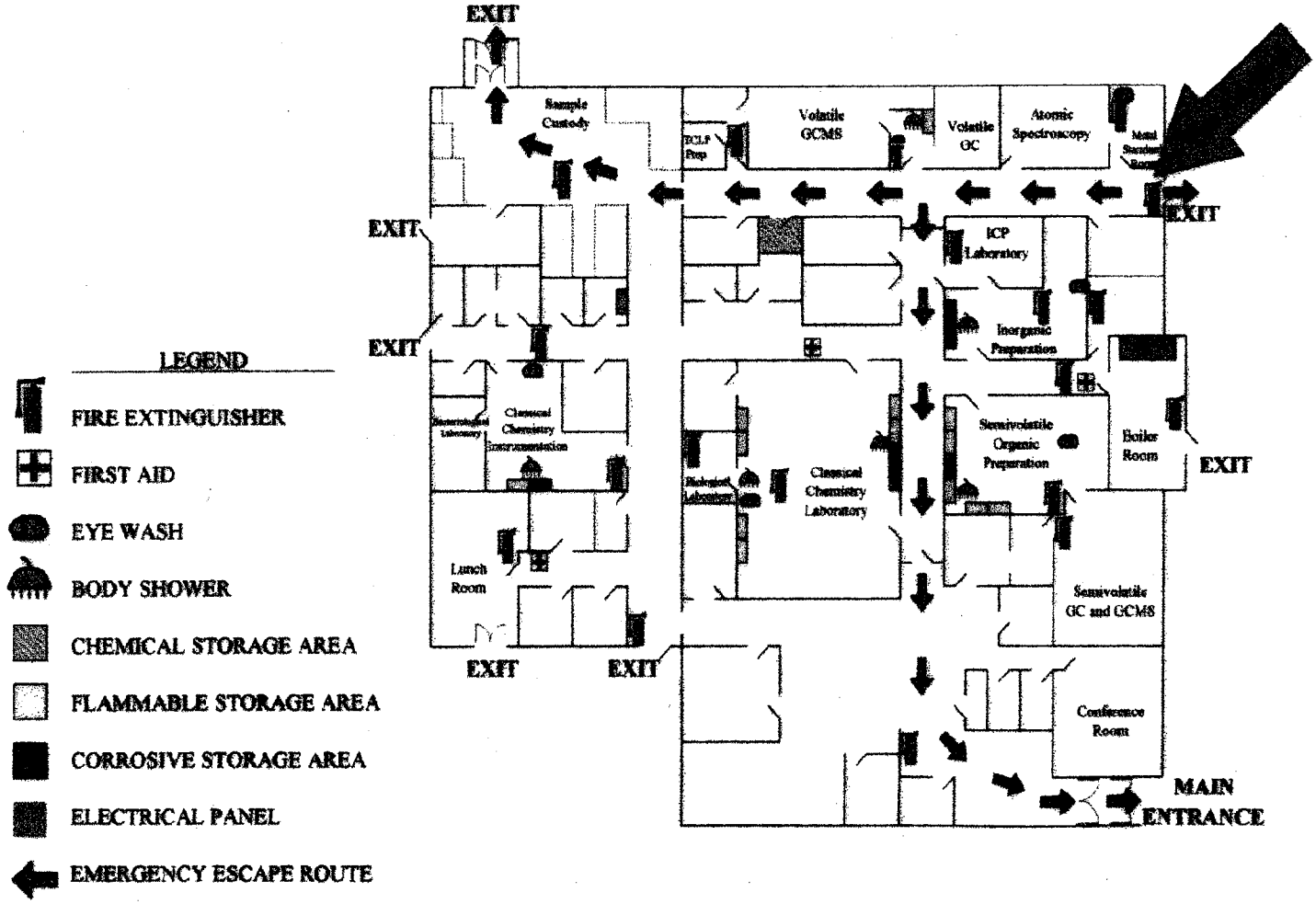
REIC remotely maintains a web site and email server outside the LAN to minimize the security threat from incoming internet traffic. Analytical data and status information are accessible to our clients through this secure client on-line access. REIC's web address is http://www.reiclabs.com.

12.3 **Preventative Maintenance** - To ensure that instruments are operating properly at all times, REIC follows a rigorous maintenance schedule and trouble-shooting procedures. All laboratory instruments undergo regular maintenance as required in the manufacturer's operation manual for each of the instruments. Trouble shooting protocols are also performed, if needed, for instruments according to instructions in the operation manual. Manufacturer service departments or local service repair companies provide repair. In the case of downtime of specialized instruments, service contracts with the manufacturer are maintained.

In the event of excessive downtime, REIC will either acquire instrumentation to complete project work or subcontract project work to fulfill project requirements.

REIC

Quality Environmental Services



12.3.1 **Maintenance Documentation:** Maintenance service contracts or internal maintenance logs are kept for each instrument. The maintenance log is kept at the instrument, so that preventive care or repair can be recorded immediately. All maintenance and repairs are documented in the instrument's logbook. The records include the date of maintenance or repair and description of work.

Other examples of the logbook entries are: name of the person providing the service, date, time, nature of service provided, notations, etc. Also, any applicable change in operation conditions, such as sensitivity, signal drift, temperature, corrections, alignments, etc, are recorded in the instrument's maintenance log book. For solvents, reagents, or gases, examples of log entries are: charting of the gas flow readings, gas pressure of cylinders, replacement dates of gas cylinders and water deionization cartridges, replacement of solvents, etc.

12.4 Instrument Maintenance Schedules:

12.4.1 Gas Chromatograph			
DAILY	**COLUMN CHANGE**	**SEMIANNUALLY**	**AS NEEDED**
Replace injector septum if necessary. Check and fill solvent rinse vials. Check cylinder and regulator output pressure. Inspect gas filter driers, check flow through flow controllers. Set and check injector, oven, and detector temperatures. Run a baseline for proper sensitivity and noise level to be used. Run solvent blank and standard solution, check for false peaks, bad retention times, baseline drift, poor peak shapes, and low sensitivity.	Check for leaks under pressure. Check carrier gas flow through column with bubble flow meter. Condition column overnight and run daily check. Clean injector glass liners or replace as necessary.	Wipe check ECD (performed by contracted service group). Reactivate or recharge flow controller filter dryers.	Bake out ECD. Leak test all gas fittings to cylinders. Optimize gas flows to the FID. Clean FID and align jet if necessary.

12.4.2 HPLC	
AS NEEDED	
Dismantle the detector flow cell and clean. Replace detector lamps according to manufacturer's recommendation. Guard column frets and packings replaced when system pressure increases.	Replace piston seals and check valves. Check and refill solvent containers.

12.4.3 Gas Chromatograph/Mass Spectrometer				
DAILY	**WEEKLY**	**COLUMN CHANGE**	**SEMI-ANNUALLY**	**AS NEEDED**
Check cylinder and regulator output pressure. Inspect gas filter driers, check flow through flow controllers, and adjust ionization gauge controllers. Set and check injector, oven, and detector temperatures. Check MS tuning, and run an auto/manual tune if necessary. Run solvent blank and standard solution, check for false peaks, bad retention times, baseline drift, poor peak shapes, and low sensitivity. Check and fill solvent rinse vials.	Replace injector septum if necessary. Change inlet liner as needed.	Check for leaks under pressure. Change the septum. Condition column overnight and run daily check.	Oil Turbo molecular pump wick. Renew rough pump oil.	Change the guard column. Auto manual tune the MS. Recalibrate. Clean the MSD source. Clean the injection port.

12.4.4 Atomic Absorption Spectrophotometer (AA)			
DAILY	**WEEKLY**	**MONTHLY**	**ANNUALLY**
Clean burner head/injection port. Check water pressure. Check gas pressures. Check & clean furnace optics if necessary. Inspect lamps for damage.	Clean aspirator and nebulizer for deposits. Dust instrument exterior Check absorbance for line/element selection. Clean furnace.	Examine O-rings in burner assembly and replace if necessary. Check cones in graphite furnace if necessary. Inspect furnace cooling lines. Refill spray chamber reservoir.	Schedule service visit by manufacturer to clean optics and for other maintenance.

12.4.5 Inductively Coupled Plasma-Atomic Emission Spectrometer (ICP-AES)				
DAILY	**MONTHLY**	**QUARTERLY**	**AS NEEDED**	**ANNUALLY**
Check nebulizer flow rate. Keep ICP exterior dust free. Clean/flush nebulizer. Check vacuum pressure gauge. Record instrument operating parameters. Record zero position and reference wavelength.	Refill argon humidification reservoir.	Clean filters. Change cooling water reservoir. Clean & inspect torch/spray chamber.	Install new power tube, when the tube wears out. Dust/clean instrument exterior and torch box. Dust off intake and exhaust.	Install new mirror. Manufacturer's preventive maintenance. Change vacuum pump oil

12.4.6 Inductively Coupled Plasma-Mass Spectroscopy (ICP-MS)				
DAILY	**WEEKLY**	**MONTHLY**	**SEMI-ANNUALLY**	**ANNUALLY**
Verify acceptable sensitivity & stability. Record all settings and operational parameters. Properly dispose of both waste reservoirs (spray chamber drain & probe rinse drain).	Perform mass calibration. Perform detector calibration Complete system tuning. Exchange/clean glassware. Check water filter & change if necessary. Check air filters & clean/exchange if necessary. Inspect pump tubing; replace if necessary. Inspect sample/skimmer cones & clean/ex change if necessary. Inspect all tubing/lines for degradation & leaks. Dust off the instrument & associated hardware.	Clean extraction lens. Check rotary pump oil levels. Check oil mist filters. Archive all analytical data on disks & then purge the data from the computer's hard drive.	Examine lens stack and clean if necessary. Examine penning gauge & clean if necessary Change rotary pump oil. Examine slide valve & check operation.	Replace detector (or as needed).

12.4.7 pH Meter, Conductivity Meters, Dissolve Oxygen, & Ion Specific Analyzer

12.4.7.1 pH Meter	
DAILY	**AS NEEDED**
Check the pH electrode tips for cracks. Analyze two calibration buffer standards & record results. (Aliquots of buffer standards shall be used only once.) Check the slope with a midrange standard buffer. Rinse electrode thoroughly between use and after use. Place the electrodes in storage buffer after use.	Solution refilled in the glass electrode. Replace the ceramic junction (Pentek pH meter).

12.4.7.2 Conductivity Meter & Conductance Bridge		
DAILY	**ANNUALLY**	**AS NEEDED**
Check and record the cell constant. Rinse the electrodes thoroughly between and after use. Place the electrode in the storage liquid after use.	Check the internal calibration with appropriate resistors (conductance bridge).	Make temperature correction. Clean according to the manufacturer's instructions (Bridge).

12.4.7.3 Dissolved Oxygen Meter	
DAILY	**AS NEEDED**
Call local National Weather Service for barometric pressure. Make corrections for barometric pressure and temperature. Record corrections and calibration results. Check that the stirring device is functioning properly. Protect the probes between and after use.	Refurbish O_2 sensor according to the manufacturer's instructions. Replace fill-solution and membrane.

12.4.7.4 Ion Specific Meter	
DAILY	**AS NEEDED**
Check the electrode tips for cracks or scratches. Calibrate with at least three standards and record results. Rinse electrode thoroughly between use and after use.	Make temperature corrections.

12.4.8 Analytical Balance and Electronic Balance	
DAILY	**AS NEEDED**
Clean weighing pan after each use. Return dust covering over the balance after use. Verify functional calibrations with Class 1 certified weights for analytical balances.	Bring in a qualified service and repair firm to service the balances. Balance certifications are performed annually by a qualified service firm.

12.4.9 Purge and Trap Auto-Sampler
Check for system leaks, accumulation of dirt in purge chamber and degradation of trap. Clean or replace as needed.

12.4.10 Low Temperature Incubator		
DAILY	**QUARTERLY**	**AS NEEDED**
Check and record the temperature from the digital meter. Prevent bacterial contamination of the incubator.	Compare the meter to the lab thermometer traceable to NIST, and record the results.	Clean the incubator according to the manufacturer's instructions.

