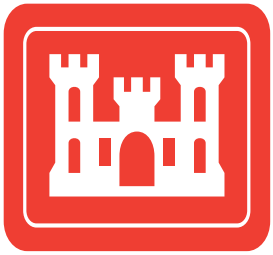
FINAL

LONG-TERM MONITORING WORK PLAN, REV. 1

Groundwater Sampling for Natural Attenuation
COLONIE FUSRAP SITE

AUGUST 2010



U.S. ARMY CORPS OF ENGINEERS
NEW YORK DISTRICT OFFICE

FORMERLY UTILIZED SITES REMEDIAL ACTION PROGRAM

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LIST OF ACRONYMS

AEC	Atomic Energy Commission
CAH	chlorinated aliphatic hydrocarbon
CERCLA	Comprehensive Environmental Restoration, Compensation, and Liability Act
CFR	Code of Federal Regulations
cfs	cubic feet per second
cis-1,2-DCE	cis-1,2-dichloroethene
COC	contaminants of concern
COI	constituents of interest
cVOC(s)	chlorinated Volatile Organic Compound(s)
CSXT	CSX Transportation (formerly Conrail)
DCE	Dichloroethene
ºF	degrees Fahrenheit
DO	dissolved oxygen
DOE	Department of Energy
DQO	Data Quality Objective
FUSRAP	Formerly Utilized Site Remedial Action Program
HNO_3	nitric acid
LTM	Long-term Monitoring
µg/L	microgram per liter
MCL	Maximum Contaminant Level
mg/L	milligram per liter
MMC	Magnus Metal Company, Inc.
MNA	Monitored Natural Attenuation
mph	miles per hour
msl	mean sea level
NiMo	Niagara Mohawk
NL	National Lead Industries
NYSDEC	New York State Department Environmental Conservation
ORP	oxidation reduction potential
PCB	polychlorinated biphenyl
PCE	Perchloroethylene, Tetrachloroethylene
pCi/L	picocuries per liter

LIST OF ACRONYMS
(continued)

QAPP	Quality Assurance Project Plan
RAO	Remedial Action Objective
RI	Remedial Investigation
Shaw	Shaw Environmental, Inc.
SOPs	Standard Operating Procedure
SVOC	Semi Volatile Organic Compound
TAL	Target Analyte List
TCE	Trichloroethene
TCL	Target Compound List
TOC	Total Organic Carbon
trans-1,2-DCE	trans-1,2-dichloroethene
UCL	Upper Confidence Level
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
VC	Vinyl chloride
VOC(s)	Volatile Organic Compound(s)
WP	Work Plan

1.0 INTRODUCTION

This Long-Term Monitoring (LTM) Work Plan (WP) has been prepared by Shaw Environmental, Inc. (Shaw) on behalf of the United States Army Corps of Engineers (USACE) for the Colonie FUSRAP Site (Site) located at 1130 Central Avenue in the Town of Colonie, Albany County, New York (Figure 1-1). Shaw has completed the soil removal action at the Site. The Record of Decision (ROD) for groundwater was issued on April 9, 2010. As detailed in the ROD, Monitored Natural Attenuation (MNA) with land use controls and groundwater sampling to assess the progress of MNA was identified as the remedial approach that would be suitable for remediation of Volatile Organic Compounds (VOCs) in the groundwater at the Site. Shaw is completing the groundwater sampling program specified in this ROD under Delivery Order Number 0031 for Contract Number W912DR-05-D-0026 in accordance with the Modification 001 to the Scope of Work (SOW) for Groundwater Sampling for Natural Attenuation issued by the USACE on January 14, 2008. The sampling effort falls under the USACE's Formerly Utilized Sites Remedial Action Program (FUSRAP), which was established to identify, investigate, and clean up or control sites previously used by the Atomic Energy Commission (AEC) and its predecessor, the Manhattan Engineering District.

Shaw submitted a revised estimate and schedule for completion of the LTM SOW, which was approved by the USACE on April 14, 2008. On June 3, 2010, USACE requested that Shaw extend the groundwater monitoring program to include eight consecutive quarterly post-ROD sampling events and modify the sampling program to match the requirements of the ROD. This LTMWP has been prepared in accordance with the modified LTM SOW.

1.1 PURPOSE AND SCOPE

MNA with land use controls has been selected as the remedial alternative for the remediation of VOCs in the groundwater at the Site. Because the available groundwater analytical data set was insufficient to demonstrate that the in situ biodegradation component of the MNA processes are active, long term monitoring was proposed in the ROD to evaluate the efficacy of MNA.

This LTMWP provides detailed directions and guides the design, performance and evaluation of groundwater sampling for MNA at the Site. The LTMWP incorporates the MNA data collection techniques and evaluation approaches recommended in the following references: *Guidance for Evaluation of Federal Agency Demonstrations that Remedial Actions are Operating Properly and Successfully Under CERCLA Section 120(h)(3)* (USEPA 1996a); *Technical Protocol for Evaluating Natural Attenuation of Chlorinated Solvents in Ground Water* (Wiedemeier et al. 1998)**;** *Performance Monitoring of MNA Remedies for VOCs in Groundwater* (USEPA, 2004a);

Designing Monitoring Programs to Effectively Evaluate the Performance of Natural Attenuation (AFCEE, 2000); and *A Decision Flowchart for the Use of Monitored Natural Attenuation and Enhanced Attenuation at Sites with Chlorinated Organic Plumes*, (ITRC, 2007).

The performance period for LTM is two years as established in the signed ROD. The LTM data collected over this period will supplement the existing Site data collected through May 2009. The data collection will be performed during the years 2010 through 2012, and will be used to document the progress of natural attenuation in groundwater at the Site.

The LTMWP will be used to accomplish the following:

- Specify the LTM performance objectives;
- Identify data needs and collection methods;
- Identify data analysis techniques; and
- Establish monitoring endpoints.

The LTMWP provides detailed procedures that will be utilized for meeting the overall objectives of natural attenuation monitoring in accordance with the requirements of the ROD.

1.2 SITE BACKGROUND

Industrial operations began on the Site in approximately 1923 when the Embossing Company purchased a portion of the present day Site to construct a facility to manufacture wood products and toys. In 1927, Magnus Metal Company, Inc. (MMC) converted the facility to a brass foundry for manufacturing railroad components. MMC cast the brass components in sand molds and manufactured brass bearing housings with surfaces of babbitt metal (an alloy of lead, copper, and antimony).

In 1937, National Lead Industries (NL) purchased the facility and continued the brass foundry operations initiated by MMC. At some point before 1941, NL purchased an adjacent lot that contained a portion of Patroon Lake and began filling Patroon Lake with used casting sand. After World War II, the operations began casting aluminum parts and frames for aircraft. In 1958, the nuclear division of NL began manufacturing items from uranium and thorium at the facility under a license issued by the AEC. NL discontinued its brass foundry operation in 1960.

From 1958 through 1984 NL carried out a number of manufacturing processes using radioactive materials consisting primarily of depleted uranium, but also thorium and enriched uranium. The plant handled enriched uranium from approximately 1960 to 1972. From 1966 to 1972, NL held

several contracts to manufacture fuel from enriched uranium for experimental nuclear reactors. Operations were conducted at the plant to reduce depleted uranium-tetra fluoride to depleted uranium metal, which was then fabricated into shielding components, ballast weights, and projectiles.

Other processes conducted at the plant included an electroplating operation for plating uranium with nickel and cadmium. Chemicals used in the plating operation included nickel sulfamate, sodium cyanide, ferric chloride, nitric acid, silicate phosphate, iridite (chromium brightener), cadmium metal, nickel metal, boric acid, and tetrachloroethylene (PCE). How or where most of these materials were disposed is unknown; very few disposal records have been located. NL letters indicate that under an AEC license approximately 42 cubic meters (cm) of graphite, slag, refractory, uranium oxide, insoluble oil, metal scrap, and combustible trash were buried in the Patroon Lake area in 1961. Chemical wastes and packaged chemicals used at the Site have included acids, bases, degreasing agents, carbon tetrachloride, benzene, polychlorinated biphenyls (PCBs), cyanide, and asbestos. The chemicals present on the Resource Conservation and Recovery Act (RCRA) Part A application permit were removed from the Site as part of this facility's closure as a designated "interim RCRA storage facility." This closure was documented in the 1995 RCRA Closure Report certified by both the Department of Energy (DOE) and an independent New York State Professional Engineer.

New York State officials closed NL in 1984, at which time Congress authorized the DOE to remediate the property. In February 1984 the Secretary of Energy accepted an offer from NL to acquire the land, buildings, and equipment in order to help expedite the cleanup. The DOE accepted the property on February 29, 1984. In 1985 the DOE acquired a portion of the Niagara Mohawk Electrical Power Station (NiMo) property bordering the Site and subsequently designated it as part of the Site.

From 1984 to 1988 remedial efforts were completed by the DOE for 53 of the 56 Vicinity Properties. From 1992 to 1996 the remaining NL buildings were demolished by DOE. Various debris, waste materials, and machinery associated with demolition of the main building were left on site at the time the USACE and their contractors initiated their remedial efforts. USACE completed the removal action at the site in September 2007.

1.3 *SITE DESCRIPTION*

As shown on **Figure 1-1** the Site is located at 1130 Central Avenue (New York State Route 5) in the Town of Colonie, Albany County, New York. The Site is an 11.2 acre parcel located immediately north and west of the Albany City line. The CSX Transportation (CSXT) vicinity

property located adjacent to the Site on the southern property line is entirely within the limits of the City of Albany.

At the time of the USACE's initial mobilization in 1998, approximately 4 acres of the Site were paved with asphalt in varying physical conditions; approximately 4 acres were vegetated with grasslands and/or tree/brushy areas. The slab of the main building covered the remaining portions of the parcel, approximately 3.2 acres in the central/southern portions of the Site.

The Site is bounded by a heavily wooded lot on the west (7 Railroad Ave), CSXT rail tracks on the southwest and south, active commercial properties on the east/northeast, New York State Route 5/Central Avenue on the north, and a NiMo electrical substation on the northwest. The surrounding area consists of mixed residential and commercial properties.

NiMo owns a revised easement for the high voltage lines in the western portion of the Site passing over the storm water drainage channel, located in the westernmost portion of the Site. The high voltage power lines and poles were installed in the new easement in 2000.

1.3.1 Climate and Precipitation

The climate at the Site is typical of upstate New York. The average annual daily maximum temperature is 57.6 degrees Fahrenheit (ºF), and the average daily minimum is 36.8ºF. The highest average monthly temperature is 83.2ºF (July), and the lowest is 11.9ºF (January). Average annual precipitation is 35.7 inches, with an average annual snowfall of 65.1 inches. Winds in the area blow predominantly out of the south-southeast to south sector and west to west-northwest sector. The mean wind speed from these sectors is 10 miles per hour (mph). Light winds (0-3 mph) blowing in no specified direction are also generally prevalent (Bechtel National, Inc. [BNI], 1992).

1.3.2 Geologic Setting

The primary geologic feature in the vicinity of the Site is the Colonie Channel, which is a buried, glacially-scoured valley that occupies the Hudson-Champlain Lowlands of east-central New York. Like the Hudson River Valley of today, the Colonie Channel was the main artery of the river system draining the lowlands of eastern New York during pre-glacial times. Most of the unconsolidated sediments above the bedrock present at the Site were deposited in glacial Lake Albany created during continental glacier advances and retreats in the Hudson Valley.

A brief description of the geological units, from the uppermost unit to the lowermost unit, is provided below.

Artificial Fill and Flood Plain Sediments: This unit consists of fill materials placed at the Site, including Patroon Lake, and consists of gravel, sand, brick fragments, metal barrels, glass, foundry tools, foundry slag, and disturbed sediment. The Flood Plain Sediments unit represents thin deposits of materials related to sedimentation in the former Patroon Lake and from floods of the unnamed tributary of Patroon Creek.

Dune Sand: This unit is fine-grained sand that is light yellow-brown and cross-laminated. Regionally, it is the unit that makes up the Pine Bush Aquifer. Based on lithologic logs, this unit thins from northwest to southwest across the Site and occurs near the ground surface, predominantly above the water table.

Upper Silt: Previously referred to as the Upper Sand. This unit is composed of lake silt and sand. Grain size analyses consistently show significant silt fractions in samples collected from this unit.

Upper Clay: This unit is most easily identified in conductivity logs and consists of a varied sequence of clay and silt.

Lower Silt: Previously referred to as Lower Sand. This unit consists predominantly of silt with some clay and lies above the Lower Clay.

Lower Clay: At the Site, the Lower Clay is approximately 100 feet thick. The clay is observed to be olive gray and very homogenous, showing few signs of silt or sand interbeds. Based on geophysical surveys, it was determined that no major channel cut features or topographic divides were apparent along the top of the Lower Clay. The apparent absence of these features further supports background geological information and geotechnical testing that identify the Lower Clay as the basal hydrogeologic boundary.

Till: This unit is described as dark gray and poorly sorted (10 percent sand, 40 percent gravel, and 50 percent clay). One Site borehole penetrated the till at a depth of 160 feet below grade. Bedrock underlies this till.

The Upper Silt forms the shallow saturated zone at the Site (hereafter referred to as the upper groundwater zone). The base of the upper groundwater zone ranges from elevations of approximately 202 to 205 feet mean sea level (msl) in the western portion of the Site. Water levels indicate a saturated thickness of over 20 feet in the north to less than 15 feet in the south near the property line. The thickness of the Upper Clay in the western portion of the Site ranges from approximately 12 to 15 feet. The top surface of the Lower Silt (hereafter referred to as the

lower groundwater zone) is typically encountered at approximately 190 feet msl and ranges from 10 feet to approximately 15 feet thick.

Permeabilities obtained from field tests conducted in 1984 and 1988 ranged from 0.04 to 109 feet/day in the upper groundwater zone (mean and median of 1.5 and 1.3 feet/day, respectively), and 0.29 to 31 feet/day in the lower groundwater zone (mean and median of 6.4 and 0.68 feet/day, respectively).

1.3.3 Groundwater Hydrology

Groundwater levels at the Site have been routinely measured since 1988. Generally, shallow groundwater in the upper groundwater zone at the Site is encountered less than 10 feet below grade. Water level measurements recorded at the Site indicate that groundwater flow across the Site is to the southeast. Generally, there is a downward vertical gradient over the northern portions of the Site, with an upward vertical gradient near the unnamed tributary and toward Patroon Creek. Groundwater level data provided in the Remedial Investigation indicate that the hydraulic gradient and general direction of groundwater flow in the lower groundwater zone closely resembles that in the upper groundwater zone. The upper groundwater zone likely drains to the unnamed tributary and to Patroon Creek.

To support excavation activities on the eastern portion of the Site, approximately 260 linear feet of sheet pile wall was installed near the CSX railroad tracks in July 2005 to depths varying between 30 and 50 feet below ground surface. The location of the sheet pile wall is shown on Figure 1-2. Along with providing structural stability, the sheet pile wall impedes groundwater to the southeast, creating a zone of stagnation directly behind the wall as groundwater levels equilibrate with up-gradient points. Groundwater flow directions may shift over time as migration pathways around the stagnation zone are established.

1.4 EXTENT OF CONTAMINATION

A number of studies have been performed at the Site since 1984 to investigate hydrogeologic conditions and evaluate the nature and extent of groundwater impacted by past operations. The upper groundwater zone beneath the Site has been impacted by historical releases of chlorinated Volatile Organic Compounds (cVOCs). Information presented in the *Groundwater Remedial Investigation (RI)* (Shaw, 2003) indicates that the areas of impact have expanded laterally from the source areas toward the railroad tracks, nearby buildings, and the unnamed tributary of Patroon Creek, consistent with the natural direction of groundwater flow. A decrease in the extent of groundwater contamination at the Site has been observed since 2003, with significantly

lower levels of contaminants generally being reported in the areas where excavation and dewatering were performed to address soils impacted with radioactive debris.

The soil removal action is now complete and has resulted in the removal of more than 135,000 cubic yards of contaminated soil from the Site (URS, 2008). To facilitate excavation activities, an on-site temporary water treatment system was constructed for the management of groundwater generated from dewatering wells and storm water that accumulated within excavations. A combined volume of approximately 31 million gallons of groundwater and storm water were treated in this system and discharged from the Site in accordance with the approved State Pollutant Discharge Elimination System Permit. The RI results and groundwater sampling performed through May 2009 indicate that VOCs have not impacted the lower groundwater zone at concentrations greater than the groundwater target cleanup goal concentrations listed in the ROD.

2.0 LONG-TERM MONITORING PLAN

2.1 DATA NEEDS AND OBJECTIVES

2.1.1 Performance Objectives

The objectives for groundwater performance monitoring at the Site are:

- Demonstrate that natural attenuation is occurring according to the expectation of providing a reduction in VOC concentrations;
- Detect changes in environmental conditions (e.g., hydrogeologic, geochemical, or other changes) that may reduce the efficacy of any of the natural attenuation processes;
- Identify any potentially toxic and/or mobile transformation products;
- Verify that the plume(s) is not expanding downgradient or laterally; and
- Verify attainment of remediation objectives.

The Remedial Action Objectives (RAOs) for the groundwater established in the ROD are as follows:

- Limit exposure of potential future onsite urban residents to VOC constituents that may migrate into homes via the vapor intrusion pathway.
- Reduce the concentrations of VOCs in onsite groundwater to levels that are protective of future onsite urban residents who may be exposed to these compounds via the vapor intrusion pathway.

The RAOs are based on limiting the excess cancer risk due to inhalation of vapors intruding into a hypothetical onsite residence to less than one in one million ($1x10^{-6}$). This risk reduction will be achieved by reducing the concentrations of groundwater contaminants to the following RAO-based target cleanup goal concentrations for the following contaminants of concern (COCs) as defined in the ROD:

- PCE - 5.5 µg/L
- Trichloroethylene (TCE) - 18 µg/L
- cis-1,2-Dichloroethylene (cis-1,2-DCE) - 1,800 µg/L
- Vinyl Chloride (VC) - 1.4 µg/L

The USACE acknowledges the NYSDEC's opposition to utilizing the target cleanup goal of 1,800 ug/L for cis-1,2-DCE (which is in the signed Record of Decision), rather than the New York state MCL of 5 ug/L. Therefore we will work the DEC and cis-1,2-DCE will be evaluated against both the target cleanup goal of 1,800 ug/L and the state MCL of 5 ug/L.

Radiological constituents are also elevated in groundwater in one monitoring well bordering the Site, but not pose a potential human health risk primarily because there is no complete pathway for human exposure to these constituents. Radiological constituents, metals (total and dissolved lead), and VOCs [daughter products of COCs: trans-1,2-DCE and 1,1-DCE] other than those listed as COCs above will be monitored as constituents of interest (COIs) for informational purposes only since the COIs do not have RAO-based target cleanup goal concentrations - associated with them. The COIs will be screened against the screening values listed in *NYSDEC Part 703: Surface Water and Groundwater Quality Class GA Standards and Groundwater Effluent Limitations* (NYSDEC, 1999) and *USEPA Drinking Water Maximum Contaminant Levels (MCLs)* (US EPA, 2004 b, c), if the NYSDEC Part 703 screening values are not available. An analyte list along with RAO-based target cleanup goal concentrations and other applicable screening values are presented in **Table 2-1**. The natural attenuation data will be evaluated using the approach presented in *Technical Protocol for Evaluating Natural Attenuation of Chlorinated Solvents in Ground Water* (Wiedemeier et al., 1998).

Data quality objectives (DQOs) were developed for the data to be collected during the LTM. The data quality objectives process helps define the purpose for which environmental data from the Site will be used, and provides guidelines for designing a data collection program that will provide data suitable for its intended use while meeting regulatory objectives. The data quality objectives process identifies the end use of the data for which the samples are collected, which is to monitor the performance of natural attenuation, mainly consisting of intrinsic biodegradation, over an extended period of time, and to confirm that the soil removal action has reduced concentrations of COCs in groundwater. The process also provides a logical, objective, and quantitative framework for establishing the quality level that data must meet to support decisions made during the implementation and maintenance of MNA. Developing the DQO process consists of seven stages:

- State the problem;
- Identify the objective(s);
- Identify inputs to the objective(s);
- Define the study boundaries;

- Develop a decision rule;
- Specify limits on decision errors; and
- Optimize the design for obtaining data.

The overall DQO is to develop and implement procedures for sample and data collection, sample shipment, and reporting that will allow reviewers to determine whether the field and laboratory data collected during the LTM at the Site meet the criteria and the monitoring endpoints established in the LTMWP. The DQOs will be achieved through the implementation of specific procedures for sampling, field data collection, calibration, internal quality control, audits, preventive maintenance, and corrective actions as described in this document. Site-specific DQOs for Site groundwater LTM are presented in the *Quality Assurance Project Plans* (QAPP) (Appendix A). An additional DQO is to document that the soil removal action at the Site resulted in COC concentration reduction.

2.1.2 Data Needs

A performance monitoring plan that measures contaminant concentrations, geochemical parameters (e.g., oxidation-reduction [redox] parameters, pH), and hydrologic parameters is being implemented. The data will be used to evaluate Site hydrogeologic and geochemical conditions over time including:

- Changes in COC plume boundaries;
- Changes in the geochemical parameters that may be indicative of groundwater changes potentially affecting the rate and extent of natural attenuation; and
- Contaminant mass and/or concentration reductions indicative of progress toward meeting the RAO-based groundwater target cleanup goal concentrations.

Plume behavior can then be evaluated to judge the effectiveness of the MNA remedy, the adequacy of the monitoring program, and the adequacy of the conceptual model for MNA. Performance monitoring for MNA will continue until RAO-based groundwater target cleanup goal concentrations or other monitoring end points specified in Section 4.0 have been met.

The DQO process presented in the QAPP (Appendix A, Table 3-2) identified the need to collect groundwater data to determine the extent to which COCs are migrating and/or degrading and to determine if natural attenuation remains a viable remedial alternative to address the observed concentrations of chlorinated solvents.

Data will be collected to meet requirements for the following analyses and interpretations:

- Measurement of COC concentrations to determine COC plume center of mass, size, and changes in center of mass and size.
- Verification that natural attenuation is continuing at an acceptable rate and to identify the point when RAO-based target cleanup goal concentrations are attained.
- Early recognition of changes in the natural attenuation process that require supplemental responsive action to meet RAO-based target cleanup objectives for the Site.
- Provide COC contaminant profiles, biodegradation products, and indicators of biological activity.
- Assess the natural attenuation processes and the effectiveness of those processes with respect to achieving RAOs.

Analytical data to be collected include both physical measurements taken in the field and laboratory analysis.

This LTMWP, along with the QAPP (**Appendix A**), present the type of monitoring data and data collection techniques that will be used. The following sections and appendices present the data collection system design and include the following:

- Number and location of sampling points (wells to be sampled);
- Sampling frequency;
- Sampling parameters (COC, COI, and MNA parameters);
- Sample collection techniques; and
- Sample handling, shipping and chain-of-custody procedures.

2.2 MONITORING WELLS SELECTED FOR THE LTM PLAN

The LTM Program will consist of sampling 15 upper groundwater zone monitoring wells and seven lower groundwater zone monitoring wells. The 22 monitoring wells selected for the LTM plan at the Site consist of monitoring wells MW-08S, MW-10S, MW-21S, MW-30S, MW-32S, MW-34S, MW-35S, MW-36S, MW-37S, MW-38S, MW-39S, MW-40S, MW-41S, MW-42S and MW-43S in the upper groundwater zone and monitoring wells MW-08M, MW-30M, MW-32M, MW-37M, MW-41M, MW-42M and MW-43M in the lower groundwater zone. A

summary of well information (location, depth, etc.) for the 22 wells selected for this LTMWP is presented as Table 2-2. The location of the selected monitoring wells is presented as **Figure 1-2**.

The monitoring wells selected to document the concentrations of COCs and the natural attenuation parameters are at the following locations:

(1) In the groundwater with the highest observed historic concentrations of COCs;
(2) In the leading edge of the contaminated groundwater;
(3) Downgradient of the contaminated groundwater; and
(4) Upgradient of the contaminated groundwater.

Only data from the upper groundwater zone will be used to determine compliance with the ROD.

2.3 SAMPLING FREQUENCY

Groundwater sampling of the selected upper groundwater zone monitoring wells at the Site for VOCs and MNA parameters will be conducted on a quarterly basis for the first two years of MNA implementation (i.e., post ROD approval). This sampling schedule is required to assess the effectiveness of MNA in achieving Site RAO-based target cleanup goal concentrations, verifying COC plume stability, and establishing degradation rates for the COCs. In addition, semi-annual groundwater sampling for VOCs will be conducted in the lower groundwater zone for the first two years of MNA implementation at the Site. The lower groundwater zone VOC data will be collected for informational purposes only to document the reduction in VOC concentration in the former source areas even though it is not a requirement of the ROD. After the first two years, the sampling frequency will be evaluated and adjusted, as necessary, until a five-year demonstration period is completed. Sampling of total and dissolved lead and radionuclides will be conducted on a semi-annual basis for the first two years. Recommendations for adjustments to the sampling frequency will be based on results from the monitoring events. These recommendations will be included in annual reports.

2.4 CHEMICAL PARAMETERS FOR ANALYSIS

The chemical analyses to be performed by the off-site laboratory for groundwater samples collected from the selected monitoring wells include VOCs (PCE, TCE, cis-1,2-DCE, trans-1,2-DCE, 1,1-DCE and VC), total and dissolved lead, and radiological parameters using EPA approved methodologies including USEPA SW-846 (USEPA, 2007), *Methods for Chemical Analysis of Water and Wastes* (USEPA, 1983), and *USEPA Prescribed Procedures for Measurement of Radioactivity in Drinking Water* (USEPA, 1980) where applicable. The

radiological analysis to be performed by the off-site laboratory includes gross alpha and gross beta (total and dissolved), combined radium (226+228) (total and dissolved), and uranium (total and dissolved). The MNA geochemical parameters analysis will also be performed on samples collected from selected monitoring wells in the upper groundwater zone. The MNA geochemical parameters include:

- nitrate (NO_3);
- soluble manganese [Mn(II)];
- ferrous iron [Fe(II)];
- sulfate;
- methane, ethane, and ethene;
- total organic carbon (TOC);
- chloride;
- Dissolved Oxygen (DO) via field measurement;
- pH (field measurement);
- temperature via field measurement;
- specific conductance via field measurement;
- oxidation/reduction potential (ORP) via field measurement; and,
- turbidity field measurement

A summary of the analyses for the LTM program for the Site are presented in **Table 2-3**.

The on-site coordinator will provide sampling containers and preservatives, and coordinate sampling procedures with the field sampling crew in accordance with the requirements in the QAPP (**Appendix A**). The specific suite of analyses to be performed is based on the COCs and COIs present in Site groundwater, and the geochemical parameters required to evaluate the occurrence of natural attenuation processes. The geochemical parameters collected via field measurement will be analyzed at the time of groundwater sample collection. The ferrous iron and soluble manganese analyses will be performed in the field using Hach kits

Groundwater samples will also be collected for analyses by a fixed laboratory. The following is a comprehensive list of parameters that will be analyzed in a fixed laboratory. A complete description of analytical methods and procedures is presented in the QAPP (**Appendix A**).

- VOCs (PCE, TCE, cis-1,2-DCE, trans-1,2-DCE, 1,1-DCE and VC);
- total and dissolved lead;

- gross alpha and gross beta (total and dissolved) ;
- uranium (total and dissolved); and,
- combined radium 226 + 228 (total and dissolved).

Changes to the analytical parameters may be recommended in future annual reports.

2.5 SAMPLING PROCEDURES

During each of the groundwater sampling events, field personnel will measure the static depth to water, obtain field measurements (i.e. DO, pH, temperature, specific conductivity, turbidity, and ORP), and collect groundwater samples utilizing low-flow sampling devices from the selected monitoring wells following procedures described in the QAPP (**Appendix A**). Field work will be performed in accordance with the Site Safety, Health, and Emergency Response Plan (**Appendix B**). Examples of well purging and sampling forms are included in Appendix C of the QAPP (**Appendix A** of this report). Completed forms will be included in the quarterly reports.

The selected monitoring wells will be sampled using low-flow purge methods. Samples will be collected from each well in accordance with the USACE EM-200-1-3 guidelines (USACE, 2001) and the American Society for Testing and Materials (ASTM) standard operating procedures for low flow groundwater sampling (ASTM, 2002). Chain-of-custody practices will follow the USACE EM-200-1-3 guidelines. The groundwater samples collected will be analyzed for the parameters listed in Section 2.4 of the LTMWP in accordance with EPA methodology. Details regarding the sample bottles and preservatives to be used are provided in Table 3-6 of the QAPP.

VOCs will be collected in 40-milliliter vials preserved with hydrochloric acid. The total lead sample will be collected in 1-liter polyethylene bottles and preserved with nitric acid (HNO_3). Although the low-flow purge method allows for minimal disturbance of the groundwater, a second lead sample will be collected from each well in unpreserved 1-liter polyethylene bottles for laboratory analysis of dissolved lead. The laboratory will filter these samples upon receipt using a 0.45 micron filter, and then preserve the filtrate with HNO_3. Radiological samples will be collected in 1-liter containers and preserved with nitric acid (HNO_3). The sample containers will arrive from the laboratory previously preserved, if required. Each sample container will be labeled indicating the well number, sampling date, sample collection time, the individual collecting the sample, the parameters being analyzed, and the preservative used. The lead and VOC samples will be shipped to an off-site laboratory on ice to preserve the integrity of the samples. The radiological samples will not require ice preservation. Details regarding the sample bottles and preservatives to be used are provided in Table 3-6 of the QAPP.

Two samples from each well will be obtained for lead analysis. The first sample from each well (total matrix) will be an unfiltered sample, and the second sample (dissolved matrix) will be filtered at the laboratory through a 0.45 micron filter prior to preservation by the laboratory.

Natural attenuation parameters will be collected in accordance with the low flow sampling protocols and collection techniques as noted above. Preservatives will be used, as applicable, to retard the hydrolysis of chemical compounds and complexes, to reduce volatility of constituents, and to retard biological action during transit and storage prior to laboratory analysis. Samples will be placed in a cooler with ice in the field as the samples are collected and shipped at 4^{o}C. Details regarding the sample bottles and preservatives to be used are provided in Table 3-6 of the QAPP. VOCs and dissolved gases (i.e. ethane, ethene, and methane) will be collected directly in acidified zero headspace vials after stabilization. Ferrous iron [Fe(II)] and soluble manganese [Mn(II)] will also be measured in the field with the use of field test kits. Per EPA protocols, nitrates will be analyzed within 48 hours; sulfates, and chlorides will be analyzed within 28 days; and ethane, ethene, and methane will be analyzed within 7 days. Lab filtered samples for dissolved fractions will be filtered and preserved (as applicable) within 72 hours.

For every twenty samples collected, one replicate sample, one matrix spike sample, and one matrix spike duplicate will be collected for off-site analysis for radiological and chemical analysis. Rinse blanks for water samples will only be required when non-dedicated or re-usable sampling equipment is used. As such, rinse blanks will not normally be obtained due to the use of dedicated equipment. Trip blanks will be required for every sampling event where analyses for VOCs are performed. One trip blank will accompany each cooler of samples sent off site for analysis.

Prior to the beginning of each sampling event, a round of static water levels will be collected from all Site wells using an electronic water level indicator. The location of the pump intake (distance from the top of the screen) will be identified prior to beginning the sampling process. During each sampling event, a QED MP20 micro purge flow cell water quality meter, or equivalent, will be used to monitor the water quality parameters in the selected monitoring wells. Readings for ferrous iron (for MNA samples), soluble manganese (for MNA samples), DO, pH, temperature, specific conductivity, turbidity, and ORP will be recorded on a water quality data sheet. Depth to water measurements using an electronic water level indicator will be obtained during the purging of the wells to monitor water level fluctuation and record drawdown. Depth to water measurements will be made continuously during the purging and the sampling process until the water level in the well is stable and drawdown ceases. The pumping rate will be measured and adjusted, as necessary, to allow the water level to stabilize. The drawdown will

not be allowed to exceed 25 percent of the distance between the top of the well screen or the static water level, whichever is lower, and the pump intake.

The water quality meter will be calibrated and maintained as per manufacturer's specifications. The water quality monitoring equipment will be thoroughly decontaminated using the procedures outlined in the QAPP (**Appendix A**).

The following procedures will be used to measure water levels using an electronic water level detector.

- Decontaminate the water level probe and the portion of cable that enters the water column with a non-phosphate detergent wash followed by a distilled water rinse. Dry using clean paper towels.
- Test the water level meter to ensure that the batteries are charged and that it is operating properly.
- If necessary, place plastic sheeting on the ground around the well to ensure that the measuring equipment does not contact the ground.
- Unlock the protective casing locking cap, remove the monitoring well cap, and place it on the plastic.
- Lower the probe into the well slowly until the alarm indicates that water has been reached.
- Read the depth to water from the graduated cable using the surveyed and marked measuring point on the monitoring well casing. This measurement should be made to the nearest 100th of a foot.
- Confirm the measurement by repeating the reading.
- Record the depth to water on the well sampling log or in the field notebook.
- Slowly remove the probe from the monitoring well and decontaminate the probe and portion of the cable that enters the water column, as previously described.
- Replace the monitoring well cap and protective-casing locking cap, and lock the well.

Water quality parameters must be stable for three consecutive readings taken several minutes apart before water samples will be collected. Stability for these parameters is defined as follows:

- pH ± 0.2 units
- Temperature ± 1.0 °C
- Turbidity ± 10 percent or 5 NTUs, whichever is greater
- Specific conductivity ± 3 percent
- DO ± 10 percent of the reading or 0.2 mg/L, whichever is greater

- ORP ± 20 mV.

If after three consecutive readings the above criteria cannot be met, sampling will commence based on the judgment of the field sampling team leader.

The following is an outline of the groundwater monitoring well sample collection procedure.

- Clearly label each sample container with a waterproof marker (pen for volatiles).
- Spread plastic sheeting on the ground around the well.
- Unlock and carefully remove the well cover to avoid having any foreign material enter the well.
- Using an electronic water level detector, measure the water level from below the measuring point on the top of the casing. Use the previously recorded depth to the bottom of the well to estimate the height of the water column in the well. Determine the volume of water in the well based on the water column and diameter of the well. Decontaminate the end of the probe between wells by washing with Alconox and water, and rinsing with deionized water.
- Purge the well using a dedicated pump.
- Groundwater samples will be collected in accordance with Low Flow Groundwater Sampling Procedures presented in the QAPP (**Appendix A**). In the case of wells that recharge slowly, sample as soon as adequate recharge has occurred. If a well does not contain or yield sufficient volume for all required laboratory analytical testing, including quality control, prioritize sample analyses.
- After well purging is completed and/or the well has sufficiently recharged, fill the sample containers with a minimum of sample agitation.
- Collect the samples in the general order of the sensitivity of the parameters to volatilization and the low flow sampling procedures. Field measurements, (i.e. DO, pH, specific conductance, turbidity, temperature, and ORP) will be collected continuously during the well purging. The preferred collection order for the remaining parameters and analyses after measuring depth to water and stabilization parameters is as follows:

    1) Ferrous Iron (Field Test Kit): Hach 8146 analysis

    2) Soluble Manganese (Field Test Kit): Hach 8149 analysis

    3) Methane/ethane/ethene and VOCs

    4) Lead, radiological and all remaining chemical parameters.

- Sound the well to determine the depth.
- Decontaminate the end of the probe between wells by washing with Alconox and water, and rinsing with deionized water.

2.6 INSPECTION AND WELL MAINTENANCE

The selected monitoring wells included in the LTMWP are installed in a very fine grained aquifer consisting predominantly of silts and some sands. It has been observed that silt and sediment accumulate at the bottom of the wells over time and reduce the length of the screen through which groundwater can flow from the aquifer into the well. Periodic silt and sediment removal is required in order to assure that representative groundwater samples can be collected from the monitoring wells. In order to maintain consistent data quality and track the progress of natural attenuation processes over an extended period of time, the selected monitoring wells at the Site will be maintained by removing the accumulated sediment and developing the wells. The sediment removal and well development activities will be performed annually, prior to the first and the fifth quarterly sampling events. This section presents the well maintenance plan for the selected monitoring wells at the Site.

2.6.1 Sediment Removal

Sediment removal will be performed at the 22 selected monitoring wells in the LTM program according to the USACE standard EM 1110-1-4000 (11/98) procedures. Pumps and tubing will be removed, and total depth will be recorded prior to and after sediment removal by a Shaw representative. The sediment will be removed using a bottom loading bailer, with rapid short upward and downward motions near the bottom of the well causing the sediment to be stirred up and enter the bailer. Sediments will be containerized in drums supplied by the drilling contractor. Once the sediment removal has been completed, the bailers will be removed to prevent accidental bailer release down the well, and well development will proceed using gentle mechanical surging as outlined in Section 2.6.2.

2.6.2 Well Redevelopment

Based on the post-ROD sampling requirements, 22 selected monitoring wells will be redeveloped to remove and reduce sediment build-up in the wells and to turbidity of the water being produced by the wells. The selected monitoring wells will be redeveloped prior to the first and the fifth quarterly sampling events.

Well redevelopment will be conducted in accordance with USACE EM 1110-1-4000 (11/98), Section 6-3, Mechanical Surging. Wells will be redeveloped by conducting gentle mechanical surging, which involves a surge block attached to a drill rod or stem and using an up and down motion (“surging”) similar to the bottom loading bailer procedure outlined in Section 2.6.1. This up and down motion will force water in and out of the well bore, mobilizing the particulates so that they can be removed. The surging will be gentle to assure that water can come into the well

and to prevent damage of the well screen. Well redevelopment will continue until the criteria stated in Section 6-4 of the USACE EM 1110-1-4000 are met, or until three hours are spent on each well, whichever occurs first.

- Redevelopment will continue until indicator parameters, i.e., pH, conductivity, temperature, ORP, DO, or turbidity have stabilized. According to the USACE criteria, "Generally three successive readings should be within ±0.2 for pH, ±0.3 percent for conductivity, ±10mV for ORP, ±1 degree Celsius for temperature, and ±10 percent for turbidity and DO".
- The well water is clear to the unaided eye and the turbidity of the water removed is at some specified level. It may be required that the turbidity be below 5 NTU's. This may not be possible. It should be noted that natural turbidity levels in groundwater at the Site may exceed 10 NTU's. It is imperative that the sample is representative of water flowing through that well.
- The sediment thickness remaining in the well is less than one percent of the screen length or less than 30 mm (0.1 ft) for screens equal to or less than 3m (10 ft) long.
- In addition, a minimum of three times the standing water volume in the well (to include the well screen and casing plus saturated annulus) will be removed from the well.

Water removed from the selected monitoring wells during redevelopment will be containerized in drums supplied by the drilling contractor.

3.0 DATA ANALYSIS TECHNIQUES

The LTM data analysis will incorporate the MNA data evaluation approaches recommended in the *Guidance for Evaluation of Federal Agency Demonstrations that Remedial Actions are Operating Properly and Successfully Under CERCLA Section 120(h)(3)* (USEPA 1996a); *Technical Protocol for Evaluating Natural Attenuation of Chlorinated Solvents in Ground Water* (Wiedemeier et al. 1998)**;** *Performance Monitoring of MNA Remedies for VOCs in Groundwater* (USEPA, 2004a), *Designing Monitoring Programs to Effectively Evaluate the Performance of Natural Attenuation* (AFCEE, 2000), and *A Decision Flowchart for the Use of Monitored Natural Attenuation and Enhanced Attenuation at Sites with Chlorinated Organic Plumes* (ITRC, 2007).

In order to evaluate the extent to which COCs in groundwater are migrating and/or degrading, Shaw will compile and evaluate the groundwater analytical and MNA geochemical parameters data collected during the implementation of the of the LTMWP. Shaw will also review the existing Site data, with emphasis on the post soil excavation groundwater data documented in the *Final 2006 Groundwater Sampling Report* (Shaw, 2007a) and the *Draft Final 2007 Groundwater Sampling Report* (Shaw, 2007b) and groundwater analytical and geochemical data collected at the Site in 2008 and 2009 (Shaw 2009a, Shaw 2009b, Shaw 2009c and Shaw 2009d).

A number of spatial and temporal data analysis techniques will be used to document the progress of natural attenuation in groundwater at the Site. Data analysis and interpretation will focus on the detection of changes or trends in the data, and assessment of the changes or trends in the context of their impact on the potential for MNA to achieve Site-related goals. The data analysis techniques are described in the following sections.

3.1 DATA BASE DEVELOPMENT

A database will be constructed and updated with quarterly data collected during the performance of the LTM program. The database will provide tabulated analytical results, including the following:

1. COC and COI concentrations - VOCs (PCE, TCE, cis-1,2-DCE, trans-1,2-DCE, 1,1-DCE and VC), total and dissolved lead, gross alpha and gross beta (total and dissolved), uranium (total and dissolved), and combined radium 226 + 228 (total and dissolved).

2. Natural attenuation parameters – nitrate (NO_3), soluble manganese [Mn(II)], ferrous iron [Fe(II)], sulfate, methane, ethane, ethene, TOC, and chloride.

3. Field measurements such as DO, pH, temperature, conductivity, ORP, and turbidity.

4. Relevant historical data collected at the Site prior to initiation of LTM.

The data tables will include a comparison of COC concentrations with the RAO-based groundwater target cleanup goal concentrations and a comparison of COI concentrations with applicable screening values.

3.2 GRAPHICAL TECHNIQUES

3.2.1 Groundwater Flow Evaluation

Groundwater elevation contour maps will be prepared using the groundwater elevation data collected during each of the quarterly sampling events. Any changes in the groundwater flow directions and gradients over time will be documented. Of particular interest will be the changes in groundwater flow caused by the sheet pile wall.

3.2.2 Isoconcentration Maps

A series of isoconcentration contour maps will be prepared for each of the quarterly sampling events to present data showing changes in COC concentrations and plume configuration for each COC whose concentration exceeds its respective RAO-based groundwater target cleanup goal concentrations regulatory acceptance criteria. Isoconcentration maps will be prepared for the upper groundwater zone only, since the data in the lower groundwater zone is being collected for informational purposes only. The isoconcentration maps will be prepared for the following analytes:

- COCs – PCE, TCE, cis-1,2-DCE and VC; and
- COIs - trans-1,2-DCE and 1,1-DCE, if the data distribution justifies it.

3.2.3 Temporal Trends

Trends in parameter concentrations measured in groundwater samples over time will be evaluated as indicators of plume stability and progress toward COC reduction. If applicable or necessary, trends will be analyzed by plotting concentration data versus time on semi-log paper with log concentration being plotted against linear time. Plotting the concentration data on the log scale counters the relatively large changes in concentration data over time.

Data will be compared to determine if temporal trends exist within the plume and in surrounding areas. In addition to trends in parameter concentrations, electron acceptors and donors, ORP, and other general geochemical indicators will be presented. Inferences will be drawn from

trend-to-trend comparisons (e.g., a decreasing trend in PCE compared to an increasing trend in TCE in the same groundwater zone may indicate degradation of PCE to TCE).

Temporal trends will be plotted for the following parameters:

- VOCs – PCE, TCE, cis-1,2-DCE, and VC at a minimum; trans-1,2-DCE and 1,1-DCE if justified by the frequency of detections in the reported data
- Total and dissolved lead;
- Gross alpha and gross beta (total and dissolved);
- Uranium (total and dissolved);
- Combined radium 226 + 228 (total and dissolved); and
- MNA geochemical parameters – some or all of the parameters including DO, ORP, nitrate (NO_3), soluble manganese [Mn(II)], ferrous iron [Fe(II)], sulfate, methane, ethane, ethene, TOC, and chloride may be plotted if the data distribution justifies it.

3.2.4 Spatial Trends

COC concentrations versus distance plots will be prepared for some of the selected monitoring wells along the groundwater flow path over several sampling events. Monitoring wells considered for plotting will include those located within the VOC plume (defined by exceedance of RAOs) and wells located upgradient and downgradient of the plume. In addition, temporal trend plots developed as part of the evaluation proposed in Section 3.2.3 will be clustered based on their spatial location. An evaluation of trends in data from selected monitoring wells located within the VOC plume, to be identified based on comparison of measured concentrations with the RAOs, will determine if the plume exhibits stability or reduction in COC concentrations. Similarly, data from a group of monitoring wells at the downgradient limits of a plume may be compared to data from previous sampling rounds to determine if the plume seems to be stable, shrinking, or expanding.

3.3 STATISTICAL TECHNIQUES

The temporal and spatial trend analysis presented in Sections 3.2.3 and 3.2.4 can be used to evaluate plume stability (i.e., stable, diminishing, or expanding plume). While plotting concentration data versus time and/or distance is a valuable tool for any plume stability analysis, discerning trends in the plotted data can often be a subjective process, particularly if the data do not display a uniform trend, but show some variability over time or space. In these cases, a statistical test such as the Mann-Whitney U Test, the Mann-Kendall Test, or a linear regression

analysis can be useful. The following sections provide details of the statistical data evaluation approaches that will be applied to the LTM data.

3.3.1 The Mann-Whitney U Test

This statistical test will be performed for the COCs (PCE, TCE, cis-1,2-DCE and VC) at monitoring wells where the COC concentrations exceed the RAOs provided there are several quarters of data exceeding their respective detection limits. The test is nonparametric, which means that the outcome of the test is not determined by the overall magnitude of the data points but rather the ranking of individual data points. The test will be conducted at the end of the eighth LTM sampling event, as it requires eight consecutive quarters of analytical data.

Typically, the eight consecutive quarters of monitoring data are divided into two groups representing the first four quarters and the last four quarters. The Mann-Whitney U method tests the hypothesis that the two data groups are statistically equivalent. The test is conducted by vertically ranking the eight data points from lowest to highest, with the lowest value on top and greatest value on the bottom. The test will be used to determine with at least 90 percent confidence whether the concentration for the individual COC at that well has decreased over time.

3.3.2 The Mann-Kendall Test

This is another nonparametric test that may be used to define the stability of a solute plume based on concentration trends at individual wells. The test will be applied to data for the COCs (PCE, TCE, cis-1,2-DCE, and VC) at the selected monitoring wells, where the COC concentrations exceed the RAOs provided there are several quarters of data exceeding the respective detection limits. To evaluate plume stability, four or more measured concentrations (higher than detection limits) over six sampling events are required. The evaluation will be performed using computer modeling software such as the Air Force Center for Environmental Excellence (AFCEE) Monitoring and Remediation Optimization System (MAROS), Version 2.2. The Mann-Kendall statistic (S) will be used to qualify the data trends as increasing, decreasing, or lacking trend, and provide a quantitative indicator of the strength of the trend.

3.3.3 Moments Analysis

The AFCEE MAROS software tool will be used to evaluate COC stability by performing an analysis of the location and movement of the center of mass of the plume. An analysis of moments will be utilized to resolve plume trends; with the zeroth moment showing change in dissolved mass over time, the first moment showing the change in the center of mass location over time, and the second moment showing the spread of the plume over time.

In addition to providing a relative measure of plume stability and condition, the moment analysis will also be used to evaluate the potential effect of removing wells from the LTM program. This will be used to identify redundant wells that may be proposed to be removed from the LTM program in the future.

3.4 REMEDIAL TIME FRAME ESTIMATION

Remedial time frames using MNA will be estimated for the COCs. Where applicable, the time-trend data will be used to calculate Site-specific degradation/attenuation rates for the COCs. The calculated degradation/attenuation rates will be used to make predictions of the time required for the individual COCs to meet the RAO based groundwater target cleanup goal concentrations.

Changes in COC attenuation rates over time will be documented.

3.5 NATURAL ATTENUATION VIABILITY ASSESSMENT

The USEPA utilizes a score sheet to assess the likelihood that anaerobic biodegradation is occurring at a site (Wiedemeier, et. al., 1998). This method relies on the fact that biodegradation will cause predictable changes in groundwater chemistry. Based on the geochemical conditions defined by each of the MNA parameters measured at the Site, points are awarded on a scale of -3 to 3. For example, if the DO concentration in the area of the plume with the highest COC concentration is less than 0.5 milligrams per liter (mg/L), 3 points are added (+3 points awarded). On the other hand, if the DO concentration in the area of the plume with the highest COC concentration is greater than 5 mg/L, 3 points are subtracted (-3 points awarded). The sum total of points awarded constitutes the biodegradation likelihood assessment score. The score is interpreted in accordance with the method described in Wiedemeier, et. al., (1998) as follows:

- 0 to 5 points - Inadequate evidence for anaerobic biodegradation of COCs;
- 6 to 14 points - Limited evidence for anaerobic biodegradation of COCs;
- 15 to 20 points - Adequate evidence for anaerobic biodegradation of COCs; and
- Greater than 20 points - Strong evidence for anaerobic biodegradation of COCs.

The geochemical data collected during the LTM will be used to develop a score for the Site in order to assess the viability of natural attenuation and track the changes in conditions supporting biodegradation over time.

4.0 MONITORING END POINTS

4.1 RAO BASED MONITORING END POINT

The remedial action will be considered complete when COC concentrations have met the RAO-based groundwater target cleanup goal concentrations in wells in the LTM groundwater monitoring program on a consistent basis. In order to make this determination, only data from the eight quarters of post-excavation groundwater monitoring for the15 selected monitoring wells in the upper groundwater zone, as required by the ROD, will be relied upon. In addition, limited groundwater sampling will be conducted in the lower groundwater zone for COCs on a semi-annual basis for the first two years of MNA implementation at the Site. The lower groundwater zone COC data will be collected for informational purpose only to document the COC concentration reduction in the former source areas although it is not a requirement of the ROD. Therefore, the lower groundwater zone data will not be used to verify the attainment of the monitoring end point.

After eight quarters of monitoring, data from the upper zone LTM groundwater monitoring wells will be evaluated statistically using the collected post-excavation data and any subsequently collected rounds of data. Trend analysis will be conducted to determine if COC concentrations are decreasing, have reached an asymptotic state, or are in a state of flux. Monitoring wells that have COC concentrations that are consistently less than the RAO-based groundwater target cleanup goal concentrations will be considered to have met the ROD requirements and further monitoring of these wells will be discontinued. The LTM end point is the demonstration of attainment of the RAOs. At the end of two years of LTM, analytical results from groundwater monitoring will be compared to the RAO based groundwater target cleanup goal concentrations to determine ROD compliance. Groundwater monitoring over the next two years of the LTM program may or may not result in COC concentrations meeting the RAO-based groundwater target cleanup goal concentrations; however, the LTM program will allow the tracking of remedial progress toward compliance with RAO-based groundwater target cleanup goal concentrations by assessing the rate of MNA processes and evaluating the suitability of geochemical conditions with regard to the viability of natural attenuation.

If the analytical results do not show compliance with RAO-based groundwater target cleanup goal concentrations , but show progress or a trend towards meeting the goals, the LTM program may be continued (on a reduced basis; semi-annual to annual monitoring) for three additional years in accordance with the requirements of the ROD. The ROD anticipates the performance monitoring period for the LTM to be between two and five years, dependent on analytical results

of the groundwater sampling. The ROD also assumes that, after the initial performance period, annual groundwater monitoring for COCs will be conducted through Year 15, with one final year (Year 16) of quarterly COC sampling designed to document attainment of the RAO-based groundwater target cleanup goal concentrations in the selected monitoring wells in the LTM program.

At the end of the five years of LTM, an assessment will be made to judge the effectiveness of the MNA remedy, the adequacy of the monitoring program, the possibility of off-site plume migration, and the time frame for the attainment of the RAO-based groundwater target cleanup goals. On the basis of these judgments, recommendations may be made for subsequent phases of remedy implementation including:

- Continue the performance monitoring program beyond the five year period without change;
- Modify the performance monitoring program;
- Terminate performance monitoring; or
- Use an alternate monitoring end point.

4.2 ALTERNATE MONITORING END POINT

At the end of five years of LTM, the data will be evaluated to determine if alternate monitoring end points in lieu of the RAO-based groundwater target cleanup goal concentrations are necessary in consultation with the state regulators. The alternate monitoring end points will be based on the following lines of evidence generated during the course of the LTM implementation:

- Evidence that COC concentrations at the property boundaries and downgradient are less than the RAO-based groundwater target cleanup goal concentrations;
- Evidence from the temporal, spatial, and statistical analysis of LTM data that the COC plumes are stable or shrinking (reduction in COC volume and mass); and
- Evidence that COC concentrations at the Site have attained equilibrium conditions at levels exceeding RAO-based groundwater target cleanup goal concentrations.

Based on the above lines of evidence, if it can be demonstrated that further reductions in COC concentrations are not feasible, the USACE may petition NYSDEC that “no further action” status be granted based on the impracticality of achieving the RAO-based groundwater target cleanup goal concentrations at all selected monitoring wells in the LTM program.

5.0 REPORTING

5.1 QUARTERLY DATA SUMMARY LETTER REPORTS

Three quarterly Data Summary Letter Reports (Quarters 1 through 3 each year) will be prepared following completion of data validation of the data collected during each sampling event. Each year, the results of the fourth quarterly sampling event will be incorporated into the annual report, along with the results of the first three quarters. The Quarterly Data Summary Letter Reports will provide the following:

- A brief description of the sampling event;
- Deviations from the work plan;
- Field and laboratory data in table format along with data validation qualifiers;
- Identification of sample results that exceed the RAO-based groundwater target cleanup goal concentrations or applicable New York State groundwater standards and/or guidance values, if available; and
- Plots of trends graphs incorporating data from preceding quarter(s) for wells with detections above standards and/or guidance values.

Data validation will address the usability of laboratory data. For the purposes of the LTM, un-useable data will be defined to include rejected data points ("R" qualifier). Those data points determined to be due to blank contamination will be considered as "non-detects" ("U" qualifier). All other qualified data will be usable with qualifications as noted in the QAPP. The percent completeness will be evaluated and any impacts will be noted in the reports.

5.2 ANNUAL REPORTS

Shaw will prepare annual LTM reports at the end of the first and the second years of quarterly sampling. The LTM reports will summarize the data collected during the first and the second years of the LTM program and present an evaluation of the performance of MNA at the Site.

The LTM reports will contain the following.

- A summary of data collection activities performed during the four quarterly sampling events preceding the report.
- Tabulated analytical results including COC and COI concentrations, MNA parameters, and field parameters including relevant historical data collected at the Site prior to initiation of LTM.

- A comparison of COC concentrations with the RAO-based groundwater target cleanup goal concentrations and COI concentrations with the applicable screening values.
- Site-specific natural attenuation rates and any changes in the rate over time.
- Time frames for attaining the RAO-based groundwater target cleanup goal concentrations for COCs.
- Identification of potentially toxic and/or mobile transformation products, specifically verifying that the natural attenuation daughter products (e.g., cis-1,2-DCE, trans-1,2-DCE, and VC) do not pose additional risks.
- Plume and stability analysis with verification that the plume(s) is not expanding downgradient or laterally. Graphical and statistical evaluation methods will be used to demonstrate that natural attenuation is occurring.
- An evaluation of groundwater geochemical data to demonstrate that natural attenuation, and specifically intrinsic bioremediation, is occurring according to expectations and to identify changes in geochemical conditions that may reduce the efficacy of the natural attenuation process.
- An assessment of the effectiveness of the MNA remedy, the adequacy of the monitoring program, the possibility of off-site plume migration, and the time frame for the attainment of the regulatory acceptance criteria.
- Recommendations for subsequent phases of remedy implementation such as proposed changes to the performance monitoring program, or termination of performance monitoring upon attainment of the ROD-based groundwater target cleanup goal concentrations

6.0 SCHEDULE

The schedule for LTM implementation (groundwater sampling for MNA) and the associated reporting is shown on **Figure 6-1**. Implementation of the LTM program includes the following tasks:

- LTMWP: Preparation and submittal of Draft, Draft Final, and Final versions of the LTMWP to USACE.
- Quarterly Groundwater Sampling: Eight events between August 2010 and July 2012.
- Quarterly Data Validation and Reporting: Preparation and submittal of Draft, Draft Final, and Final versions of the Quarterly Data Summary Letter Reports to USACE for the first three quarterly events during each year.
- Annual LTM Reports: Preparation and submittal of Draft, Draft Final, and Final versions of the Annual LTM Reports to USACE after the fourth and the eighth quarters of the LTM.

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USEPA, 2004a, Performance Monitoring of MNA Remedies for VOCs in Groundwater, EPA/600/R-04/027.

US EPA, 2007, Office of Solid Waste and Emergency Response Test Methods for Evaluating Solid Waste Physical/Chemical Methods (SW-846), Update IV.

Wiedemeier et al, 1998, Technical Protocol for Evaluating Natural Attenuation of Chlorinated Solvents in Groundwater, EPA/600/R-98/128.

TABLES

Table 2-1
Laboratory Analyte Lists, Methods, and Screening Values
Long -Term Monitoring Work Plan, Colonie FUSRAP Site

Analyte	CAS #	Groundwater Screening Values		Remedial Action Objective
		USEPA DW MCL	NYDEC GA GW Stds[1]	(Minimum Screening Value)
TCL VOCs SW-846 5030B/8260B		(ug/L)	(ug/L)	(ug/L)
1,1-Dichloroethylene	75-35-4	7.0	5.0	-
cis-1,2-Dichloroethylene	156-59-2	70	5.0	1,800
Tetrachloroethylene	127-18-4	5.0	5.0	5.5
trans-1,2-Dichloroethylene	156-60-5	100	5.0	-
Trichloroethylene	79-01-6	5.0	5.0	1.8
Vinyl chloride	75-01-4	2.0	2.0	1.4
Radiological Parameters		(pCi/L)	(pCi/L)	(pCi/L)
Gross Alpha (EPA 900.0)	12587-46-1	15	15	-
Gross Beta (EPA 900.0)	12587-47-2	4 mrem/yr	1,000	-
Radium 226 (EPA 903.0 Mod)	13982-63-3	5.0	3.0	-
Radium 228 (EPA 904 Mod)	15262-20-1	5.0	5.0	-
Uranium (SW 6020)	7440-61-1	20	NS	-
TAL Metals SW-846 3010A/6020/6010B/7470A		(ug/L)	(ug/L)	(ug/L)
Lead	7439-92-1	15	25	-
Natural Attenuation Parameters		(ug/L)	(ug/L)	(ug/L)
Methane (SW3810/RSK 175)	74-82-8	NS	NS	-
Ethane (SW3810/RSK 175)	74-84-0	NS	NS	-
Ethene (SW3810/RSK 175)	74-85-1	NS	NS	-
Chloride (EPA 300)	16887-00-6	250,000	250,000	-
Sulfate (EPA 300)	14808-79-8	250,000	250,000	-
Nitrate (EPA 300)	14797-55-8	10,000	10,000	-
Total Organic Carbon (SW 9060A)	TOC	NS	NS	-

Method Ref: USEPA Test Methods for Evaluating Solid Waste Physical/Chemical Methods, Update IIIB IV (USEPA, 20047), Methods for Chemical Analysis of Water and Wastes (USEPA, 1983), and USEPA Prescribed Procedures for Measurement of Radioactivity in Drinking Water (USEPA, 1980)

Criteria Ref.: The groundwater screeningaction levels are based on the NYDEC Part 703: Surface Water and Groundwater Quality Class GA Standards and Groundwater Effluent Limitations (NYDEC, 1999) and the USEPA DW MCLs (USEPA, 2004). The Remedial Action Objectives are risk based concentrations established in the Feasibility study.

[1] For cis-1,3-Dichloropropene and trans-1,3-Dichloropropene, the NYDEC GW GA standard applies to the sum of both isomers. For Radium 226 and Radium 228, the NYDEC GW GA standard applies to the sum of both isotopes.

- = RAO not established.

GW = groundwater

MCL = maximum contaminant level

µg/L = micrograms per liter = parts per billion

mRem/yr = millirem per year

NS = No Standard

pCi/L = picocuries per liter

Table 2-2
Summary of Monitoring Well Information
Long-Term Monitoring Work Plan, Colonie FUSRAP Site

Well ID	Date Installed	Well Diameter	Top of Casing elevation (ft amsl)	Top of Riser elevation (ft amsl)	Ground Surface elevation (ft amsl)	Top of Screen		Bottom of Screen		Total Depth	
						depth (ft bgs)	elevation (ft amsl)	depth (ft bgs)	elevation (ft amsl)	depth (ft bgs)	elevation (ft amsl)
08M*	11/13/1984	2"	231.3	230.8	228.5	35.6	192.9	40.6	187.9	42.6	185.9
08S*	11/7/1984	2"	231.4	230.9	228.9	6.0	222.9	11.0	217.9	13.0	215.9
10S	8/15/1988	2"	217.3	216.8	214.5	7.1	207.4	12.1	202.4	12.5	202
21S	9/20/1993	2"	217.0	216.5	214.3	5.0	209.2	15.0	199.2	18.0	196.3
30M	8/1/2000	2"	226.94	226.63	225.12	27.0	198.12	37.0	188.12	37	188.12
30S	8/2/2000	2"	227.02	226.74	225.24	4.5	222.24	14.5	212.24	14.5	210.74
32S	12/11/2001	2"	224.4	224.1	222.2	9	213.2	19	203.2	19	203.2
32M	12/11/2001	2"	224.53	224.2	222.17	52.5	169.7	62.5	159.7	62.5	159.67
34S	12/20/2001	2"	220.53	219.84	218.33	8.5	209.8	18.5	199.8	18.5	199.83
35S	12/21/2001	2"	218.02	217.8	215.82	7	208.8	17	198.8	17	198.82
37S	2/27/2002	2"	220.26	219.96	218.05	11	207.1	21	197.1	21	197.05
37M	2/26/2002	2"	219.9	219.73	217.94	50	167.9	60	157.9	60	157.94
39S	5/14/2002	2"	219.18	218.94	216.17	7.5	208.7	17.5	198.7	18	198.17
40S	5/17/2004	2"	227.97	225.97	223.11	14	209.1	24	199.1	24	199.11
41S	12/11/2006	2"	224.97	224.82	223.15	10	213.2	20	203.2	22	201.15
41M	12/11/2006	2"	224.81	224.61	223.1	53	170.1	63	160.1	66	157.1
42S	12/12/2006	2"	226.03	225.77	224.23	10	214.2	20	204.2	23	201.23
42M	12/12/2006	2"	225.78	225.46	223.96	53	171.0	63	161.0	66	157.96
43S	12/13/2006	2"	225.79	225.57	223.96	6	218.0	16	208.0	19	204.96
43M	12/13/2006	2"	225.82	225.71	223.73	42	181.7	52	171.7	55	168.73

ft amsl - feet above mean sea level.

ft bgs - feet below ground surface.

S: Designation on monitoring wells indicates a shallow installation 12 to 25 ft. total depth range.

M: Designation on monitoring wells indicates a deeper installation 27 to 62 ft. total depth range.

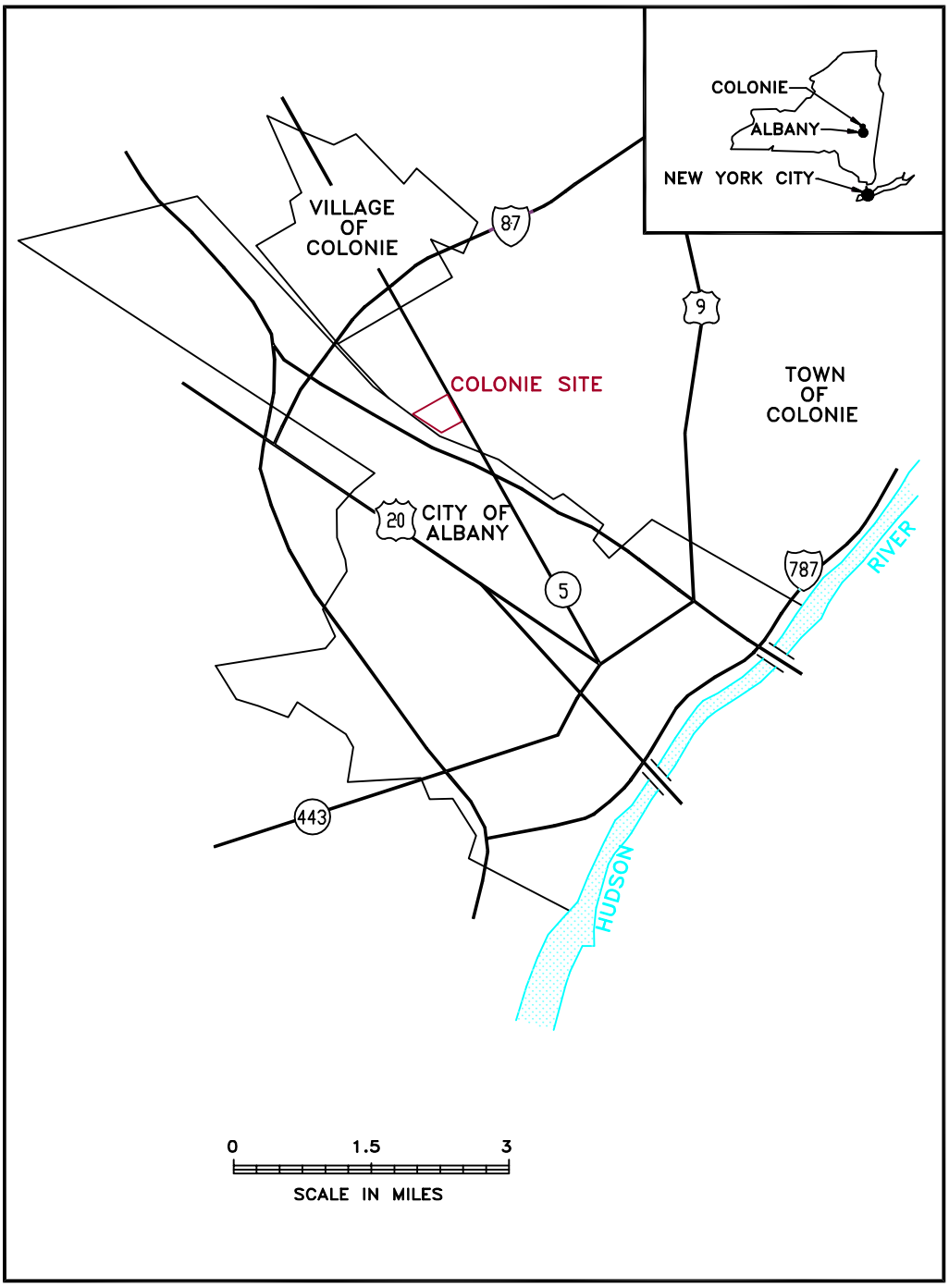
*: Upgradient Monitoring Well

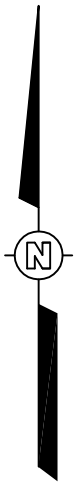
Table 2-3
Groundwater Sampling Program
Long-Term Monitoring Work Plan, Colonie FUSRAP Site

Well Location	VOCs[1]	Lead[2]	Radionuclides[2]			MNA			
			Gross Alpha & Gross Beta[2]	Total Uranium[2]	Combined Radium[2]	Nitrate, Sulfate & Chloride	Methane, Ethane, & Ethene	Total Organic Carbon	Soluble Mn & Ferrous Iron[3]
Upper Zone									
MW-08S	Q	S	NS	NS	NS	Q	Q	Q	Q
MW-10S	Q	S	NS	NS	NS	Q	Q	Q	Q
MW-21S	Q	S	NS	NS	NS	Q	Q	Q	Q
MW-30S	Q	NS	S	S	S	Q	Q	Q	Q
MW-32S	Q	NS	S	S	S	Q	Q	Q	Q
MW-34S	Q	NS	NS	NS	NS	Q	Q	Q	Q
MW-35S	Q	NS	NS	NS	NS	Q	Q	Q	Q
MW-36S	Q	NS	NS	NS	NS	Q	Q	Q	Q
MW-37S	Q	NS	S	S	S	Q	Q	Q	Q
MW-38S	Q	NS	NS	NS	NS	Q	Q	Q	Q
MW-39S	Q	NS	NS	NS	NS	Q	Q	Q	Q
MW-40S	Q	S	S	S	S	Q	Q	Q	Q
MW-41S	Q	NS	S	S	S	Q	Q	Q	Q
MW-42S	Q	NS	S	S	S	Q	Q	Q	Q
MW-43S	Q	S	S	S	S	Q	Q	Q	Q
Lower Zone									
MW-08M	NS	S	NS	NS	NS	NS	NS	NS	NS
MW-30M	NS	NS	S	S	S	NS	NS	NS	NS
MW-32M	S	S	S	S	S	NS	NS	NS	NS
MW-37M	NS	NS	S	S	S	NS	NS	NS	NS
MW-41M	S	S	S	S	S	NS	NS	NS	NS
MW-42M	NS	NS	S	S	S	NS	NS	NS	NS
MW-43M	S	S	S	S	S	NS	NS	NS	NS

[1]VOCs include PCE, TCE, cis-1,2-DCE, trans-1,2-DCE, 1,1-DCE, and VC.
[2]Total & Dissolved fractions are to be analyzed for this analyte.
[3]Soluble manganese and ferrous iron are to be performed in the field using Hach kits.
S = Semiannually Sampling
Q = Quarterly Sampling
NS = No Sample

FIGURES





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ALBANY, NY	S. SHKOLNIK 05-05-08			837935A6

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Format Revised: 12/15/99 Xref: .

Shaw Environmental, Inc.