12.4.11 Norwalk Walk-in Coolers and Study Chambers		
DAILY	**WEEKLY**	**ANNUALLY**
Inspect the digital temperature readout device. Make sure the proper temperature is maintained. Check that the wheel chart needle is recording properly.	Check and record that the audible alarm is functioning. Replace and file the (7day) wheel chart-papers. Reorganize and clean the interiors.	Compare the monitors to the lab thermometer traceable to NIST, and record the results.

12.4.12 Working Thermometers (Glass/Mercury)	
DAILY	**ANNUALLY**
Check for continuity of the liquid column.	Compare each dedicated thermometer to the lab thermometer traceable to NIST, and record the results.

12.4.13 Deionized Water Units			
DAILY	**QUARTERLY**	**ANNUALLY**	**AS NEEDED**
Note the cartridge indicator reading.	Analyze for pH, Conductivity, Chlorine, and Bacteria.	Analyze for heavy metals; Pb, Cd, Cu, Cr, Ni, and Zn.	Change the cartridges when exhausted. Record the analyses results and any system changes.

12.4.14 Drying Ovens	
DAILY	**ANNUALLY**
Check and record the temperature (thermometer bulb in sand). Check that the door fits properly. Check and prevent sample cross contamination.	Compare the thermometer to the lab thermometer traceable to NIST, and record the results.

12.4.15 Muffle Furnace	
DAILY	**ANNUALLY**
Check and record the temperature setting. Check that the door fits properly. Check sure the fumes are properly exhausted.	Compare the meter to the lab thermometer traceable to NIST, and record the results.

12.4.16 LECO Tube Sulfur Analyzer	
AS NEEDED	
Calibrate with standards from a commercial supplier. Set and check the operating temperature.	Check all tubing and the gas pressure. Clean the titration vessel after use.

12.4.17 Total Organic Carbon Analyzer
The injection septum is replaced every 100 (or less) injections. All pump tubes should be replaced at two-week intervals. Every two or three day's intervals check printer tape, infrared zero, and infrared span.

12.4.18 Spectrophotometer or Colorimeters	
DAILY	**BIANNUALLY**
Clean sample cells thoroughly or replace with new ones.	Verify the wavelength with a color standard or equivalent, and record results.

12.4.19 BOD Incubator		
DAILY	**QUARTERLY**	**AS NEEDED**
Check the digital meter and the inside thermometer. Make sure that thermometer bulb is immersed in liquid. Check that the door seals properly. Prevent bacterial contamination of the incubator.	Compare the meter to the Lab thermometer traceable to NIST.	Clean the incubator according to manufacturer's instructions.

13.0 Calculations of Data Quality Indicators

13.1 **Precision:** Precision is a measure of the degree of reproducibility of an analytical value and is used to check on the quality of the sampling and analytical procedures. Precision of the analytical method, at each stage, is determined by calculation of the relative percent difference (RPD) between duplicate analytical recoveries of sample component, relative to the average of those recoveries: Since an absolute value is used for the difference between R_1 and R_2, there is no lower control limit. These calculations are usually performed on sample matrix spikes and matrix spike duplicates and/or samples and respective sample duplicates.

$$RPD = \{ |(R_1 - R_2)| / [(R_1 + R2)/2] \} \times 100$$

Where: R_1 and R_2 = concentration of Duplicates 1 and 2, respectively.

13.2 **Accuracy:** Accuracy is a degree to which a measurement agrees with the actual value (i.e., amount of measurement bias). Accuracy is expressed as a percent recovery of a sample's target value (known concentration of reference material). The accuracy of the analytical procedure is determined by the addition of a known amount of material (matrix spike) to a field sample matrix or a Laboratory Control matrix. A Laboratory Control matrix is made up of deionized (distilled water) or clean soil (of known physical and chemical properties). Percent recovery is calculated as follows: If RPD or R-values do not meet acceptance criteria as specified in Section 3, results reported in all samples processed as part of the same set must be labeled as suspect, and the sample analysis may need to be repeated. The laboratory Quality Manager will be notified, and the necessary corrective action will be implemented.

$$R = [(x_s - x_u)/K] \times 100$$

Where: R = % Recovery
x_s = the measured value for the spiked sample
x_u = the measured value for the unspiked sample, and
K = the known value of spike in the sample.

13.3 **Completeness:** Completeness is a measure of the amount of data obtained from a measurement system compared to the amount that was expected to be obtained. Analytical completeness is assessed by comparing the total number of samples with valid analytical results to the number of samples collected and delivered to the laboratory. The result is calculated following data validation and reduction. Completeness (C) is determined by:

$$C = S_2/S_1$$

where: S_1 = total number of samples planned, and
S_2 = number of valid data points.

A value of 95% or higher is the goal. For values less than 95 percent, problems in the analytical procedures must be examined and possible solutions explored.

13.4 **Detection Limits:** When analytical measurements fall below the confidence level, the results are reported as "non-detects" (ND). This level can be: the Minimum quantifying level (MQL), practical quantitation limit (PQL), or method detection limit (MDL). The choice is based upon the needs of the client, objectives of the project, and requirements of the regulatory agency. The MQL is the concentration of an analyte that can be measured and reported based on the sample matrix. The MQL may be 2 to 10 times greater than the MDL. The PQL is the lowest concentration level that can be reliably achieved within the specified limits of precision and accuracy during routine laboratory operating conditions. The MDL is the minimum concentration of a substance that can be reliably recovered in a sample matrix, distinguished from the background noise level, and reported with a 99% confidence that the analyte concentration is greater than zero. For unknown or difficult matrices, REIC laboratory will either determine or use the MDL(s) provided in the EPA analytical methods being employed. When determining MDLs, the analyst uses the procedures given in 40 CFR Part 136, Appendix B. The detection limit is defined as follows for all measurements:

$$MDL = t_{(n-1,\ 1-\alpha=0.99)} \times S$$

where:	*MDL*	=	*method detection limit*
	S	=	*standard deviation of the replicate analyses*
	t (n-1, 1-α=0.99)	=	*Students' t-value appropriate to a 99 percent confidence level and a standard deviation estimate with n-1 degrees of freedom*

13.5 **Control Chart Procedures:** For selected parameters, as precision data is accrued, parameter and matrix specific control charts are generated. The average RPD (P') and the standard deviation (Sp) of the RPD will be recalculated. In a precision control chart, the assessment is expressed as a RPD interval from zero to:

$$P' + [(3)\ S_p] = \textit{precision control level.}$$
$$P' + [(2)\ S_p] = \textit{precision warning level.}$$

For the accuracy control charts, the average percent recovery (R') and the standard deviation (S_r) of the average percent recovery will be recalculated for selected parameters and matrices. The accuracy assessment is expressed as percent recovery interval from:

$$R' + [(3)\ S_r] = \textit{upper control level.}$$

$$R' + [(2)\ S_r] = \textit{upper warning level.}$$

down to:

$$R' - [(2)\ S_{lr}] = \textit{lower warning level.}$$

$$R' - [(3)\ S_r] = \textit{lower control level.}$$

The precision and accuracy control charts for selected parameters will be updated on a regular basis. After each five to ten new measurements are added, the average of the most current twenty to thirty data points and the standard deviation of the average will be updated.

14.0 Corrective Action

14.1 **Field Activities:** Field activities that are improper will be corrected as quickly as possible. The project field manager or designated field team leader will be responsible to see that corrective action is initiated and documented; whenever the error has the potential to compromise the quality of the data being generated or there is a chance that the error might be repeated. The Quality Manager can also make recommendations, during the field audits or field data reviews, to the field manager who can ensure

immediate implementation. The corrective action report must document in detail the nature of the problem, proposed corrective action, who is responsible for executing it, and who will verify that it was carried out. Examples for frequently measured parameters in the field and limits to which they should agree (as determined by replicate measurements or prior expectations) include:

- pH determination should agree within 0.02 pH units.
- Conductivity measurements should agree within 2 numbers of the last significant digit.
- Depth to water level determinations/readings should agree within 0.01 foot. If re-measurements are not successful, then instrument calibration and operation and the field analyst technique should be evaluated.

14.2 **Laboratory Activities:** When the performance of analytical systems is found to be unsatisfactory, corrective action will be initiated. The General Manager, Laboratory Operations Coordinators, Laboratory Managers, Project Personnel, Laboratory Supervisor, Analyst/Technician, and Quality Officer may be involved in the corrective action depending on the extent of the correction. For corrective actions that will impact the project budget or schedule, the general manager, laboratory operations coordinators, and/or the project manager/coordinator must be closely involved. There are two kinds of corrective action:

- **Immediate corrective actions** are taken to correct or repair nonconforming equipment and systems. The need for such action is likely to be identified by the analyst through calibration checks and spike analyses. Immediate corrective actions are initiated by notifying the Laboratory Supervisor and/or Laboratory Manager. If re-analysis using a separate aliquot of sample along with the associated quality control is not possible, the General Manager and/or Laboratory Operations Directors must be notified and written notification must be provided to the client within one working day.
- **Long-term corrective actions** are taken to eliminate causes of nonconformance. The need for such a corrective action may be identified through audits. Examples of this type of corrective action include:
    - Identifying vendors to supply reagents of sufficient purity;
    - Rescheduling of field activity or laboratory routine to ensure that samples are always analyzed within the correct holding time; and
    - Personnel training or replacement.

14.3 **Corrective Actions Procedures:** Corrective actions may be initiated as a result a problem identified through a system or performance audit, data review, or data end user's request. The process is generally initiated by the Quality Control Manager or Laboratory Manager and documented with a system performance log by the analyst or laboratory supervisor responsible for the data. The analyst has the ultimate responsibility of evaluating the effectiveness of the corrective actions. If the corrective action is ineffective, it is the analyst's responsibility to notify the Laboratory Supervisor and/or Laboratory Manager. Laboratory management must verify that corrective actions have been effective by performing a follow-up data review, submitting a proficiency sample or performing other internal audit activities. For either immediate or long-term corrective actions taken as a result of non-conformance in field and laboratory activities, the procedure is as follows:

- Define the problem;
- Assign the responsibility to appropriate personnel to investigate the problem;
- Find and describe the cause of the problem;
- Determine the appropriate corrective action to eliminate the problem;
- Assign and accept responsibility for implementing the corrective action;

- Establish the effectiveness of the suggested corrective action and implement the correction; and
- Verify that the corrective action has achieved its goal and the problem has been eliminated, i.e., in the preparation of new standard or calibration solutions, provided the results of the old together with the new calibration standards verify that the problem as been eliminated.

Occasionally data is reported when the accompanying quality control data are not within established quality control objectives, sample hold times have been exceeded, clients request data be reported below the laboratory's established reporting limits or some other reason the data is not to standard. These instances are documented in the final analysis results by using data qualifier codes (flags) to alert the data end user to the fact that the data may only be used within limitations. Final reports may also have a parameter comment that is added by the analyst to qualify a result when the data management codes do not suffice or additional qualification is needed.

Data Qualifiers	
Qualifier	**Description**
B	Analyte detected in the associated Method Blank
E	Value estimated due to calibration range exceedence
H	Sample extraction/analysis holding time exceeded
J	Analyte detected at less than the PQL
R	RPD exceeds accepted recovery limits
S	Spike/Surrogate Recovery exceeds accepted recovery limits

Specific corrective action procedures per method are further discussed in REIC's SOPs.

14.4. **Non-Conforming Work:** If at any time it is determined that any aspect of the analytical process has compromised the Laboratory's ability to generate defensible data the analyst must notify the Laboratory Supervisor/Manager immediately. The Laboratory Supervisor/Manager must review the data and notify the Laboratory Operations Coordinators and/or General Manager. Clients must then be notified in writing (e-mail is acceptable) of the irregularity by the Project Manager/Coordinator within the notified working day. This policy applies to situations in which the Laboratory Supervisor/Manager and Laboratory Operations Coordinators and/or General Manager have determined that the significance of the irregularity justifies recalling work that has already been released or when the Laboratory has decided that it will not report results that are considered invalid. This policy does not apply to those situations in which a data qualifier/flag or sample note can be used to qualify the data. Corrective actions described previously in this chapter must be taken immediately to remedy the situation.