U.S. ARMY CORPS OF ENGINEERS
FORMERLY UTILIZED SITES
REMEDIAL ACTION PROGRAM

FIGURE 1-1
SITE LOCATION MAP
COLONIE FUSRAP SITE
1130 CENTRAL AVENUE
ALBANY, NY 12205

IMAGE ---
X-REF X
OFFICE ALB
DRAWING NUMBER 837935D91

CENTRAL AVENUE N.Y.S. ROUTE 5
(99' RIGHT OF WAY)

PROJECT NORTH

RESIDENCE
NIAGARA MOHAWK SUBSTATION
STORAGE SHED
BLACKTOP ACCESS ROAD
GRAVEL
BLACKTOP
VELLANO'S
MONROE MUFFLER
GRIMMS
TOWN OF COLONIE
CITY OF ALBANY
CONCRETE BLOCK BUILDING
DENSE TREES
BRICK STOCKPILE
PALLETS STORED MATERIAL
MURPHY'S OVERHEAD DOOR
6' CHAIN LINK FENCE W/TRIPLE BARBED WIRE TOP
GRAVEL ACCESS ROAD
DENSE TREES & BRUSH GROUND OBSCURED
CLEANOUT MANHOLE BURIED, NOT FIELD VERIFIED
DRAINAGE STRUCTURE BURIED TOP PIPE ELEV=212.65 48"RCP INV=208.15
5'x 3' CONCRETE BOX CULVERT
4'x 5' STONE ARCH CULVERT
MH RIM=224.81 18"INV. IN=213.99
CB TF=227.06 24"INV OUT=223.66
CB TF=222.07 (A)INV IN=207.57 (B)INV IN=UNOBTAINABLE (C)INV IN=219.07± (D)INV OUT=207.27
48"DIA. HALF CIRCLE "SPECIAL SECTION"
12"HDPE INV=219.47
RIP-RAP AROUND END SECTION
STEEL SHEETING
STAKE STA. 4+50
STAKE STA. 3+00
STAKE STA. 0+00
CLUSTER "H"
YARDBORO AVENUE (40' RIGHT OF WAY)
I-90 TO ROUTE 85 RAMP
RAILROAD AVENUE (80' RIGHT OF WAY)
TOWN OF COLONIE
CITY OF ALBANY
STREAM
SHED
GARAGE
BUILDING
CHAINLINK FENCE
WOOD FENCE
POOL
58
68
74
78
80
110

MW-08S MW-08M
MW-25M
MW-02S MW-02MR
MW-14M MW-14S
MW-43S MW-43M
MW-32M MW-32S
MW-41M MW-41S
MW-42M MW-42S
MW-40S
MW-37M MW-37S
MW-36M MW-36S
MW-30M MW-30S
MW-34M MW-34S
MW-10MR MW-10S
MW-21S MW-21M
MW-33S MW-33M
MW-35S MW-35M
MW-39S MW-39M
MW-38S MW-38M
PZ-11B PZ-11A
PZ-12
PZ-13B PZ-13A
PZ-14B PZ-14A
PZ-15B PZ-15A

GENERAL NOTES:

1. TOPOGRAPHIC FEATURES SHOWN HEREON ARE BASED ON FIELD SURVEY CONDUCTED THROUGH SEPTEMBER 24, 2007.
2. OTHER THAN THOSE SHOWN HEREON, NO OTHER UNDERGROUND UTILITY INFORMATION IS INCLUDED ON THIS DRAWING. THERE MAYBE OTHER UNDERGROUND UTILITIES UNKNOWN TO THE UNDERSIGNED WHICH HAVE NOT BEEN SURVEYED AT THIS TIME.
3. SITE ELEVATIONS AND COORDINATE GRID ARE BASED ON SITE MONUMENTATION AND INFORMATION PROVIDED BY ICF KAISER ENGINEERS, INC.

LEGEND

⊕	MONITORING WELL USED FOR LONG-TERM MONITORING
□ CB	CATCH BASIN
←—	GUY WIRE
○ IRF	IRON ROD FOUND
⊕	MONITORING WELL
⊕ PZ-14B	PIEZOMETER
○ SMH	SANITARY MANHOLE
⊠ MON	SQUARE CONCRETE MONUMENT
○ STORM MH	STORMWATER MANHOLE
○ TMH	TELEPHONE MANHOLE
□ TSB	TRAFFIC SIGNAL BOX
∅	UTILITY POLE
○ WMTR	WATER METER
○ WSO	WATER SHUT-OFF
○ YCIRF	YELLOW CAPPED IRON ROD FOUND
———	OVERHEAD ELECTRIC
- - - -	UNDERGROUND PIPE
×—×—×	FENCE LINE
HDPE	HIGH DENSITY POLYETHYLENE PIPE
RCP	REINFORCED CONCRETE PIPE

BAR SCALE
60 0 30 60 120
1 inch = 60 ft.

REV	DATE	BY	CHK'D	APR'VD	DESCRIPTION/ISSUE

Shaw Environmental, Inc.

U.S. ARMY CORPS OF ENGINEERS
FORMERLY UTILIZED SITES
REMEDIAL ACTION PROGRAM

FIGURE 1-2
SITE PLAN WITH MONITORING LOCATIONS
COLONIE FUSRAP SITE
1130 CENTRAL AVENUE, ALBANY, NY 12205

DESIGNED BY	KSD	05/05/08	CHECKED BY		
DRAWN BY	SSH	05/05/08	APPROVED BY		
SCALE: 1" = 60'	DRAWING NO. 837935D91		SHEET NO. 1 OF 1		REVISION NO.

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Image: .
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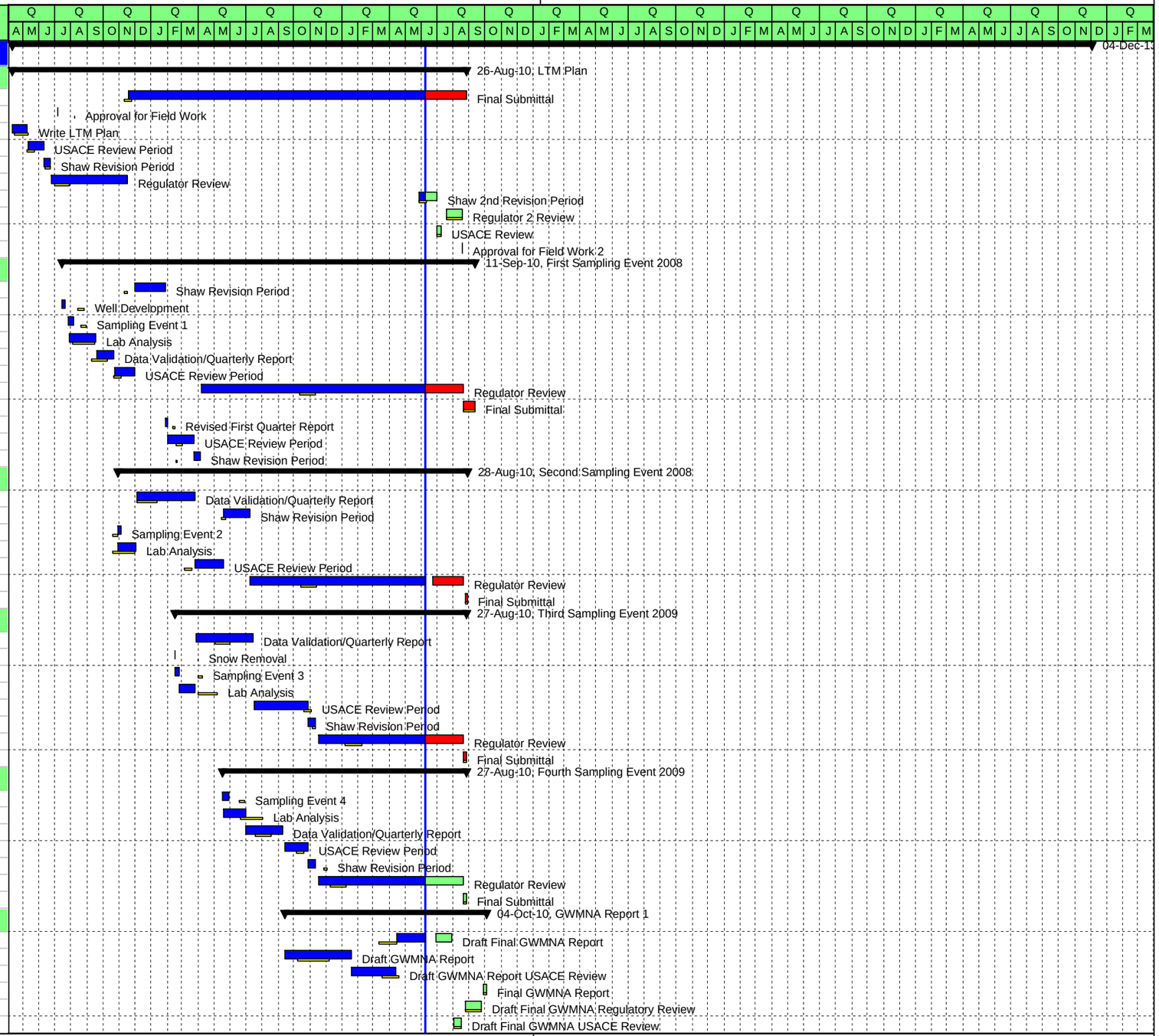
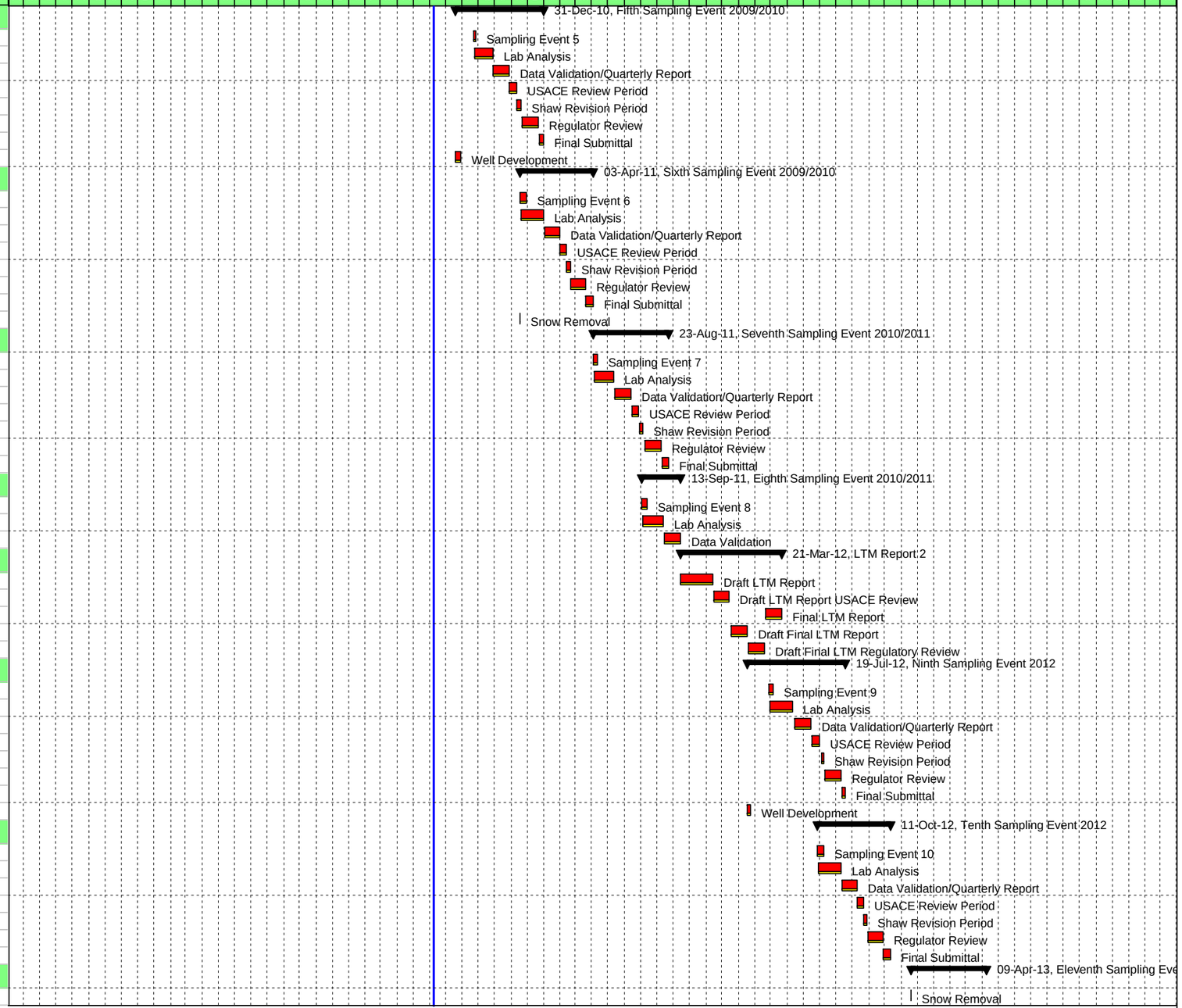
Plot Date/Time: 06/24/10 02:12pm
Plotted by: matt.sousville

Activity ID	Activity Name	At Completion Duration	Start	Finish	Suspend Date	Resume Date
Groundwater Sampling for Natur...		2064	11-Apr-08 A	04-Dec-13		
LTM Plan		868	11-Apr-08 A	26-Aug-10		
050	Final Submittal	119	19-Nov-08 A	26-Aug-10	02-Dec-08	13-May-10
060	Approval for Field Work	0	07-Jul-08 A	07-Jul-08 A		
010	Write LTM Plan	28	11-Apr-08 A	09-May-08 A		
020	USACE Review Period	29	12-May-08 A	10-Jun-08 A		
030	Shaw Revision Period	13	11-Jun-08 A	23-Jun-08 A		
040	Regulator Review	147	24-Jun-08 A	18-Nov-08 A		
042	Shaw 2nd Revision Period	35	27-May-10 A	30-Jun-10		
044	Regulator 2 Review	32	19-Jul-10	19-Aug-10		
043	USACE Review	9	01-Jul-10	09-Jul-10		
061	Approval for Field Work 2	0	19-Aug-10	19-Aug-10		
First Sampling Event 2008		790	14-Jul-08 A	11-Sep-10		
120	Shaw Revision Period	0	02-Dec-08 A	28-Jan-09 A	02-Dec-08	28-Jan-09
070	Well Development	8	14-Jul-08 A	22-Jul-08 A		
080	Sampling Event 1	9	28-Jul-08 A	06-Aug-08 A		
090	Lab Analysis	51	29-Jul-08 A	18-Sep-08 A		
100	Data Validation/Quarterly Report	33	19-Sep-08 A	22-Oct-08 A		
110	USACE Review Period	38	24-Oct-08 A	01-Dec-08 A		
130	Regulator Review	501	07-Apr-09 A	20-Aug-10		
140	Final Submittal	22	21-Aug-10	11-Sep-10		
121	Revised First Quarter Report	5	28-Jan-09 A	02-Feb-09 A		
122	USACE Review Period	50	02-Feb-09 A	24-Mar-09 A		
123	Shaw Revision Period	12	25-Mar-09 A	06-Apr-09 A		
Second Sampling Event 2008		669	29-Oct-08 A	28-Aug-10		
170	Data Validation/Quarterly Report	60	05-Dec-08 A	26-Mar-09 A	28-Jan-09	20-Mar-09
190	Shaw Revision Period	10	20-May-09 A	09-Jul-09 A	21-May-09	30-Jun-09
150	Sampling Event 2	8	29-Oct-08 A	06-Nov-08 A		
160	Lab Analysis	35	30-Oct-08 A	03-Dec-08 A		
180	USACE Review Period	53	27-Mar-09 A	19-May-09 A		
200	Regulator Review	407	10-Jul-09 A	20-Aug-10		
210	Final Submittal	5	24-Aug-10	28-Aug-10		
Third Sampling Event 2009		558	16-Feb-09 A	27-Aug-10		
250	Data Validation/Quarterly Report	68	29-Mar-09 A	15-Jul-09 A	21-May-09	30-Jun-09
220	Snow Removal	0	16-Feb-09 A	16-Feb-09 A		
230	Sampling Event 3	7	16-Feb-09 A	23-Feb-09 A		
240	Lab Analysis	30	24-Feb-09 A	26-Mar-09 A		
260	USACE Review Period	103	17-Jul-09 A	28-Oct-09 A		
270	Shaw Revision Period	14	29-Oct-09 A	12-Nov-09 A		
280	Regulator Review	277	17-Nov-09 A	20-Aug-10		
290	Final Submittal	7	21-Aug-10	27-Aug-10		
Fourth Sampling Event 2009		467	18-May-09 A	27-Aug-10		
300	Sampling Event 4	11	18-May-09 A	29-May-09 A		
310	Lab Analysis	42	20-May-09 A	01-Jul-09 A		
320	Data Validation/Quarterly Report	70	02-Jul-09 A	10-Sep-09 A		
330	USACE Review Period	44	14-Sep-09 A	28-Oct-09 A		
340	Shaw Revision Period	14	29-Oct-09 A	12-Nov-09 A		
350	Regulator Review	277	17-Nov-09 A	20-Aug-10		
360	Final Submittal	7	21-Aug-10	27-Aug-10		
GWMNA Report 1		386	14-Sep-09 A	04-Oct-10		
390	Draft Final GWMNA Report	31	15-Apr-10 A	30-Jul-10	15-Apr-10	30-Jun-10
370	Draft GWMNA Report	127	14-Sep-09 A	18-Jan-10 A		
380	Draft GWMNA Report USACE Review	85	19-Jan-10 A	14-Apr-10 A		
410	Final GWMNA Report	8	27-Sep-10	04-Oct-10		
400	Draft Final GWMNA Regulatory Review	32	24-Aug-10	24-Sep-10		
391	Draft Final GWMNA USACE Review	15	02-Aug-10	16-Aug-10		



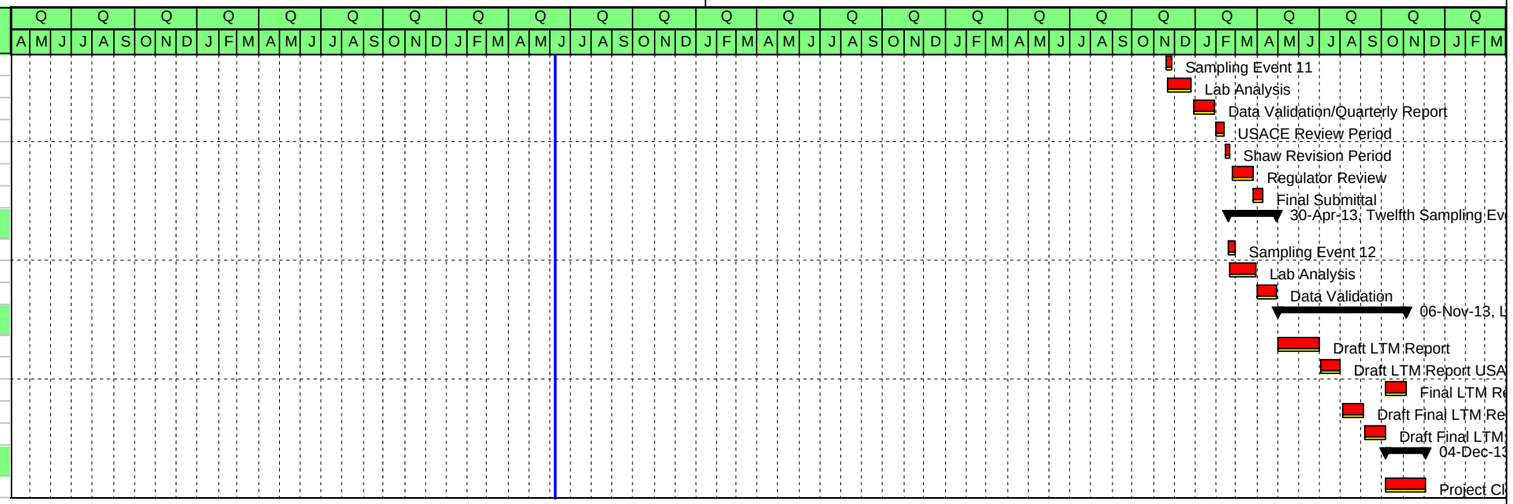
Remaining Level of Effort
Actual Level of Effort
Primary Baseline
Actual Work
Remaining Work
Critical Remaining Work
Milestone
Summary

Activity ID	Activity Name	At Completion Duration	Start	Finish	Suspend Date	Resume Date
Fifth Sampling Event 2009/2010		166	19-Jul-10	31-Dec-10		
430	Sampling Event 5	5	23-Aug-10	27-Aug-10		
440	Lab Analysis	34	25-Aug-10	27-Sep-10		
450	Data Validation/Quarterly Report	31	27-Sep-10	27-Oct-10		
460	USACE Review Period	15	28-Oct-10	11-Nov-10		
470	Shaw Revision Period	8	12-Nov-10	19-Nov-10		
480	Regulator Review	31	22-Nov-10	22-Dec-10		
490	Final Submittal	9	23-Dec-10	31-Dec-10		
420	Well Development	12	19-Jul-10	30-Jul-10		
Sixth Sampling Event 2009/2010		137	18-Nov-10	03-Apr-11		
500	Sampling Event 6	12	18-Nov-10	29-Nov-10		
510	Lab Analysis	42	20-Nov-10	31-Dec-10		
520	Data Validation/Quarterly Report	30	02-Jan-11	31-Jan-11		
530	USACE Review Period	13	31-Jan-11	12-Feb-11		
540	Shaw Revision Period	7	13-Feb-11	19-Feb-11		
550	Regulator Review	29	20-Feb-11	20-Mar-11		
560	Final Submittal	14	21-Mar-11	03-Apr-11		
499	Snow Removal	0	18-Nov-10	18-Nov-10		
Seventh Sampling Event 2010/2011		142	04-Apr-11	23-Aug-11		
580	Sampling Event 7	9	04-Apr-11	12-Apr-11		
590	Lab Analysis	36	06-Apr-11	11-May-11		
600	Data Validation/Quarterly Report	30	15-May-11	13-Jun-11		
610	USACE Review Period	14	15-Jun-11	28-Jun-11		
620	Shaw Revision Period	7	30-Jun-11	06-Jul-11		
630	Regulator Review	30	10-Jul-11	08-Aug-11		
640	Final Submittal	14	10-Aug-11	23-Aug-11		
Eighth Sampling Event 2010/2011		72	04-Jul-11	13-Sep-11		
650	Sampling Event 8	10	04-Jul-11	13-Jul-11		
660	Lab Analysis	40	05-Jul-11	13-Aug-11		
670	Data Validation	30	15-Aug-11	13-Sep-11		
LTM Report 2		190	14-Sep-11	21-Mar-12		
720	Draft LTM Report	62	14-Sep-11	14-Nov-11		
730	Draft LTM Report USACE Review	29	16-Nov-11	14-Dec-11		
760	Final LTM Report	31	20-Feb-12	21-Mar-12		
740	Draft Final LTM Report	31	18-Dec-11	17-Jan-12		
750	Draft Final LTM Regulatory Review	31	19-Jan-12	18-Feb-12		
Ninth Sampling Event 2012		184	18-Jan-12	19-Jul-12		
780	Sampling Event 9	8	27-Feb-12	05-Mar-12		
790	Lab Analysis	43	29-Feb-12	11-Apr-12		
800	Data Validation/Quarterly Report	30	16-Apr-12	15-May-12		
810	USACE Review Period	15	18-May-12	01-Jun-12		
820	Shaw Revision Period	5	04-Jun-12	08-Jun-12		
830	Regulator Review	30	11-Jun-12	10-Jul-12		
840	Final Submittal	8	12-Jul-12	19-Jul-12		
770	Well Development	7	18-Jan-12	24-Jan-12		
Tenth Sampling Event 2012		137	28-May-12	11-Oct-12		
850	Sampling Event 10	12	28-May-12	08-Jun-12		
860	Lab Analysis	42	30-May-12	10-Jul-12		
870	Data Validation/Quarterly Report	30	12-Jul-12	10-Aug-12		
880	USACE Review Period	13	10-Aug-12	22-Aug-12		
890	Shaw Revision Period	7	23-Aug-12	29-Aug-12		
900	Regulator Review	29	30-Aug-12	27-Sep-12		
910	Final Submittal	14	28-Sep-12	11-Oct-12		
Eleventh Sampling Event 2012		142	19-Nov-12	09-Apr-13		
920	Snow Removal	0	19-Nov-12	19-Nov-12		



Remaining Level of Effort
Actual Level of Effort
Primary Baseline
Actual Work
Remaining Work
Critical Remaining Work
Milestone
Summary

Activity ID	Activity Name	At Completion Duration	Start	Finish	Suspend Date	Resume Date
930	Sampling Event 11	9	19-Nov-12	27-Nov-12		
940	Lab Analysis	36	21-Nov-12	26-Dec-12		
950	Data Validation/Quarterly Report	30	30-Dec-12	28-Jan-13		
960	USACE Review Period	14	30-Jan-13	12-Feb-13		
970	Shaw Revision Period	7	14-Feb-13	20-Feb-13		
980	Regulator Review	30	24-Feb-13	25-Mar-13		
990	Final Submittal	14	27-Mar-13	09-Apr-13		
Twelfth Sampling Event 2013		72	18-Feb-13	30-Apr-13		
1000	Sampling Event 12	10	18-Feb-13	27-Feb-13		
1010	Lab Analysis	40	19-Feb-13	30-Mar-13		
1020	Data Validation	30	01-Apr-13	30-Apr-13		
LTM Report 3		190	01-May-13	06-Nov-13		
1070	Draft LTM Report	62	01-May-13	01-Jul-13		
1080	Draft LTM Report USACE Review	29	03-Jul-13	31-Jul-13		
1090	Final LTM Report	31	07-Oct-13	06-Nov-13		
1100	Draft Final LTM Report	31	04-Aug-13	03-Sep-13		
1110	Draft Final LTM Regulatory Review	31	05-Sep-13	05-Oct-13		
Project Closeout		60	06-Oct-13	04-Dec-13		
1500	Project Closeout	60	06-Oct-13	04-Dec-13		



Remaining Level of Effort
Actual Level of Effort
Primary Baseline
Actual Work
Remaining Work
Critical Remaining Work
Milestone
Summary

APPENDIX A

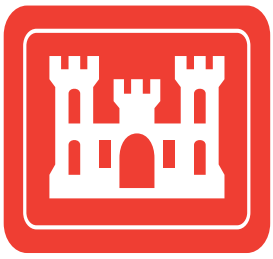
QUALITY ASSURANCE PROJECT PLAN

FINAL

QUALITY ASSURANCE PROJECT PLAN, REV. 1

Groundwater Sampling for Natural Attenuation
COLONIE FUSRAP SITE

AUGUST 2010



U.S. ARMY CORPS OF ENGINEERS
BALTIMORE DISTRICT OFFICE

FORMERLY UTILIZED SITES REMEDIAL ACTION PROGRAM

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1.0 Introduction

1.1 Project Authorization

This Contractor's Quality Assurance Project Plan (QAPP) has been prepared by Shaw Environmental, Inc. (Shaw) for the United States Army Corps of Engineers (USACE) under the Formerly Utilized Site Remedial Action Program (FUSRAP) in accordance with the modifications to the Scope of Work for Groundwater Sampling for Monitored Natural Attenuation Long-term Monitoring activities outlined in the Request for Proposal under Contract W912DR-05-0026, dated 14 January 2008 defined by Modification 001. The scope of work details field activities associated with the inspection, redevelopment of wells, sampling of groundwater monitoring wells, and the preparation of sampling reports presenting current data and data trends. The Colonie FUSRAP Site location is presented in **Figure 1-1**; **Figure 1-2** presents the site base map, including monitoring well locations.

The purpose of this QAPP is to ensure that the USACE needs and applicable technical requirements of the Record of Decision (ROD) and contract are met, that applicable industry codes and standards are complied with, and that corporate and professional goals are satisfied.

The objectives of this QAPP are to establish procedures to ensure that the well development, sampling and subsequent data/laboratory analysis meets technical specifications and conforms to the requirements of the task order. Specifically, this plan describes the quality assurance (QA) requirements and procedures that will be implemented for the project.

1.2 Project Plans

All work to be performed at the Site shall be in accordance with the USACE approved Operations Work Plan (January 2002). The following information and/or documents are included as appendices to the Operations Work Plan or are stand alone documents that direct the work:

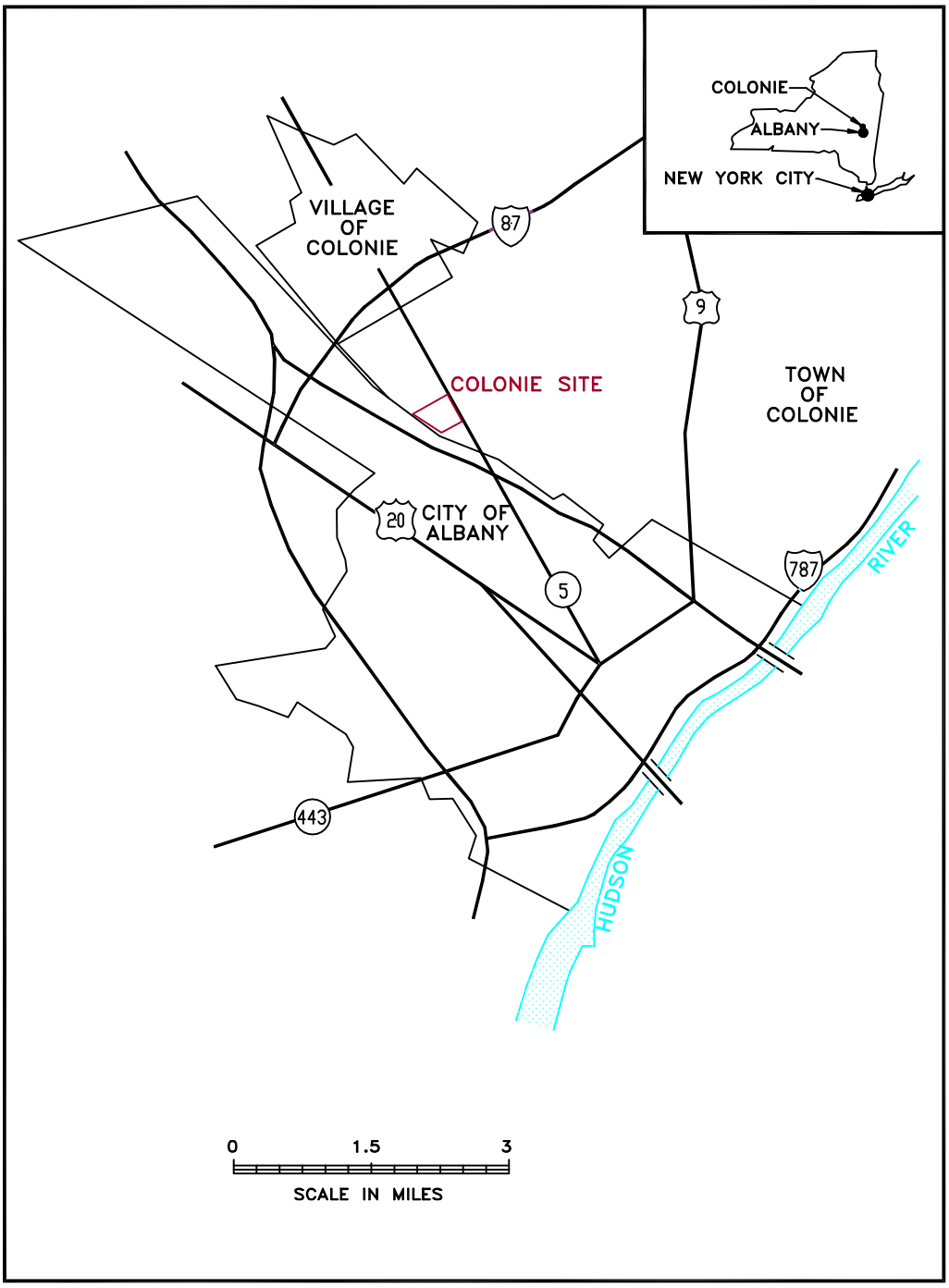
- Health and Safety and Emergency Response Plan;
- Sampling and Analysis Plan;
- Waste Transportation and Disposal Plan; and

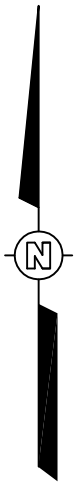
Long Term Monitoring Plan.

1.3 Project Scope of Work

The general scope of work for the groundwater sampling for monitored natural attenuation is described in the Request for Proposal and briefly summarized below:

- Prepare plans for conducting the work and reporting of data;
- Conduct full round of water level measurements and prepare groundwater elevation mapping;
- Annual redevelopment of existing monitoring wells selected for monitored natural attenuation sampling;
- Quarterly sampling of select monitoring wells;
- Packaging and transportation of samples to offsite laboratory for analysis;
- Offsite laboratory analysis;
- Quarterly and annual data reporting; and
- Transportation and disposal of impacted waters at an off-site facility.





OFFICE	DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
ALBANY, NY	S. SHKOLNIK 05-05-08			837935A6

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Format Revised: 12/15/99 Xref: .

Shaw Environmental, Inc.

U.S. ARMY CORPS OF ENGINEERS
FORMERLY UTILIZED SITES
REMEDIAL ACTION PROGRAM

FIGURE 1-1
SITE LOCATION MAP
COLONIE FUSRAP SITE
1130 CENTRAL AVENUE
ALBANY, NY 12205

IMAGE ---
X-REF X
OFFICE ALB
DRAWING NUMBER 837935D91

CENTRAL AVENUE N.Y.S. ROUTE 5
(99' RIGHT OF WAY)

PROJECT NORTH

RESIDENCE
NIAGARA MOHAWK SUBSTATION
STORAGE SHED
BLACKTOP ACCESS ROAD
GRAVEL
BLACKTOP
VELLANO'S
MONROE MUFFLER
GRIMMS
TOWN OF COLONIE
CITY OF ALBANY
CONCRETE BLOCK BUILDING
DENSE TREES
BRICK STOCKPILE
PALLETS STORED MATERIAL
MURPHY'S OVERHEAD DOOR
6' CHAIN LINK FENCE W/TRIPLE BARBED WIRE TOP
GRAVEL ACCESS ROAD
DENSE TREES & BRUSH GROUND OBSCURED
CLEANOUT MANHOLE BURIED, NOT FIELD VERIFIED
DRAINAGE STRUCTURE BURIED TOP PIPE ELEV=212.65 48"RCP INV=208.15
5'x 3' CONCRETE BOX CULVERT
4'x 5' STONE ARCH CULVERT
MH RIM=224.81 18"INV. IN=213.99
CB TF=227.06 24"INV OUT=223.66
CB TF=222.07 (A)INV IN=207.57 (B)INV IN=UNOBTAINABLE (C)INV IN=219.07± (D)INV OUT=207.27
48"DIA. HALF CIRCLE "SPECIAL SECTION"
12"HDPE INV=219.47
RIP-RAP AROUND END SECTION
STEEL SHEETING
STAKE STA. 4+50
STAKE STA. 3+00
STAKE STA. 0+00
CLUSTER "H"
YARDBORO AVENUE (40' RIGHT OF WAY)
I-90 TO ROUTE 85 RAMP
RAILROAD AVENUE (80' RIGHT OF WAY)
TOWN OF COLONIE
CITY OF ALBANY
STREAM
SHED
GARAGE
BUILDING
CHAINLINK FENCE
WOOD FENCE
POOL
58
68
74
78
80
110

MW-08S MW-08M
MW-25M
MW-02S MW-02MR
MW-14M MW-14S
MW-43S MW-43M
MW-32M MW-32S
MW-41M MW-41S
MW-42M MW-42S
MW-40S
MW-37M MW-37S
MW-36M MW-36S
MW-30M MW-30S
MW-34M MW-34S
MW-10MR MW-10S
MW-21S MW-21M
MW-33S MW-33M
MW-35S MW-35M
MW-39S MW-39M
MW-38S MW-38M
PZ-11B PZ-11A
PZ-12
PZ-13B PZ-13A
PZ-14B PZ-14A
PZ-15B PZ-15A

GENERAL NOTES:

1. TOPOGRAPHIC FEATURES SHOWN HEREON ARE BASED ON FIELD SURVEY CONDUCTED THROUGH SEPTEMBER 24, 2007.
2. OTHER THAN THOSE SHOWN HEREON, NO OTHER UNDERGROUND UTILITY INFORMATION IS INCLUDED ON THIS DRAWING. THERE MAYBE OTHER UNDERGROUND UTILITIES UNKNOWN TO THE UNDERSIGNED WHICH HAVE NOT BEEN SURVEYED AT THIS TIME.
3. SITE ELEVATIONS AND COORDINATE GRID ARE BASED ON SITE MONUMENTATION AND INFORMATION PROVIDED BY ICF KAISER ENGINEERS, INC.

LEGEND

⊕	MONITORING WELL USED FOR LONG-TERM MONITORING
□ CB	CATCH BASIN
←—	GUY WIRE
○ IRF	IRON ROD FOUND
⊕	MONITORING WELL
⊕ PZ-14B	PIEZOMETER
○ SMH	SANITARY MANHOLE
⊠ MON	SQUARE CONCRETE MONUMENT
○ STORM MH	STORMWATER MANHOLE
○ TMH	TELEPHONE MANHOLE
□ TSB	TRAFFIC SIGNAL BOX
∅	UTILITY POLE
○ WMTR	WATER METER
○ WSO	WATER SHUT-OFF
○ YCIRF	YELLOW CAPPED IRON ROD FOUND
———	OVERHEAD ELECTRIC
- - - -	UNDERGROUND PIPE
×—×—×	FENCE LINE
HDPE	HIGH DENSITY POLYETHYLENE PIPE
RCP	REINFORCED CONCRETE PIPE

BAR SCALE
60 0 30 60 120
1 inch = 60 ft.

REV	DATE	BY	CHK'D	APR'VD	DESCRIPTION/ISSUE

Shaw Environmental, Inc.

U.S. ARMY CORPS OF ENGINEERS
FORMERLY UTILIZED SITES
REMEDIAL ACTION PROGRAM

FIGURE 1-2
SITE PLAN WITH MONITORING LOCATIONS
COLONIE FUSRAP SITE
1130 CENTRAL AVENUE, ALBANY, NY 12205

DESIGNED BY	KSD	05/05/08	CHECKED BY		
DRAWN BY	SSH	05/05/08	APPROVED BY		
SCALE: 1" = 60'	DRAWING NO. 837935D91		SHEET NO. 1 OF 1		REVISION NO.

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Plotted by: matt.sousville

2.0 Project Management

2.1 Project Objectives

The objective of the long term groundwater monitoring is to evaluate the extent to which contaminants are migrating and/or degrading. The long term monitoring plan defines the monitoring goals, end points, sampling frequency, wells to be monitored, constituents to be monitored, as well as sampling method, sample handling, and shipping procedures.

2.2 Project Organization

The project organizational structure for USACE is defined in the Request for Proposal as follows:

USACE Contracting Officer Representative – **Thomas Meyer**, Acting Chief, HTRW Branch Baltimore District.

USACE Project Manager - James Moore, Project Manager, New York District

USACE Design Center Manager – **Phyllis Della-Camera**, Design Team Leader, Baltimore District.

The project organizational structure for Shaw is as follows:

2.2.1 Shaw Program Manager

Shaw's Program Manager is **Jeffrey N. Parks, P.G**. Mr. Parks has overall responsibility for the activities conducted for the Contract and Task Order (TO). Responsibilities include maintaining formal communications with the Contracting Officer (CO); contract changes; guidance on particularly difficult problems which may arise during the execution of the TO; communication of program status and problems encountered to the CO; and lastly, overall client satisfaction.

2.2.2 Shaw Program Health and Safety Manager

Shaw's Program Health and Safety Manager is **Mr. Warren Houseman**. Mr. Houseman has the overall responsibility for assuring that Shaw's work is performed consistent with Shaw's internal standards and the requirements of its Contract with the USACE.

2.2.3 Shaw Project Manager

Shaw's Project Manager (PM) is **Ms. Heather Fariello**. Ms. Fariello has primary responsibility for the completion of activities on this TO. She reports to Shaw's Program Manager and the USACE Project Manager. Shaw's PM has day-to-day control and responsibility for planning, scheduling, cost control, implementation of project tasks, technical reports, and TO management

documents. The PM monitors project personnel during the performance of this TO, and directs technical resources. Shaw's PM has overall responsibility for safety, quality, schedule, approval of project deliverables, and, lastly, achieving the performance-based milestones.

2.2.4 Shaw Technical Lead

Shaw's Technical Lead is **Mr. Vikas Tandon**. Mr. Tandon has the responsibility for developing the performance objectives, monitoring the data collection, data analysis techniques, establishment of monitoring end points. In addition, Mr. Tandon will prepare the long term monitoring report, summarizing the data collection activities, tabulating results, comparing compounds of concern (COC) concentrations with regulatory criteria, estimating the natural attenuation rates and any changes in the rates over time. He will also provide the statistical analysis for plume stability and behavior, the geochemical evaluation, and the assessment of the effectiveness of the MNA remedy.

2.2.5 Shaw Project Chemist/Data Validation Manager

Shaw's Project Chemist is **Mr. Eric Malarek**. Mr. Malarek will ensure that the work performed is in accordance with the QAPP, Work Plans, Standard Operating Procedures (SOPs), and other pertinent analytical procedures. Shaw SOPs are included in **Appendix C.** He will be responsible for sample tracking, data management, laboratory coordination, data interpretation, and report writing. He will be responsible for the review, evaluation, and validation of all analytical data for the project and will participate in interpreting and presenting the analytical data. This includes reviewing selected field and analytical data to ensure adherence to Quality Assurance/Quality Control (QA/QC) procedures, and approving the quality of data before they are included in the evaluations. He will be responsible for the validation of the analytical data from the contract laboratory according to the QAPP, USACE requirements, and laboratory SOPs. Mr. Malarek is also responsible for the production of a final validation report for the project with a justification for qualifiers applied (if any), while maintaining strict adherence to project schedules. He will work with field sampling technicians and the contract laboratory to ensure that the work performed is in accordance with the QAPP and is responsible to the Shaw PM.

2.2.6 Shaw Field Lead

Shaw's Field Lead is **Mr. Robert Adams**. Mr. Adams is responsible for coordinating equipment and supply deliveries, field team activities, and meeting schedule deadlines. He will ensure that the work is being conducted in accordance with the Work Plan and coordinate the daily safety meeting prior to the start of work each day. Mr. Adams reports to the Shaw PM and will typically lead the field teams and coordinate the on-site efforts. He is trained in low-flow sampling and can recognize potential issues and respond accordingly and safely. All field

activities on the CSX parcel will be conducted utilizing CSX On-Track Worker certified personnel.

2.2.7 Shaw Project Contractor Quality Control Manager

Shaw's Project Quality Control (QC) Manager**, Mr. Virgil Barton,** is responsible for ensuring that the QC procedures and objectives in the project-specific work plans are met, reviewing selected field and analytical data to ensure adherence to Quality Assurance/Quality Control (QA/QC) procedures, and approving the quality of data before they are included in the LTM report. The Project QC Manager is also responsible for day-to-day compliance monitoring of the approved QC plans including records filing, archiving and reporting project activities including completion of daily QC reports.

2.2.8 Shaw Site Safety and Health Officer

Shaw's Site Safety and Health Officer (SSHO), **James Joice,** is responsible for day-to-day compliance with the approved Health and Safety and Emergency Response Plan. This plan specifies site-specific personnel training; maintenance of the medical monitoring program; management of personal protective equipment, decontamination operations, and operations support to the on-site field staff. The SSHO will ensure that all field staff maintain Occupational Safety and Health Administration Hazardous Waste Operations and Response certifications and are current under medical monitoring programs meeting 29 Code of Federal Regulations (CFR) 1910.120.

2.2.9 Analytical Laboratory Project Manager

The Analytical Laboratory Project Manager, **Ye Myint** is responsible for the technical quality of the laboratory, adherence to the laboratory QA Manual, laboratory personnel management, cost control, and strict adherence to project schedules concerning the analysis for the parameters of interest. The laboratory Project Manager will ensure the satisfactory analysis of all samples and completeness of data documentation according to the analytical statement of work and QAPP. Shaw will monitor the laboratory activities. Mr. Myint is responsible to the Project Chemist/Data Validation Manager.

2.3 Qualifications of Chemical Quality Management Personnel

The qualifications of laboratory personnel must meet the requirements outlined in the *DoD Quality Systems Manual for Environmental Laboratories, Final Version 4.1* (DoD, 2009). As referenced in this document the Environmental Chemistry Technical Director shall have a bachelor's degree in the chemical, environmental, biological or physical sciences, or engineering, with at least 24 college credit hours in chemistry and at least two years of experience in the environmental analysis of representative inorganic and organic analytes for

which the laboratory seeks or maintains accreditation. A master's or doctoral degree in one of the above disciplines may be substituted for one year of experience. The Radiological Technical Director must have bachelor's degree in chemistry, physics, or engineering with 24 college credit hours of chemistry with two or more years of experience in the radiological analysis of environmental samples. A master's or doctoral degree in one of the above disciplines may be substituted for one year experience. Laboratory support staff, analysts, supervisors should all have adequate training to perform the required analysis as defined in the Laboratory Quality Assurance Plan (LQAP).

2.4 Laboratory Selection

As of the date of this version of the QAPP, all offsite analytical work is currently being performed by EMAX Laboratories, Inc. Their facility is located at 1835 W. 205th Street, Torrance, CA 90501 (310-618-8889 x121, Ye Myint point of contact). Past efforts have been conducted by other laboratories and future work may be performed by other laboratories. Any potential changes in the analytical laboratory will be coordinated in advance of any such changes with the USACE project staff. The laboratory was evaluated based upon cost, technical expertise and capability, and past performance. Further discussion regarding the analytical procedures for the Groundwater Monitored Natural Attenuation Long-Term Monitoring is presented in **Section 3.5**.

The analytical laboratory contracted to perform the chemical analyses is an Environmental Laboratory Accreditation Program (ELAP) and a National Environmental Laboratory Accreditation Conference (NELAC) accredited laboratory. The LQAP and accreditations for the primary laboratory selected have been submitted under separate cover and are provided in **Appendix D** of this document. The subcontracted radiological lab's LQAP is available upon request. All chemical samples are to be analyzed using (as applicable) the latest *USEPA Office of Solid Waste and Emergency Response Test Methods for Evaluating Solid Waste Physical/Chemical Methods (SW-846), Update IV* (USEPA, 2007), *Methods for Chemical Analysis of Water and Wastes* (USEPA, 1983), *USEPA Prescribed Procedures for Measurement of Radioactivity in Drinking Water* (USEPA, 1980), and the *DoD Quality Systems Manual for Environmental Laboratories, Final Version 4.1* (DoD, 2009).

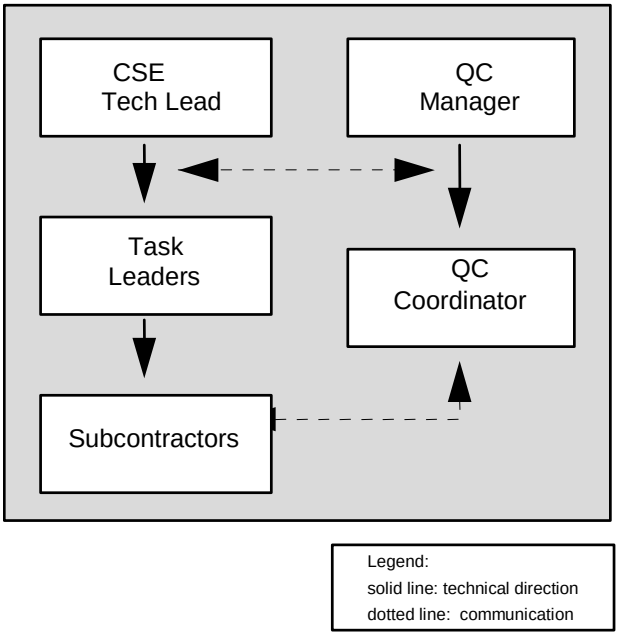
The radiological analyses will be subcontracted through the primary chemical laboratory. The radiological parameters are being subcontracted by EMAX to GEL Laboratories, LLC of 2040 Savage Road, Charleston, SC 29407. The analytical laboratory contracted to perform the radiological analyses will use validated analytical procedures for all radiochemical analyses. These procedures are designed specifically for low-level radiochemistry and are adaptations of those recommended by the U.S. Environmental Protection Agency (USEPA), the Environmental Measurements Laboratory (HSL-300), and other agencies, as appropriate. Radiological samples

are to be analyzed (as applicable) using the latest methods (USEPA, 1980). The laboratory will possess all required permits and licenses in conformance with applicable regulatory requirements, including licenses to receive, handle and store radioactive material as well as ELAP and NELAC accreditation (where applicable).

2.5 Lines of Authority

Figure 2-1 is a diagram modeling the lines of technical direction and communication within the Shaw project staff. Technical direction is communicated down the organizational structure. QA/QC requirements are communicated to staff through an independent quality organization. Communication of project objectives is typically provided to project staff through meetings, reporting, and reviews.

Figure 2-1 Lines of Authority



2.6 Subcontractors and Key Points of Contact

Table 2-1 below lists the Shaw key points of contact and subcontractor key points of contact.

Table 2-1 Shaw and Subcontractor Key Points of Contact

Name/Affiliation	Key Point of Contact
Jeffrey N. Parks, P.G., Shaw Program Manager Jeffrey.Parks@shawgrp.com	2113 Emmorton Park Road Edgewood, MD 21040 Phone: (410) 612-6326 Fax: (410) 612-6351
Warren Houseman, Shaw Health and Safety Manager Warren.Houseman@shawgrp.com	2790 Mosside Boulevard Monroeville, PA 15146 Phone: (412) 858-3917 Fax: (412) 858-3976
Heather A. Fariello, CHMM., Shaw Project Manager Heather.Fariello@shawgrp.com	13 British American Blvd. Latham, NY 12110-1405 Phone: (518) 785-2346 Fax: (518) 783-8397
Vikas Tandon, Shaw Technical Lead Vikas.Tandon@shawgrp.com	2790 Mosside Boulevard Monroeville, PA 15146-2792 Phone: (412) 380-4246 Fax: (412) 372-8968
Eric Malarek, Shaw Project Chemist / Data Validation Manager Eric.Malarek@shawgrp.com	2113 Emmorton Park Road Edgewood, MD 21040 Phone: (410) 612-6322 Fax: (410) 612-6351
Robert Adams, Shaw Field Lead Robert.Adams@shawgrp.com	13 British American Blvd. Latham, NY 12110-1405 Phone: (518) 783-1996 Fax: (518) 783-8397
James Joice, Shaw Site Safety & Health Officer James.Joice@shawgrp.com	16406 US Route 224 East Findlay, OH 45840-9761 Phone: (419) 424-4960 Cell: (419) 306-3637 Fax: (419) 425-6039
Virgil Barton, Shaw Contractor Quality Control Systems Manager Virgil.Barton@shawgrp.com	4171 Essen Lane Baton Rouge, LA 70809 Phone: (225) 987-7380 Fax: (225) 987-3592
Ye Myint, EMAX Laboratories, Inc. Project Manager - Analytical Laboratory Subcontractor YMyint@emaxlabs.com	1835 W. 205th Street Torrance, CA 90501 Phone: (310) 618-8889 x121 Fax: (310) 618-0818

3.0 Quality Assurance Project Plan

This Quality Assurance Project Plan (QAPP) establishes function-specific responsibilities and authorities for data quality and defines procedures that will ensure that Colonie Groundwater (GW) Sampling for Long-term Monitoring (LTM) Monitored Natural Attenuation (MNA) activities will result in the generation of reliable data and follows *DoD Quality Systems Manual for Environmental Laboratories, Final Version 4.1 (DoD, 2009)* requirements. Inherent in the QA program is the implementation of quality control measures. These measures provide assurance that the monitoring of quality-related events has occurred, and that the data gathered in support of the project are complete, accurate, and precise. Implementation of this QAPP will help ensure the validity of the data collected and will establish a firm foundation for decisions regarding the GW MNA LTM. This document was developed in accordance with specifications contained in the USACE, *Requirements for the Preparation of Sampling and Analysis Plans,* EM 200-1-3, (USACE, 2001), USEPA *Data Quality Objectives Process for Hazardous Waste Site Investigations* EPA QA/G-4HW (USEPA, 2000b), and the *DoD Quality Systems Manual for Environmental Laboratories, Final Version 4.1* (DoD, 2009) (DoD QSM).

Sample collection will be performed in accordance with established Shaw SOPs designed to ensure the collection of representative samples. Shaw SOPs may be found in **Appendix C**. A subcontractor laboratory that is approved by the USACE will perform the analytical sample analysis. Laboratory analytical methods will be performed in accordance with USEPA protocols and methods. Shaw will have the laboratory data validated according to the QAPP requirements, DoD QSM requirements, the analytical method, and laboratory SOPs. Data validation qualifiers will be consistent with the USEPA Region II SOPs and other USEPA and multi-agency guidance documents. Further discussion for regarding data validation may be found in **Section 3.9.3**.

3.1 Quality Assurance Project Objectives

Quality assurance is defined as the overall system of activities for assuring the reliability of data produced. The system integrates the quality planning, assessment, and corrective actions of various groups in the organization to provide the independent QA program necessary to establish and maintain an effective system for collection and analysis of environmental samples and related activities. The program encompasses the generation of complete data with its subsequent review, validation, and documentation.

3.1.1 Data Quality Objectives

The overall QA objective is to develop and implement procedures for sample and data collection, evaluation, and reporting that will allow reviewers to determine whether the field and laboratory procedures meet the criteria and endpoints established in the Data Quality Objectives (DQOs). DQOs are qualitative and quantitative statements that outline the decision making process and

specify the data required to support corrective actions. DQOs specify the level of uncertainty that will be accepted in results derived from environmental data.

The DQO process used for developing data quality criteria and performance specifications for decision making is consistent with the *Data Quality Objectives Process for Hazardous Waste Investigations*, USEPA QA/G-4HW (USEPA, 2000b). The DQO process consists of the seven steps below. A phased approach has been adopted for LTM to optimize resource utilization and minimize decision errors. Each phase is broken out in the following DQO elements. DQO elements common to all investigative areas are included following each process step. The components of project-specific DQOs are defined on **Table 3-1**. Project-specific DQOs may be found on **Table 3-2**.

Table 3-1 Components of Project Specific Data Quality Objectives

DQO Elements		**Definition**
Problem Statement	Problem and Objectives	Describes the activity objectives and problem of focus associated with the scope of work.
Decision Identification	Decision Statement and Alternative Actions	Describes the decision statement that the study will attempt to resolve and the alternative actions.
Decision Inputs	Chemical Data	Defines the chemical analytical parameters to be conducted.
	Physical Data	Defines the physical analytical parameters or measurements to be conducted.
	Sampling Method	Defines the type of sampling method to be used.
	Data Use	Provides the data's end use.
	Validation Level	Defines the USEPA validation level to be performed.
	Analytical Method	Specifies the USEPA methodology for chemical and physical analyses.
	Quantitation Limit (QL)	Specifies the QLs for the chemical analyses.
	Field Quality Control (QC) Samples	Provides the field QC samples to be performed.
	Action Levels	Provides the levels of concern.
Study Boundary	Spatial and temporal boundaries	Provides the spatial, population characteristics, and sample collection constraints.
Decision Rule Development	Decision Rule	Defines the compounds of concern and action levels for which decisions are to be made.
Tolerance Limits on Decision Errors	Acceptable Tolerance Limits	Specifies the decision maker's tolerable limits on decision errors.
Design Optimization	Sampling Design	Specifies the optimal design for collection of data.

1. **State the Problem:** Define the problem to focus the study. Specific activities conducted during this process step include (1) the identification of the planning team, (2) identification of primary decision-maker, (3) statement of the problem, and (4) available resources and relevant deadlines.

   (1) The planning team consists of the New York State Department Environmental Conservation (NYDEC), United States Environmental Protection Agency (USEPA), and the United States Army Corps of Engineers (USACE).

   (2) The USACE is the primary decision-maker.

   (3) Refer to **Table 3-2**.

   (4) Resource specifications are contained in the LTM Work Plan, Rev1, Groundwater Sampling for Natural Attenuation, Colonie FUSRAP Site. The period of performance for this project is approximately 2 to 5 years.

2. **Identify the Decision:** Define the decision statement that the study will attempt to resolve. Activities conducted during this step of the process involve (1) identification of the principal study question and (2) definition of resultant alternative actions.

   (1) What is the extent for which the site contaminants have migrated and/or degraded in the groundwater of existing wells as a long term monitoring, and are the groundwater conditions conducive for natural attenuation as remedial alternative?

   (2) Resultant alternative actions include:

   (2a) If contaminants are consistent with historical levels at all existing wells above the action levels, no migration and/or degradation will be observed and additional monitoring and/or remediation may be recommended.

   (2b) If contaminants are detected at lower concentrations and not increasing at down gradient wells, degradation is occurring and natural attenuation will be considered as alternative remedial action.

   (2c) If contaminants are detected above the action levels at down gradient wells, migration is occurring and additional monitoring and/or remediation may be recommended.

3. **Identify Inputs to the Decision:** Identify information inputs required to resolve the decision statement and which inputs require environmental measurements. This step of the process includes (1) identification of the data that will be required to make the decision, (2) information source determination, (3) identification of data required for study action levels, and (4) confirmation of appropriate field sampling and analytical methods.

Table 3-2 Project Specific Data Quality Objectives for Colonie Groundwater Long-Term Monitoring

DQO Elements		DQO Output	
		Groundwater Contaminant Monitoring	**Groundwater Monitored Natural Attenuation**
1. State The Problem	Problem Statement	Due to historical activities at the Colonie Site, contaminants – mainly chlorinated solvents, metals, and radio nuclides may be present in the groundwater.	Due to historical activities at Colonie Site, chlorinated solvents may be present in the groundwater. Natural attenuation parameters will be collected to determine if natural attenuation remains a viable remediation alternative for the chlorinated solvents.

Table 3-2 Project Specific Data Quality Objectives for Colonie Groundwater Long-Term Monitoring

DQO Elements		DQO Output	
		Groundwater Contaminant Monitoring	**Groundwater Monitored Natural Attenuation**
2. Identify The Decision	Decision Statement	Determine the extent to which the contaminants are migrating and/or degrading in groundwater of existing wells as a long term monitoring. Upper groundwater zone: VOC sampling shall be performed quarterly at the following well locations: MW-8S, MW-10S, MW-21S, MW-30S, MW-32S, MW-34S, MW-35S, MW-36S, MW37S, MW-38S, MW39S, MW-40S, MW-41S, MW42-S and MW-43S. Total and dissolved lead will be sampled semi-annually at the locations: MW-08S, MW-10S, MW21S, MW-40S, and MW-43S. Total and dissolved radionuclides will be sampled semi-annually at the locations: MW30S, MW-32S, MW37S, MW-40S, MW-41S, MW42-S, and MW-43S. Lower groundwater zone: VOC shall be performed semiannually at the following well locations: MW-32M, MW-41M, and MW43M. Total and dissolved lead shall be performed semiannually at the following well locations: MW-08M, MW-32M, MW-41M, and MW43M. Total and dissolved radionuclides shall be performed semiannually at the following well locations: MW-30M, MW-32M, MW-37M, MW-41M, MW-42M, and MW43M.	By contouring natural attenuation data across the Colonie site, it will be possible to determine if groundwater is favorable for natural attenuation of the chlorinated solvents. The evaluation of data collected will determine if 1) natural degradation is likely or unlikely to be occurring and rate thereof, 2) if water quality of the groundwater is favorable for natural attenuation of chlorinated organic compounds, and 3) if degradation will occur before potential receptors are impacted. Quarterly sampling for natural attenuation parameters will be performed at the following well locations: MW-8S, MW-10S, MW-21S, MW30S, MW-32S, MW-34S, MW-35S, MW-36S, MW37S, MW-38S, MW39S, MW-40S, MW-41S, MW42-S and MW-43S in the upper groundwater zone. No MNA samples are proposed to be collected in the lower groundwater zone.

Table 3-2 Project Specific Data Quality Objectives for Colonie Groundwater Long-Term Monitoring

DQO Elements		DQO Output	
		Groundwater Contaminant Monitoring	**Groundwater Monitored Natural Attenuation**
	Alternative Actions	If contaminant levels are consistent with historical levels at all existing wells above the action levels, no migration and/or degradation will be observed, and additional monitoring and/or remediation may be recommended. If contaminants are detected at lower concentrations and not increasing at down gradient wells, degradation is occurring. If contaminants are detected above the action levels at down gradient wells, migration is occurring and additional monitoring and/or remediation may be recommended.	If MNA data evaluation is favorable of natural attenuation, natural attenuation may be recommended as continuing remediation alternative. If MNA data evaluation is unfavorable, additional monitoring and/or remediation alternatives may be considered.
3. Identify The Inputs To The Decision	Chemicals Of Interest	VOCs: tetrachloroethylene (PCE), trichloroethene (TCE), cis-1,2-dichloroethylene (cis-1,2-DCE), trans-1,2-dichloroethylene (trans-1,2-DCE), 1,1-dichloroethylene (1,1-DCE) and vinyl chloride (VC) lead (total and dissolved) Gross Alpha and Gross Beta (total and dissolved) Total Uranium (total and dissolved) Combined Radium 226 + 228 (total and dissolved)	Nitrate, Sulfate, and Chloride Soluble Manganese (Field Test Kit) Ferrous Iron (Field Test Kit) Methane, Ethane, and Ethene Total Organic Carbon
	Physical Data	Map locations for all sample locations will be generated.	Map locations for all sample locations will be generated.
	Analytical Methods	Chemical & Radiological Data: (Aqueous) VOCs: SW 5030B/8260B Lead: SW 3010A/6010B for ICP Gross Alpha and Gross Beta: EPA 900.0 Total Uranium: SW 6020 Combined Radium 226 + 228: EPA 903.0 Mod & EPA 904 Mod	Chemical Data: (Aqueous) Nitrate, Sulfate, and Chloride: EPA 300 Soluble Manganese (Field Kit Test): Hach 8149 Ferrous Iron (Field Kit Test): Hach 8146 Methane, Ethane, and Ethene: SW 3810/RSK 175 Total Organic Carbon: SW 9060A
	MQLs	Refer to **Table 3-3**.	Refer to **Table 3-3**.

Table 3-2 Project Specific Data Quality Objectives for Colonie Groundwater Long-Term Monitoring

DQO Elements		DQO Output	
		Groundwater Contaminant Monitoring	**Groundwater Monitored Natural Attenuation**
	Field Quality Control Samples	Rinse Blank (only required when non-dedicated or re-usable sampling equipment is used) Trip Blank (1 per cooler for aqueous matrix VOCs) Field Duplicate (5% frequency per matrix)	Rinse Blank (only required when non-dedicated or re-usable sampling equipment is used) Field Duplicate (5% frequency per matrix)
	Data Use	Long-Term Monitoring	Monitored Natural Attenuation
	Validation Data Level	Full Validation – See **Section 3.9.3**	Limited Validation – See **Section 3.9.3**
4. Define The Boundaries Of The Study	Action Levels	Compounds of Concern: Remedial Action Objectives (RAOs) identified in the Long-Term Monitoring Work Plan; Rev1. Non-compounds of Concern: NY State GA GW standards Part 703 and Federal DW MCLs for informational purposes only.	*Wiedemeier et al.* (1996) Conditions for Supporting Natural Attenuation for Chlorinated Solvents, see **Table 3-4**.
	Media To Sample	Groundwater	Groundwater
	Spatial Boundaries	See **Figure 1-2**	See **Figure 1-2**
	Time Frame	Sample Quarterly/Semiannually for 2 years.	Sample Quarterly for 2 years.
	Practical Constraints	Below freezing temperatures in winter.	Below freezing temperatures in winter.
	Scale	See **Figure 1-2**	See **Figure 1-2**
5. Develop A Decision Rule	Decision Rule	If contaminants are not detected above the action level, NFA will be recommended. If contaminants are detected above the action level, additional monitoring and/or remediation alternatives may be performed.	If MNA data evaluation is favorable for natural attenuation, natural attenuation may be recommended as continuing remediation alternative. If MNA data evaluation is unfavorable, additional monitoring and/or remediation alternatives may be considered.
6. Specify Tolerable Limits On Decision Errors	Tolerance Limits	The data will be statistically compared to historical levels.	No tolerance limits for MNA data.

Table 3-2 Project Specific Data Quality Objectives for Colonie Groundwater Long-Term Monitoring

DQO Elements		DQO Output	
		Groundwater Contaminant Monitoring	**Groundwater Monitored Natural Attenuation**
7. Optimize The Design For Obtaining Data	Sampling Design	See **Figure 1-2**	See **Figure 1-2**

(1) Refer to **Table 3-2**.

(2) Samples will be analyzed using *USEPA Office of Solid Waste and Emergency Response Test Methods for Evaluating Solid Waste Physical/Chemical Methods (SW-846), Update IV* (USEPA, 2007), *USEPA Prescribed Procedures for Measurement of Radioactivity in Drinking Water* (USEPA, 1980), *Methods for Chemical Analysis of Water and Wastes* (USEPA, 1983), and the *DoD Quality Systems Manual for Environmental Laboratories, Final Version 4.1* (DoD, 2009) methodology where applicable. Refer to **Section 3.5**.

(3) The groundwater action levels are based on the Remedial Action Objectives (RAOs) identified in the Long-Term Monitoring Work Plan; Rev1 for the compounds of concern and for informational purposes the NY State GA GW standards Part 703 and Federal DW MCLs for the non-compounds of concern. The natural attenuation data will be compared to *Wiedemeier et al.* (1996) Conditions for Supporting Natural Attenuation for Chlorinated Solvents (**Table 3-4**).

(4) Field sampling will be performed in accordance with the Long-Term Monitoring Work Plan, Rev1, Groundwater Sampling for Natural Attenuation Colonie, FUSRAP Site.

4. **Define the Boundaries:** Define decision statement spatial and temporal boundaries. This step specifies (1) the spatial boundary, (2) population characteristics, applicable geographic areas and associated homogeneous characteristics, and (3) constraints on sample collection.

All Areas:

(1, 2, 3) Refer to **Table 3-2**.

5. **Develop a Decision Rule:** Define the (1) parameters of interest, (2) action levels, and (3) develop a decision rule.

   (1) Parameters of interest are listed in the decision inputs. See **Table 3-2**.

   (2) The groundwater action levels are based on Remedial Action Objectives (RAOs) identified in the Long-Term Monitoring Work Plan, Rev. 1 for the compounds of concern and for informational purposes the New York State GA GW standards Part 703 and Federal DW MCLs for the non-compounds of concern. The natural attenuation data will be compared to *Wiedemeier et al.* (1996) Conditions for Supporting Natural Attenuation for Chlorinated Solvents (**Table 3-4**).

   (3) These will be developed in LTM annual report.

6. **Specify Acceptable Limits on Decision Errors:** Specify the decision maker's tolerable limits on decision errors. This step of the process includes (1) parameter range of interest, (2) decision errors, (3) potential parameter values, and (4) the probability tolerance for decision errors identified during this phase.

(1) Parameter ranges are not defined at this time.

(2) Decision errors include:

(1a)(i) Deciding that groundwater contaminants were degrading and conducive for natural attenuation and not migrating when they were non-conducive and migrating, and (ii) Deciding that groundwater contaminants were not degrading and non-conducive for natural attenuation when they were conducive and degrading. The consequences of deciding that the groundwater contaminants were not degrading and non-conducive for natural attenuation when they are will result in unnecessary monitoring and remedial actions. The consequences of deciding that the groundwater contaminants were degrading and conducive for natural attenuation and not migrating when they are will result in liabilities associated with future damages and possible environmental clean-up costs. Additionally, public opinion will be compromised.

(1b) The true state when the most severe decision error occurs (the groundwater contaminants were degrading and conducive for natural attenuation and not migrating when they are) is that groundwater contaminants are not degrading, non-conducive for natural attenuation, and migrating across the site. The true state when the less severe decision error occurs (the groundwater contaminants were not degrading and non-conducive for natural attenuation when they are) is that groundwater contaminants are degrading and conducive for natural attenuation.

(1c) The null hypothesis (H0) is: Groundwater contaminants were non-conducive for natural attenuation and not degraded while migrating across the site warranting additional monitoring and alternative remediation. The alternative hypothesis (Ha) is: Groundwater contaminants degraded and were conducive for natural attenuation while not migrating across the site and not warranting any further alternative remediation.

(1d) The false positive decision error occurs when H0 is erroneously rejected corresponding to decision error I. The false negative decision error occurs when Ha is erroneously accepted corresponding to decision error II. Project specific Type I and Type II error rates are 0.05 and 0.2, respectively.

(3,4) The consequence of decision errors and acceptable probability will be determined as part of the LTM annual report.

7. **Optimize Data Design:** Identify data collection activities commensurate with data quality specifications. This final step in the process consists of (1) reviewing DQO outputs and existing environmental data, (2) developing data collection design alternatives, (3) formulating mathematical expressions to resolve design problems for each alternative, (4) selecting cost-effective data design capable of achieving DQOs, and (5) documentation of operational details and theoretical assumptions.

(1) This QAPP contains the proposed LTM and MNA sampling design program. A phased approach has been adopted for site characterization to optimize resource utilization and minimize decision errors for each area. DQO refinement will be an iterative process throughout the project life cycle.

(2) The development of the data collection alternatives was performed with Shaw, USACE, USEPA, and NYSDEC during the project planning session. Systematic sampling will be performed to collect additional data needed to complete the groundwater long-term monitoring and monitored natural attenuation. Further discussion as to the sampling program may be found in LTM Work Plan, Rev1, Groundwater Sampling for Natural Attenuation, Colonie FUSRAP Site.

(3) Qualitative assessments will be established during the refinement process.

(4) This QAPP contains the proposed LTM sampling design program based on cost and project DQOs.

(5) Refer to LTM Work Plan, Rev. 1, Groundwater Sampling for Natural Attenuation, Colonie FUSRAP Site.

The overall QA objective is to develop and implement procedures for sample and data collection, sample shipment, and reporting that will allow QA reviewers to determine whether the field and laboratory data collected during the LTM at the Colonie site meet the criteria and endpoints established in the DQOs. The QA objective will be achieved through the implementation of specific procedures for sampling, field data collection, COC, calibration, internal QC, audits, preventive maintenance, and corrective actions as described in this document.

3.2 Accuracy, Precision, Representativeness, Completeness, Comparability, and Sensitivity

The DQO process will be used to ensure chemical data will be of known defensible quality appropriate to achieving project objectives. Project data needs will be defined in terms of a qualitative assessment of requirements expressed as accuracy, precision, representativeness, completeness, comparability, and sensitivity. Laboratory data will be evaluated against the QAPP requirements which includes the *DoD Quality Systems Manual for Environmental Laboratories, Final Version 4.1* (DoD, 2009) and the USEPA analytical method requirements. Laboratory data found to be outside of the criteria will be flagged in accordance with USEPA Region II SOPs and other USEPA and multi-agency guidance documents. Further discussion may be found in **Section 3.9** of this QAPP.