15.0 QA Report to Management

The General Manager will be updated of the quality control procedures and results of field and laboratory operations. Oral reports will be on a weekly basis and formal detailed reports on a periodic basis (or as needed). The quality assurance report issued, as part of the report to the client, shall be retained as part of the project file and may not be available for review by any other external auditor other than the client.

Management shall also receive quality assurance reports as they are obtained from external systems or performance audits. The Quality Manager will provide a formal report to management on a periodic basis. The report may include:

- Overall over-view of the progress of the QA program.
- Changes in the project specific QA plans, training, and accomplishments.

- Summaries of field audits and laboratory quarterly audits Summaries of findings of monthly analytical data packages review.
- Significant QA/QC problems, recommended solutions, and results of corrective actions.
- Response to external audit findings and any corrective action implemented.

16.0 Subcontracting, Support Services, and Supplies

16.1 **Subcontracting Laboratory Services** – A listing is maintained of laboratories that provide subcontracted services for REIC along with copies of all associated certifications (such as NELAC, USACE, and state certifications). A Chain-of-Custody is generated by REIC prior to sending or initiating services from the subcontracted laboratory. All associated documentation provided by the subcontractor for a specific project is included as an appendix to REIC's final analysis report (Certificate of Analysis) that is submitted to the client.

16.2 **Outside Support Services and Supplies** – REIC only uses those outside support services and supplies that are of adequate quality to sustain confidence in the laboratory's tests. Records of all suppliers for support services or supplies required for tests are maintained by the purchasing department.

16.3 **Inspection/Acceptance Requirements for Supplies and Consumables** – Prior to acceptance of any supplies and consumables, the items are checked for breakage. Any discrepancies in the packing lists are noted. The packing slips are given to the purchasing department for filing.

16.4 **Customer Complaint Resolution** – In its commitment to quality improvement, REIC has implemented a "Client Concerns" program to address complaints and issues regarding data quality. The program is intended to address the following areas of concern:

- Sample turnaround time
- Data quality
- Invoicing
- Customer service

Client concerns are given a unique numerical identifier and can be initiated by any REIC staff member. All concerns are reviewed by the General Manager and Laboratory Operations Directors and copies are filed with REIC's Project Managers/Coordinators. These files are available to clients for review except in the case where client confidentiality may be compromised. REIC's Client Concerns SOP further addresses how complaints are registered, documented, and brought to closure (changes is procedure, corrective action taken, etc.).

17.0 References

1. **Code of Federal Regulations**; Part 136 (40 CFR 136); U.S. Government Printing Office: Washington, DC. Web Address: http://ecfr.gpoaccess.gov/cgi. (Updated daily.)
2. **Code of Federal Regulations**; Part 141 (40 CFR 141); U.S. Government Printing Office: Washington, DC. Web Address: http://ecfr.gpoaccess.gov/cgi. (Updated daily.)
3. **Method for the Determination of Organic Compounds in Drinking Water**; EPA/600/4-88/039, Dec. 1988; Revised July 1991; appended with "Supplement I", EPA/600/4-90/020, July 1990; "Supplement II", EPA/600/R-92/129, Aug. 1992; and "Supplement III", EPA/600/R-95/131, August 1995. U.S. EPA.
4. **Manual for the Certification of Laboratories Analyzing Drinking Water**, Fifth Edition, EPA/815-R-05-004. January 2005. U.S. EPA.
5. **Methods for Chemical Analysis of Water and Wastes**; EPA/600/4-79/020; March 1983, U.S. EPA.

6. **Annual Book of ASTM Standards**, Vol. 11.01 and Vol. 11.02; American Society for Testing and Materials, Philadelphia, PA. http://www.astm.org
7. **18th Edition of Standard Methods for the Examination of Water and Wastewater**; American Public Health Association, Washington, DC.
8. **Methods for the Determination of Metals in Environmental Samples**; EPA/600/4-91/010, June 1991; appended with Supplement I, EPA/600/R-94/111, May 1994; USEPA.
9. **Methods for the Determination of Inorganic Substances in Environmental Samples**; EPA/600/R-93/100; Aug. 1993, USEPA.
10. **Technical Notes on Drinking Water Methods**; EPA/600/R-94/173; Oct. 1994, U.S. EPA.
11. **Microbiological Methods for Monitoring the Environment, Water and Waste**; EPA/600/8-78/017, Dec. 1978; U.S. EPA.
12. **Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms**, Fifth Edition; EPA/-821-R-02-012, October 2002; U.S. EPA.
13. **Test Methods for Evaluating Solid Waste, Physical / Chemical Methods**, Third Edition, SW-846; Nov. 1986; revised by Revision I, Dec. 1987; amended by Update I, July 1992; Update IIA, Aug. 1993; and Update II, Sept. 1994; and Update IIB, Jan. 1995; Update III, June 1996, Revision 5, December 1996. U.S. EPA. http://www.epa.gov/epaoswer/hazwaste/test/main.htm.
14. **Contract Laboratory Program Statement of Work for Inorganic Analysis**, Multi-Media, Multi-Concentration; Document No(s). ILM 05.2, 2002; U.S. EPA.
15. **Contract Laboratory Program Statement of Work for Organic Analysis, Multi-Media, Multi-Concentration**; Document No. OLM04.3, 2003; U.S. EPA.
16. **Superfund Analytical Methods for Low Concentration in Water for Inorganics Analysis**; Oct. 1991, U.S. EPA.
17. **Superfund Analytical Methods for Low Concentration in Water for Organics Analysis**; Oct. 1992, U.S. EPA.
18. **Code of Federal Regulations**; Part 503 (40 CFR 503); for EPA Standards for the Use or Disposal of Sewage Sludge; U.S. EPA
19. **Publicly Owned Treatment Works (POTW) Sludge Sampling and Analysis Guidance Document**; Office of Water Permits Division; 1989; U.S. EPA.
20. **Drinking Water Monitoring and Analytical Requirements, Coliform Sampling**; Title 40, Part 141, Subpart C of the Code of Federal Regulations(40 CFR 141.21)
21. **Short-Term Methods for Estimating the Chronic Toxicity of Effluent and Receiving Waters to Freshwater Organisms**, 3rd Edition; EPA/600/4-91/002, July 1994; Environmental Monitoring Systems Laboratory, U.S. EPA, Cincinnati, OH.
22. **Short-Term Methods for Estimating the Chronic Toxicity of Effluent and Receiving Waters to Marine and Estuarine Organisms**, Third Edition; EPA/600/4-91/003, July 1994; Environmental Monitoring Systems Laboratory, U.S. EPA, Cincinnati, OH.
23. **RCRA Groundwater Monitoring Technical Enforcement Guidance Document (TEGD)**; OSWER-9950.1, Sept. 1996; updated by RCRA Ground-Water Monitoring: Draft Technical Guidance; EPA/530/R-93/001, Nov. 1992; Office of Solid Waste, U.S. EPA.
24. **Region II CERCLA Quality Assurance Manual**; Revision 1; U.S. EPA 1989.
25. **Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analyses**; EPA/540/R-94/013 February 1994, Hazardous Site Evaluation Division, U.S. EPA.
26. **Laboratory Data Validation Functional Guidelines for Evaluating Organic Analyses**; EPA/540/R-94/082, Dec. 1994, Hazardous Site Evaluation Division, U.S. EPA.

Appendix A: REIC's Corporate Code of Ethics

REI Consultants

CORPORATE CODE OF ETHICS

REI CONSULTANTS, INC.
AND SUBSIDIARY COMPANIES

1. **GENERAL POLICY:** This Code is established to protect REI Consultants, Inc. (REIC) its clients and its employees from actual or potential conflicts of interest and unlawful acts, and to ensure that only the highest of professional ethics are incorporated in all facets of work. Every effort must be made to ensure that all business decisions, products, and interactions are initiated and completed in a manner characteristic of honest, responsible and equitable actions.
2. **CLIENT PRODUCTS AND INTERACTIONS:** All products, including data, reports, conclusions and communications will be carried out in a professional and responsible manner. All evaluations, data reduction, conclusions, reports and other activities relating to client projects will be performed in an objective, sound scientific manner and in accordance with Good Laboratory Practices (GLP) guidelines. Open and honest communications will be provided to approved client representatives and be available for the primary purpose of clarifications or resolving problems. All documents, information, data, reports, communications and other items of client interaction will be protected and held confidential within REIC and not be transferred or communicated to anyone outside REIC, other than to an approved client representative.
3. **CONFLICTS OF INTEREST:** Employees will report, through their immediate supervisor, any financial or employment interests in any business (1) which directly competes with REIC or (2) which supplies REIC with a substantial amount of goods or services or (3) which sells to REIC a substantial part of its output or (4) which is directly involved with any specific client. This does not apply to an interest as a security holder in companies whose securities are listed on any national securities exchange or traded over the counter by members of the National Association of Securities Dealers, unless it exceeds approximately 5% of voting control. This applies to the employee or any member of his/her immediate family.
4. **BRIBES, PAYOFFS, KICKBACKS AND RECEIPT OF GIFTS:**
   A. Employees or members of their immediate families should not enter into any agreement, arrangement or device by way of fee, rebate, loan advance, consultant agreement, legal representation or otherwise, designed or intended to reward directly or indirectly, any governmental agency or employee, official or representative thereof, or any officer, director, employer or shareholder of any customer or potential customer for decisions or actions favorable to REIC. In short, nothing in the nature of a bribe, payoff, or kick back should be paid or accepted to secure or maintain business.
   B. Employees or members of their immediate families shall not seek or accept favors, gifts, payments, loans, travel, lodging, entertainment or the equivalent from any vendor, potential vendor or other party with whom REIC does business. Promotional gifts of a nominal value motivated by commonly accepted business courtesies, such as hats, mugs and pens may be accepted, but not if acceptance of such gifts could infer prejudice toward or obligation to the donor. Providing and receiving normal business entertainment, such as lunches and dinners, is allowed provided such activities are not frequent or lavish. Other forms of entertainment, such as theater and sporting event tickets, golf dates or other outings may be accepted only if it is practical for the employee to reciprocate. If reciprocation is not possible, the employee should obtain supervisory approval. Approval of attendance of conventions and other meetings where entertainment is customary and provided on a group basis shall satisfy the requisite supervisory approval. Nothing in the nature of a bribe, payoff, or kickback will be accepted from any existing or potential vendor or other party with whom REIC does business.
5. **POLITICAL CONTRIBUTIONS:** No Company funds or services will be contributed, directly or indirectly, to any political campaign of any person seeking political office or expended in support of or opposition to such party or person except to the extent that REIC resources (including time of employees) may be utilized to maintain the operation of legally organized Political Action Committees as permitted by applicable law.
6. **DISCLOSURE AND USE OF PROPRIETARY INFORMATION**
   A. Company and client information not generally available to the public shall not be used by employees directly or indirectly, for their own personal gain, nor shall it be provided for the use of others (see Section 2). Specifically, such non-public information shall not be used in connection with the purchase, sale or trading of Company securities. Use or dissemination of such information for these purposes can result in both civil and criminal penalties.

B. An employee shall not copy data, reports, communications, licensed or copyrighted software, or instruction manuals for personal use.

7. **USE, DISPOSITION AND PROTECTION OF COMPANY ASSETS:**
   A. Employees shall not knowingly cause REIC to use any funds or other assets or provide any services, for any purpose that is unlawful under the laws of the United States, any state thereof, or any jurisdiction, foreign or domestic.
   B. Employees of REIC or any subsidiary shall not use Company funds to create any undisclosed or unrecorded Company assets for any purpose.
   C. No payment on behalf of REIC or any subsidiary shall directly or indirectly be approved or made with the intention or understanding that part of such payments is to be used for any purpose other than that described by the properly approved document supporting the payment.
8. **BOOKS AND RECORDS:**
   A. All supervisors are responsible for enforcement of compliance by employees who are subject to this Code of Ethics, as well as to ensure such employee's knowledge and compliance therewith.
   B. Any employee having information of any violation of this Code of Ethics must report such information or knowledge promptly to the appropriate level of management within that employee's company.
   C. Appropriate disciplinary action shall be taken with respect to any violation of the Code of Ethics.