3.2.1.1 Precision

Precision refers to the level of agreement among repeated measurements of the same parameter. It is usually stated in terms of standard deviation, relative standard deviation, relative error ratio (RER), relative percent difference (RPD), range, or relative range. The overall precision of data is a mixture of sampling and analytical factors. The analytical precision is easier to control and quantify because the laboratory is a controlled, and therefore, measurable environment. Sampling precision is unique to each site, making it harder to control and quantify. The goals for each factor are addressed below.

Sampling precision will be evaluated by obtaining one duplicate sample for every 20 samples collected for each type of media (5% frequency). For chemical data, precision will be evaluated by calculating the RPD as follows:

RPD = $|R1 - R2| / [(R1+R2)/2]$
R1 = original sample result
R2 = duplicate sample result

Criteria = RPD ≤ 25% for inorganic parameters
= RPD ≤ 50% for organic parameters

For radiological data, precision control criterion will be evaluated by calculating the RER equivalency as follows:

RER = $|R1 - R2| / (SQRT [(TPU1^2)+(TPU2^2)])$
R1 = original sample result
R2 = duplicate sample result
TPU1 = total propagated uncertainty of the original sample result (1σ)
TPU2 = total propagated uncertainty of the duplicate sample result (1σ)

Criteria = RER ≤ 1.5

The RPD or RER will be calculated for both the field duplicates and laboratory duplicates for where each analytical parameter that was detected in both samples. It is expected that the field and laboratory duplicates for groundwater matrices will have a RPD less than 25% for inorganic and less than 50% for organic parameters and will have a RER less than 1.5 for radiological parameters. If these criteria are not met for the field duplicates, a careful examination of the sampling techniques, sample media, and analytical procedure will be conducted to identify the cause of the high RPD or high RER and the usefulness of the data.

Actual laboratory control limits will be based upon the method performance based data (**Table 3-3**). If the precision criteria are not met for laboratory duplicates, an examination of the data will be conducted to determine the cause of the variability and usefulness of the data. Laboratory

analytical precision will also be performed by the analysis of matrix spikes (MSs) / matrix spike duplicates (MSDs), as well as laboratory control samples (LCSs) / laboratory control sample duplicates (LCSDs).

3.2.1.2 Accuracy

Accuracy values can be presented in a variety of ways. Average error is one way of presenting this information, however; more commonly, accuracy is presented as percent bias or percent recovery. Percent bias is a standardized average error (the average error divided by the actual or spiked concentration and converted to a percentage). Percent bias is unit-less and allows accuracy of analytical procedures to be compared easily. Percent recovery provides the same information as percent bias. The accuracy of sampling activities will be qualitatively controlled through the use of SOPs that have been developed to standardize the collection of measurements and samples. For chemical data, accuracy of the extraction and analysis procedures will be checked quantitatively through the use of matrix spikes (MS), laboratory control samples (LCS), surrogate spikes, and blanks as applicable to the analytical method performed. Percent recovery is defined as:

For surrogate and internal QC sample % Recovery = (R/S) x 100

Where:

S	=	Spiked surrogate or internal QC sample concentration
R	=	Reported surrogate or internal QC sample concentration
% Bias	=	% Recovery - 100

For matrix spike % Recovery = (R-I/S) x 100

Where:

S	=	Spiked spike concentration
R	=	Reported spike concentration
I	=	Initial spiked sample concentration
% Bias	=	% Recovery – 100

The spiked test concentration “S” is the resultant concentration found for the MS/MSD or LCS samples. The initial spiked sample concentration “I” is the original sample concentration for the MS/MSD samples and is usually zero for the internal QC LCS and surrogate samples. Actual laboratory control limits will be based upon the method performance based data (**Table 3-3**).

LCSs will be analyzed to assess general method performance by the ability of the laboratory to successfully recover the target analytes from a control matrix. The LCS is similar in composition to the method blank. For aqueous analyses, spiked analyte-free reagent water will be used. The LCS is spiked with single-component target analytes before it is carried through

the preparation, cleanup, and determinative procedures. LCSs are performed at a rate of one per preparation batch per matrix. When samples are not subjected to a separate preparatory procedure (i.e., purge and trap VOC analyses), the continuing calibration verification (CCV) may be used as the LCS, provided the CCV acceptance limits are used for evaluation. The results of the LCS will be evaluated, in conjunction with other QC information during the data validation process to ascertain the acceptability of the data generated for that batch of samples.

MSs and MSDs are used to assess the performance of the method as applied to a particular project matrix. A MS is an environmental sample to which known concentrations of certain target analytes have been added before sample manipulation from the preparation, cleanup, and determinative procedures have been implemented. The original field sample is mixed or shaken to ensure homogeneous fractions when allowed by the method. MSs are performed by the lab at a rate of one per preparation batch per matrix. Project MS/MSD will be collected for groundwater samples at a 5 percent (1 per 20) frequency. The results of the MS are evaluated, in conjunction with other QC information during the validation process to assess the effect of the matrix on the bias of the analysis.

Documentation protocols for field sampling and measurements are outlined in SOPs as presented in **Appendix C**. Field inspection performed by the Shaw QA/QC Manager will be used to identify deviations and execute corrective actions. Consistent and proper calibration of equipment throughout the field exercises, as described in this QAPP, will ensure measurement accuracy.

3.2.1.3 Representativeness

Representativeness is a qualitative parameter that expresses the degree to which sample data accurately and precisely represent actual conditions and is a measure of the degree to which the measured results accurately reflect the medium being sampled. In the field, the representativeness of the data depends on selection of appropriate sampling locations, collection of an adequate number of samples, and use of consistent sampling procedures to ensure the material collected is as a "sample" of the whole.

Field handling protocols (i.e., storage, handling in the field, and shipping) have also been designed to protect the representativeness of the collected samples. Proper field documentation and QC inspections will be used to establish that protocols have been followed and that sample identification and integrity have been maintained. The sampling procedures, as described in the work plan, are designed with the goal of obtaining representative samples for each of the different matrices.

In the analytical laboratory, the representativeness of the analytical data is a function of the procedures used in processing the samples. The objective for representativeness is to provide

data of the same high quality as other analyses of similar samples using the same methods during the same time period within the laboratory. Representativeness is determined by comparing the quality control data for these samples against other data for similar samples analyzed at the same time.

3.2.1.4 Completeness

Completeness is a measure of the amount of information that must be collected during the field investigation to allow for successful achievement of the objectives. An adequate amount and type of data must be collected for conclusions to be useable. Missing data may reduce the precision of estimates or introduce bias, thus lowering the confidence level of the conclusions. While completeness has been historically presented as a percentage of the data that is considered useable, this does not take into account critical sample locations or critical analytical parameters.

The amount and type of data that may be lost due to sampling or analytical error cannot be predicted or evaluated in advance. The importance of any lost or suspect data will be evaluated in terms of the sample location, analytical parameter, nature of the problem, decision to be made, and the consequence of an erroneous decision. Critical locations or parameters for which data is determined to be inadequate will either be re-sampled and reanalyzed or the data will be appropriately qualified based on the decision of the Project Officer. The completeness goal percentage of useable data is set at 90% for the Colonie GW LTM Program.

Completeness will be inferred from records review and data validation. Sampling completeness is assessed through evaluation of the total number of samples proposed for collection versus the actual number of samples collected and analyzed. Analytical completeness is assessed by comparing the number of useable data points collected to the total number of data points generated. For the purposes of the LTM, un-useable data will be defined to include rejected data points ("R" qualifier). Those data points determined to be resultant due to blank contamination will be considered as "non-detects" ("U" qualifier). All other qualified data will be usable with qualifications as noted in **Table 3-17**. The analytical completeness may be calculated on a parameter basis as well as an overall basis to pinpoint any usability issues based upon the resulting data validation. Completeness is calculated using the following equations:

$$\% \text{ Sampling Completeness} = \frac{\text{Number of Actual Samples Collected}}{\text{Number of Proposed Samples}}$$

$$\% \text{ Analytical Completeness} = \frac{\text{Number of Useable Data}}{\text{Number of Requested Analyses}}$$

3.2.1.5 Comparability

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared with another. Comparability will be controlled through the use of SOPs that have been developed to standardize the collection of measurements and samples and approved analytical technique with defined QC criteria. Consistent and proper calibration of equipment throughout the field exercises, as described in this QAPP, will assist in the comparability of measurements. Field documentation will be used during this project to establish that protocols for sampling and measurement follow appropriate SOPs.

Analytical results are comparable to results of other laboratories with the use of the following procedures/programs: instrument standards traceable to National Institute of Standards and Testing (NIST), USEPA, or NYSDEC sources; the use of standard methodology; reporting results from similar matrices in consistent units; applying appropriate levels of quality control within the context of the laboratory quality assurance program; and participation in inter-laboratory studies to document laboratory performance. By using traceable standards and standard methods, the analytical results can be compared to other laboratories operating similarly. The QA program documents internal performance and the inter-laboratory studies document performance compared to other laboratories. Periodic laboratory proficiency studies are instituted as a means of monitoring intra-laboratory performance.

3.2.1.6 Sensitivity

The term "sensitivity" is used broadly to describe the method detection limit (MDL), minimum detectable concentrations (MDCs), minimum detectable activity (MDA), quantitation limit (QL), and method reporting limits (MRL) established to meet project-specific DQOs; and not limited to the definition which describes the capability of a method or instrument to discriminate between measurement responses. Methods are selected based upon their sensitivity, technological, and economical considerations while keeping the screening values and available methodology in mind and were sufficient in meeting the given levels of concern (LOCs).

The laboratory generates QLs (MDC for radiological) and MDLs (MDA for radiological) for each target analyte of interest and are compared at the onset of the project. The MDL or MDC is the minimum concentration of an analyte that can be measured and reported with a 99 percent confidence that the analyte is above zero and is identified from the analysis of a sample in a given matrix containing the analyte. MDLs are derived by the method as described in 40 code of federal regulations (CFR) Chapter 136 Appendix B. The laboratory has developed statistically derived MDLs below the established QLs. The MDL and MDA values differ and change periodically because each is laboratory, instrument, analyst, matrix, and method (sample volumes, dilutions, counts, etc.) specific. In some cases for the chemical analyses, the more conservative MDLs are reported by the lab for each analyte for the chemical parameters. The QLs are the values at which the laboratory has demonstrated the ability to reliably quantitate the target value of an analyte for the method performed and are based upon the lowest calibration standard used for the initial calibration curve or the lowest verification standard performed. The QLs must be at least 3 times the MDL. **Table 3-3** lists the QLs to be used for this long-term monitoring and MNA scope. The LOCs desired for this project dictate the sensitivity requirements and are listed as well. The conditions for supporting natural attenuation for chlorinated solvents are presented in **Table 3-4**.

The laboratory uses a MRL and MDC to report non-detects for each sample. The MRL and MDC are terms to express a sample quantitation limit. The reporting limit is the threshold value below which the laboratory reports non-detected values as "U," "ND," or "<" and will vary for each sample based upon dilutions, sample volumes, percent moistures (for solids), and the method performed. For chemical parameters, any MRL must be at least three times the MDL to be reliable.

Data is sometimes calculated over a linear range. The highest concentration of the standards is truncated until linearity is achieved (minimum of three concentration levels must remain). The resulting highest concentration within the linear range represents the upper quantitation limit. Each target compound for every sample was reported at a specific level. The target analytes detected above the MDL or MDA, but less than the MRL, MDC, or 3 times the MDL (whichever is greater), are treated as estimated values "J". Target analytes detected above the upper calibration standard are diluted and analyzed within established calibration windows. The units for aqueous samples may be expressed as 1) parts per million (ppm) as milligrams per liter (mg/L); 2) parts per billion (ppb) as micrograms per liter (µg/L) or; 3) picocuries per liter (pCi/L), depending upon the analysis performed.

Table 3-3 Laboratory Analyte Lists, Methods, PQLs, Control Limits, and Screening Values

Analyte		Aq.	Aq.	Aq.	Aq.	Aq.	Groundwater Screening Values		Remedial Action Objective
	CAS #	QL	MDL	MS/MSD	RPD	BS	USEPA DW MCL	NYDEC GA GW Stds[1]	
VOCs (SW 5030B/8260B)		(ug/L)	(ug/L)	(%)	(%)	(%)	(ug/L)	(ug/L)	(ug/L)
1,1-Dichloroethylene	75-35-4	1.0	0.2	70-130	30	70-130	7.0	5.0	--
cis-1,2-Dichloroethylene	156-59-2	1.0	0.2	70-125	30	70-125	70	5.0	1,800
Tetrachloroethylene	127-18-4	1.0	0.2	45-150	30	45-150	5.0	5.0	5.5
trans-1,2-Dichloroethylene	156-60-5	1.0	0.2	60-140	30	60-140	100	5.0	--
Trichloroethylene	79-01-6	1.0	0.2	70-125	30	70-125	5.0	5.0	18
Vinyl chloride	75-01-4	1.0	0.5	50-145	30	50-145	2.0	2.0	1.4
Lead (SW 3010A/6010B)		(ug/L)	(ug/L)	(%)	(%)	(%)	(ug/L)	(ug/L)	(ug/L)
Lead	7439-92-1	10	3.0	80-120	20	80-120	15	25	--
Radiological Parameters		(pCi/L)	(pCi/L)	(%)	RER	(%)	(pCi/L)	(pCi/L)	(pCi/L)
Gross Alpha (EPA 900.0)	12587-46-1	3.0	NA	75-125	1.5	80-120	15	15	--
Gross Beta (EPA 900.0)	12587-47-2	4.0	NA	75-125	1.5	80-120	4 mrem/yr	1,000	--
Radium 226 (EPA 903.0 Mod.)	13982-63-3	1.0	NA	75-125	1.5	80-120	5.0	3.0	--
Radium 228 (EPA 904 Mod.)	15262-20-1	1.0	NA	75-125	1.5	80-120	5.0	5.0	--
Uranium (SW 6020)	7440-61-1	1.0	0.5	80-120	20	80-120	20	NS	--
Natural Attenuation Parameters[2]		(ug/L)	(ug/L)	(%)	(%)	(%)	(ug/L)	(ug/L)	(ug/L)
Methane (SW3810/RSK 175)	74-82-8	2.0	0.6	75-125	30	75-125	NS	NS	--
Ethane (SW3810/RSK 175)	74-84-0	2.0	0.6	75-125	30	75-125	NS	NS	--
Ethene (SW3810/RSK 175)	74-85-1	2.0	0.6	75-125	30	75-125	NS	NS	--
Chloride (EPA 300)	16887-00-6	2000	100	75-125	20	75-125	250,000	250,000	--
Sulfate (EPA 300)	14808-79-8	1000	250	75-125	20	75-125	250,000	250,000	--
Nitrate (EPA 300)	14797-55-8	100	50	75-125	20	75-125	10,000	10,000	--
Total Organic Carbon (SW 9060A)	TOC	1000	500	75-125	20	75-125	NS	NS	--

Method Ref: *USEPA Test Methods for Evaluating Solid Waste Physical/Chemical Methods, Update IV* (USEPA, 2007), Methods for Chemical Analysis of Water and Wastes (USEPA, 1983), and *USEPA Prescribed Procedures for Measurement of Radioactivity in Drinking Water* (USEPA, 1980)
Limits Ref: *DoD Quality Systems Manual for Environmental Laboratories, Final Version 4.1* (DoD, 2009), where available.
Criteria Ref.: The groundwater screening levels are based on the *NYDEC Part 703: Surface Water and Groundwater Quality Class GA Standards and Groundwater Effluent Limitations* (NYDEC, 1999) and the *USEPA DW MCLs* (USEPA, 2004). The Remedial Action Objectives are risk based concentrations established in the Feasibility study.
[1]For cis-1,3-Dichloropropene and trans-1,3-Dichloropropene, the NYDEC GW GA standard applies to the sum of both isomers. For Radium 228, the NYDEC GW GA standard and MCL apply to the sum of both isotopes 226 + 228.
[2]For natural attenuation supporting conditions see Table 3-4.
-- = RAO not established.
µg/L = micrograms per liter = parts per billion
pCi/L = picocuries per liter
RPD = Relative Percent Difference
RER = Relative Error Ratio
NS = No Standard
NA = Not Applicable
NOTE: Shaded cells indicate that the MDL is greater than the minimum screening value for the analyte.

Table 3-4 Parameters for Supporting the Natural Attenuation of Chlorinated Aliphatic Hydrocarbons

Parameter	Condition	Reasoning
Dissolved Oxygen	<0.5 mg/L	Suppresses the reductive pathway
Nitrate	<1 mg/L	May compete with reductive pathway
Ferrous Iron (Fe^{2+})	>1 mg/L	Reductive pathway possible
Sulfate	<20 mg/L	May compete with reductive pathway
Methane	>0.5 mg/L	Ultimate reductive pathway daughter product
pH	5 < pH < 9	Optimal range for reductive pathway
TOC	>20 mg/L	Energy source, drives de-chlorination
Temperature	>20°C	Biochemical process is accelerated
Soluble Manganese	- -	May compete with reductive pathway
Chloride	>2x bkgrnd	Daughter product of organic chlorine
Oxidation/Reduction Potential	<50 mill volts < -100 mill volts	Reductive pathway possible Reductive pathway likely
Daughter products, ethene, ethane	- -	Provide evidence that degradation is occurring

3.3 Sampling Locations and Rationale

A summary of the sampling locations is provided as **Table 3-5**. Further specific information on sampling locations and procedures is contained in LTM Work Plan; Rev1 and **Appendix C**.

3.4 Sample Management

3.4.1 Sample Number and Type

The parameters, media, and estimated laboratory samples as well as the associated QC samples to be collected during this scope of work for the Colonie LTM are presented in **Table 3-5**.

Sample collection, preservation, handling, storage, packaging, and shipping will be performed in a manner that minimizes damage, loss, deterioration, and artifacts. Procedures described are designed to eliminate external contamination and to ensure data quality through the use of approved standardized sampling procedures. References to methods of collection and detailed SOPs are provided in **Appendix C**.

3.4.2 Sample Containers

The integrity of containers for aqueous samples is ensured by the use of appropriate cleaning techniques as specified by the USEPA and DoD guidance. The contract laboratory will purchase pre-cleaned sample bottles for chemical analyses according to requirements set forth in USEPA and DoD Guidelines. Sample container requirements for analyses to be performed for the site investigation are provided on **Table 3-6**.

3.4.3 Sample Preservatives

Preservatives will be used, as applicable, to retard hydrolysis of chemical compounds and complexes, reduce volatility of constituents, and retard biological action during transit and storage prior to laboratory analysis. Preservation acids and bases will be added to the sample containers by the labatory prior to bottle shipment to the site prior to sampling. Additional preservatives will be added to appropriate samples at the time of collection, if required. Sample preservation requirements for analyses to be performed are provided in **Table 3-6**.

3.4.4 Holding Times

Sample holding time is defined as the interval between sample collection and sample extraction and analysis such that a sample may be considered valid and representative of the sample matrix. Sample holding time requirements for analyses to be performed are provided in **Table 3-6**. The laboratory QA program will be responsible for ensuring the adequacy of the sample tracking system in precluding holding time deficiencies.

Table 3-5 Colonie GW LTM Sampling Program

Well Location	Notes	VOCs[1]	Lead[2]	Radionuclides[2]			MNA			
				Gross Alpha & Gross Beta[2]	Total Uranium[2]	Combined Radium[2]	Nitrate, Sulfate & Chloride	Methane, Ethane, & Ethene	Total Organic Carbon	Soluble Mn & Ferrous Iron[3]
Upper Zone										
MW-08S		Q	S	NS	NS	NS	Q	Q	Q	Q
MW-10S		Q	S	NS	NS	NS	Q	Q	Q	Q
MW-21S		Q	S	NS	NS	NS	Q	Q	Q	Q
MW-30S		Q	NS	S	S	S	Q	Q	Q	Q
MW-32S		Q	NS	S	S	S	Q	Q	Q	Q
MW-34S		Q	NS	NS	NS	NS	Q	Q	Q	Q
MW-35S		Q	NS	NS	NS	NS	Q	Q	Q	Q
MW-36S		Q	NS	NS	NS	NS	Q	Q	Q	Q
MW-37S		Q	NS	S	S	S	Q	Q	Q	Q
MW-38S		Q	NS	NS	NS	NS	Q	Q	Q	Q
MW-39S		Q	NS	NS	NS	NS	Q	Q	Q	Q
MW-40S		Q	S	S	S	S	Q	Q	Q	Q
MW-41S		Q	NS	S	S	S	Q	Q	Q	Q
MW-42S		Q	NS	S	S	S	Q	Q	Q	Q
MW-43S		Q	S	S	S	S	Q	Q	Q	Q
Lower Zone										
MW-08M		NS	S	NS	NS	NS	NS	NS	NS	NS
MW-30M		NS	NS	S	S	S	NS	NS	NS	NS
MW-32M		S	S	S	S	S	NS	NS	NS	NS
MW-37M		NS	NS	S	S	S	NS	NS	NS	NS
MW-41M		S	S	S	S	S	NS	NS	NS	NS
MW-42M		NS	NS	S	S	S	NS	NS	NS	NS
MW-43M		S	S	S	S	S	NS	NS	NS	NS
Field Duplicates (5% Frequency per matrix)										
MW-DUP-##		Q	S	S	S	S	Q	Q	Q	Q
Rinse Blanks (only be required when non-dedicated or re-usable sampling equipment is used)										
Trip Blanks (1 per cooler as needed)										
TB1		Q								
TB2		Q								
TB3		Q								
TB4		Q								

[1]VOCs include PCE, TCE, cis-1,2-DCE, trans-1,2-DCE, 1,1-DCE, and VC.
[2]Total & Dissolved fractions are to be analyzed for this analyte.
[3]Soluble manganese and ferrous iron are to be performed in the field using Hach kits.
S = Semiannually Sampling
Q = Quarterly Sampling
NS = No Sample

Table 3-6 Analysis Container, Preservation, and Holding Time Requirements

Analyte	Sample Container/Preservation		Holding Times
	Aqueous		
VOCs	3x 40 mL, glass vials, Teflon-lined septum (5x for MS/MSD)	HCl pH<2, Cool: 4±2°C, zero headspace	Aqueous: 14 days; 7 days if no HCl
Lead (Total and Dissolved)	1x 1L HDPE (2x for MS/MSD) and 1x 1L HDPE (2x for MS/MSD)	HNO_3 pH<2 for total fraction Plain for dissolved fraction (lab filtered)	Aqueous: 180 days
Gross Alpha and Gross Beta (Total and Dissolved)	1x 1L HDPE (2x for MS/MSD) and 1x 1L HDPE (2x for MS/MSD)	HNO_3 pH<2 for total fraction Plain for dissolved fraction (lab filtered)	Aqueous: 180 days
Combined Radium (226 + 228) (Total and Dissolved)	1x 1L HDPE (2x for MS/MSD) and 1x 1L HDPE (2x for MS/MSD)	HNO_3 pH<2 for total fraction Plain for dissolved fraction (lab filtered)	Aqueous: 180 days
Total Uranium (Total and Dissolved)	1x 1L HDPE (2x for MS/MSD) and 1x 1L HDPE (2x for MS/MSD)	HNO_3 pH<2 for total fraction Plain for dissolved fraction (lab filtered)	Aqueous: 180 days
Methane, Ethane and Ethene	3x 40 mL, glass vials, Teflon-lined septum (5x for MS/MSD)	Cool: 4±2°C, zero headspace	Aqueous: 7 days
Sulfate, Chloride, and Nitrate	1x 250mL HDPE (2x for MS/MSD) and 1x 250mL HDPE (2x for MS/MSD)	Cool: 4±2°C Cool: 4±2°C; H_2SO_4 pH<2 for nitrate fraction	Aqueous: 28 days; 2 days for nitrate
Total Organic Carbon	1x 250mL amber Glass, Teflon-lined septum (3x for MS/MSD) and 1x 250mL amber Glass, Teflon-lined septum (3x for MS/MSD)	Cool: 4±2°C; H_2SO_4 pH<2; zero headspace for total fraction Plain; zero headspace for dissolved fraction (lab filtered)	Aqueous: 28 days

*Parameters with same preservation requirements may be combined at laboratory's discretion.

Ref: *USEPA Test Methods for Evaluating Solid Waste Physical/Chemical Methods, Update IV* (USEPA, 2007), *Methods for Chemical Analysis of Water and Wastes* (USEPA, 1983), and *USEPA Prescribed Procedures for Measurement of Radioactivity in Drinking Water* (USEPA, 1980).

3.4.5 Sample Identification

Each sample will be assigned a unique sequential number at the time of sampling on the sample label, which will be permanently affixed to the sample container using polyethylene tape. The sample identification number consists of an alphanumeric designation related to the event, sample origin/type, well location or QC samples (as appropriate), and groundwater zone or field duplicate number (as appropriate) according to the following convention:

- Groundwater Samples: Groundwater samples will be named after the monitoring well from which the sample is collected.

Sample Origin/type:

MW-	= Groundwater monitoring well sample (followed by a "-"dash)

Well Location and QC Samples:

# or ##	= Sequential sample number for each sample well, as appropriate.
DUP-	= Field Duplicate (followed by a "-"dash)

Groundwater Zone and Field Duplicate Samples:

S	= Upper Groundwater Zone
M	= Lower Groundwater Zone
# or ##	= Field duplicate sequential sample order as 1, 2, 3, and so on.

Examples:

MW-08S = Sample collected from monitoring well 08S

MW-DUP-1 = The first duplicate collected for the project. The field duplicate key will be noted in the field logbook.

- Field QC Blanks: All field QC blanks will use the following designation system:

Type:

RB	= Rinse Blank (if required)
TB	= Trip Blank

Collection Order:

# or ##	= QC blank sequential sample order as 01, 02, 03, and so on.

Examples:

RB1 = The first rinse blank taken for the project.
TB2 = The second trip blank taken for the project.

3.4.6 Documentation Requirements

Information pertinent to the sampling effort will be recorded in a field logbooks and a chain of custody (COC) form will trace the sample. Field logbook SOPs EI-FS-001 and field log sheets EI-FS-002 may be found in **Appendix C**. All entries will be made in indelible ink on consecutively numbered pages, and corrections will consist of lineout deletions that are initialed and dated. At a minimum, required field logbook entries include:

Time and date of sample collection;

Sampler identification;

Sample identification number;

Sample type;

Analytical request;

Sampling methodology (grab and composite sample);

Preservation used, as applicable;

Associated QA/QC samples;

Physical field measurements; and

Signature and date of personnel responsible for observations.

Each sample will be assigned a unique sequential number at the time of sampling, which will be permanently affixed to the sample container with polyethylene tape to prevent the loss of the label during shipment. Further discussion as to sample labeling is provided in SOP EI-FS-006 in **Appendix C**. The sample label will be filled out using indelible ink and will include the following information:

Project name and number;

Sample location/site ID;

Sampling date and time;

Analyses to be performed;

Preservative, as applicable; and

Sampler name.

3.4.7 Packaging and COC Requirements

Environmental samples required for shipment must be packaged appropriately in leak-proof coolers to the laboratory. Appropriate custody procedures and documentation must be performed to ensure sample integrity. Further discussion of shipping and packing may be found

in SOP EI-FS-012 of **Appendix C**. The following sections discuss sample packaging, shipment, and custody requirements.

3.4.7.1 Shipping Coolers

Leak proof sample coolers will be shipped to arrive at the laboratory the morning after sampling (priority overnight). The laboratory will be notified of the sample shipment and the estimated date of arrival of the samples being delivered. Shipping coolers are to be clean, leak proof, contamination-free, and in good condition. These containers will be used to transport environmental samples to the laboratory. Suitable sample cooler(s) to handle sample containers packed with bagged ice will be required for sample shipment.

3.4.7.2 Temperature Blanks

Temperature blanks are to be provided to Shaw and will be included in each environmental sample shipping container requiring wet ice. Temperature blanks are required for each cooler for where samples have to meet the USEPA storage requirements of 4ºC±2ºC during shipment when required. See **Table 3-6** for sample preservation requirements. These blanks will be used by the laboratory to measure the shipping container internal temperatures at receipt. These samples will not be analyzed for any scoped analysis.

3.4.7.3 Sample Packaging and Shipment

Samples will be transferred to the contract laboratory for analysis via waterproof plastic coolers. Before samples can be put in the cooler, any drains will be sealed with tape to prevent leaking. Each cooler will be packed in the following manner:

1. Ensure sample lids are tight.
2. Wrap environmental samples and associated QC samples in bubble wrap or similar foam packing material and place in a watertight plastic bag.
3. Fill cooler with enough packing material to prevent breakage of glass bottles.
4. Place sufficient ice in cooler to maintain the internal temperature at 4±2°C during transport. The ice will be double-bagged in sealed 1 gallon size Ziplock bags to prevent contact of the melt water with the samples.
5. Place a temperature blank (if applicable) in cooler.
6. Place associated COCs in a water proof plastic bag, and tape it with masking tape to the inside lid of the cooler.

7. Seal coolers at a minimum of two locations with signed custody seals or evidence tape before being transferred off site. Attach completed shipping label and Saturday Delivery label (if applicable) to top of the cooler. Cover seals with wide, clear packing tape, and continue around the cooler to seal the lid. If the cooler has a drain spout, it may also be sealed with clear packing tape.

3.4.7.4 Chain-of-Custody

Sampling will be evidenced through the completion of a COC form, which accompanies the sample containers in the field, during transit to the laboratory, and upon receipt by the laboratory. The COC will be annotated to indicate time and date that samples are relinquished. In addition, shipping containers will be affixed with custody seals. Further discussion of COC may be found in SOP EI-FS-003 of **Appendix C**. The COC will be filled out using indelible ink and will include the following information:

Project name and number;

The signatures of the sampling personnel;

The site code and sample number;

Sampling dates, locations, and times (military format);

List of the chemical analysis, volume, and preservatives used;

Type of sample, whether "grab" or "composite";

The total number of containers per location;

The custody seal number;

Sample relinquisher, date and time;

Any special remarks (i.e. MS/MSD this sample); and

Courier, or carrier air bill number, and analytical laboratory.

3.5 Off-Site Analytical Procedures

The chemical analysis to be performed by the off-site laboratory includes select VOCs, lead (total and dissolved), radionuclides (total and dissolved) and MNA analysis. The VOC target list includes PCE, TCE, cis-1,2-DCE, trans-1,2-DCE, 1,1-DCE, and VC. The radionuclide analysis includes gross alpha and gross beta (total and dissolved), combined radium (226+228) (total and dissolved), and total uranium (total and dissolved). The MNA analysis to be performed includes, methane, ethene, ethane, sulfate, chloride, nitrate, total organic carbon, ferrous iron (in field), and soluble manganese (in field). The ferrous iron and soluble manganese are to be performed in

the field using Hach kits and the remaining natural attenuation parameters are to be performed by the off-site laboratory.

The off-site analytical preparatory and determinative methods, analyte lists, project MQLs, and screening values to be performed for Colonie LTM are provided on **Table 3-3**. All samples will be performed following the method requirements as outlined in the cited *USEPA Office of Solid Waste and Emergency Response Test Methods for Evaluating Solid Waste Physical/Chemical Methods (SW-846), Update IV* (USEPA, 2007), *USEPA EMSL Prescribed Procedures for Measurement of Radioactivity in Drinking Water* (USEPA, 1980), *Methods for Chemical Analysis of Water and Wastes* (USEPA, 1983), and the *DoD Quality Systems Manual for Environmental Laboratories, Final Version 4.1* (DoD, 2009).

When difficult matrices are present or uncommon analytes requested, the laboratory may perform required and appropriate modifications. SOPs for methods and any modifications used on this project must be submitted to Shaw prior to sample analysis. The laboratory must meet all of the USEPA and DOD QSM QC criteria cited above as well as the project specific criteria as noted in **Section 3.6**.

3.5.1 Volatile Organic Compounds

Samples will be analyzed for the select VOCs using USEPA SW-846 Method 5030B/8260B for aqueous samples using purge and trap technology. Aqueous samples will be sent to the laboratory in zero headspace vials. An inert gas is bubbled through a 25 milliliters (mL) aqueous sample contained at ambient temperature. The vapor is swept through a sorbent column where the purgeable compounds were trapped. After purging is completed for the aqueous samples, the sorbent column is heated and back flushed with the inert gas to desorb the purgeable compounds onto a gas chromatograph programmed to separate the purgeable compounds, which are then detected with a mass spectrometer. The gas chromatography/mass spectroscopy (GC/MS) instrument is calibrated for a series of target analytes using chemical standards of known concentration and purity. Quantification of these target analytes is performed against specific internal standards as identified in the respective method. Identification of these target analytes is based on a comparison of the analyte to the chemical standards used during calibration based on the analyte's retention time and mass spectra.

3.5.2 Lead (Total and Dissolved)

Lead is analyzed using inductively coupled plasma (ICP) technique. Samples for dissolved lead are to be filtered by the laboratory with a 0.45 micron filter prior to acidification. Lead is analyzed for aqueous samples using USEPA SW-846 Method 3010A/6010B. The lab may use the hot block digestion in order to get lower detection limits as well as reducing contamination

issues that occur from hot plate or microwave digestion procedures. The ICP method involves the simultaneous or sequential multi-element assessment of trace elements in solution. The basis of the method is the measurement of atomic emission by optical spectrometry. Samples are nebulized and the aerosol that was produced was transported to the plasma torch where excitation occurs. Characteristic atomic-line emission spectra are produced by a radio-frequency ICP. A background correction technique is utilized to compensate for variable background contribution for the assessment of trace elements.

3.5.3 Gross Alpha and Gross Beta (Total and Dissolved)

Samples will be analyzed for Gross Alpha and Gross Beta by USEPA Method 900.0. Samples for dissolved Gross Alpha and Gross Beta are to be filtered by the laboratory with a 0.45 micron filter prior to acidification. An aliquot of a preserved sample is evaporated to a small volume and transferred quantitatively to a tarred 2-in. stainless steel counting planchet. The sample residue is dried to constant weight, reweighed to determine dry residue weight, and then counted for alpha and/or beta radioactivity. Counting efficiencies for both alpha and beta particle activities are selected according to the amount of sample solids from counting efficiency vs. sample solids standard curves.

3.5.4 Combined Radium 226 + 228 (Total and Dissolved)

Samples will be analyzed for combined radium through the addition of radium 226 and radium 228 isotopes together. Samples for dissolved combined radium are to be filtered by the laboratory with a 0.45 micron filter prior to acidification.

Samples will be analyzed for Radium 226 by USEPA Method 903.0 Mod. The radium in the sample is collected by co-precipitation with barium and lead sulfate and purified by re-precipitation from EDTA solution. Citric acid is added to the water sample to assure that complete interchange occurs before the first precipitation step. The final BaSO4 precipitate, which includes radium-226, radium-224, and radium-223, is alpha counted to determine the total disintegration rate of the radium isotopes. The radium activities are counted in an alpha counter where efficiency for determining radium-226 has been calibrated with a standard of known radium-226 activity. By making a correction for the in-growth of alpha activity in radium-226 for the elapsed time after separation, one can determine radium activity in the sample. Because some daughter in-growth can occur before the separated radium is counted, it is necessary to make activity corrections for the count rate.