9. **PROFESSIONALISM:** REIC functions and communicates to clients in a manner consistent with the highest of current professional standards. Client confidentiality and privacy is maintained at all times; and responses to inquiries are approved by the client prior to verbal or written correspondence.

   In cases where possible problems or errors are encountered, REIC openly discusses potential areas of concern and will readily communicate difficulties or mistakes to its clients. Open, frank and professional interactions are required for all staff and subcontractors within the REIC organization.

☐ **I have read and agree to conduct all of my activities and responsibilities in conjunction with REIC's Corporate Code of Ethics.**

_____

Name

_____

Signature **Date**

INTEGRITY AGREEMENT

I. I, _____, state that I understand the high standards of integrity required of me with regard to the duties I perform and the data I report in connection with my employment at *REI Consultants*.

II. I agree that in the performance of my duties at *REI Consultants:*

a. I shall not intentionally report data values that are not the actual values obtained;
b. I shall not intentionally report the dates and times of data analyses that are not the actual dates and times of data analyses; and
c. I shall not intentionally represent another individual's work as my own.

III. I agree to inform *REI Consultants* of any accidental reporting of non-authentic data by myself in a timely manner.

IV. I agree to inform *REI Consultants* of any accidental or intentional reporting of non-authentic data by other employees.

_____
(Signature)

_____
(Date)

Appendix B: *Certification Statement*

REI Consultants NELAC Certification Statement

The applicant understands and acknowledges that REI Consultants, Inc. is required to be continually in compliance with the National Environmental Laboratory Accreditation Conference (NELAC) standards, and shall be subject to suspension, revocation, and denial of accreditation as specified therein.

I hereby certify that I am authorized to sign this application on behalf of the applicant/owner and that there are no misrepresentations in my answers to the questions on this application.

(Signature, QA Officer)	Angela M. Leef (Printed Name of QA Officer)	5-22-06 Date
(Signature, General Manager)	Clarence L. Haile (Printed Name, General Manager)	22 May 2006 Date

Appendix C: *Initial Demonstration of Capability (IDC)*

An initial demonstration of capability (IDC) is performed prior to using any analytical procedure, and at any time there is a significant change in instrument type, personnel, or test method. All demonstrations are documented through the use of the form in this appendix. A copy of the certification statement is retained in a file in the Laboratory Managers offices and/or the QC Department.

An IDC study will include a precision and accuracy study, MDL study, and performance evaluation (PE) study. For any methods or procedures that the method does not mandate an IDC or no procedure is provided (such as Turbidity, TCLP, Flash Point, etc.), the IDC will be performed by demonstrating the procedure to the Laboratory Supervisor or designee and documented with the IDC form and recorded in the personnel training records.

Precision and Accuracy Study (P/A Study)

1. Four duplicate samples are prepared by spiking the analytes at the mid-level concentration of the initial calibration range into a clean matrix.
2. The samples are analyzed according to the test method either concurrently or over a period of days.
3. Using all of the results, the mean recovery and the standard deviation are calculated for each parameter of interest.
4. The calculated mean and standard deviation are compared to the corresponding acceptance criteria for precision and accuracy on the test method (if applicable) or in the laboratory generated acceptance criteria (if there are not established mandatory criteria). If any one of the parameters do not meet the acceptance criteria, the performance is considered unacceptable for that parameter.

Method Detection Limit Study (MDL Study)

1. Seven duplicate samples are prepared by spiking the analytes at the level of 1 to 2 times the practical quantitation limit (PQL) into a clean matrix.
2. The samples are analyzed according to the test method, either concurrently or over a period of days.
3. Using all of the results, the mean recovery and the standard deviation are calculated for each parameter of interest.
4. The MDL is calculated by multiplying the standard deviation by 3.14. The recovery and calculated MDL are compared to the corresponding acceptance criteria in the test method (if applicable) or in laboratory generated acceptance criteria (if there are not established mandatory criteria). If any one of the parameters do not meet the acceptance criteria, the performance is unacceptable for that parameter.

Performance Evaluation

REIC will use the appropriate test method to analyze the proficiency test (PT) sample or a standard reference material provided by a certified vendor. If any one of the parameters do not meet the acceptance criteria, the performance is unacceptable for that parameter.

The analysis of actual samples may begin upon meeting the required criteria. When one or more of the tested parameters fail at least one of the acceptance criteria, the laboratory will repeat the test for all parameters that failed to meet the criteria.

Appendix C: Demonstration of Capability Certification Statement

REI Consultants

Demonstration of Capability Certification Statement

Date: _____

Analyst: _____

Method: _____

Parameter/Group: _____

SOP #: _____

Revision #: _____

Matrix: _____

We the undersigned, CERTIFY that:

1. *The analyst identified above, using the cited test method(s), which is in use at this facility for the analyses of samples under the National Environmental Laboratory Accreditation Program, have met the Demonstration of Capability.*
2. *The test method(s) was performed by the analyst(s) identified on this certification.*
3. *A copy of the test method(s) and the laboratory-specific SOPs are available for all personnel on-site.*
4. *The data associated with the demonstration of capability are true, accurate, complete and self-explanatory.*[3]
5. *All raw data (including a copy of this certification form) necessary to reconstruct and validate these analytes have been retained at the facility, and that the associated information is well organized and available for review by authorized assessors.*

_____ _____

Laboratory Manager (Joe Robertson/Ivan Leef) Date

_____ _____

Angela M. Leef Date
Quality Manager

[3] True: Consistent with supporting data.
Accurate: Based on good laboratory practices consistent with sound scientific principles/practices.
Complete: Includes the results of all supporting performance testing.
Self-Explanatory: Data properly labeled and stored so that the results are clear and require no additional explanation.

Appendix D

Sample Containers and Preservations

Appendix D: Required Containers, Preservation Techniques, and Holding Times			
Measurement	**Containers**	**Preservation**	**Max Holding Time to Analysis**
Bacterial Tests			
Coliform, Fecal & Total	***P,G***	Cool, 4°C 0.008% $Na_2S_2O_3$	***6 hours***
Fecal Streptococci	***P,G***	*Cool, 4°C 0.008% $Na_2S_2O_3$*	***6 hours***
Inorganic Tests			
Acidity	***P,G***	*Cool, 4°C*	***14 days*****
Alkalinity	***P,G***	*Cool, 4°C*	***14 days*****
Ammonia	***P,G***	*Cool, 4°C, H_2SO_4 to pH <2*	***28 days*****
Bicarbonate	***P,G***	*Cool, 4°C*	***14 days*****
BOD 5-Day	***P,G***	*Cool, 4°C*	***48 hours*****
Bromide	***P,G***	*None Required*	***28 days*****
Carbon, Organic (TOC)	***P,G***	*Cool, 4°C; H_2SO_4 to pH<2*	***28 days*****
COD	***P,G***	*Cool, 4°C; H_2SO_4 to pH<2*	***28 days*****
Chloride	***P,G***	*None Required*	***28 days*****
Chlorine, Residual	***P,G***	*None Required*	***Analyze Immediately*****
Conductance, Specific	***P,G***	*Cool, 4°C*	***28 days*****
Color	***P,G***	*Cool, 4°C*	***48 hours*****
Cyanide, Total & Amenable	***P,G***	*Cool, 4°C; NaOH to pH>12; 0.6 g ascorbic acid*	***14 days**, ++++***
Fluoride	***P***	*None Required*	***28 days*****
Formaldehyde	***G***	*Cool, 4°C*	***30 days*****
Hardness	***P,G***	*H_2SO_4 or HNO_3 to pH<2*	***6 months*****
Hydrogen Sulfide, Total	***P***	*Cool, 4°C; Add Zinc Acetate*	***28 days*****
Ignitability	***G***	*Cool, 4°C*	***7 days***
MBAS, (Surfactants)	***P,G***	*Cool, 4°C*	***48 hours*****
Nitrate-Nitrite	***P,G***	*Cool, 4°C H_2SO_4 to pH<2*	***28 days*****
Nitrite	***P,G***	Cool, 4°C	**48 hours****
Odor	***G***	Cool, 4°C	**Analyze Immediately****
Oil & Grease	***G***	Cool, 4°C; H_2SO_4 to pH<2	**28 days****
Kjeldahl Organic Nitrogen	***P,G***	Cool, 4°C; H_2SO_4 to pH<2	**28 days****
Orthophosphate	***P,G***	. Filter Immediately, Cool, 4°C	**48 hours****
Oxygen, Dissolved	***G, Top& Bottle***	None Required	**Analyze Immediately****
Oxygen, Winkler	***G, Top& Bottle***	Fix on site and store in dark	**8 hours****
pH	***P,G***	None Required	**Analyze Immediately****
Phenolic Materials	***G***	Cool, 4°C; H_2SO_4 to pH<2	**28 days****
Phosphorus, Total	***P,G***	Cool, 4°C; H_2SO_4 to pH<2	**28 days****
Phosphate, Total	***G***	Cool, 4°C; H_2SO_4 to pH<2 or Freeze	**28 days****
Phosphorus, Total Dissolved	***P,G***	Filter, Cool, 4°C; H_2SO_4 to pH<2	**24 hrs**
Reactivity (CN&S)	***P,G***	Cool, 4°C	**14 days****
Residue, Total	***P,G***	Cool, 4°C	**7 days****
Residue, Filterable	***P,G***	Cool, 4°C	**7 days****
Residue, Nonfilterable	***P,G***	Cool, 4°C	**7 days****
Residue, Settleable	***P,G***	Cool, 4°C	**48 hours****

Appendix D: Required Containers, Preservation Techniques, and Holding Times			
Measurement	**Containers**	**Preservation**	**Max Holding Time to Analysis**
Residue, Volatile	***P,G***	Cool, 4°C	**7 days****
Sulfate	***P,G***	Cool, 4°C	**28 days****
Specific Gravity	***P,G***	Cool, 4°C	**Analyze Immediately****
Sulfide	***P,G***	Cool, 4°C; add Zinc Acetate & NaOH to pH>9	**7 days****
Sulfite	***P,G***	EDTA	**Analyze Immediately**
Turbidity	***P,G***	Cool, 4°C	**48 hours****
Metals			
Chromium VI	***P,G***	*Cool, 4°C*	***24 hours*****
Mercury	***P,G***	*HNO_3 to pH<2*	***28 days*****
Metals, except Chromium VI and Mercury	***P,G***	*HNO_3 to pH<2*	***6 months***
Organic Tests (Semivolatiles)			
Chlorinated Hydrocarbons	***G, Teflon Lined Cap***	*Cool, 4°C; 0.008% $Na_2S_2O_3$+++++*	***7 days to extraction 40 days after extraction***
Extractable Organic Halides (EOX)	***G, Teflon Lined Cap***	*Cool, 4°C*	***28 days*****
Chlorinated Herbicides	***G, Teflon Lined Cap***	*Cool, 4°C; 0.008% $Na_2S_2O_3$+++++*	***7 days to extraction 40 days after extraction***
PCB's	***G, Teflon Lined Cap***	*Cool, 4°C; 0.008% $Na_2S_2O_3$+++++*	***7 days to extraction 40 days after extraction***
Pesticides	***G, Teflon Lined Cap***	*Cool, 4°C; 0.008% $Na_2S_2O_3$+++++*	***7 days to extraction 40 days after extraction***
Phthalate Esters	***G, Teflon Lined Cap***	*Cool, 4°C*	***7 days to extraction 40 days after extraction***
Phenols (Acid Extractables)	***G, Teflon Lined Cap***	*Cool, 4°C; 0.008% $Na_2S_2O_3$+++++*	***14 days to extraction 40 days after extraction***
Polynuclear Aromatic Hydrocarbons (PAH)	***G, Teflon Lined Cap***	*Cool, 4°C; 0.008% $Na_2S_2O_3$+++++ Store in dark*	***7 days to extraction 40 days after extraction***
Organic Tests (Volatiles)			
Acrylonitrile & Acrolein	***G Teflon Lined Cap***	*Cool, 4°C; 0.008% $Na_2S_2O_3$ +++++ Adjust pH to 4-5*	***14 days***
BTEX	***G, Teflon Lined Cap***	Cool, 4°C; Hcl; pH<2; 0.008% $Na_2S_2O_3$+++++	**14 days**
Purgeable Aromatic Hydrocarbons	***G, Teflon Lined Cap***	Cool, 4°C; HCl to pH<2; 0.008% $Na_2S_2O_3$+++++	**14 days**
Purgeable Halocarbons	***G, Teflon Lined Cap***	Cool, 4°C; HCl to pH<2; 0.008% $Na_2S_2O_3$+++++	**14 days**
Trihalomethanes	***G, Teflon Lined Cap***	Cool, 4°C; HCl to pH<2; 0.008% $Na_2S_2O_3$+++++	**14 days**
Toxicity Testing			
Acute tests	***Cubitainers***	Cool, 4°C	**36 hours**
Chronic tests	***Cubitainers***	Cool, 4°C	**36 hours**
Renewal	***Cubitainers***	Cool, 4°C	**36 hours**
Screening	***Cubitainers***	Cool, 4°C	**36 hours**