Samples will be analyzed for Radium 228 by USEPA Method 904 Mod. The radium in the sample is collected by co-precipitation with barium and lead sulfate and purified by re-precipitation from EDTA solution. After a 36-hr in-growth of actinium-228 from radium-228, the actinium-228 is carried on yttrium oxalate, purified and counted for beta activity.

3.5.5 Uranium (Total and Dissolved)

Total uranium will be analyzed using inductively coupled plasma mass spectroscopy (ICP/MS) using USEPA SW-846 Methods 3010A (Mod.)/6020 for aqueous samples. Samples for dissolved uranium are to be filtered by the laboratory with a 0.45 micron filter prior to acidification. The modifications to the preparatory methods for the ICP/MS analysis include the use of a hot block digestion step. The lab may use the hot block digestion in order to get lower detection limits as well as reducing contamination issues that may occur from hot plate or microwave digestion procedures. The ICP/MS method involves the simultaneous or sequential multi-element assessment of trace elements in solution. The basis of the method is the measurement of atomic emission by optical spectrometry. Samples are nebulized and the aerosol that was produced was transported to the plasma torch where excitation occurs. Characteristic atomic-line emission spectra are produced by a radio-frequency ICP. A background correction technique is utilized to compensate for variable background contribution for the assessment of trace elements. Identification of uranium is based on the analyte's retention time and mass spectra.

3.5.6 Ethene, Methane, and Ethane

Samples will be analyzed for ethene, methane, and ethane using USEPA Method 3810/RSK 175. This method uses a gas chromatograph equipped with a thermal conductivity detector. An inert gas is bubbled through a 25 mL sample contained in a specifically designed purging chamber at ambient temperature. The vapor is swept through a sorbent column where the purgeable compounds are trapped. After purging is completed for aqueous samples, the sorbent column is heated and back flushed with the inert gas to desorb the purgeable compounds onto a gas chromatography programmed to separate the purgeable compounds that are then detected with the thermal conductivity detector.

3.5.7 Total Organic Carbon

Samples will be analyzed for Total Organic Carbon (TOC) using USEPA SW-846 Method 9060A. Aqueous samples are subjected to either a catalytic combustion or wet chemical oxidation to convert the organic carbon in the sample to carbon dioxide. The carbon dioxide formed is then measured directly by an infrared detector or converted to methane and measured by a flame ionization detector. The amount of carbon dioxide or methane produced is directly proportional to the concentration of carbonaceous material.

3.5.8 Chloride, Sulfate, and Nitrate

Aqueous samples will be analyzed for chloride, sulfate, and nitrate using ion chromatography method USEPA 300. The anions of interest are separated on the basis of their relative affinities for a low capacity, strong basic anion exchanger when they are converted to their highly

conductive acid forms and measured by conductivity on the basis of retention times. Concentrations are determined from a linear curve for each anion based on peak height or area under each peak produced.

3.6 On-Site Analytical Procedures

The chemical analysis to be performed on-site includes ferrous iron and soluble manganese. Ferrous iron and soluble manganese are to be performed in the field using Hach kits and the remaining natural attenuation parameters are to be performed by the off-site laboratory as described in the prior section.

3.6.1 Ferrous Iron (Field Test Kit)

Samples will be analyzed in the field for ferrous iron using Hach method 8146. This procedure is a colorimetric determination. The 1,10-phenanthroline indicator in Ferrous Iron Reagent reacts with ferrous iron in the sample to form an orange color in proportion to the iron concentration. Ferric iron does not react. The ferric iron (Fe3+) concentration can be determined by subtracting the ferrous iron concentration from the results of a total iron test. A chelation occurs producing an orange-red color.

3.6.2 Soluble Manganese (Field Test Kit)

Samples will be analyzed for soluble manganese using Hach method 8149. The 1-(2-Pyridylazo)-2-Naphthol (PAN) method is a highly sensitive and rapid procedure for detecting low levels of manganese. An ascorbic acid reagent is used initially to reduce all oxidized forms of manganese to Mn2+. An alkaline-cyanide reagent is added to mask any potential interferences. PAN Indicator is then added to combine with the Mn2+ to form an orange-colored complex.

3.7 Calibration Procedures

3.7.1 Field Equipment Calibration

Field equipment that may be used during collection of environmental samples at the site includes the Horiba U-10 Water Quality Checker or equivalent, a photoionization detector (PID) equipped with an 10.6 eV lamp, an MSA Passport® combustible gas indicator or equivalent, and an MIE *personal* DataRAM™ (pDR) or equivalent (to measure real-time concentrations of airborne particulates).

Field QC check control limits (pH, conductivity, and turbidity) for the Horiba U-10 Water Quality Checker are outlined below. In addition, field determinations of pH, conductivity, turbidity, temperature, dissolved oxygen, and oxidation/reduction potential are obtained in

duplicate once for every 20 aqueous samples collected. Water quality parameters are considered to be stable for sample collection for when there are three consecutive readings as defined as follows:

- pH ± 0.2 units
- Temperature ± 1.0 °C
- Turbidity ± 10 percent or 5 NTUs, whichever is greater
- Specific conductivity ± 3 percent of reading
- Dissolved oxygen ± 10 percent of reading or 0.2 mg/L, whichever is greater
- Redox Potential (ORP or Eh) ± 20 mV

3.7.1.1 Horiba (or equivalent)

The Horiba (or equivalent) will be calibrated upon arrival to the site and daily while in the field. The calibration of pH, conductivity, dissolved oxygen, and reduction oxidation potential will include a daily initial measurement prior to calibration, a measurement after calibration, and measurement at the end of the day. Measurements will be documented in the field logbook or on a separate calibration log form by the field personnel performing the calibration.

- pH: If the pH QC sample (pH 7.0 or pH 10.0 buffer after initial automatic calibration with pH 4.0 buffer) exceeds ±0.5 pH units from the true value, the source of the error is determined and the instrument re-calibrated. If a continuing calibration check with pH 7.0 buffer is off by ±0.5 pH unit, the instrument is re-calibrated.

- Conductivity: QC samples must be within ±10% of the true values. The true value for conductivity in the automatic calibration solution is 4,490 umhos/cm.

3.7.1.2 Turbidity Meter

The turbidity meter will be calibrated upon arrival and departure of the site and daily while in the field. The calibration of the turbidity meters will include a daily initial measurement prior to calibration, a measurement after calibration, and measurement at the end of the day. Measurements will be documented in the field logbook or on a separate calibration log form by the field personnel performing the calibration. QC samples must be within ±10% of the true values. Turbidity QC samples are commercially prepared polymer standards such as those available from Advanced Polymer System, Inc. or equivalent.

3.7.1.3 Other Field Equipment

The PID, Passport and pDR are each calibrated according to the manufacturer's instructions at the beginning of the day, whenever the instrument is turned off for more than two hours, and at the discretion of the Site Safety and Health Officer (SSHO). The Hach test kit calibration and

maintenance procedures for ferrous iron and soluble manganese may be found in the field SOPs located in **Appendix C**

3.7.1.4 Field Equipment Maintenance

Prior to field sampling events, each piece of field equipment is inspected to ensure it is operational. If necessary, the equipment is serviced. Meters that require charged batteries are fully charged or have fresh batteries. Due to Shaw's relationship with a number of firms that rent instrumentation and safety and sampling equipment, significant downtime should not occur. In addition to this, key spare parts and equipment are available on-site to prevent downtime.

The proper calibration and documentation of field equipment are designed to assure that the field equipment is functioning optimally. Equipment logbooks are required to record usage, maintenance, calibration, and repair. Further details as to field calibrations and equipment use may be found in Shaw's field SOPs located in **Appendix C**.

3.7.2 Laboratory Calibration

Prior to sample analysis, chemical calibration of each target analyte/compound must be performed to ensure analytical instrumentation is functioning within the established sensitivity range. Laboratory calibration steps include the performing of solution validation, initial calibration, daily calibration, and continuing calibration procedures. Protocols defining the QC procedures, rounding rules, corrective actions, and QC measurements for instrument calibration should be done in accordance with criteria specified in the analytical method, laboratory QA plan, and the prime contractor's SOPs. The units and QLs for the analytical methods to be used are found on **Table 3-3**. The QA/QC method calibration requirements may be found in **Tables 3-7 through 3-13**. Further details as to laboratory calibrations and equipment use may be found in the laboratory's LQAP located in **Appendix D**.

3.8 Internal QC Checks

3.8.1 Laboratory QC Elements

Laboratory analytical goals are summarized on **Table 3-14** for parameters specified in **Section 3.5**. USEPA and USACE QC criteria will be followed in accordance with the actual USEPA method and DoD QSM protocols. QC criteria will be assessed to provide quantitative data for determining method performance through the data validation process. The following general QC criteria will be included in each analytical lot as appropriate:

Initial Calibration;

Continuing Calibration;

Independent Source Standards;

Method and/or Preparation Blanks;

Calibration blanks;

Table 3-7 Quality Control Method Criteria for Volatile Organic Compounds by USEPA SW-846 8260B

Procedure	Frequency	Acceptance Criteria		Corrective Action
Initial Calibration 5-pt curve	Set-up, major maintenance, and quarterly	RRF > 0.1 for SPCCs chloromethane, 1,1-dichloroethane, and bromoform RRF > 0.3 for SPCCs 1,1,2,2-tetrachloroethane and chlorobenzene RRF > 0.05 for the other target compounds (see **Table 3-3**) RSD ≤ 30% for CCCs response factors RSD ≤ 15% for the other target compounds (see **Table 3-3**) If linear regression is used r ≥0.995 or r^2 ≥0.99 ICV: %Rec. = 80-120% Retention times within ±0.06 RRT units Qualify results between MDL and MRL as estimated.		If RSD of the average RRF for calibration check compounds > 30%, the initial calibration must be repeated. Data reviewer should review and judge the target compounds against the acceptance criteria.
Continuing calibration check	Every 12 hours	RRF > 0.1 for SPCCs chloromethane, 1,1-dichloroethane, bromoform RRF > 0.3 for SPCCs 1,1,2,2-tetrachloroethane and chlorobenzene RRF > 0.05 for the other target compound (see **Table 3-3**) %D ≤ 20% for every target compound (see **Table 3-3**)		Samples cannot begin until this criterion is met. Data reviewer should review and judge the target compounds against the acceptance criteria.
Method blanks	Every 12 hours	< ½ MRL; <MRL for common laboratory contaminants.		Document source of contamination.
Tuning BFB	Prior to calibration	Must meet tuning criteria.		Re-tune, re-calibrated.
LCS	Every batch	Standards Every target compound (see **Table 3-3**)	Aqueous Every target compound (see **Table 3-3**)	Qualify associated data biased high or biased low as appropriate.
Internal Standards	Every sample	Standards Bromochloromethane 1,4-difluorobenzene chlorobenzene	Criteria Retention time ±30 seconds of last CC Area changes by a factor of two (-50% to +100%)	Inspect for malfunction. Demonstrate that system is functioning properly. Reanalyze samples with standards outside criteria.
Surrogate	Every sample	Standards 4-bromofluorobenzene 1,2-dichloroethane-d_4 toluene-d_8	Aqueous 75–120% 70–120% 85–120%	If surrogate compounds do not meet criteria, there should be a re-analysis to confirm that the non-compliance is due to the sample matrix effects rather than laboratory deficiencies.
Matrix Spike and Duplicate	1 per 20 per matrix	Standards Every target compound (see **Table 3-3**)	Aqueous Every target compound (see **Table 3-3**)	If MS/MSD results do not meet criteria, the reviewer should review the data in conjunction with other QC results to identify whether the problem is specific to the QC samples or systematic.

Ref: USEPA Test Methods for Evaluating Solid Waste Physical/Chemical Methods, Update IV (USEPA, 2007) and DoD Quality Systems Manual for Environmental Laboratories, Final Version 4.1 (DoD, 2009).

Table 3-8 Quality Control Method Criteria for Lead by SW-846 6010B and Uranium by SW-846 6020

Procedure	Frequency of QC Procedure	Acceptance Criteria	Corrective Action
Initial calibration curve (5-pt curve Hg) (1-pt curve low level ICP)	Daily or major maintenance, instrument modification, replacement of the torch, replacement of the mirror	r > 0.995 for each element r: linear correlation coefficient Low level check std. ± 20% recovery Second Source = ICV = 90-110% recovery If MSA performed, r≥ 0.995 Qualify results between MDL and MRL as estimated.	If r < 0.995 for an element, the standards for that element must be prepared again and/or the lower/upper range standard must be used.
Tuning	Prior to initial calibration.	For ICPMS only: Mass calibration ≤ 0.1 amu from the true value; Resolution < 0.9 amu full width at 10% peak height; For stability, RSD ≤ 5% for at least four replicate analytes	Retune instrument then reanalyze tuning solutions.
Second source standard (ICV)	Once after initial calibration.	Recovery ±10% of true value for ICP and ICPMS	Correct problem and verify second source standard. Rerun second source verification. If that fails, correct problem and repeat initial calibration.
Continuing calibration verification (CCV)	Every 10 samples or 2 per 8 hr and end of run.	Recovery ±10% of true value for ICP and ICPMS	Reanalyze CCV. If the CCV fails second time, the analysis must be terminated, the problem corrected, the instrument re-calibrated, and the calibration re-verified prior to continuing sample analyses.
Low-level calibration check standard	Once after initial calibration.	Recovery ±20% of true value for ICP and ICPMS	No samples may be analyzed without a valid low-level calibration check standard. Low-level calibration check standard should be less than or equal to the reporting limit.
Highest mixed standard	Before sample analysis	Recovery ±10% of true value for ICP and ICPMS	If criteria are not met, reanalyze the daily standards. If the daily standard fails a second time, initial calibration must be repeated.
Interference check standard (ICS)	Beginning and end of each sample analytical run or 2 per 8 hr.	ICS-A: <2 x MDL ICS-AB: Recovery ±20% of true value for ICP	Terminate the analysis, correct the problem, re-calibrate, re-verify the calibration, and reanalyze the samples.
Initial and continuing calibration blank (ICB/CCB)	Every 10 samples, end of analytical run	< LOD (level of detection)	If the average in not within criteria, terminate the analysis, correct the problem, re-calibrate, and reanalyze each sample analyzed since the last acceptable CCB.
Serial Dilution (ICP)	1 per 20 per matrix for samples >10x IDL	Difference between diluted and undiluted sample <10% for ICP	Chemical or physical interference should be suspected. Investigate to identify cause.
Preparation/method blank	1 per batch per matrix	< ½ MRL; <MRL for common laboratory contaminants.	Documented source of contamination.
Laboratory Control Sample	1 per 20 samples	See **Table 3-3**	Qualify associated data biased high or biased low as appropriate.
Matrix spike and duplicate and sample duplicate	1 per 20 samples per matrix	See **Table 3-3**	If matrix spike recovery does not meet criteria (except Ag), a post digestion spike is required for each method except GFAA. Qualify results in accordance with USEPA criteria.

Ref: USEPA Test Methods for Evaluating Solid Waste Physical/Chemical Methods, Update IV (USEPA, 2007) and DoD Quality Systems Manual for Environmental Laboratories, Final Version 4.1 (DoD, 2009).

Table 3-9 Quality Control Method Criteria for Gross Alpha and Gross Beta by USEPA 900.0

Procedure	Frequency of QC Procedure	Acceptance Criteria	Corrective Action
Initial calibration	Major maintenance, instrument modification, per manufacturer's specifications	Calibration std. NIST traceable; Counting error for not-counts $\pm$5%; Efficiency of each detector at 0% solids $\geq$20%	If criteria are not met, reanalyze the daily standards. If the daily standard fails a second time, initial calibration must be repeated.
Continuing calibration blank (CCB)	Every 10 samples, end of analytical run	No target analytes >MDC	If not within criteria, terminate the analysis, correct the problem, re-calibrate, and reanalyze all samples analyzed since the last acceptable CCB.
Preparation blank	1 per 20 samples per matrix	No target analytes >MDC	Documented source of contamination.
Laboratory Control Sample	1 per 20 samples	See **Table 3-3**	Qualify associated data biased high or biased low as appropriate.
Matrix spike and duplicate	1 per 20 samples per matrix	See **Table 3-3**	IF MS/MSD results do not meet criteria, the reviewer should review the data in conjunction with other QC results to determine if the problem is specific to QC samples or systematic. Qualify as appropriate.

Ref: USEPA EMSL Prescribed Procedures for Measurement of Radioactivity in Drinking Water (USEPA, 1980) and DoD Quality Systems Manual for Environmental Laboratories, Final Version 4.1 (DoD, 2009).

Table 3-10 Quality Control Method Criteria for Radium 226 by USEPA 903.0 Mod. and Radium 228 by USEPA 904 Mod.

Procedure	Frequency of QC Procedure	Acceptance Criteria	Corrective Action
Initial calibration curve (3 point)	Major maintenance, instrument modification, per manufacturer's specifications	If linear reg.: Correlation coefficient $\geq$0.995.	If criteria are not met, reanalyze the daily standards. If the daily standard fails a second time, initial calibration must be repeated.
Continuing calibration verification (CCV)	Every 10 samples, end of analytical run	Recovery ±10% of true value.	Reanalyze CCV. If the CCV fails second time, the analysis must be terminated, the problem corrected, the instrument re-calibrated, and the calibration re-verified prior to continuing sample analyses.
Continuing calibration blank (CCB)	Every 10 samples, end of analytical run	No target analytes >MDC	If not within criteria, terminate the analysis, correct the problem, re-calibrate, and reanalyze all samples analyzed since the last acceptable CCB.
Preparation blank	1 per 20 samples per matrix	No target analytes >MDC	Documented source of contamination.
Laboratory Control Sample	1 per 20 samples	See **Table 3-3**	Qualify associated data biased high or biased low as appropriate.
Matrix spike and duplicate	1 per 20 samples per matrix	See **Table 3-3**	If MS/MSD results do not meet criteria, the reviewer should review the data in conjunction with other QC results to determine if the problem is specific to QC samples or systematic. Qualify as appropriate.

Ref: USEPA EMSL Prescribed Procedures for Measurement of Radioactivity in Drinking Water (USEPA, 1980) and DoD Quality Systems Manual for Environmental Laboratories, Final Version 4.1 (DoD, 2009).

Table 3-11 Quality Control Method Criteria for Methane, Ethane, and Ethene by USEPA SW-846 3810/RSK175

Procedure	Frequency of QC Procedure	Acceptance Criteria	Corrective Action
Initial calibration curve 5-pt curve	Set-up, major maintenance	If linear regression is used r ≥0.995 If calibration factor is used: %RSD<20% ICV: %Rec. = 80-120% Qualify results between MDL and MRL as estimated.	Must meet criteria prior to sample analysis
Continuing calibration (calibration check)	Daily	%D recovery ± 20% of the response factor from the initial curve for every target compound. CCV: %Rec. = 80-120%	If criteria are not met, reanalyze the daily standard. If the daily standard fails a second time, initial calibration must be repeated.
Laboratory Control Standard (LCS)	Every batch	See **Table 3-3**	%R are outside criteria, sample batch should be re-calibrated and re-analyzed. If still outside criteria, qualify associated data biased high or biased low as appropriate.
Method/preparation blanks	1 per batch	< ½ MRL	Document source of contamination.
Matrix spike and duplicate	1 per 20 samples per matrix	See **Table 3-3**	If MS/MSD results do not meet criteria, the reviewer should review the data in conjunction with other QC results to determine if the problem is specific to QC samples or systematic. Qualify as appropriate.

Ref: USEPA Test Methods for Evaluating Solid Waste Physical/Chemical Methods, Update IV (USEPA, 2007) and DoD Quality Systems Manual for Environmental Laboratories, Final Version 4.1 (DoD, 2009).

Table 3-12 Quality Control Method Criteria for Chloride, Sulfate, and Nitrate by USEPA 300

Procedure	Frequency of QC Procedure	Acceptance Criteria	Corrective Action
Initial calibration curve 5-pt curve	Major maintenance, instrument modification, per manufacturer's specifications	For each anion: r > 0.995 r: linear correlation coefficient Retention times within ±3 Std deviations Qualify results between MDL and MRL as estimated.	If r < 0.995, the standards must be prepared again.
Initial calibration standard (ICV) and second source standard	1 per batch	Recovery ±10% of true value.	If criteria are not met, reanalyze the daily standards. If the daily standard fails a second time, initial calibration must be repeated.
Continuing calibration verification (CCV)	Every 10 samples, end of analytical run	Recovery ±10% of true value.	Reanalyze CCV. If the CCV fails second time, the analysis must be terminated, the problem corrected, the instrument re-calibrated, and the calibration re-verified prior to continuing sample analyses.
Continuing calibration blank (CCB)	Every 10 samples, end of analytical run	< ½MRL	If not within criteria, terminate the analysis, correct the problem, re-calibrate, and reanalyze all samples analyzed since the last acceptable CCB.
Preparation blank	1 per 20 samples per matrix	< ½MRL	Documented source of contamination.
Laboratory Control Sample	Every batch for all compounds	See **Table 3-3**	%R are outside criteria, sample batch should be re-calibrated and re-analyzed. If still outside criteria, qualify associated data biased high or biased low as appropriate.
Sample duplicate	1 per 10 samples per matrix	RPD≤10%.	If SD results do not meet criteria, the reviewer should review the data in conjunction with other QC results to determine if the problem is specific to QC samples or systematic. Qualify as appropriate.
Matrix spike and duplicate	1 per 20 samples per matrix	See **Table 3-3**	If MS/MSD results do not meet criteria, the reviewer should review the data in conjunction with other QC results to determine if the problem is specific to QC samples or systematic. Qualify as appropriate.

Ref: Methods for Chemical Analysis of Water and Wastes (USEPA, 1983) and DoD Quality Systems Manual for Environmental Laboratories, Final Version 4.1 (DoD, 2009).

Table 3-13 Quality Control Method Criteria for Organic Carbon by USEPA SW-846 9060A

Procedure	Frequency of QC Procedure	Acceptance Criteria	Corrective Action
Initial calibration curve 5-pt curve	Major maintenance, instrument modification, per manufacturer's specifications	r > 0.995 r: linear correlation coefficient Qualify results between MDL and MRL as estimated.	If r < 0.995, the standards must be prepared again.
Initial calibration standard (calibration verification)	1 per batch	Recovery ±10% of true value.	If criteria are not met, reanalyze the daily standards. If the daily standard fails a second time, initial calibration must be repeated.
Continuing calibration verification (CCV)	Every 10 samples, end of analytical run	Recovery ±10% of true value.	Reanalyze CCV. If the CCV fails second time, the analysis must be terminated, the problem corrected, the instrument re-calibrated, and the calibration re-verified prior to continuing sample analyses.
Continuing calibration blank (CCB)	Every 10 samples, end of analytical run	< ½ MRL; <MRL for common laboratory contaminants.	If not within criteria, terminate the analysis, correct the problem, re-calibrate, and reanalyze all samples analyzed since the last acceptable CCB.
Preparation blank	1 per 20 samples per matrix	< ½ MRL; <MRL for common laboratory contaminants.	Documented source of contamination.
Laboratory Control Sample	Every batch for all compounds	See **Table 3-3**	%R are outside criteria, sample batch should be re-calibrated and re-analyzed. If still outside criteria, qualify associated data biased high or biased low as appropriate.
Matrix spike and duplicate	1 per 20 samples per matrix	See **Table 3-3**	If MS/MSD results do not meet criteria, the reviewer should review the data in conjunction with other QC results to determine if the problem is specific to QC samples or systematic. Qualify as appropriate.

Ref: USEPA Test Methods for Evaluating Solid Waste Physical/Chemical Methods, Update IV (USEPA, 2007) and DoD Quality Systems Manual for Environmental Laboratories, Final Version 4.1 (DoD, 2009).

Table 3-14 Analytical Quality Control Objective, Frequency, and Requirements

Item	DQO	Parameter	Frequency of Association	Criteria Requirement
Analytical Method	C, R	All	Each analysis	Method analysis based on USEPA methods as defined on **Tables 3-7 through 3-13**.
Chemical Data Packages	A,P,C	All	Each lot/batch	Pass peer review and formal QA/QC check.
Quarterly Laboratory Internal Audit Reports	R	All	Per Lab QAPP	No deficiencies.
Laboratory System Controls	R	All	During laboratory operations	Custody of sample within laboratory fully accounted for and documented.
Holding Time	A,P,R	All	Each analysis	No deficiencies.
Method and Calibration Blanks	A	All	Each lot/batch	< ½ MRL; <MRL for common laboratory contaminants. For metals, calibration blanks <2MDL.
Laboratory Control Samples and duplicates	A,P	All	Each lot/batch	Must meet USEPA method criteria (**Tables 3-3, 3-7 through 3-13**).
Matrix Spikes and duplicates	A,P	All	Each lot/batch	Must meet USEPA method criteria (**Tables 3-3, 3-7 through 3-13**).
Surrogates	A	Organics	Organic fractions, including QC samples	Must meet USEPA method criteria (**Table 3-7**).
Serial dilution	A	Metals	Each lot/batch	Must meet USEPA method criteria (**Table 3-8**).

Legend:
C = Comparability A = Accuracy R = Representativeness P = Precision

MS and MSDs;

Laboratory Duplicates;

Field Duplicates (from field sampling);

Serial Dilutions (for ICP and ICP/MS metals);

Interference Check Sample (for ICP and ICP/MS metals);

Surrogates (for organics);

Internal Standard (if necessary);

Post Digestion Spikes (for metals);

LCSs and

Instrument Performance Check (Tune) Sample (for gas chromatograph/mass spectrometer).

Specific QC method criteria for the parameters of interest may be found in **Table 3-3 and Tables 3-7 through 3-13**. Method specific QC measures will be enforced for this scope of work for Colonie LTM.

3.8.2 Field Quality Control Samples

Field operations performed during the Colonie LTM will include the collection of several types of QC samples on **Table 3-15**. Field QC elements are summarized on **Table 3-16**. Trip blanks and field duplicates will be collected during the acquisition of environmental samples at the Colonie Site. Rinse blanks will only be collected when non-dedicated or re-usable sampling equipment is used. In addition, every cooler transporting sample(s) will have a temperature blank. If a target analyte is detected in any of the QC blanks, data will be evaluated to determine if corrective action measures will be required.

Table 3-15 Field Quality Control Samples

Type of Control	Purpose of Sample	Collection Frequency
Duplicate Sample	ensure precision in sample homogeneity during collection and analysis	1 per 20 (5%) samples per matrix.
Rinse Blank	ensure the decontamination of sampling equipment has been adequately performed; to assess cross contamination and/or incidental contamination to the sample container	Only required when non-dedicated or re-usable sampling equipment is used. If needed, not to exceed 5% frequency per matrix per equipment type.
Trip Blank	assess whether cross-contamination occurs during shipment or storage with aqueous VOC samples	1 trip blank per cooler containing aqueous VOC samples
Temperature Blank	verify sample cooler temperature during transport	1 temperature blank per cooler

Table 3-16 Field QC Elements of QA Program

Item	DQO	Parameter	Frequency of Association	Criteria Requirement*
Field Duplicates	P	All	5% (1 per 20) of samples per matrix	Organics: RPD ≤ 50% Inorganics: RPD ≤ 25% Radiological: RER ≤ 1.5 (qualify as appropriate*)
Rinse Blank	A,R	All	Only required when non-dedicated or re-usable sampling equipment is used. If needed, not to exceed 5% frequency per matrix per equipment type.	< ½MRL; <MRL for common laboratory contaminants; qualify as appropriate*
Trip Blank	A,R	Aqueous VOCs	1 per cooler	< ½MRL; <MRL for common laboratory contaminants; qualify as appropriate*
Chain of Custody	R	All	Every sample	Filled out correctly to include signatures; no missing or incorrect info
Field Instrument Calibration Logs	A	All Field Analysis	Every measurement	All measurements must have associated calibration reference

*Ref: USEPA data validation guidelines.
Legend:
A = Accuracy R = Representativeness P = Precision

3.9 Data Collection, Reduction, Validation, and Reporting

The collection, reduction, validation, and reporting of environmental data are described in this section. The intended use of the data and the associated acceptance criteria for data quality will be determined before the data collection effort begins. Reported data will include, when appropriate, statements of precision, accuracy, representativeness, completeness, comparability, and sensitivity. Data processing procedures will be documented, reviewed, and revised by the QC Manager, as required to meet USEPA data quality requirements. The laboratory QA Manager will be responsible for data processing at the contract laboratory.

3.9.1 Lab Data Collection

Data are initially collected, converted to standard reporting units and recorded by the laboratory chemist. The laboratory chemist conducts preliminary data analyses using a variety of methods and procedures. Because many analytical instruments are microprocessor controlled, some of the requisite analyses can be performed directly in the instrument's operating or outputting mode. Those instruments interfaced to stand-alone computers or microprocessors often permit data analysis programs to be written and modified to produce data formats specifically suited to end user requirements. Data requiring manual recording, integration, and/or analysis may be converted to a more appropriate format prior to subsequent analyses. Through all stages and aspects of data processing, the data are double-checked for translation or transcription errors and are initialed by both the recorder and the checker. The laboratory QA Manager or other designated individual not directly involved in the analysis reviews the data for acceptability.

3.9.2 Lab Data Reduction

Data reduction frequently includes computation of analytical results from raw instrument data and summary statistics, including standard errors, confidence intervals, test of hypotheses relative to the parameters, and model validation. Data reduction procedures address the reliability of computations and the overall accuracy of the data reduction. The numerical transformation algorithms used for data reduction will be verified against a known problem set to ensure that the reduction methods are correct. The equations and the typical calculation sequence that should be followed to reduce the data to the acceptable format are instrument and method-specific. Where standard methods are modified, data reduction techniques will be described in a report accompanying the data.

3.9.3 Data Validation

Data validation is the process whereby data are determined to be of acceptable or unacceptable quality based on a set of predefined criteria by Shaw. These criteria depend upon the type(s) of data involved and the purpose for which data are collected. Data packages will be validated to ensure project compliance with specified analytical, QA, and data reduction procedures; data reporting requirements; and required accuracy, precision, and completeness criteria. All parameters of interest for the long-term monitoring samples will be fully validated for the Colonie LTM-. The monitored natural attenuation will have a limited validated. Specific validation levels may be found in the DQOs tables in **Section 3.1.1**. Data validation results will be reported with the final findings. Data will be validated using a combination of the following criteria:

Project specific Work Plan, Rev 1. and/or QAPP criteria;

DoD Quality Systems Manual for Environmental Laboratories, Final Version 4.1 (DoD, 2009);

Method-specific criteria following *USEPA Office of Solid Waste and Emergency Response Test Methods for Evaluating Solid Waste Physical/Chemical Methods (SW-846), Update IV* (USEPA, 2007), *Methods for Chemical Analysis of Water and Wastes* (USEPA, 1983), and *USEPA EMSL Prescribed Procedures for Measurement of Radioactivity in Drinking Water* (USEPA, 1980), and

Subcontract Laboratory SOPs.

Table 3-17 present the laboratory and the data validation qualifiers to be used for the Colonie LTM and are to be applied as applicable. The laboratory qualifiers are as per *DoD Quality Systems Manual for Environmental Laboratories, Final Version 4.1* (DoD, 2009) and the data validation qualifiers are consistent with the following USEPA, Region II, and multi-agency guidance (as applicable):

USEPA Hazardous Waste Support Branch Validating Volatile Organic Compounds by Gas Chromatography / Mass Spectrometry SW-846 Method 8260B, Revision 2 (SOP HW-24), (USEPA, 2008a),

USEPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review (USEPA, 2008b),

USEPA, USDOD, USDOE, USNRC, et al., Multi-Agency Radiological Laboratory Analytical Protocols Manual, Chapter 8 (July 2004),

USEPA Region II Evaluation of Metals Data for the Contract Laboratory Program, Revision 13 (SOP HW-2, September, 2006), and

USEPA Contract Laboratory Program Functional Guidelines for Inorganic Data Review (February, 2004).

Table 3-17 Laboratory and Data Validation Qualifiers

Qualifier	Definition
Laboratory Qualifiers[1]	
U	Undetected at the limit of detection: The associated data value is the limit of detection, adjusted by any dilution factor used in the analysis.
J	Estimated: The analyte was positively identified; the quantitation is an estimation.
B	Blank contamination: The analyte was detected above one-half the reporting limit in an associated blank.
N	Non-target analyte: The analyte is a tentatively identified compound (using mass spectroscopy).
Q	One or more quality control criteria failed.
USEPA Data Validation Qualifiers[2]	
U	The analyte was analyzed for, but was not detected above the level of the reported sample quantitation limit due to blank contamination.
J	The positive result is an estimated quantity. The associated numerical value is the appropriate concentration of the analyte in the sample.
J+	The result is an estimated quantity, but the result may be biased high.
J-	The result is an estimated quantity, but the result may be biased low.
N	The analysis indicates the present of an analyte for which there is presumptive evidence to make a "tentative identification".
NJ	The analysis indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents its approximate concentration.
R	The data are unusable. The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meeting the Quality Control criteria. The analyte may or may not be present in the sample.
UJ	The analyte was analyzed for, but was not detected above the reported sample quantitation limit. The reported quantitation limit is approximate and may be inaccurate or imprecise.

[1] The noted laboratory qualifiers are a minimum. If a laboratory has more and they are consistent with DoD and properly defined, the laboratory may use them. Data qualifiers may be combined when appropriate. Ref.: *DoD Quality Systems Manual for Environmental Laboratories, Final Version 4.1* (DoD, 2009).

[2] The USEPA data validation qualifiers are compilation from *USEPA Hazardous Waste Support Branch Validating Volatile Organic Compounds by Gas Chromatography / Mass Spectrometry SW-846 Method 8260B, Revision 2 (SOP HW-24), (USEPA, 2008a), USEPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review (USEPA, 2008b), USEPA, USDOD, USDOE, USNRC, et al., Multi-Agency Radiological Laboratory Analytical Protocols Manual, Chapter 8 (July 2004), USEPA Region II Evaluation of Metals Data for the Contract Laboratory Program, Revision 13 (SOP HW-2, September, 2006), and USEPA Contract Laboratory Program Functional Guidelines for Inorganic Data Review (February, 2004).*

Data generated requiring limited validation effort (see **Table 3-2**) will be performed to assess laboratory performance, including a review of: completeness, chain-of-custody, holding times, QC results reported on summary forms (LCS, Method blanks, MS/MSD, and equipment blank), detection and reporting limits, and other contractual items. Data generated requiring full level data validation (see **Table 3-2**) will be assessed for accuracy, precision, comparability, representativeness, completeness, and sensitivity. Blank contamination assessment is discussed in the **Section 3.9.4**. The subcontract laboratory will provide an Excel spreadsheets and/or Access databases (or equivalent) which will be used by Shaw to assist in the hardcopy validation of the following elements as applicable:

Holding Times and Preservation;

Blank Analysis;

Initial Calibration;

Continuing Calibration;

Gas Chromatograph/Mass Spectrometer or GC Instrument Performance Check;

Surrogate Spike Recoveries;

Internal Standards;

ICP and ICP/MS Serial Dilutions;

ICP and ICP/MS Interference Check Sample;

Matrix Spike and Matrix Spike Duplicate Recoveries;

Laboratory Sample Duplicate;

Field Duplicate Sample Analysis;

Laboratory Control Samples and

Quantitation Verification.

For the purposes of the LTM, un-useable data will be defined to include rejected data points ("R" qualifier). Those data points determined to be resultant due to blank contamination will be considered as "non-detects" ("U" qualifier). All other qualified data will be usable with qualifications as noted in **Table 3-17**.

3.9.4 Blank Contamination Assessment

Blank contamination assessment will be performed for the chemical and radiological analysis to determine the impact of field sampling and laboratory analysis environments on data quality. Field and laboratory QC blank data will be reviewed in accordance with fore-mentioned validation guidance and the *USEPA Risk Assessment Guidance for Superfund Volume I Human Health Evaluation Manual (Part A)* (USEPA, 1989) as part of the full validation efforts. Method blanks, calibration blanks, trip blanks, and rinse blanks (if required) will be evaluated for the groundwater samples collected under this QAPP in accordance with the project specified DQOs. This includes all parameters of interest for the long-term monitoring samples. After data qualification, any flagged data will be evaluated against the *USEPA Risk Assessment Guidance for Superfund Volume I Human Health Evaluation Manual (Part A)* (USEPA, 1989) for usability. From a data usability standpoint, samples found due to blank contamination will be considered non-detect at the reporting limit or level of contamination (whichever is higher) due to the probability that concentrations are from an external laboratory and/or field contamination and not necessarily indicative at the site. This is consistent with USEPA guidance and previous blank assessments conducted. Laboratory and field blanks will be collected and processed at the frequencies specified in **Tables 3-14, 3-15, and 3-16**.

The criterion for the evaluation of blank contamination applies to any blank associated with the samples, and states that no contamination should be in the blank. If contamination is detected, data associated with the blank will be carefully evaluated to determine if there is an inherent variability in the data for the lot, or if the problem is an isolated occurrence not affecting all samples in the lot. The Shaw PM will make project decisions (use qualified data, resample, reanalyze) based upon the analytical limitations of the data. The following criteria apply for blank assessment for where blank contamination qualification applies:

Radiological and Inorganic: Any detected analyte in the environmental sample at less than five times the concentration in the associated blank will be qualified "U."

Organic*:* The sample result is qualified "U," when the compound concentration is greater than the reporting limit but less than five times the amount in the blank. For common laboratory contaminants, the concentration level is ten times the amount in any blank (i.e., methylene chloride, acetone, toluene, cyclohexane, and 2-butanone).

Action levels for groundwater samples will be based upon a 1x dilution factor and adjusted for each sample as appropriate. In cases where more than one blank is associated with a given sample, qualification will be based upon a comparison with the associated blank having the highest concentration of the contaminant. Blank qualification is part of the data validation process and the Shaw PM will assess data usefulness based on the project DQOs.

3.9.4.1 Rinse Blanks

Rinse blanks will only be required when non-dedicated or re-usable sampling equipment is used. The integrity of decontamination events and sample cross-contamination will be evaluated by the rinse blank for all sampled parameters for the LTM if using non-dedicated or re-usable sampling equipment. If needed, a rinse blank will be collected at a frequency of five percent (1 per 20) of the total number of samples collected or per sampling event, whichever is greater per sampling technique. All target analytes for the rinse blanks should be <½ MRL (<MRL for common laboratory contaminants: methylene chloride, acetone, toluene, cyclohexane, and 2-butanone).

The blank contamination assessment for rinse blanks will be performed to assess the impact of contaminant contributions originating from non-point sources, such as field sampling equipment decontamination procedures. Rinse blanks are intended to identify cross-contamination between samples as a result of sampling equipment decontamination procedures. Rinse blanks will be collected by pouring the required volume of de-ionized, organic-free water over the equipment and collecting the water in the appropriate sample containers.

The rinse blank results are evaluated for the analytes of concern to ascertain the efficiency of decontamination and assess the potential for cross-contamination. The blank assessment for rinse blanks (if required) will be treated as described in **Section 3.9.4**.

3.9.4.2 Trip Blanks

The integrity of sample storage and transport and sample cross-contamination will be evaluated by the trip blank for all aqueous VOC samples for the LTM. A trip blank will be included at a frequency of one per cooler of aqueous VOC samples transported to the laboratory. All target analytes for the trip blanks should be <½ MRL; <MRL for common laboratory contaminants: methylene chloride, acetone, toluene, cyclohexane, and 2-butanone.

The blank contamination assessment for trip blanks will be performed to assess the impact of VOC contaminant contributions originating from non-point sources during sample storage and transport to the laboratory. The blank assessment for trip blanks will be treated as described in **Section 3.9.4**.

3.9.4.3 Laboratory Blanks

Method blanks will be used to determine the potential contamination from the laboratory environment and analytical method used to process the sample. Method blanks will be processed at the beginning of each analytical run by the laboratory to determine whether the internal laboratory environment, reagents used during analyses, analytical techniques, or the instrumentation system are sources of contamination that could affect the integrity of the sample.

The method blank contamination assessment will be evaluated during the data validation process. A method blank is a volume of analyte-free water that is processed through the entire analytical scheme (i.e., extraction, digestion, concentration, and analysis) as with the actual samples.

Method blanks are compared against the same matrix environmental samples on a batch specific basis; therefore, no unit conversions were necessary for method blanks since they were treated in the same manner as the samples. Calibration blanks will also compared against the environmental samples. Calibration blanks are aqueous samples and are reported in µg/L or mg/L units. The blank assessment for laboratory blanks will be treated as described in **Section 3.9.4**.

3.9.5 Data Reporting

The contract laboratory will provide electronic and hard copy chemistry data to Shaw. The hardcopy data is to be provided in CLP-like format (Shaw Level IV) to meet USEPA full data validation requirements necessary for risk assessments. The standard electronic data deliverable

(EDD) format for this project will also be provided in an ASCII comma delimited format or an Excel spreadsheet format to facilitate the data evaluation and validation processes.

All non-detects will be reported as "less than" the reporting limit (<MDL for metals and <MDC for radiological) for each analyte. See **Section 3.2.1.6** for further discussion on sensitivity. Any positive value below the MRL or MDC and above the MDL or MDA will be reported as estimated "J". In some cases, metals will be reported at the MDL level. Any positive value above the MDL must be reported for the method blanks. Values detected above the reporting limit will be reported as determined to no more than three significant figures.

The units for aqueous samples may be expressed as 1) parts per million (ppm) as milligrams per liter (mg/L); 2) parts per billion (ppb) as micrograms per liter (µg/L) or; 3) picocuries per liter (pCi/L), depending upon the analysis performed. For radiological data expressed as pCi/L, the associated estimated 2 sigma error is to be reported for each result.

3.9.6 Data Management

Data management will begin when the contractor transmits a request for analytical services to the laboratory, stating the number, type, sample numbers, methods for analysis, and any other information necessary for the laboratory to analyze and document a particular job. Data files of initial input information, sample IDs, parameters, dates, etc. will be established as sample containers and COC documentation are prepared for shipment from the field sampling team.

Once the samples arrive at the laboratory, this information will be used to create a laboratory database for each sample delivery group (SDG). Status information (i.e., date sampled, date received, data extraction/analysis due dates, etc.) will form a part of the record. Supporting analytical based records will be generated and stored by the laboratory. This includes, as applicable, sample preparation and analysis information logs, instrument logs, storage records, sample custody records, sample raw data reports, graphs, and chromatograms. From these records data, hard-copy deliverables will be generated from the laboratory to Shaw. Further data deliverable requirements may be found in the laboratory statement of work (SOW). Shaw will maintain the laboratory documentation until work assignment closeout, when records will be transferred to USACE.

3.9.7 Laboratory Turnaround Time

The laboratory is required to meet the deliverable turnaround time (TAT) for the project as specified in the laboratory SOW. If for any reason the laboratory realizes that the TAT will not be met, Shaw must be notified of the affected samples, analysis, reason for lateness, and revised due dates prior to the original due date. The TAT starts from the time of receipt the samples at the laboratory.

3.10 Corrective Action Procedures

Corrective action will be initiated through the development and implementation of routine internal QC checks. Specific limits beyond which corrective action is required will be established for each system. Corrective action requirements will be implemented in response to deficiencies encountered during system inspections. A closed-loop corrective action system will be used to address system and data quality issues. Steps comprising a closed-loop corrective action system include:

Defining the problem;

Assigning responsibility for problem investigation;

Investigating and determining the cause of the problem;

Assigning responsibility for problem resolution; and

Verifying that the resolution has corrected the problem.

Documentation will be done on all of the steps of the corrective action system, including the dates and parties involved. Such documentation will be reviewed during system inspections. Problems identified by assessment procedures will be resolved at the level it occurred with support from upper management. Problems that cannot be resolved at this level will be reported to the QC Manager for resolution, who will determine at which management level the problem can best be resolved, and will notify the appropriate manager.

Corrective actions will be categorized as either routine or non-routine and will require short-term or long-term action. Both types will require administrative coordination between the person initiating the corrective action and the QC staff.

3.10.1 Routine Corrective Action

Work plans and SOPs will establish technical procedures and the associated QC requirements. Where possible, SOPs will include specific criteria for determining the expected quality and examples of the appropriate corrective action procedures that may be taken if the criteria are not met. Routine corrective action will involve either short-term action for sporadic problems or long-term action for more chronic problems. Corrective action initiated at the project level will be reported to the QC Manager to ensure corrective action is implemented and the problem is resolved.

3.10.2 Non-routine Corrective Action

Activities that are not covered by a specific SOP require an iterative process whereby the systems and QC specifications are estimated prior to the activity, and adjustments are made, as needed, during the course of the activity. Documentation on the corrective action requirements,

the assignment of responsibility for corrective action, due dates for completion of corrective action, and validation of completion will be maintained. Such documentation will be reviewed during system inspections.

Problems identified by assessment procedures will be resolved at the level it occurred with support from upper management. Problems that cannot be resolved at this level will be reported to the QC Manager for resolution, who will determine at which management level the problem can best be resolved, and will notify the appropriate manager.

3.10.3 Quality Improvement

The Shaw Quality Improvement Process (QIP) comprises the internal systems that evaluate our quality program's effectiveness in ensuring and continually improving the quality of our work. The primary goals of our QIP and the QC program defined in this document are to prevent non-conformances and facilitate continual process improvement. The Shaw QIP is based on problem prevention, resolution, and corrective action. QIP goals include the timely identification and resolution of the quality problems in manner that minimizes their impact on work products and prevents their reoccurrence. To the extent that the first of these goals is not achieved, identified deficiencies or non-conformances are to be corrected in a timely and cost-effective manner and with the intent of preventing their recurrence. This QC Plan includes provisions for preventing quality problems and facilitating process improvements as well as for identifying, documenting, and tracking deficiencies until corrective action has been verified.

Project staff is encouraged to provide recommendations for improvements in established work processes and techniques. The intent is to identify activities that are compliant but can be performed in a more efficient or cost-effective manner. Typical quality improvement recommendations include identifying an existing practice that should be improved (i.e., a bottleneck in production) and/or recommending an alternative practice that provides a benefit without compromising prescribed standards of quality. Project staff is encouraged to bring their recommendations to the attention of project management or the QC staff through verbal or written means. Deviations from established protocols will not be implemented without prior written approval by the USACE Project Manager and concurrence of the Shaw Contractor Quality Control (CQC) Systems Manager. Prior to receipt of such approvals, the Shaw PM will determine whether the change requires a modification to the Work Plan or a generation of a Project Procedure. If so, proposed changes to the Work Plan and protocols will be evaluated and implemented in accordance with the process described herein. Where a staff-initiated recommendation results in a tangible benefit to the project, acknowledgment will be given by the Shaw PM.

3.10.4 Problem Prevention

The preventive action program is intended to identify problems before they are adverse to quality. Inspections, self-assessments, and peer review are examples of the tools that will be used by the project staff to identify potential quality problems. Input regarding project operations will be regularly sought from clients, subcontractors, and staff. The Project Manager will foster a no-fault attitude for problem identification, and staff is encouraged to identify process improvement opportunities, problems, and solutions. While the entire QC program is directed towards problem prevention, certain elements of the program have greater potential to be pro-active. The primary tools for problem prevention on this project and the specific sections of this QAPP where they are addressed include: a project organization, instrument calibration, preventive maintenance, and QC data checks and inspections. Should these preventive measures fail, tracking and communicating deficiencies provides a mechanism for preventing their recurrence.

3.10.5 Stop Work Protocols

All Shaw personnel have the authority to issue a stop work order. A stop work order will be issued under conditions when the quality of work jeopardizes the attainment of the project objectives. A stop work order must not create an operational, safety, public health, or environmental hazard. Under a stop work order, work may not be conducted within affected activities until the responsible manager acknowledges the implementation of a corrective action in accordance with the resolution criteria of the order. Immediate notification of work stoppage must be made to the PM, SSHO, QA Manager, CQC System Manager and Program Manager. Proper notification will also be made to the USACE.

3.10.6 Deficiency Identification, Resolution, and Documentation

Deficiency identification and resolution are primary responsibilities of the operational staff (both Shaw and its subcontractors) and the PM. In the interest of timeliness of corrective actions, a Corrective Action Request (CAR) can occur by any member of the project staff, whether a Shaw or subcontractor employee. Deficiencies are to be documented using CARs and the Daily QC Report. If the individual recommending a CAR is also responsible for correcting the problem, then he or she should do so and document the results. Otherwise, the CAR will be forwarded to the Shaw QC Specialist and the Shaw PM, who will then be responsible for evaluating the validity of the request, formulating a resolution and prevention strategy, assigning personnel and resources, and specifying and enforcing a schedule for corrective actions. Once a corrective action has been completed, the CAR and supporting information are to be forwarded to the QC Specialist and/or the CQC Systems Manager for closure. An example of a Shaw CAR format is provided as **Table 3-18**.

While deficiency identification and resolution occurs primarily at the operational level, QC inspections of data, field records, and procedures provide a backup mechanism to address problems that either are not identified or cannot be resolved at the operational level. Through implementation of an inspection program, the field and QC staff are responsible for verifying that deficiencies are identified, documented as prescribed herein, and corrected in a timely manner. Deficiencies identified by either project or QC staff are to be corrected by the operational staff and documented by the QC staff.

In addition to observing actual work operations, the QC staff is responsible for reviewing CARs during follow-up QC inspections. The purpose of these reviews are to verify whether established protocols are being implemented properly and corrective action commitments are met; to determine whether corrective actions are effective in resolving problems, to identify trends within and among similar work units; and to facilitate system root cause analysis of larger problems. Particular attention will be given by the QC Specialist or designee to work units that generate either an unusually large or unusually small number of CARs. The CQC Systems Manager and his staff have full authority to stop work for unresolved quality deficiencies.

Problems that cannot be resolved at this level are documented by the QC Specialist or designee. Minor deficiencies that are identified during a QC inspection but which can be readily corrected and verified in the field are to be documented in the Daily QC Report. Deficiencies identified in a QC inspection but that cannot be readily corrected are to be documented by the QC Specialist or designee on a CAR and in the Daily QC Report. Copies of CARs are to be referenced in and attached to the Daily QC Report.

3.10.7 Reports

The QC Specialist will report to the Shaw PM and CQC Systems Manager regarding QC activities on-site. The Daily QC report is the main tool of the QC Specialist for evaluating field reconnaissance activities. A field logbook will also be maintained. The weekly QC report will contain information on the total number of man-hours worked, lost-time accidents, and the amount of time lost to accidents. The daily and weekly QC reports will be submitted to the Shaw PM no later than the next working day.

3.11 Quality Assessments

This section discusses the inspection program used to monitor the total measurement system and to evaluate the quality of operation in the field and at the laboratory. A performance inspection is a planned independent check of the operation of a system to obtain a quantitative measure of the quality of data generated, and involves the use of standard reference samples or materials which are certified as to their chemical composition or physical characteristics. Systems

inspection is of a qualitative nature and consists of on-site review of a system's QA system and physical facilities for sampling/analysis, calibration, and measurement.

3.11.1 Document Review

Project plans will be reviewed and approved prior to implementation. The PM and QC Manager will provide a qualitative self-evaluation for establishing whether the prevailing management structure, polices, practices, and procedures are adequate to ensuring that the results needed are obtained. The PM will provide an independent qualitative evaluation of a particular program operation and/or organization to establish whether the prevailing management structure, policies, practices, and procedures are adequate for ensuring that the results needed are obtained.

Table 3-18 Corrective Action Request Form

CORRECTIVE ACTION REQUEST FORM
Document Control Number: Date of Problem:_____ Originator: Description of Problem and Effect on System: Persons Notified:_____ Title_____ Date: Description of Corrective Action: Person Completing Action: Signature_____ Title_____ Date Approval:_____ Title_____ Date

3.11.2 Document Control

The goal of Shaw's Document Control Program is to ensure that the project documents issued or generated will be accounted for upon completion of the project. The program includes a numerical document control system, document inventory procedure, and a central filing system with a designated person(s) responsible for its maintenance. Documents used or generated during the course of the project are accounted for and become a part of the project files upon completion of the task. These may include but are not limited to the following:

Project Deliverables;

Investigation Requirements;

Reports and correspondence material; and

Contract Documents.

3.11.3 Field System Audits

Field system audits of site activities may be performed at the discretion of the Shaw QC Manager. The Shaw technical audit team would perform an inspection of all field site activities. If elected to be performed, the audit team will compare current field practices with procedures outlined in the project work plans (i.e., Work Plan, QAPP). The following elements would be evaluated during LTM- activities at Colonie:

Overall level of organization and professionalism;

Project activities;

Document control and management;

Level of QC conducted per each field team; and

Task specific activities.

After audit completion, deficiencies would be discussed with the field staff and corrections will be identified. If any of these deficiencies could affect the data integrity, the audit team will inform the Project Manager so corrections can be implemented immediately. Corrective action procedures are outlined in **Section 3.10**.

3.11.4 Daily QC Reports

The field operations are to be implemented through the following basic elements:

Correction of deficiencies identified and documented prior and during field operations and meetings;

Ongoing evaluation of field operations by the CQC Representative to ensure compliance with the established protocols, requirements, and DQOs of the field sampling program; and

Ongoing audits of field and laboratory operations (if performed) to provide an independent assessment of compliance with established protocols and DQOs.

In order to ensure that all elements are evaluated, Daily Quality Control Reports (DQCRs) are completed. These reports may include the general areas of field sampling and off-site laboratory operations. The components as they occur for the DQCR will include the following:

Summary of sampling events;

The sampling task manager and associated sampling personnel for the sampling event;

Sampling summary to include associated field QC samples;

Summary of COCs generated with copies attached;

Summary of Phase Checklists (if applicable) (Pre-Field Operations, Preparatory, Initial, and Follow-up) generated with cross-reference to the associated sampling event;

Summary of Corrective Action Reports issued with copies attached;

Summary of all audit reports completed with copies attached;

Notification of revisions to field sampling SOPs;

Notification of revisions to analytical SOPs;

Laboratory sample status with a summary form for the status of in house samples attached;

Health and Safety status including violations, corrective instructions given, and corrective actions taken;

Communication summary (primarily between the client, NYDEC, USACE, and Shaw) which would have a impact on existing protocols, SOPs, or DQOs; and

Documentation of conflicts on-site with respect to interpretation of protocols and specifications as well as action taken.

Figure 3-1 presents a basic example template for the DQCR that would be submitted for operations involving the LTM.

Figure 3-1 Daily Quality Control Report

DAILY QUALITY CONTROL REPORT
COLONIE LTM

Report Number : _____
Date: _____

USACE Project Manager: James Moore Weather: _____
USACE Site Representative: _____ _____
Contract Number: W912DR-05-0026

1. Contractor/Subcontractor Personnel and Areas of Responsibility

NUMBER OF PERSONNEL	TRADE	TOTAL HOURS	EMPLOYER	LOCATION AND DESCRIPTION OF WORK

2. Equipment Used in Daily Operations

EQUIPMENT	OWNER	DATE OF SAFETY CHECK	HOURS USED	HOURS IDLE

3. <u>Work Performed Today</u> (Indicate location and description of work performed by prime and/or subcontractors.)

_____
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4. <u>Control Activities Performed</u> (Specify feature of work and indicate P for Preparatory, I for Initial, or F for Follow-up Phase. For Preparatory Inspections: Identify features of work and attach completed checklist, list any issued and responses. For Initial Inspections: identify feature of work and attach completed checklist. For Follow-up Inspections: List inspection milestones reached (hold/witness points) inspections performed, results of inspections compared to specifications requirements, CARs issued/closed, and corrective actions taken.)

_____
_____
_____
_____
_____

5. <u>Summary of Samples Collected</u> (soil, groundwater, etc., and associated chain-of-custodies)

_____
_____
_____
_____
_____

6. Tests Performed and Test Results (Identify test requirements by paragraph number in specifications and/or sheet number in plans).

_____
_____
_____
_____

7. Materials Ordered and/or Received (Note inspection results and storage provided).

_____
_____
_____
_____

8. Job Safety (List items checked, results, instructions, and/or corrective actions taken)

_____
_____
_____
_____
_____

9. Remarks (Instructions received or given. Conflict(s) in Plans or specifications. Delays encountered).

_____
_____
_____
_____
_____

10. List of Attachments (List all attachments to this report, include date and reference number where applicable. Attachments are to include copies of inspection checklists, test reports, data reports, chain-of-custodies, and field measurements/calculation sheets).

_____
_____
_____
_____

I certify this report to be complete and correct, and all materials and equipment used and work performed during this reporting period are accurate to the best of my knowledge.

CQC System Manager

Signature

Date

Appendix A
Abbreviations and Acronyms

Abbreviations and Acronyms

CAR	Corrective Action Request
CERCLA	Comprehensive Environmental Restoration, Compensation, and Liability Act
CFR	Code of Federal Regulations
CCV	continuing calibration verification
CO	Contracting Officer
COC	compounds of concern
COC	chain of custody
CQC	Contractor Quality Control
CQCR	Contractor Quality Control Reports
CVAA	cold vapor atomic absorption
^{o}F	Degrees Fahrenheit
^{o}C	Degrees Celsius
DoD	Department of Defense
DQO	Data Quality Objective
DQCR	Daily Quality Control Report
EDD	electronic data deliverable
FUSRAP	Formerly Utilized Site Remedial Action Program
GC/MS	gas chromatography/mass spectroscopy
GW	Groundwater
Hg	mercury
HTRW	Hazardous, Toxic and Radiological Waste
ICP	inductively coupled plasma
ICP/MS	inductively coupled plasma mass spectroscopy
LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
LOC	Level of Concern
LTM	Long-term Monitoring
LQAP	Laboratory Quality Assurance Plan
µg/L	microgram per liter
MCL	Maximum Contaminant Level
MDA	maximum detectable activity
MDC	maximum detected concentration
MDL	method detection limit
mg/L	milligram per liter
MNA	Monitored Natural Attenuation
MRL	method reporting limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
NELAC	National Environmental Laboratory Accreditation Conference
NIST	National Institute of Standards and Testing
NYDEC	New York State Department Environmental Conservation
%R	Percent Recovery
pCi/L	picocuries per liter
PID	photoionization detector
PM	Project Manager
ppb	parts per billion

ppm	parts per million
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QA/QC	Quality Assurance/Quality Control
QC	Quality Control
QIP	Quality Improvement Process
QL	Quantitation Limit
QSM	Quality Systems Manual
RAO	Remedial Action Objectives
Redox	oxidation/reduction
RER	relative error ratio
RPD	relative percent difference
RRT	relative retention time
SDG	Sample Delivery Group
Shaw	Shaw Environmental, Inc.
SOPs	standard operating procedure
SOW	Statement of Work
SSHO	Site Safety and Health Officer
TAL	Target Analyte List
TAT	turn-around-time
TCL	Target Compound List
TO	Task Order
TOC	Total Organic Carbon
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
VOC	Volatile Organic Compound(s)

Appendix B
References

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Appendix C
Shaw Standard Operating Procedures
(Provided separately)

STANDARD OPERATING PROCEDURE

Subject: Field Logbook

1. PURPOSE

This procedure is intended to communicate the requirements for selection, use, and maintenance of all field logbooks. Field logbooks are often used to document observations, sampling information, and other pertinent information on project sites. They are considered legal documents and should be maintained and documented accordingly as part of the project file.

2. SCOPE

This procedure is applicable to all Shaw E & I site operations where field logbooks are utilized to document all site activities and pertinent information.

3. REFERENCES

- Nielsen Environmental Field School, 1997, *Field Notebook Guidelines*

4. DEFINITIONS

- **Significant detail**—Any piece and/or pieces of information or an observation that can be considered pertinent to the legal reconstruction of events, description of conditions, or documentation of samples and/or sampling procedures.
- **Significant event**—Any event or events that could influence or be considered pertinent to a specific task or function and therefore require documentation in the Field Logbook.
- **Field Logbook**—Logbooks used at field sites that contain detailed information regarding site activities that must include dates, times, personnel names, activities conducted, equipment used, weather conditions, etc. Field logbooks can be used by a variety of different field personnel and are part of the project file.

5. RESPONSIBILITIES

5.1 Procedure Responsibility

The Field Sampling Discipline Lead is responsible for maintenance, management, and revision of this procedure. Questions, comments, or suggestions regarding this technical SOP should be directed to the Field Sampling Discipline Lead.

5.2 Project Responsibility

Shaw employees performing this task, or any portion thereof, are responsible for meeting the requirements of this procedure. Shaw employees conducting technical review of task performance are also responsible for following appropriate portions of this SOP.

For those projects where the activities of this SOP are conducted, the Project Manager, or designee, is responsible for ensuring that those activities are conducted in accordance with this and other appropriate procedures. Project participants are responsible for documenting information in sufficient

detail to provide objective documentation (i.e. checkprints, calculations, reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

6. PROCEDURE

6.1 General

Each site or operation, as applicable, will have one current Logbook, which will serve as an index of all activities performed at the site or in the task performance. The Logbook is initiated at the start of the first applicable activity. Summary entries are made for every day that covered activities take place. Multiple field logbooks may be used depending upon the number of different types of field personnel conducting work and the various activities at the site. These field logbooks and the site logbooks shall be made part of the project files.

Information recorded in field logbooks includes observations (significant events and details), data, calculations, time, weather, and descriptions of the data collection activity, methods, instruments, and results. Additionally, the field logbook may contain descriptions of wastes, biota, geologic material, and site features including sketches, maps, or drawings as appropriate.

6.2 Equipment and Materials

- Logbook(s), bound with numbered pages, hard-covered, waterproof preferred. One per project or separate significant task (example-treatment residual composite collection).
- Indelible black or dark blue ink pen
- Other items needed to perform required tasks: compass, ruler, calculator, etc.

6.3 Preparation

Site personnel responsible for maintaining field logbooks must be familiar with the SOPs for all tasks to be performed.

Field logbooks are project files and should remain with project documentation when not in use. *Personnel should not keep Field logbooks in their possession when not in use. Field logbooks should only leave the project site for limited periods, and they should always be returned to the site files or the designated on-site location (Sampler's Trailer, etc.)*.

Field logbooks shall be bound with lined, consecutively numbered pages. All pages must be numbered prior to initial use of the field logbook.

The front cover shall include the following information:

- Project Number
- Project Name and Task(s) included in logbook
- Dates covered by logbook—the starting date must be entered on the first day of use
- Logbook number—if more than one logbook will be needed to cover project/task(s)

The inside front cover shall contain a listing and sign-off of each person authorized to make entries and/or review the logbook. All persons who make entries or review/approve such entries must signify their authority to enter into the logbook via their signature and the date of their signing on the inside front cover. If initials are used for entries instead of full names, the initials must be entered beside the full name on the inside cover.

6.4 Operation

The following requirements must be met when using a field logbook:

- Record significant details and/or events, work, observations, material quantities, calculations, drawings, and related information directly in the field logbook. If data-collection forms are in use, the information on the form need not be duplicated in the field logbook. However, any forms used to record site information *must be referenced* in the field logbook.
- Information must be factual and unbiased.
- Do not start a new page until the previous one is full or has been marked with a single diagonal line so that additional entries cannot be made. Use both sides of each page.
- Write in black or dark blue indelible ink.
- Do not erase, scribble over, or blot out any entry. Do not use White-Out or like correction items. Before an entry has been signed and dated, changes may be made; however, care must be taken not to obliterate what was written originally. Indicate any deletion by a single line through the material to be deleted. Any change shall be initialed and dated. Error codes (Attachment 1) should be added to the end of the deleted entry. All error codes should be circled.
- Do not remove any pages from the book.
- Do not use loose paper and copy into the field logbook later.
- Record sufficient information to completely document field activities and all significant details/events applicable to the project/task(s) covered by the logbook.
- All entries should be neat and legible.

Specific requirements for field logbook entries include the following:

- Initial and date each page.
- Sign and date the final page of entries for each day.
- Initial, date, and if used, code all changes properly.
- Draw a diagonal line through the remainder of the final page at the end of the day.
- Record the following information on a daily basis:

  a) Date and time

  b) Name of individual making entry

  c) Detailed description of activity being conducted including well, boring, sampling, location number as appropriate

  d) Unusual site conditions

  e) Weather conditions (i.e., temperature, cloud cover, precipitation, wind direction and speed) and other pertinent data

  f) Sample pickup (chain-of-custody form numbers, carrier, time)

  g) Sampling activities/sample log sheet numbers

  h) Start and completion of borehole/trench/monitoring well installation or sampling activity

i) Health and Safety issues, such as PPE upgrades, monitoring results, near-misses, and incidents associated with the logbook areas

j) Instrumentation calibration details

Entries into the field logbook shall be preceded with the time of the observation. The time should be recorded frequently and at the point of events or measurements that are critical to the activity being logged. All measurements made and samples collected must be recorded unless they are documented by automatic methods (e.g., data logger) or on a separate form required by an operating procedure. In such cases, the field logbook must reference the automatic data record or form.

While sampling, make sure to record observations such as color and odor. Indicate the locations from which samples are being taken, sample identification numbers, the order of filling bottles, sample volumes, and parameters to be analyzed. If field duplicate samples are being collected, note the duplicate pair sample identification numbers. If samples are collected that will be used for matrix spike and/or matrix spike/matrix spike duplicate analysis, record that information in the field logbook.

A sketch of the station location may be warranted. All maps or sketches made in the field logbook should have descriptions of the features shown and a direction indicator. There must be at least one fixed point with measurements on any map drawn. Maps and sketches should be oriented so that north is towards the top of the page.

Other events and observations that should be recorded include (but are not limited to) the following:

- Changes in weather that impact field activities
- Visitors to the site associated with the covered task(s). Note their time of arrival and departure and provide a brief summary of their purpose on site.
- Subcontractor activities applicable to the covered task(s)
- Deviations from procedures outlined in any governing documents, including the reason for the deviation. Deviations from procedures must be accompanied with the proper authorization.
- Significant events that may influence data, such as vehicles in the vicinity of VOC sampling efforts
- Problems, downtime, or delays
- Upgrade or downgrade of personal protective equipment

6.5 Post-Operation

To guard against loss of data due to damage or disappearance of field logbooks, all original completed logbooks shall be securely stored by the project. All field logbooks will be copied at the end of each work shift and attached to the daily reports.

At the conclusion of each activity or phase of site work, the individual responsible for the field logbook will ensure that all entries have been appropriately signed and dated and that corrections were made properly (single lines drawn through incorrect information, initialed, coded, and dated). The completed field logbook shall be submitted to the project records file.

6.6 Restrictions/Limitations

Field logbooks constitute the official record of on-site technical work, investigations, and data collection activities. Their use, control, and ownership are restricted to activities pertaining to specific field operations carried out by Shaw personnel and their subcontractors. They are documents that may be used in court to indicate and defend dates, personnel, procedures, and techniques employed

during site activities. Entries made in these notebooks should be factual, clear, precise, and as non-subjective as possible. Field logbooks, and entries within, are not to be utilized for personal use.

7. ATTACHMENTS

- Attachment 1, Common Data Error Codes

8. FORMS

None.

Attachment 1
Common Data Error Codes

COMMON DATA ERROR CODES

- RE Recording Error
- CE Calculation Error
- TE Transcription Error
- SE Spelling Error
- CL Changed for Clarity
- DC Original Sample Description Changed After Further Evaluation
- WO Write Over
- NI Not Initialed and Dated at Time of Entry
- OB Not Recorded at the Time of Initial Observation

All Error Codes should be circled.

STANDARD OPERATING PROCEDURE

Subject: Field Logsheet

1. PURPOSE

This procedure is intended to communicate the requirements for proper use and completion of Field Logsheets to document sample collection and data gathering activities. Field Logsheets are often utilized to document single location/event information. Examples include boring logs and drum/container logs. This procedure also provides several templates that *may* be utilized or modified to a particular need.

2. SCOPE

This procedure is applicable to all Shaw E & I projects where Field Logsheets are utilized to document data and/or sample collection information. This procedure does **not** mandate the use of Field Logsheets on all Shaw E & I data/sample collection efforts, and projects/programs are free to utilize other means (Field Logbooks, direct data entry, etc.) to document sample collection and other pertinent data gathering activities.

3. REFERENCES

- U.S. Environmental Protection Agency, 1998, *EPA Guidance for Quality Assurance Project Plans*, EPA/600/R-98/018, Washington, D.C.
- U.S. Army Corps of Engineers, 2001, *Requirements for the Preparation of Sampling and Analysis Plans*, EM200-1-3, Washington, D.C.

4. DEFINITIONS

None

5. RESPONSIBILITIES

5.1 Procedure Responsibility

The Field Sampling Discipline Lead is responsible for maintenance, management, and revision of this procedure. Questions, comments, or suggestions regarding this SOP should be directed to the Field Sampling Discipline Lead.

5.2 Project Responsibility

Shaw employees performing this task, or any portion thereof, are responsible for meeting the requirements of this procedure. Shaw employees conducting technical review of task performance are also responsible for following appropriate portions of this SOP.

For those projects where the activities of this SOP are conducted, the Project Manager, or designee, is responsible for ensuring that those activities are conducted in accordance with this and other appropriate procedures. Project participants are responsible for documenting information in sufficient detail to provide objective documentation (i.e. checkprints, calculations,

reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

6. PROCEDURE

Field Logsheets can be prepared to address the specific needs of each project and they can even be converted to laptop data entry forms. Field Logsheets are considered legally defensible, and all appropriate requirements must be observed.

6.1 Required Information

All Field Logsheets must contain entry lines for the following in addition to whatever sample/data gathering-specific information is desired:

- Site/Project Name
- Project Number
- Date (including time if required to properly document)
- Comments or Issues area to record any non-specified information pertinent to the sample/data collection effort
- Initial or signature line for person responsible for completion

6.2 Proper Completion/Use

Whenever Field Logsheets are utilized, the following requirements must be strictly followed and enforced:

- Field Logsheets are to be completed in **real-time.** They should not be filled out by transcription from another source.
- All corrections **must** be single-line cross-out with the initials of the person making the correction.
- All data/information areas **must** be completed. If an entry line/block is not applicable to a particular sample/data gathering effort, this must be indicated on the form by either a single line cross-out or the letters “NA” being written in the data line/block.