-Legend and footnotes on next page-

Definitions, Abbreviations, and Footnotes:

Measurement and Container Definitions		
BOD	-	Biochemical Oxygen Demand
COD	-	Chemical Oxygen Demand
PCB	-	Polychlorinated Biphenyl
G	-	Glass
P	-	Polyethylene

Preservations		
HCl	-	Hydrochloric Acid
HNO_3	-	Nitric Acid (metals grade)
NaOH	-	Sodium Hydroxide (ACS grade)
H_2SO_4	-	Sulfuric Acid (metals grade)
$Na_2S_2O_3$	-	Sodium Thiosulfate
°C	-	Degrees Celsius

* *For nonvolatile organics, containers for soil and sediment samples are glass with Teflon-lined caps and for volatiles, containers are glass with Teflon-lined septum. Soil sample containers for organics are glass bottles with Teflon-lined caps, polyethylene (P), or glass (G).*

\+ *Samples should be analyzed as soon as possible after collection. The times listed are the maximum times that samples may be held before analysis and still considered valid. Samples may be held for longer periods only if the laboratory has data on file to show that the specific types of samples under study are stable for the longer time.*

** *Holding times provided are for waters. EPA does not have holding times for these parameters in soil. These water holding times will be used as goals for those methods where a soil analysis is applicable.*

++ *7/40 = 7 days until extraction; 40 days from extraction until analysis.*
14/40 =14 days until extraction; 40 days from extraction until analysis.

*** *Mercury in soil has a 6-month holding time (EPA, Contract Laboratory Program).*

+++++ *Sample preservation should be performed immediately upon sample collection. The only preservation for soil samples is cooling at 4°C. For composite samples, each aliquot should be preserved at the time of collection. When use of an automatic sampler makes it impossible to preserve each aliquot, then samples may be preserved by maintaining at 4°C until compositing and sample splitting are completed. Only add sodium thiosulfate if the sample contains free or combined chlorine. A field test kit needs to be used for this determination. If free or combined chlorine is present, add sodium thiosulfate prior to the addition of HCl if HCl is required.*

**** *These parameters are best analyzed in the field. In consideration of shipping limitations, when these analyses are requested of our laboratory for confirmation purposes, REIC policy is to analyze these constituents within 24 hours of receipt.*

++++ *Maximum holding time is 24 hours when sulfide is present. Optionally, all samples may be tested with lead acetate paper before pH adjustments in order to determine if sulfide is present. If sulfide is present, it can be removed by the addition of cadmium nitrate powder until a negative spot test is obtained. The sample is filtered and then NaOH is added to pH 12. The ascorbic acid only needs to be added if an oxidizing agent such as chlorine is present.*

Appendix E: REI Consultants, Inc. Major Equipment Listing

High Pressure Liquid Chromatography Systems (HPLC)

Instrument ID	Make	Model	Detector Type*	Serial Number	Analysis	Service Date
SVHPLC1	Hewlett-Packard	1050	79853C UV 1046A Fluorescence 1046A Electrochemical	3140J02567/3118A01145 314A01167	8310/550/549.2/ 547/531.1	Oct. 1993
SVHPLC2	Hewlett-Packard	1050	79853C UV	3323J0342/3405A02856 3141A01167	8310/8330/ 8315/8332/550	Oct. 1993
SVHPLC3	Hewlett-Packard	1050	79853C UV	3114A00220/3522J04571	8330/550	May 2004

Gas Chromatograph/Mass Spectrometry Systems (GC/MS)

Instrument ID	Make	GC Model	Detector Model	Serial Number(s) (GC/MS/AutoSampler/Concentrator)	Analysis	Service Date
VOMS1	Hewlett-Packard	5890 Series II	5971A	---------Out of Service---------		
VOMS2	Agilent	6890	5973	US00038210/US03340487 11934-596A/951533009	524.2/8260B/624	July 2001
VOMS3	Hewlett-Packard	5890 Series II	5972	3336A55398/Not Listed/ 12292/93342001	524.2/8260B/624	Sept. 1994
VOMS4	Hewlett-Packard	5890 Series II	5971A	3133A37795/3188A02802/ 3425A30105/3424A00103	524.2/8260B/624	April 1996
VOMS5	Agilent	6890N	5973N	CN10403035/US35110132/ 14141/329020204EandP	524.2/8260B/624	Feb. 2004

Gas Chromatograph/Mass Spectrometry Systems (GC/MS)

Instrument ID	Make	GC Model	Detector Model	Serial Number(s) (Instrument/Towers)	Analysis	Service Date
SVMS1	Hewlett-Packard	6890+	5973	US00028664/US91922554	525.2/8270C/625	July 1999
SVMS2	Agilent	6890+	5973N	US00037590/US72010542	525.2/8270C/625	Sept. 2003
SVMS3	Hewlett-Packard	6890+	5973	US00020797/ILLEGIBLE	525.2/8270C/625	May 2001

* SVHPLC1 includes Pickering post-column carbamate system

Appendix E: REI Consultants, Inc. Major Equipment Listing

Gas Chromatograph Systems (GC)

Instrument ID	Make	GC Model	Detector Type	Serial Number(s) (GC/AutoSampler/Concentrator)	Analysis	Service Date
VOGC1	Hewlett-Packard	5890 Series II	5320ELCD 4430 PID	3235A44098/91224005/ARCHON8100-13686/14-2000-60M	8021B/502.2	Feb. 1993
VOGC2	Hewlett-Packard	5890 Series II	TCD	GC: 3336A53082	3810	May 2000
VOGC3	Hewlett-Packard	5890 Series II	4430 PID 4410 FID	3033A33205/90080047/92261018	8021B/8015B/603	May 1991
VOGC4	Hewlett-Packard	5890 Series II	4430 PID 4410 FID	3203A41263/90135021/3203A41263	8021B/8015B	Oct. 1999
VOGC5	Hewlett-Packard	5890 Series II	4430 PID 4410 FID	---------Out of Service--------	8021B/8015B	May 2004
VOGC6	Hewlett-Packard	5890 Series II	4430 PID 4410 FID	3336A58707/12723/91224005	8021B/8015B	Feb. 1991
VOGC7	Agilent	6890 +	4430 PID 4410 FID	US00025299/11917-496A/89297002	8021B/8015B	May 2002

Instrument ID	Make	GC Model	Detector Model	Serial Number(s) (Instrument/Towers)	Analysis	Service Date
SVECD1	Hewlett-Packard	6890+	Dual Micro ECD	US00024533/US83901937/ US83502200/US90204383	8081A/8082	June 1998
SVECD2	Agilent	6890N	Dual ECD	CN10431060/CN431130210 CN42620095/CN42620100	8081A/8082/508/608 8151A/515.1/615	Aug. 2004
SVECD3	Hewlett-Packard	5890 Series II	NPD	3223A43710/3302A33624	507	Aug. 1990
SVECD4	Hewlett-Packard	5890 Series II+	Dual ECD	3310A47808/3013A21120 3237A32145	504/552/548/8032	Aug. 1992
SVECD5	Hewlett-Packard	5890 Series II	Dual ECD	3019A28629/3013A21569 3114A25953	8082	April 1990
SVFID1	Agilent	6890+	Dual FID	US00043338/US74804333	8015B (DRO/ORO)	Jan. 2003
SVFID2	Hewlett-Packard	5890 Series II	Dual FID	3133A37645/3013A22182	8100/8041	April 1996
SVFID3	Hewlett-Packard	5890 Series II	Dual FID	3308A46965/3013A22245 3237A32170	8015B (DRO/ORO)	Nov. 1992

Appendix E: REI Consultants, Inc. Major Equipment Listing

Metals

Instrument ID	Make	Model	Serial Number	Type	Analysis	Service Date
X7	Thermo Elemental	X7	X0303	ICPMS	200.8/6020	Nov. 2003
Iris	Thermo-Jarrell Ash	Iris Advantage	7996	Solid State, Axial/Radial ICP-AES	200.7/6010B	July 1998
Atomscan	Thermo-Jarrell Ash	Atom-Scan Advantage	10942	Sequential/PMT/ Radial ICP-AES	200.7/6010B	Nov. 2000
Spec20Plus	Varian	SpectrAA-20Plus	AA20-92121878	FAAS	200/7000 Series	Dec. 1992
220Z_1	Varian	SpectrAA-220 Zeeman	EL99073382	GFAAS	200/7000 Series	Sept. 1999
220Z_2	Varian	SpectrAA-220 Zeeman	EL99073383	GFAAS	200/7000 Series	Sept. 1999
M6000A	CETAC	M-6000A	09004MAS	Mercury Analyzer	245.1/7470A/ 7471A	Oct. 2000
Vista	Varian	Vista Pro	EL05093961	Solid State Axial ICP-AES	200.7/6010B	Oct. 2005

Classical Chemistry

Instrument ID	Make	Model	Serial Number	Type	Analysis	Service Date
DX300	Dionex	DX-300	921720/863819	IC	300.0/9056	1992
DX120	Dionex	DX-120	99070575/ 98093279	IC	300.0/9056	Aug. 1998
LECO	LECO	SC-444	3153/3255/3023	Carbon/Sulfur Analyzer	Carbon and Sulfur	1994
Auto Titrator Systems (2)	Schott	TWAIPHA	441895/441894	Titrator	pH/Alkalinity Forms/ Acidity Forms	Jan. 2002
Technicon	Bran Luebbe	Auto Analyzer 3	9521803 5449246 9523576 54503545 950100	Auto Analyzer	Cyanide/Ammonia	Nov. 2001
Oil and Grease	Horizon	SPE-DEX 3000 XL/SPE-DEX3000	05-2017 1004	Oil and Grease Extractor	Oil and Grease, 1664	March 2005 July 2000
%Water	Karl Fisher/ EM Science	Karl Fisher Titrator Aqua Star C3000 Titrator Aqua Star EV-6L Oil Evaporator	81365-10 84242-02	Titrator	%Water	March 2002
TOC	Tekman Dohrmann	Phoenix 8000	US01249002/ 190J1368	TOC Analyzer	TOC	Oct. 2001

Appendix F: NELAC Method List

Organic Analyses:

Parameter/ Group	Matrix	Method
BNAs	Soil and Liquid	SW8270C / EPA 625
Aromatic Hydrocarbons	Liquid	SW8260B/EPA 624 and SW8021B/EPA 602
BTEX and MTBE	Soil and Liquid	SW8021B / EPA 602
Herbicides	Soil and Liquid	SW8151A / EPA 615
PCBs	Soil, Oil and Liquid	SW8082 / EPA 608
Pesticides including Toxaphene and Chlordane	Soil and Liquid	SW8081A / EPA 608
TPH (DRO)	Soil and Liquid	SW8015B
TPH (GRO)	Soil and Liquid	SW8015B
Volatiles	Liquid	SW8260B / EPA 624 and SW8021B / EPA 601 and EPA 602
Volatiles High and Low Level	Soils	SW8260B / EPA 624 and SW8021B / EPA 601 and EPA 602
Flash Point	Soil and Liquid	SW1010
Explosives	Soil and Liquid	SW8330
PAHs	Soil and Liquid	SW8310/EPA 610

Metals Analyses:

Parameter	Matrix	Method
Antimony, Arsenic, Barium, Beryllium, Cadmium, Chromium, Cobalt, Copper, Lead, Manganese, Molybdenum, Nickel, Selenium, Silver, Strontium, Thallium, Tin Titanium, Vanadium, and Zinc	Liquid	EPA 200.8/SW6020
Aluminum, Antimony, Arsenic, Barium, Beryllium, Boron, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Molybdenum, Nickel, Potassium, Selenium, Silicon, Silver, Sodium, Strontium, Thallium, Tin, Titanium, Vanadium, and Zinc	Liquid	EPA 200.7/SW6010B
Aluminum, Antimony, Arsenic, Barium, Beryllium, Boron, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Molybdenum, Nickel, Potassium, Selenium, Silicon, Silver, Sodium, Strontium, Thallium, Tin, Titanium, Vanadium, and Zinc	Soil	SW6010B
Antimony	Liquid	EPA 204.2 /SW7041
Arsenic	Liquid	EPA 206.2 /SW7060A
Cadmium	Liquid	EPA 213.2/ SW 7131A
Chromium	Liquid	EPA 218.2/SW7191
Lead	Liquid	EPA 239.2/SW7421
Mercury	Liquid	EPA 245.1/SW7470A
Mercury	Soil	SW7471A
Selenium	Liquid	EPA 270.2/SW7740
Thallium	Liquid	EPA 279.2/SW7841
Hexavalent Chromium	Soil and Liquid	SW7196A and SM3500CrD
Total Hardness as $CaCO_3$	Liquid	SM2340B

Appendix F: NELAC Method List

Classical Chemistry Analyses:

Parameter	Matrix	Method
BOD	Liquid	SM5210B
COD	Liquid	EPA 410.4
TOC	Liquid	EPA 415.2
Fluoride	Liquid	EPA 300.0 and 340.2
Alkalinity as CaCO3	Liquid	SM2320B
Chloride	Liquid	EPA 300.0
Conductivity	Liquid	SM2510B
Sulfate	Liquid	EPA 300.0
Nitrite as Nitrogen	Liquid	EPA 300.0
Ammonia Nitrogen as Nitrogen	Liquid	EPA 350.1, 350.2, and 350.3
Nitrate Nitrogen as Nitrogen	Liquid	EPA 300.0
Orthophosphate as Phosphorus	Liquid	EPA 300.0
TKN	Liquid	EPA 351.3 and 351.4
Total Phosphorus as Phosphorus	Liquid	EPA 365.2
Oil and Grease	Liquid	EPA 1664
pH	Liquid	EPA 150.1
TDS	Liquid	SM2540C
TS	Liquid	SM2540B
TSS	Liquid	SM2540D
Total Cyanide	Liquid	EPA 335.4 and 335.2
Total Phenolics	Liquid	EPA 420.1
Corrosivity	Soil	SW9045C
Turbidity	Liquid	EPA 180.1

APPENDIX E QC Documentation

Quality Control Certification

PLAN OF OPERATIONS

INTERIM SOIL REMOVAL ACTION Continuation
Soil Excavation and Disposal
Plum Brook Ordnance Works –TNT Area B
Sandusky, Ohio

Contract No. W91237-06-C-0003

This document is provided to certify that the Independent Quality Control Team (IQCT) have reviewed the Plan of Operations in accordance with the Quality Control Plan. All comments resulting from the various reviews have been resolved and/or incorporated.

Assignment	Name	Signature	Date
Senior Review			
	Mark Perkins		7-13-06
Peer Review			
	George Karas		7-12-06

Comments on Final Plan of Operations

INTERIM SOIL REMOVAL ACTION Continuation
Soil Excavation and Disposal
Plum Brook Ordnance Works –TNT Area B
Sandusky, Ohio

The following comments were provided by the McTech Independent Quality Control Team (IQCT). All comments resulting from this review has been resolved and/or incorporated.

General:

Check spacing and reconcile Table of Contents once all changes have been made.
Response: Concur, spacing and Table of Contents were revised as necessary.

Specific:

Section 1.1, last paragraph, second to last sentence: Delete the word, "stabilized", as no soil will be stabilized under this SOW.
Response: Concur, deleted.

Section 4.2, paragraph 2, sentence three: Change "three" storage areas to "two" storage areas.
Sentence four: Delete, "One area is proposed for the storage of clean backfill material, one area is proposed as staging area for nitroaromatic contaminated soils, and the last area is "where lead contaminated soil will be treated" and replace with, "One area is proposed for the storage of clean backfill material and one area is proposed as staging area for nitroaromatic contaminated soils." It is not expected that any of the soil will need to be treated or stabilized. If treatment is required, a modification must be written to the SOW and an addendum to this Plan of Operations will be written.
Response: Concur, changes were made as suggested.

Section 5.2, paragraph 1, sentence 2: Delete, "and lead" as field screening for lead will not be performed (Lead is not a PRG; however, the stockpiles will be sampled for lead for disposal purposes)
Response: Concur, deleted because field screening for lead is not required.

Section 5.2.1, paragraph 3: Delete entire paragraph. Field screening for lead will not be performed.
Response: Concur, deleted entire paragraph.

Table 4: Delete Target Analyte Metals from confirmatory analysis table as metals are not a PRG (TCLP analysis for metals will be performed on the soil stockpiled for disposal).
Response: Concur, removed as the stockpiled soil will be analyzed for TCLP metals.

Comments on Draft Plan of Operations

INTERIM SOIL REMOVAL ACTION Continuation
Soil Excavation and Disposal
Plum Brook Ordnance Works –TNT Area B
Sandusky, Ohio

The following comments were provided by the USACE Huntington District, Ohio EPA and NASA PBS. All comments resulting from this review has been resolved and/or incorporated.

July 14, 2006

U.S. Army Corps of Engineers
Huntington District
502 Eighth Street
Huntington, WV 25701-2070
ATTN: CELRH-EC-CE (Lisa A. Humphreys)

RE: NASA Plum Brook Ordnance Works
Soil Removal Plan for TNT B

Dear Ms. Humphreys:

Ohio EPA has review the draft Plan of Operations, Interim Soil Removal Action, Continuation Soil Excavation and Disposal Plum Brook Ordnance Works - TNT Area B Sandusky, Ohio. The document, dated June 2006 was received at Ohio EPA on June 28, 2006. Comment are provided below.

Ohio EPA has also reviewed the draft Site Specific Safety and Health Plan for this project. The document, dated June 2006 was received at Ohio EPA on June 28, 2006. No comments are provided for this document.

Ohio EPA has also reviewed the draft Interim Soil Removal Action Report, TNT-B for this project. The document, dated May 2006 was received at Ohio EPA on July 7, 2006. No comments are provided for this document.

General Comment

The DSMOA allows Ohio EPA to have a minimum 30 days to review and comment on submittals. The first two documents were received at Ohio EPA on June 28, 2006. The accompanying cover letter requested review and comment be completed by July 10, 2006, so that field activities could begin on that date. This particular timing allowed 6 working days for review and comment.

The Plan of Operations also indicates that it should be reviewed in conjunction with the Final ISRA TNT B (WTI May 2006). This document was not received at Ohio EPA until Friday July 7, 2006, resulting in essentially zero days for review.

If the Corps desires to have a complete and useful review conducted by Ohio EPA, the time frame in the DSMOA must be adhered to.

Specific Comments

Section 1.3 The plan states that "Once these excavation are complete, the 5 former building locations will be assumed 'clean', based upon confirmation sampling from test pit and trenching activities..."

Section 1.3 then goes on to say that "Field screening efforts shall be used to verify the 'clean' limits of the 5 former building locations..."

Section 5.2.1 describes the field screening method. For nitroaromatics, this will consist of using a colorimetric test kit with a range of 0.7 ppm to 30 ppm. The PRG for 2-amino-4,6-DNT and 4-amino-2,6-DNT is 0.4; a level less than the equipment's stated detection limit. Further, colorimetric kits often have a plus or minus error range of 10% to 35%. A significant source of error can occur when judging the stain's endpoint, and the tubes are affected by high humidity which is a likely condition during Ohio summers. Therefore, it appears that this test kit would have limited usefulness for screening and be total inappropriate for confirmation purposes.

Nitroaromatics represent only one subset of the Contaminants of Concern. PCBs and PAHs are also present, yet no screening or confirmational testing has been proposed to demonstrate that the excavation has removed these contaminants to meet the PRGs.

Section 3.2 This section states that full TCLP analysis will be performed on all soil and IDW that is to be removed from the project site. However, none of the COCs for this project are on the TCLP Final Rule list. This would be a misapplication of the TCLP procedure which could provide technically invalid results. Rather than pay for expensive and unnecessary analytical testing, it is recommended that only the analytical required for waste characterization by either Erie County Landfill or EQ Environmental in Michigan be performed on these soils.

Section 5.2 The text indicates that "McTech shall excavate the five former building locations ... described in Task 6 of the SOW and reiterated in Section 2.1 of this plan." There does not appear to be a Section 2.1 in this plan, however.

This section also indicates that confirmation samples of the excavation are not required as they were taken during previous work. Further, if field screening indicates levels of nitroaromatics above the PRGs, a confirmation sample

must be collected. The text refers the reader to Section 5.2.3 Table 4. There is no Section 5.2.3 in this document; Table 4 is in Section 5.2.2.

Samples taken during previous work (trenching and test pitting) should not constitute confirmation sampling of current work. Previous sampling efforts should only assist in determining the limits of excavation. If it believed that historical trenching data provides "confirmation" of future excavations, then there would be no need for the use of field screening or standard analytical methods once excavation begins.

Once an area is being actively excavated, screening (colorimetric test kits) is a good tool to allow you to estimate whether or not sufficient contaminated material has been removed in order to meet clean up goals. Samples (analyzed by SW-846 methods) from the sidewalls and floor of the excavation would serve as confirmation that goals have been met. Otherwise, all you would have is an assumption.

Sincerely,

Paul M. Jayko
Division of Emergency & Remedial Response

pc: NWDO- DERR file
Richard Meadows, USACE
Bonnie Buthker, SWDO-OFFO

RESPONSES TO Ohio EPA Paul Jayko COMMENTS dated July 14, 2006.

Kimberlie Chambers, McTech Corp, 07/17/06.

General Response:

Concur, the condensed review period was requested due to unforeseen complications, i.e. it was necessary to change contractors due to original contractor's inability to fulfill contractual requirements. The U. S. Army Corps of Engineers is greatly appreciative of Ohio EPA Paul Jayko's efforts in expediting the completed review of the Draft *Plan of Operations* and *Site Specific Safety and Health Plan, Interim Soil Removal Action (ISRA) Continuation, Soil Excavation and Disposal, Plum Brook Ordnance Works – TNT Area B, McTech, June 2006.*

Specific Responses:

Section 1.3: Concur, field screening for nitroaromatics or any other contaminant is not necessary as confirmation sampling of the horizontal extent of contamination was completed and approved during the initial ISRA and documented in the Final *ISRA Report TNT B, Soil Excavation and Ex-Situ Stabilization, Plum Brook Ordnance Works, Sandusky, OHIO, WTI May 2006.* Therefore, Task 8 of the SOW will not be completed per direction of the USACE POC, Lisa Humphrey's and all references to field screening in the *Plan of Operations ISRA Continuation* have been removed.

Section 3.2: Concur, sampling for those parameter outside of regulatory required and landfill requirements would be unnecessary. The parameter included in the *Plan of Operations ISRA Continuation* have been discussed and communicated by Erie County Lantfill to Lisa Humphrey's and subsequently included in this report.

Section 5.2: Concur, per response to Section 1.3 and further discussion with the Paul Jayko and Lisa Humphrey's all references to field screening have been removed.

USACE Review Comments for
Plan of Operations
Interim Soil Removal Action Continuation
Plum Brook Ordnance Works – TNT B Area
Contract No. W91237-06-C-0003
July 2006

RESPONSES TO United State Army Corps of Engineers, Lisa Humphreys, COMMENTS:

Kimberlie Chambers, McTech Corp, 07/14/06

1. General – Through this document as well as all other work plans, please revise the reference to the *Final Action Memorandum for the TNT B Interim Removal Action* author to "USACE, 2003 rather than WTI, 2003.

Concur, this change was made globally.

2. Page 6, Section 1.4.2 (Task 2) Preparation and Submission of an ISRA QCP – Please reword this section to reflect that although a QCP was done earlier and approved, a new QCP has been prepared and submitted for review because of the use of a new Contractor. Also, this would be consistent with the QCP that was submitted. It was a complete document rather than an addendum.

Concur, the first sentence was changed to, "McTech Corp will prepare a Plan of Operations that covers the office and field activities planned for the 5 former building locations.

3. Page 7, Section 1.4.4 (Task 4) Field Activities / Utilities – Under Utilities, please reword to reflect that although we had an approved permit for the last round of excavation / test pit investigation activities, NASA requested that a new excavation permit be submitted this time to ensure field conditions or excavation limits had not changed.

Concur, the Utilities paragraph was changed to the following, "An excavation permit has been acquired and coordinated with the Plum Brook Operation Support Group (PBOSG) for the TNT B area as well as additional excavation areas discovered through the trenching and test pit efforts. The excavation permit was submitted by McTech Corp on June 19, 2006 and approved during the preconstruction meeting with PBOW NASA and PBOSG on July 10, 2006."

4. Page 10, Section 1.4.7 (Task 7) Disposal/Investigative Derived Waste –
   a. 4th paragraph – Please reword to reflect that a separate IDW plan is not needed (since IDW for this project will be minimal) and that any reference to IDW should actually be made to the section in the Plan of Operations that reflects those activities.

   Concur, the following sentence was added to the first paragraph, "Due to the minimal IDW expected to be generated, an IDW Plan is not a

separate Plan but rather is included as a distinct section, Section 6.0 within the Plan of Operations." and the fourth paragraph was deleted.

b. 6th & 7th paragraphs – these are a repeat of paragraphs 2 & 3 and should be removed.

Concur, these paragraphs were removed.

5. Page 12, Section 2.0 Project Organization and Responsibilities,
   a. D. On-Site Project Manager – Please list what company Gary Cooper is with.

   Concur, C&K Industrial Services, Inc. has been listed.

   b. K. Barnes Nursery – Barnes Nursery is not the company that is providing the backfill or trucking services. Please replace this with Molnar Construction, Matt Molnar, POC @ 419-656-3423.

   Concur, K. has been updated with Molnar Construction information.

6. Page 14, Section 3.1 Site RI/FS and Final Action Memorandum – I believe the RI/FS was done by IT / Shaw rather than Dames and Moore, but I could be wrong. Please check the USACE AR website for the correct author of the document and date.

Concur, the correct reference is, "*TNT B Remedial Investigation, Former Plum Brook Ordnance Works, Sandusky, Ohio, Volume I – Final Report of Findings*, (IT Corporation, USACE, August 2000) and *Volume IV – Final Feasibility Study*, (IT Corporation, USACE, July 2001)".

7. Page 15, Section 3.2 Resource Conservation and Recovery Act – Please capitalize "Federal".

Concur, capitalized "Federal".

8. Page 15, Section 4.1 Borrow Area – Please revise this paragraph to reflect that Molnar Construction will be providing the backfill and trucking services and that the 2 borrow site areas are located at Kalahari Water Park Area and Corsos Nursery. The Contractor selected 2 locations due to the amount of available backfill located at each site.

Concur, the following sentences were added to this section, "There are two separate borrow sites that will be used, Kalahari Water Park and Corsos Nursery. Based upon soil available at each borrow site, 3 samples will be collected from the Kalahari Water Park site and 4 will be collected from the Corsos Nursery site. The samples will be 5 point composite samples, collected using dedicated disposable sampling equipment."

9. Page 16, Section 4.2 Storage / Staging Area Preparation – Please remove the reference to Jersey barriers and replace with wording to reflect use of "haybales" or "construction of a diked area with soil walls for containment". The 6-mil plastic will be placed on the floor, over the "soil walls or haybales" as well as

used for cover of the backfill or contaminated stockpiled soil. It will be covered in this fashion to prevent run-off from the contaminated pile onto "clean" soil or run-off from surrounding area into diked area.

Concur, "earthen berms and/or haybales" has replaced "Jersey barriers".

10. Page 16, Section 4.3 Excavation and Disposal of Contaminated Soil
    a. 1st paragraph – revise to reflect new excavation permit was submitted and approved or if using future tense, will be submitted and approved prior to beginning field activities.

    Concur, the first two sentences now read as follows, "McTech applied for the digging and excavation permit on June 19, 2006. This permits was subsequently approved and issued on July 10, 2006."

    b. 3rd paragraph – please include at end of 2nd sentence the following wording" prior to disposal".

    Concur, "prior to disposal" was added.

11. Page 18, Section 5.2.2 Confirmatory Analysis – Please remove this section. We are not doing confirmatory sampling. That was conducted during the test pit investigation and outlined in the approved Final TNT B ISRA Report.

Concur, this section was removed.

12. Page 18, Section 5.3 Waste Characterization – Please revise this paragraph as well as any other references in the work plan (i.e., pg 21, under IDW) to reflect that NASA (Bob Lallier for haz or non-haz manifests)) or a NASA Representative (i.e., PBOSG, Gary Ponikvar for non-haz only) will sign for the manifests rather than USACE or McTech.

Concur, the following sentence replaced references to USACE and McTech, "Manifest must be signed by NASA (Bob Lallier for haz or non-haz manifests) or a NASA Representative (i.e., PBOSG, Gary Ponikvar for non-haz only)."

13. Page 22, Section 7.3 Sample Identification Labeling – Please add that all sampling will be done in accordance with USEPA protocol,

Concur, this information was added as a first sentence to the first paragraph.

14. Page 26, Section 92. Lab Quality Assurance for Chemical Data Measurement – Remove last sentence in 1st paragraph. USACE is not doing QA sampling because we are not doing confirmatory sampling, but rather on for disposal.

    Concur, this sentence was removed.

15. Page 27, Section 10.0 Daily Quality Control Reports – please add "field photos" to the list of information that will go in the QCRs.

Concur, "field photo descriptions" was added as suggested.

16. Page 27, Section 11.0 Corrective Action – 2nd paragraph – please revise paragraph to state that no revisions will be done without approval from USACE COR.

Concur, this paragraph has been revised as follows, "Any deviations from the approved plans will be fully documented. The USACE Contracting Officer's Representative (COR) will be notified if deviations from the approved plans are necessary. The USACE COR must approve the deviation prior to proceeding with the deviation. Deviations from the plans that compromise data quality or personnel safety will not be allowed."

17. Page 28, Section 12.0 Spill Prevention, Containment, and Countermeasure – Should be Spill Hotline (i.e., National Response Center) be added to this section? Revise as appropriate.

Concur, National Response Center was added.

18. Page 28, Section 12.1 Potential Spills – Take out the reference to MAECTITE.

Concur, this reference was removed.

19. Page 29, Section 12.2 Spill Prevention – Add equipment checksheets / lists will be used.

Concur, this checklist has been included in Appendix C of the SSHP and a sentence to this fact has been added to the 2nd bullet

20. Page 29, Section 12.3 Spill Response – Should "eye wash stations" be added to the bulleted list? Revise accordingly.

Concur, added as second to last bullet.

21. Page 30, Section 12.5 Spill Reporting – If possible, mention the RQs for the onsite chemicals or that these will be displayed in the office trailer so that the on-site personnel will know if they have a reportable quantity if a spill should happen.

Concur, reportable quantities will be posted in the office trailer.

22. Page 31, Section 13.1 Erosion and Silt Control –
    a. 3rd bullet – you can remove this bullet or either mention that all excavated soil will be contaminated soil and that it will be contained in the stockpiled area.

23. **Concur, the third bullet was changed as follows, "All excavated soil will be deposited in stockpile areas to prevent any contamination from migrating to waterways or washing away by high water or runoff."**

    a. 4th bullet – You can delete the last 2 sentences. These areas have already been done and will most likely not affect any activities at the 5 areas we'll be working in.

    Concur, these sentences were deleted.

24. Page 31, Section 14.0 Air Emission Controls – mention that a water truck will be on-site to control dust.

Concur, the following sentence was added, "A water truck will remain on site for the duration of the project."

RESPONSES TO United State Army Corps of Engineers, Frank Albert, COMMENTS:

Kimberlie Chambers, McTech Corp, 07/11/06

I have reviewed the subject draft Plan of Operations and have the following comments to offer:

1. Cover – Ordinance has been misspelled and the contract number needs to be revised (here and within the document).

Concur, "ordinance" has been corrected to "ordnance" as well as the correct contract number, W91237-06-C-0003, inserted, throughout the Plan of Operations.

2. Defn's – SARA – Ammendments has been misspelled

Concur, the extra "m" was removed.

3. 1.1, 3rd sentence. The D&M reference for the RI/FS is incorrect. This removal action is based upon RI, IT Corp. August 2000 and FS, IT Corp. July 2001. The correct references and full names for each are contained in Sec. 8.0 of the SOW. Please revise throughout the document.

Concur, the D&M referenced was replaced by the IT references as follows, "*TNT B Remedial Investigation, Former Plum Brook Ordnance Works, Sandusky, Ohio, Volume I – Final Report of Findings*, (IT Corporation, USACE, August 2000) and *Volume IV – Final Feasibility Study*, (IT Corporation, USACE, July 2001)."

4. 1.1, 4th sentence. The phrase "...**constituents** of concern..." should be revised to "...**contaminants** of concern..." Also, the *Final Action Memorandum* reference is incorrect; this reference should be **USACE, 2003**. This reference needs to be revised throughout this plan.

Concur, "contaminants" replaced "constituents and the reference was corrected to USACE, 2003 throughout the document.

5. 1.1, last sentence. You may want to revise the last portion of the sentence to state "..stabilization of soil is necessary due to **lead levels exceeding the regulatory**

disposal limit for hazardous waste"...or something to that effect, so that it is understood what the driver. There is no COC that I am aware of that would require stabilization, since lead was not a COC, but the limits of lead have at times required stabilization for non-hazardous waste disposal.

Concur, the following paragraph was added, "Based on the analytical results from the test pits excavated within the contaminated limits, it is assumed that the soil removed will not be hazardous and will not require stabilization, treatment or hazardous waste disposal and can be disposed of at a non-hazardous waste landfill. However, if the levels of contamination in the soil render it unacceptable to the landfill and if ex-situ stabilization of soil is required prior to disposal; a modification to the Scope of Work (SOW) and this Plan of Operations will be necessary."

6. 1.3, 6th paragraph. This section leads me to question "If the excavated walls are found to not be "clean", then what? You may want to expand that additional excavation at the direction of USACE may be in order; this may require a modification to accomplish due to funding limitations; etc.

Concur, this language is confusing and field screening was not required by regulation or USACE. And after further discussion with the USACE POC and Ohio EPA, Section 1.4.7, Task 7 has been deleted from the Plan of Operations."

7. 1.4, 1st sentence. Recommend that you note that the SOW is included in Appendix A.

Concur, a reference to Appendix A was added.

8. 1.4, passage following Task 10. This paragraph appears right out of the SOW; meaning that reference is to the "Contractor"; and the Contractor shall do things. This should be written in the context that McTech **will** do certain things and not just be a re-statement directly from the SOW.

Concur, "will" has replaced "shall" and "McTech Corp" has replaced "contractor".

9. 1.4.1, Title. The SSHP should be defined as **Site-Specific** Safety and Health Plan (SSHP).

Concur, defined as suggested.

10. 1.4.1 – 1.4.10, General Comment on content for all of these sections. The various tasks are stated directly from the SOW, which is included as a reference in Appendix A. Personally, I'd rather see the tasks re-stated to be more directed towards what McTech **will** do rather than what the Contractor **shall** do. The **shall** connotation is more like USACE directing what the contractor shall do; the Plan should be more like "we will do this"; do you understand where I am coming from with that comment? I recommend all **shall** be revised to **will**. I hate to infer an entire re-write of these sections, but I think the

Plan would "read better" with such revision, and not appear to just be a cut from the SOW. The Plan could be abbreviated considerably with more bullet-type statements, with reference to compliance or in accordance with the SOW, Appendix A.

Concur, changes were made, see response to number 8 and future plans and reports written by McTech Corp will "read better" as efforts are made to clarify tasks rather than just restate them from the SOW.

11. 1.4.4, 2nd paragraph. Recommend that you define PBOSG.

Concur, Plum Brook Operations Support Group has been defined in this paragraph and added to the Definitions and Acronyms page.

12. 1.4.6. I recommend that you provide an introductory-type statement regarding the 5 areas to be excavated, and with that, not include the discussion of areas that have already been completed. I think this task should just state the areas we are concerned with for this project. The other information regarding areas already addressed is referenced in the SOW.

Concur, the following statement is made just prior to the description of the 5 areas, "The following paragraphs detail these 5 different locations within the TNT Area B." In addition, the descriptions of those areas where excavation is complete have been deleted.

13. 2.0., D and E. The company for Mr. Gary Cooper was not provided, as was the case for the other members of the project team.

Concur, references to Gary Cooper's employer, C&K Industrial Services, Inc. was provided as well as the rest of the project team, McTech Corp.

14. 2.0., K. It is noted that the QCP states that Molnar Construction, Inc. will perform this task.

Concur, Molnar Construction will perform this task; the Plan of Operations was corrected.

15. 3.0, Title. The title should be revised to APPLICABLE **or** RELEVANT AND APPROPRIATE REQUIREMENTS.

Concur, the commas were removed and "or" was added.

3.0

a. General comment. Recommend a short introductory statement regarding ARARs and their use for this project.

Concur, following the approved language in the Final *ISRA Report for TNTB,* the following paragraphs were added. "Characterization activities at the PBOW TNT B site have indicated soil contamination resulting from United States Department of Defense activities including the manufacture of 2,4,6-TNT, DNT, and pentolite at the site. The *Final Action Memorandum for the TNT B Interim Removal Action* (USACE, 2003) identified soil remediation goals for thirteen COCs. The COCs were identified in surface and subsurface soils which include nitroaromatics.

The *Final Action Memorandum for the TNT B Interim Removal Action* (USACE, 2003) addressed soil contamination only. WTI was contracted to perform the ISRA for the soil contamination. The elements of the selected remedy(s) are presented in *Final Action Memorandum for the TNT B Interim Removal Action* (USACE, 2003). The overall objective of the ISRA for the PBOW site is to minimize threats to, and provide adequate protection to, human health and the environment from exposure to contaminants in soil. Successfully meeting the soil remedial objectives would sufficiently address the principal threats at this site, which are nitroaromatics in the soil."

b. Please note that the RI/FS and Final Action Memorandum references are incorrect. Please see previous comments.

Concur, the references were changes as noted in response to comment number 3 and 4.

c. Last sentence. The statement that Table 1 is on the following page should be revised since the table is on the same page.

Concur, "the following page" was replaced with "below".

16. 3.2, last paragraph. Recommend that you state why the TCLP analysis will be compared to RCRA levels, which is to determine disposal requirements. As stated, the sentence leaves one to wonder why the comparison will be made.

Concur, the last sentence was changed to the following, "Because the requirements of the EPA and RCRA apply to all wastes generated from PBOW, analytical data from the TCLP analysis will be compared to the RCRA regulatory levels for TCLP constituents."

17. 4.1, 2nd sentence. You may want to revise "site" to Site, so that it is understood you mean the PBOW or TNT B site; or revise as you feel appropriate. Also, it appears from Table 2 that you will be taking about 1 sample per 1,000 CY of borrow material. You should mention that QC is 10%. The method of sample taking should be discussed in more detail; how many per CY of borrow, how will the sample be composited (maybe 5 composites per 1,000 CY??), etc. More detail is needed because the Plan of Operations also contains the Sampling and Analysis Plan (although not specifically separated into a section named SAP) within the document.

Concur, "NASA PBS" was inserted before "site". Per the SOW and USACE POC no QC samples will be taken; therefore, this column was removed from Table 2. More detail

was added in regard to sample collection as follows, "One sample per 1000 cubic yards of material needed will be collected. It is anticipated that approximately 6,800 cubic yards of borrow soil will be needed to fill the five excavations; therefore, a total of 7 samples will be collected and analyzed. Based upon soil available at each borrow site, 3 samples will be collected from the Kalahari Water Park site and 4 will be collected from the Nursery site. The samples will be 5 point composite samples, collected using dedicated disposable sampling equipment."

18. 4.3, 4th paragraph. Please refer to comment for Section 4.1 regarding how the samples will be obtained, how often per 500 CY.

Concur, the fourth paragraph has been rewritten as follows, "Refer to Section 5.3 for the parameters to be analyzed for the disposal of the excavated soil. McTech will collect 1-5 point composite sample for waste characterization purposes per 500 tons of excavated contaminated soil. It is anticipated that a total of 33 soil samples will be collected for characterization purposes."

19. 5.1, Table 2. Recommend you add a note regarding how often samples will be taken for backup to the quantity shown in the Number of Samples column.
20. 5.2. The 3rd should be deleted or revised, due to statements made in the 5th sentence. The 3rd states that confirmation samples are not required...the 5th states that they will be required if field screening indicates nitroaromatics above PRGs.

Concur, this paragraph is confusing; the third sentence is the correct sentence and the 5th sentence, as well as all references to field screening, was deleted. See response to comment number 6. above.

21. 5.2.1, 1st and 2nd sentences. I do not understand the difference between these sentences, other that the 2nd has the word "areas". Appears to be duplication.

Concur, see response to comment numbers 6. and 20. above.

22. 5.2.2. Recommend you state how the number of *estimated* confirmation samples was arrived at, and that QC is 10%.

Concur, see response to comment numbers 6. and 20. above.

23. 5.3, Table 5. It is noted that Section 4.3 indicated 14 samples were estimated for disposal characterization (1 per 500 CY of soil). Table 5 lists 33 samples and I do not understand the difference. Table 5 should have notes that indicate how the number of *estimated* waste characterization samples was arrived at, and that QC is 10% of that total. Also, recommend you state how the number of IDW samples was derived.

Concur, 14 was changed to 33. The following note was added to Table 5, "*The number of soil samples was estimated based on one sample per every 500 ton excavated. The

number of IDW samples was estimated based upon IDW generation from the initial ISRA." And regarding QC sampling, "The number of QC samples is approximately 10% of total number of samples."**

24. 6.0, last paragraph. You may want to note that a pump will be used to transfer decon liquids to the drums. Also, there is no discussion on the setup/makeup of the decontamination area, but such discussion should be added as to the location(s), control of wastes spreading (plastic and berms), etc. and then the disassembly and disposal of the decon area.

Concur, the following sentences were to the last paragraph, "There will be one main decontamination area located by the stockpile area. It will be constructed using and earthen berm and lined with plastic. A second decontamination area will be transportable (kiddie swimming pool or equivalent) between office trailer site and each excavation area as necessary." and "A pump will be available to transfer decontamination liquids to the drums."

25. 6.1., 1st sentence. Since you will have a mixture of solid and liquid wastes, and the acetone is a flammable waste, you may want to state that such wastes will be segregated; if not, and the acetone is mixed with other non-hazardous wastes, you will generate excess hazardous waste for disposal.

Concur, the following sentence was added to the beginning of the second paragraph in this section, "Flammable or other known hazardous waste will be segregated and stored separately."

26. 7.3. This section should contain discussion regarding sample ID system. The 2nd bullet states that the number assigned is IAW the SOW, but I could not find such discussion in the SOW. The ID system should be something like a 7-10 digit system, with identifiers as to location, etc., with discussion provided and a sample ID number shown per the discussion of each identifying "digit".

Concur, the existing text was removed and following text has been added to this section, "Sample numbers should be assigned sequentially and include the project number and former building location number from which the soil was excavated. For example: 200609M412-001, 200609M412-002 and 200609MNENH-001, 200609MNENH-002 and so on."

27. 7.4, last paragraph. It is noted that the chain-of-custody form was not included in Appendix C.

Concur, It is now included.

28. 8.0.

a. 3rd bullet. Wouldn't the custody seals be placed on the jar lid too? if the cooler gets wet inside, it appears that the custody seals on the plastic bags could come off, but that would not prove if the sample jar (lid) had been tampered with.

Concur, the following has been added to the beginning of last sentence in the 3rd bullet, "Sample containers and".

b. Last bullet. Recommend that you clarify that the custody seals be placed on the lid of the cooler and not on the cooler.

Concur, "cooler" has been changed to "cooler lid".

29. 9.3

a. 2nd paragraph, 1st sentence. The words "in the" were repeated before "QCP".

Concur, the words "in the" have been removed.

b. 1st bullet. Contract specifications should be revised to Scope of Work.

Concur, revised as suggested.

30. 12.1, 1st set of bullets, 4th bullet. Since lead stabilization is not included in the SOW, the statements regarding MAECTITE® should be deleted.

Concur, reference was deleted.

31. 12.2.

a. 1st bullet. Recommend that drums be placed on pallets for ease of movement and loading later once they are full.

Concur, the following sentence has been added, "Drums should be placed on a pallet for ease of transportation.

b. 2nd bullet. Equipment must/should be subjected to inspection, and the Contractor should document this on USACE equipment inspection checklist. Recommend including the equipment checklist in Appendix C.

Concur, this checklist has been included in Appendix C of the SSHP and a sentence to this fact has been added to the 2nd bullet.

32. 12.3, spills reported bullet. The term "If appropriate" should be defined more and not left up to interpretation. Typically appropriate would mean a reportable quantity, which would be something like 25 gallons, of if the spill entered waters where it might disperse, etc.

Concur, the following was added to the 10th bullet, "If the spilled material reaches any navigable body of water,"

33. 12.4. You may want to add an item like caution tape or the orange plastic construction fence as items that could be used to cordon off a spill area.

Concur, the following bullet was added, "Fluorescent making tape and/or orange construction fence".

34. 12.5, 2nd paragraph. It appears that the NASA POC, Bob Lallier, should also be notified in the event of a spill.

Concur, added NASA POC to second sentence.

35. 12.6. It is noted that the ER team may be held up at the NASA security gate if they respond. I don't think that they will readily be allowed onsite. You may consider stating that NASA ER may respond. Please clarify with Lisa Humphreys.

Concur, NASA was added.

36. 13.1., 2nd sentence. The word "is" should be revised to "are". Also, hay bales and silt fence could be employed for silt/erosion control.

Concur, changed "is" to "are" and added the following sentence to the first bullet, "In addition, silt fence and straw bales may also be used to prevent erosion from runoff water."

37. 15.0. It is noted that the bullet format does not match previous formats.

Concur, changed bullet format to match previous.

38. 16.0. The Draft TNT B Action Memorandum should be revised to the Final memorandum, with date USACE, 2003.

Concur, changed as suggested.