7. ATTACHMENTS

None.

8. FORMS

- Container Field Logsheet
- Soil/Sediment Field Logsheet
- Surface Water Field Logsheet
- Air Field Logsheet

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Container Field Logsheet

(FS002.1_0)

Date:	Time:	Site:	
Container Number:		Project #:	
Container Size:		Weather:	
Container Location:		Photograph:	

Container material of construction:		plastic	glass	metal	fiberboard
Container condition:	intact	bulging	leaking		
Lid type:	screw	bung	ring		
Lid material of construction:		plastic	glass	metal	fiberboard
Labels:	manufacturer:				
	address:				
	content name:				
	chemical name:				
	chemical formula:				
	other:				
Hazard	flammability:				
Label:	reactivity:				
	health:				
	other:				
PID:		Calibration Date:			
O2/LEL:		Calibration Date:			
Sampling Device:		Decontamination technique:			
Contents Description:					
	Amount:	1/4	1/2	3/4	full
	Color:				
	State:	solid	liquid	paste	other:
Sample Number:			Preservative:		
QC Samples:					
Analyses requested:					
Analytical Laboratory:					
Field Technician (Print):					
Comments:					

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Soil/Sediment Field Logsheet

(FS002.2_0)

Site Name: Project #:

Sample ID:	Sample Location Sketch:
Sample Type*:	
*: SED=Sediment; SUR=Surface soil; SUB=Subsurface Soil; OTH=Other. grab=Grab, comp=Composite	
Date Sampled:	
Time Sampled:	
Depth (ft bgs):	
Physical description:	
Analyses requested:	Photograph Log #:
PID:	Calibration Date:
O2/LEL:	Calibration Date:
Weather:	
Temperature: ° F	
Sampling Equipment:	
Equipment Decontamination Technique:	
QC Samples:	
Analytical Laboratory:	
Comments:	
Field Technician: (Print)	Date:

Shaw® Shaw E & I

Surface Water Field Logsheet
(FS002.3_0)

Site Name: Project #:

Sample ID:		Sample Location Sketch:
Date Sampled:		
Time Sampled:		
Depth (ft below surface):		
Analysis	Preservative	
Field Reading	Calibration Date	
Sp cond:		
pH:		Photograph Log #:
Temp:		Weather:
D.O.:		Temperature: ° F
Turbidity:		Sampling Equipment:
		Equipment Decon Technique:

QC Samples:
Analytical Laboratory:
Comments:
Field Technician: (Print) Date:

Shaw® Shaw E & I

Air Field Logsheet
(FS002.4_0)

Site Name: Project #:

Sample ID:	Sample Location Sketch:
Date Sampled:	
Time Sampled:	
Sampling Technique:	
Analyses:	
Field Reading	Calibration Date
	Photograph Log #:
Weather:	
Temperature: ° F	
Sampling Equipment:	
Equipment Decon Technique:	
QC Samples:	
Analytical Laboratory:	
Comments:	
Field Technician: (Print)	Date:

STANDARD OPERATING PROCEDURE

Subject: Chain of Custody Documentation - Paper

1. PURPOSE

The purpose of this procedure is to provide the requirements for completion of written Chain of Custody (COC) documentation and to provide a suggested Chain of Custody Form for project use.

2. SCOPE

This procedure is applicable to all Shaw E & I efforts where samples are transferred among parties, including to off-site testing facilities. Adherence to this procedure is not required whenever the same individual/team is performing the sampling and testing within the same workday, and transfer to the testing process is being documented by other means, e.g. sampling and then field-screening in a mobile laboratory.

3. REFERENCES

- U.S. Environmental Protection Agency, 1986, *Test Methods for Evaluating Solid Waste; Physical/Chemical Methods, SW-846*, Third Edition.
- U.S. Army Corps of Engineers, *Requirements for the Preparation of Sampling and Analysis Plans*, EM200-1-3.
- Shaw E & I, 2002, *Sampler's Training Course Handout*.

4. DEFINITIONS

- **Custody**—The legal term used to define the control and evidence traceability of an environmental sample. A sample is considered to be in an individual's custody when it is in actual physical possession of the person, is in view of the person, is locked in a container controlled by the person, or has been placed into a designated secure area by the person.
- **Chain of Custody Form**—A form used to document and track the custody and transfers of a sample from collection to analysis or placement in a designated secure area within the testing facility.
- **COC Continuation Page**—Additional page(s) that may be included with a Chain of Custody form. The continuation page(s) contain the information on additional samples contained within the *same* cooler/shipping container associated with the cooler/shipping container Chain of Custody form.

5. RESPONSIBILITIES

5.1 Procedure Responsibility

The Field Sampling Discipline Lead is responsible for maintenance, management, and revision of this procedure. Questions, comments, or suggestions regarding this technical SOP should be directed to the Field Sampling Discipline Lead.

5.2 Project Responsibility

Shaw E & I employees performing this task, or any portion thereof, are responsible for meeting the requirements of this procedure. Shaw employees conducting technical review of task performance are also responsible for following appropriate portions of this SOP.

For those projects where the activities of this SOP are conducted, the Project Manager, or designee, is responsible for ensuring that those activities are conducted in accordance with this and other appropriate procedures. Project participants are responsible for documenting information in sufficient detail to provide objective documentation (checkprints, calculations, reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

6. PROCEDURE

6.1 Documentation

All Chain of Custody documentation must be completed in indelible ink. All corrections must be performed using standard single-line cross-out methods, and the initials of the individual making the change must be included beside the corrected entry.

6.2 Continuation Pages

Continuation pages may be utilized for shipping containers/coolers with sufficient samples/sample containers that all of the lines of the Chain of Custody form are used before the documentation of the cooler/shipping container is complete. The number of pages in total must be filled out. *All samples entered onto a Continuation Page must be included in the same cooler/shipping container as those on the Chain of Custody form itself.*

6.3 Header Information

- Each Chain of Custody form must be assigned a unique Reference Document Number–use the Project/proposal number followed by a unique numeric sequence or current date (if only one cooler sent per day). Continuation Pages should contain the same Document Reference Number as the Chain of Custody form that they are associated with. The project team should maintain a log of Chain of Custody Reference Document Numbers.
- The page identifier and total page count section must be completed. Total pages include the Chain of Custody form and any attached Continuation Pages.
- Project number, name, and location information must be completed for all forms.
- If available, the laboratory Purchase Order Number should be included on the appropriate line.
- The name and phone number of the *Project Contact* should be included; the Project Contact should be a responsible individual that the laboratory may access to address analytical issues. This person is usually the analytical lead for the project.
- The *Shipment Date* should be provided on the applicable lines.
- If shipping by carrier, the *Waybill/Airbill Number* must be included. Note: couriers will not sign custody documents. Therefore, inclusion of the waybill/airbill number on the Chain of Custody is the *only* means of documenting the transfer to the carrier.
- Laboratory Destination and Contact information should be provided.

- The Sampler(s) names should be provided on the appropriate line. This line should include all persons whose initials appear on any of the sample containers, to provide the laboratory a means of cross-referencing containers.
- The "Send Report To" information should be completed. If multiple reports/locations are needed, the information should be provided on a separate page included with the Chain of Custody documents.

6.4 Sample Information Section–Including on Continuation Page(s)

During actual sampling, each sample must be entered on the COC form at the time of collection in order to document possession. The sampler must not wait until sampling is completed before entering samples on the COC.

- Complete the *Sample ID Number* for each line. If there are multiple container types for a sample, use additional lines to indicate the needed information.
- Ensure that the *Sample Description* matches the description on the sample label–the laboratory will use this information for cross-referencing.
- Provide the *Collection Date* and *Time*. These must match those on the sample label and Field Logbook/Logsheets.
- Indicate whether the sample is a Grab or Composite sample.
- Indicate the *Matrix* of the sample. Use the Matrix Codes listed on the Chain of Custody form.
- Indicate the *Number of Containers* and the *Container Type*. If a sample has multiple container types, use multiple lines and cross-out the information spaces to the left of the container blocks. *Failure to do this may cause the laboratory to log-in each container type as a separate sample/lab-ID, resulting in a confused report and invoice.*
  - Alternatively, if each sample has the same number/type container types, use "various" in the *Container Type* block and provide detail in the *Special Instructions* section, e.g., "Each sample consists of one 16-oz jar, two pre-weighed VOC w/DI water, and one pre-weighed VOC w/Methanol."
- Check the appropriate *Preservative* box for each line/container type.
- Write in and check the *Analyses Requested* boxes for each line/container type. The appropriate method number (e.g., EPA Method 8260C) must be written as well as the method name.
- Indicate the *Turn-around Time Requested* for each sample.
- Use the *Special Instructions* section to provide important information to the laboratory, e.g., samples that may require dilution or samples that will need to be composited by the laboratory. This section may also be used to inform the laboratory of additional information contained in attachments to the Chain of Custody package.
- Circle the appropriate *QC/Data Package Level* requested.

6.5 Custody Transfer Section

- The first *Relinquished By* space must be completed by the individual who will either transfer the samples or seal the shipping container.

- If the samples will be transferred to a courier, write the courier/carrier company in the *Received By* box and enter the Date and Time that the shipping container was closed.
- All other transfers must be performed in person, and the Relinquisher must witness the signing by the Receiver.
- A copy of the Chain of Custody form and all associated Continuation Pages should be maintained in the project files.

7. ATTACHMENTS

None.

8. FORMS

- Shaw E & I Chain of Custody Form
- Shaw E & I COC Continuation Page

Shaw® Shaw E & I

FS003.1_0

Ref. Document # _____

Shaw E & I Chain of Custody Form

Page _____ of ____

Project Number: _____

Project Name / Location: _____

Purchase Order #: _____

Project Contact: _____
(Name & phone #)

Shipment Date: _____

Waybill/Airbill Number: _____

Lab Destination: _____

Lab Contact Name / ph. #: _____

Send Report To: _____

Phone/Fax Number: _____

Address: _____

City: _____

Sampler's Name(s): _____

Sample ID Number	Sample Description	Collection Information			Matrix	# of containers	Container type	Preservative						Analyses Requested									Turn Around Time Requested
		Date	Time	G/C				HCL	NaOH	HNO_3	H_2SO_4	Ice											

Special Instructions:

QC/Data Package Level Required:
I II III IV/Project Specific: _____

Relinquished By:	Date:	Received By:	Date:
	Time:		Time:
Relinquished By:	Date:	Received By:	Date:
	Time:		Time:
Relinquished By:	Date:	Received By:	Date:
	Time:		Time:

G/C Codes

C = Composite G = Grab

Matrix Codes

DW = Drinking Water	SO =Soil
GW = Ground Water	SL = Sludge
WW = Waste Water	CP = Chip Samples
SW = Surface Water	WP = Wipe Samples
LIQ = Other Liquid	SOL = Other Solid
AS = Air Sample	SED = Sediment

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Shaw E & I COC Continuation Page

COC Ref. Document # _____ Page _____ of _____

Project Number: _____ Shipment Date: _____

Project Name / Location: _____

Sample ID Number	Sample Description	Collection Information			Matrix	# of containers	Container type	Preservative						Analyses Requested										Turn Around Time Requested
		Date	Time	G/C				HCL	NaOH	HNO_3	H_2SO_4	Ice												

STANDARD OPERATING PROCEDURE

Subject: Custody Seals

1. PURPOSE

The purpose of this procedure is to provide the requirements for completion and attachment of Custody Seals on environmental samples and shipping containers.

2. SCOPE

This procedure is applicable to all Shaw E & I efforts where sample legal defensibility and custody integrity is desired. Adherence to this procedure is not required whenever the same individual/team is performing the sampling and testing within the same workday, and transfer to the testing process is being documented by other means, i.e. sampling and then field-screening in a mobile laboratory.

3. REFERENCES

- U.S. Environmental Protection Agency, 1986, *Test Methods for Evaluating Solid Waste; Physical/Chemical Methods, SW-846*, Third Edition.
- U.S. Army Corps of Engineers, *Requirements for the Preparation of Sampling and Analysis Plans, EM200-1-3*
- Shaw E & I, 2002, Sampler's Training Course Handout.

4. DEFINITIONS

- **Custody**—The legal term used to define the control and evidence traceability of an environmental sample. A sample is considered to be in one's custody if it is in actual physical possession of the person, is in view of the person, has been locked in a container controlled by the person, or has been placed into a designated secure area by the person.
- **Custody Seal**—Commercially available thin strips of adhesive paper with write-in lines for the date/time and identification of the using party. Custody seals are placed over the caps of sample containers and along the cover seals of shipping containers as a means to detect tampering before arrival at the testing facility. All Shaw E & I strategic alliance laboratories provide Custody Seals in their sample container supply kits.

5. RESPONSIBILITIES

5.1 Procedure Responsibility

The Field Sampling Discipline Lead is responsible for maintenance, management, and revision of this procedure. Questions, comments, or suggestions regarding this technical SOP should be directed to the Field Sampling Discipline Lead.

5.2 Project Responsibility

Shaw E & I employees performing this task, or any portion thereof, are responsible for meeting the requirements of this procedure. Shaw E & I employees conducting technical review of task performance are also responsible for following appropriate portions of this SOP.

For those projects where the activities of this SOP are conducted, the Project Manager, or designee, is responsible for ensuring that those activities are conducted in accordance with this and other appropriate procedures. Project participants are responsible for documenting information in sufficient detail to provide objective documentation (i.e. checkprints, calculations, reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

6. PROCEDURE

6.1 Completing the Custody Seal Information

- All Custody Seals must be completed in indelible ink. All corrections must be made using standard single-line cross-out methods, and the initials of the individual making the change must be included beside the corrected entry.
- Each Custody Seal attached must be completed by writing the *Date*, at a minimum, and signing with *full signature* by the person responsible for the sealing of the sample.
- If a space is provided, the *Time* should also be added.

6.2 Attaching the Custody Seals

Whenever possible, custody seals should be attached over the sample container lids during actual sampling and not when the samples are packaged for shipment. This will provide confidence in legal custody and will demonstrate non-tampering during the sample collection process.

Do not attach custody seals to VOC sample containers, as contamination may occur. For these samples, the custody seal should be used to seal the folded plastic zip bag that holds the sample containers.

- For sample jars, the completed Custody Seal should be placed across the top of the lid with the edges below the lid/jar interface and attached to the jar material. This will require the visible breaking of the seal in order to open the container.
- Sample coolers and shipping containers should have Custody Seals attached in such a manner that the seal extends lengthwise from the top edge of the lid to the side of the cooler/container.

7. ATTACHMENTS

None.

8. FORMS

None.

STANDARD OPERATING PROCEDURE

Subject: Sample Labeling

1. PURPOSE

The purpose of this procedure is to provide the requirements for completion and attachment of sample labels on environmental sample containers.

2. SCOPE

This procedure is applicable to all Shaw E & I projects/proposals where samples will be collected.

3. REFERENCES

- U.S. Environmental Protection Agency, 1986, *Test Methods for Evaluating Solid Waste; Physical/Chemical Methods*, SW-846, Third Edition.
- U.S. Army Corps of Engineers, *Requirements for the Preparation of Sampling and Analysis Plans*, EM200-1-3
- Shaw E & I, 2002, Sampler's Training Course Handout.

4. DEFINITIONS

- **Sample Label**—Any writing surface with an adhesive backing that can be used to document sample identification information. The sample label is attached to the sample container as a means of identification and, in some commercially available or laboratory-supplied containers, may be pre-attached. All Shaw E & I strategic alliance laboratories provide sample labels or pre-labeled containers in their sample container supply kits.

5. RESPONSIBILITIES

5.1 Procedure Responsibility

The Field Sampling Discipline Lead is responsible for maintenance, management, and revision of this procedure. Questions, comments, or suggestions regarding this technical SOP should be directed to the Field Sampling Discipline Lead.

5.2 Project Responsibility

Shaw E & I employees performing this task, or any portion thereof, are responsible for meeting the requirements of this procedure. Shaw E & I employees conducting technical review of task performance are also responsible for following appropriate portions of this SOP.

For those projects where the activities of this SOP are conducted, the Project Manager, or designee, is responsible for ensuring that those activities are conducted in accordance with this and other appropriate procedures. Project participants are responsible for documenting information in sufficient detail to provide objective documentation (i.e. checkprints, calculations, reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

6. PROCEDURE

- All sample labels must be completed in indelible ink. All corrections must be performed using standard single-line cross-out methods, and the initials of the individual making the change must be included beside the corrected entry.
- Sample labels should be completed and attached as samples are collected. Do not wait until final packaging to attach and/or complete the sample labels.
- Sample labels must be attached to the non-sealing portion of the container. Do not place labels on or across sample container caps.
- If the laboratory has provided pre-labeled containers, make sure to fill one for each parameter set needed. Laboratory pre-labeled containers are often bar-coded and it is important to provide a complete container set for each sample.
- The following information must be recorded on the Sample Label:
  - Sample Identification Number
  - Date and Time collected
  - Initials of person(s) responsible for collection
- If a space is provided, the *Analysis Requested* should also be added.
- If a *Description* is provided, remember it must match that on the Chain of Custody form for cross-referencing purposes.
- Cover the completed and attached label with clear plastic tape to prevent bleeding of the ink if it becomes wetted. *Do **not** perform this step for pre-weighed VOC vials, as the final weight values will be influenced by the mass of the tape. Protect these containers by enclosing the rack/holder in a plastic bag within the cooler.*

7. ATTACHMENTS

None.

8. FORMS

None.

STANDARD OPERATING PROCEDURE

Subject: Shipping and Packaging of Non Hazardous Samples

1. PURPOSE

The purpose of this procedure is to provide general instructions in the packaging and shipping of non-hazardous samples. The primary use of this procedure is for the transportation of samples collected on site to be sent off site for physical, chemical, and/or radiological analysis.

2. SCOPE

This procedure applies to the shipping and packaging of all non-hazardous samples. Non-hazardous samples are those that do not meet any hazard class definitions found in 49 CFR 107-178, including materials designated as Class 9 materials and materials that represent Reportable Quantities (hazardous substances) and/or materials that are not classified as *Dangerous Goods* under current IATA regulations.

In general most soil, air, and aqueous samples, including those that are acid or caustic preserved do **not** qualify as *hazardous materials* or *dangerous goods*. An exception is methanolic soil VOC vials: these containers are flammable in any quantity and **must** be packaged, shipped, and declared as *Dangerous Goods* whenever transported by air.

The Class 9 "Environmentally Hazardous" designation should only be applied to samples if they are known or suspected (via screening) to contain a sufficient concentration of contaminant to pose a health and/ or environmental risk if spilled in transport. Samples for which screening has shown a potential hazard (i.e. flammability) or those that are derived from a known hazard, including a site/facility with confirmed contamination by an *infectious substance* must also be shipped in accordance with the applicable DOT/IATA requirements. Refer to Shaw E & I SOP FS013.

Improper shipment of hazardous materials, especially willful misrepresentation and shipment as non-hazardous materials, is a violation of federal law and is punishable by fines and possible imprisonment of the guilty parties. It is also a violation of Shaw E & I policy and can result in disciplinary action up to and including termination of employment.

3. REFERENCES

- U.S. Army Corps of Engineers, 2001, *Requirements for the Preparation of Sampling and Analysis Plans*, EM200-1-3, Washington, D.C.
- U.S. Department of Transportation Regulations, 49 CFR Parts 108-178
- International Air Transport Association (IATA), *Dangerous Goods Regulations*, current edition.

4. DEFINITIONS

- **Cooler/Shipping Container**—Any hard-sided insulated container meeting DOT's or IATA's general packaging requirements.
- **Bubble Wrap**—Plastic sheeting with entrained air bubbles for protective packaging purposes.

5. RESPONSIBILITIES

5.1 Procedure Responsibility

The Field Sampling Discipline Lead is responsible for maintenance, management, and revision of this procedure. Questions, comments, or suggestions regarding this technical SOP should be sent to the Field Sampling Discipline Lead.

5.2 Project Responsibility

Shaw employees performing this task, or any portion thereof, are responsible for meeting the requirements of this procedure. Shaw employees conducting technical review of task performance are also responsible for following appropriate portions of this SOP.

For those projects where the activities of this SOP are conducted, the Project Manager, or designee, is responsible for ensuring that those activities are conducted in accordance with this and other appropriate procedures. Project participants are responsible for documenting information in sufficient detail to provide objective documentation (i.e. checkprints, calculations, reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

6. PROCEDURE

6.1 Packaging

- Use tape and seal off the cooler drain on the inside and outside to prevent leakage.
- Place packing material on the bottom on the shipping container (cooler) to provide a soft impact surface.
- Place a large (30-55 gallon or equivalent) plastic bag into the cooler (to minimize possibility of leakage during transit).
- Starting with the largest glass containers, wrap each container with sufficient bubble wrap to ensure the best chance to prevent breakage of the container.
- Pack the largest glass containers in the bottom of the cooler, placing packing material between each of the containers to avoid breakage from bumping.
- Double-bag the ice (chips or cubes) in gallon- or quart-sized resealable plastic freezer bags and wedge the ice bags between the sample bottles.
- Add bagged ice across the top of the samples.
- When sufficiently full, seal the inner protective plastic bag, and place additional packing material on top of the bag to minimize shifting of containers during shipment.
- Tape a gallon-sized resealable plastic bag to the inside of the cooler lid, place the completed chain of custody document inside, and seal the bag shut.
- Tape the shipping container (cooler) shut using packing tape, duct tape, or other tear-resistant adhesive strips. Taping should be performed to ensure the lid cannot open during transport.
- Place a custody seal on two separate portions of the cooler, to provide evidence that the lid has not been opened prior to receipt by the intended recipient.

6.2 Labeling

- A “This Side Up” arrow should be adhered to all sides of the cooler, especially ones without obvious handles.
- The name and address of the receiver and the shipper must be on the top of the cooler.
- The airbill must be attached to the top of the cooler.

6.3 Shipping Documentation

- A Cooler Shipment Checklist (Attachment 1) should be completed and kept in the project file.

7. ATTACHMENTS

- Attachment 1, Shaw E & I Cooler Shipment Checklist

8. FORMS

None.

Attachment 1
Shaw E & I Cooler Shipment Checklist

Shaw™
Shaw E & I, Inc.

Project Name _____ Project Number _____
Address _____ Date _____ Time _____
City, State, Zip _____ Fax No. _____
Site Contact No. _____

SAMPLE CHECKLIST	YES	NO	COMMENTS
SAMPLE LIDS ARE TIGHT AND CUSTODY SEALS IN PLACE?	❒	❒	
ARE ALL SAMPLE NUMBERS, DATES, TIMES AND OTHER LABEL INFORMATION LEGIBLE AND COMPLETE?	❒	❒	
HAVE ALL SAMPLE NUMBERS, DATES, TIMES AND OTHER SAMPLING DATA BEEN LOGGED INTO THE SAMPLE LOG BOOK?	❒	❒	
DO SAMPLE NUMBERS AND SAMPLE DESCRIPTIONS ON THE LABELS MATCH THOSE ON THE COC?	❒	❒	
HAVE THE SAMPLES BEEN PROPERLY PRESERVED?	❒	❒	
HAVE THE CHAIN OF CUSTODIES BEEN FILLED OUT COMPLETELY AND CORRECTLY?	❒	❒	
DOES THE ANALYTICAL SPECIFIED ON THE COC MATCH THE ANALYTICAL SPECIFIED IN THE SCOPE OF WORK?	❒	❒	
HAVE THE COC'S BEEN PROPERLY SIGNED IN THE TRANSFER SECTION?	❒	❒	

PACKAGING CHECKLIST	YES	NO	COMMENTS
HAS EACH SAMPLE BEEN PLACED INTO AN INDIVIDUAL PLASTIC BAG?	❒	❒	
HAS THE DRAIN PLUG OF THE COOLER BEEN TAPED CLOSED WITH WATER PROFF TAPE FROM THE INSIDE?	❒	❒	
HAVE ALL THE SAMPLES BEEN PLACED INTO THE COOLER IN AN UPRIGHT POSITION?	❒	❒	
IS THERE ADEQUATE SPACING OF SAMPLES SO THAT THEY WILL NOT TOUCH DURING SHIPMENT?	❒	❒	
HAVE AN ADEQUATE NUMBER OF BLUE ICE PACKS OR WATER ICE BEEN PLACED AROUND AND ON TOP OF THE SAMPLE?	❒	❒	
HAS FRESH BLUE ICE OR WATER ICE BEEN ADDED TO THE COOLER THE DAY OF THE SHIPMENT?	❒	❒	
HAS THE COOLER BEEN FILLED WITH ADDITIONAL CUSHIONING MATERIAL?	❒	❒	
HAS THE COC BEEN PLACE IN A ZIPLOCK BAG AND TAPED TO THE INSIDE OF THE LID OF THE COOLER?	❒	❒	
HAVE CUSTODY SEALS BEEN PLACED ONTO THE LID?	❒	❒	
HAS THE COOLER BEEN LABELED "THIS SIDE UP"?	❒	❒	
IF REQUIRED, HAS THE COOLER BEEN LABELED WITH THE DOT PROPER SHIPPING NAME, UN NUMBER AND LABEL?	❒	❒	
HAS THE LABORATORY PERFORMING THE ANALYSES BEEN NOTIFIED OF THE SHIPMENT OF SAMPLES?	❒	❒	

PROBLEMS/RESOLUTIONS: _____

_____

_____

PREPARED BY: _____ SIGNATURE _____

STANDARD OPERATING PROCEDURE

Subject: Decontamination of Contact Sampling Equipment

1. PURPOSE

This procedure is intended to provide minimal guidelines for the decontamination of contact sampling equipment. Contact sampling equipment is equipment that comes in direct contact with the sample or the portion of a sample that will undergo chemical analyses or physical testing.

2. SCOPE

This procedure applies to all instances where non-disposable direct contact sampling equipment is utilized for sample collection and no project-specific procedure is in place. This procedure is not intended to address decontamination of peristaltic or other sampling pumps and tubing. The steps outlined in this procedure must be executed between each distinct sample data point.

3. REFERENCES

- U.S. Environmental Protection Agency, Region 4, 2001, *Environmental Investigations Standard Operating Procedures and Quality Assurance Manual*, 980 College Station Road, Athens, Georgia. November.
- US Army Corp of Engineers, Washington, D.C., 2001, Requirements for the Preparation of Sampling and Analysis Plans (EM-200-1-3), February.

4. DEFINITIONS

- **Soap**—A standard brand of phosphate-free laboratory detergent, such as Liquinox®.
- **Organic Desorbing Agent**—A solvent used for removing organic compounds. The specific solvent would depend upon the type of organic compound to be removed. See Attachment 1 for recommendations.
- **Inorganic Desorbing Agent**—An acid solution for use in removing trace metal compounds. The specific acid solution would depend upon the type of inorganic compound to be removed. See Attachment 1 for recommendations.
- **Tap water**—Water obtained from any municipal water treatment system. An untreated potable water supply can be used as a substitute for tap water if the water does not contain the constituents of concern.
- **Distilled Water**—Water that has been purified via distillation. Distilled water can be purchased in most stores and is acceptable as a final rinse in non-trace analytical decontamination processes. Examples would include disposal profiling, HazCat, and other gross screening applications.
- **Analyte-free water**—Water that has been treated by passing through a standard deionizing resin column, and for organics either distillation or activated carbon units. At a minimum, the finished water should contain no detectable heavy metals or other inorganic compounds, and/or no detectable organic compounds (i.e., at or above analytical detection limits). Type I and Type II Reagent Grade Water meet this definition as does most laboratory-supplied blank water.

5. RESPONSIBILITIES

5.1 Procedure Responsibility

The Field Sampling Discipline Lead is responsible for maintenance, management, and revision of this procedure. Questions, comments, or suggestions regarding this technical SOP should be sent to the Field Sampling Discipline Lead.

5.2 Project Responsibility

Shaw employees performing this task, or any portion thereof, are responsible for meeting the requirements of this procedure. Shaw employees conducting technical review of task performance are also responsible for following appropriate portions of this SOP.

For those projects where the activities of this SOP are conducted, the Project Manager, or designee, is responsible for ensuring that those activities are conducted in accordance with this and other appropriate procedures. Project participants are responsible for documenting information in sufficient detail to provide objective documentation (checkprints, calculations, reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

6. PROCEDURE

Wear appropriate eye protection including safety goggles when working with corrosive liquids, especially when diluting concentrated materials to create low-percentage solutions and follow all project Health and Safety requirements. Decontamination wastes are to be recovered and handled as impacted project waste materials and must be disposed of in accordance with regulatory requirements.

A decontamination area should be established. Implements can either be immersed in a 5-gallon bucket containing each solution/rinse or the solutions can be contained in hand-held units made of an inert and compatible material; such as a Teflon™ wash bottle. The analyte-free water needs to be placed in a container that will be free of any compounds of concern.

Consult Attachment 1 for the decontamination solutions/solvents appropriate to the task. The minimum steps for decontamination are as follows:

1. Remove particulate matter and other surface debris by brushing and/or dipping in the soap solution.
2. Rinse thoroughly with tap water.
3. If necessary, rinse with other applicable solutions/solvents. If hexane is used, be sure to follow it with isopropyl alcohol to allow for the final water rinses to properly mix and contact the surface.
4. Final rinse three times to make sure all residual solutions/solvents are removed.
5. Place decontaminated equipment on a clean surface appropriate for the compounds of concern and allow to air dry.

7. ATTACHMENTS

- Attachment 1, Recommended Decontamination Procedures.

8. FORMS

None.

Attachment 1
Recommended Decontamination Procedures

Compound	Detergent Wash	Tap Water	Inorganic Desorbing Agent	Tap Water	Organic Desorbing Agent[1]	Final Water Rinse[4]	Air Dry
Organic Constituents							
Volatile Organic Compounds	✓	✓			Methanol Purge & Trap grade	✓	✓
Base Neutrals/Acid Extractables/PCBs/Pesticides	✓	✓			Hexane followed by Isopropyl Alcohol	✓	✓
Organic Bases[2]	✓	✓	1% nitric acid	✓	Isopropyl Alcohol	✓	✓
Organic Acids[3]	✓	✓	1% nitric acid		Isopropyl Alcohol	✓	✓
Inorganic Constituents							
Trace Metals and Radio Isotopes	✓	✓	10% Nitric acid -Trace metals grade	✓		✓	✓
Cations/Anions	✓	✓				✓	✓
Acidic Compounds	✓	✓				✓	✓
Basic Compounds (caustic)	✓	✓	1% nitric acid	✓		✓	✓

1 – All organic solvents must be Pesticide Grade or better. The selection of appropriate solvent rinses should first consider if a *known or suspected* contaminant requires removal from sampling equipment. Secondly, identify whether the subsequent analytical protocol would be impacted by the proposed solvent or an impurity thereof (e.g., residual acetone present in isopropyl alcohol would be measured with certain volatile organics analysis).
2 - Organic bases include amines, hydrazines.
3 - Organic acids include phenols, thiols, nitro and sulfonic compounds.
4- Use a grade of water appropriate to the application. For trace level analysis this must be Analyte Free Water. For non-trace applications store-bought distilled water is sufficient

Adapted from: Appendix E, Requirements for the Preparation of Sampling and Analysis Plans (EM-200-1-3), February 2001. US Army Corp of Engineers, Washington, D.C.

Revision 1- 3/2006

STANDARD OPERATING PROCEDURE

Subject: Measurement of Water Level and LNAPL in Monitoring Wells

1. PURPOSE

The purpose of this procedure is to provide the methods and procedures for measurement of groundwater well water levels and for conducting LNAPL measurements. Well water levels can either be determined as part of the well purging/sampling effort or be independently determined to provide information on site hydrology.

2. SCOPE

This procedure is applicable to all Shaw E & I projects where groundwater level and/or LNAPL measurements are taken.

3. REFERENCES

- American Society of Testing and Materials, D4750-87 (Reapproved 2001), *Standard Test Method for Determining Subsurface Liquid Levels in a Borehole or Monitoring Well (Observation Well)*, West Conshohocken, PA.
- U.S. Department of the Interior, 1977 (updated 1984), *National Handbook of Recommended Methods for Water-Data Acquisition*, Chapter 2, Reston, VA.

4. DEFINITIONS

- **Measuring Tape**—Steel or plastic tape with graduations to 0.01 feet. The tape shall not stretch more than 0.05 feet under normal use.
- **Electronic Measuring Device**—Commercial probe and cable designed to register a signal when the probe contacts water. The cable must have graduations to 0.01 feet.
- **Oil/water Interface Probe**- a specialized electronic measuring device that detects organic liquids. It is used to determine the interface and physical extent of any oil within the well.

5. RESPONSIBILITIES

5.1 Procedure Responsibility

The Field Sampling Discipline Lead is responsible for maintenance, management, and revision of this procedure. Questions, comments, or suggestions regarding this technical SOP should be sent to the Field Sampling Discipline Lead.

5.2 Project Responsibility

Shaw E & I employees performing this task, or any portion thereof, are responsible for meeting the requirements of this procedure. Shaw E & I employees conducting technical review of task performance are also responsible for following appropriate portions of this SOP.

For those projects where the activities of this SOP are conducted, the Project Manager, or designee, is responsible for ensuring that those activities are conducted in accordance with this

and other appropriate procedures. Project participants are responsible for documenting information in sufficient detail to provide objective documentation (checkprints, calculations, reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

6. PROCEDURE

Two techniques are discussed below: the measuring-tape method and the electronic method.

6.1 Equipment

The following equipment should be used when measuring groundwater levels:

- Decontaminated, weighted tape with graduations to 0.01 feet. The weight should be sufficient to ensure plumbness of the tape, but slender enough so as not to raise the water level significantly when submerged in the water.
- Decontaminated, commercial electronic water-level measuring device.
- Engineer's rule, graduated to 0.01 feet.
- Oil/water interface probe and meter.

6.2 Weighted Steel Tape

The following procedure should be used when measuring groundwater levels with a measuring tape:

1. Unlock the well cover and remove the cap.
2. Locate the reference point on the riser pipe.
3. Don a pair of clean gloves.
4. Slowly lower the weighted tape down the well until the bottom is reached, indicated by a bump and sudden slack in the line.
5. Straighten the tape out, removing the slack, and measure the distance at the reference point.
6. Record the reading at the reference point as Depth to Bottom (DTB).
7. Withdraw the tape from the well and record the reading at the wet/dry interface as Depth to Water (DTW).
8. The difference between the two measurements is the depth of the water column (DWC).
9. Dry and decontaminate the wetted portion of the tape.

6.3 Electronic Measurement

The following procedure should be used when measuring groundwater levels with an electronic water-level measuring device:

1. Check for proper instrument response by inserting the probe in water. Fix or replace the instrument as needed.
2. Unlock the well cover and remove the cap.
3. Locate the reference point on the riser pipe.

4. Don a pair of clean gloves.
5. Slowly lower the probe down the well until the signal indicates that the water has been contacted.
6. Record the reading at the reference point as DTW.
7. Withdraw the probe and repeat steps 5 & 6. Duplicate measurements should agree within 0.02 feet. If not, continue with measurements until 0.02 feet precision is achieved.
8. Lower the probe until the bottom of the well is reached, as indicated by slack in the line.
9. Pull slightly to remove the slack, measure at the reference point, and record as DTB.
10. Determine the water column length as (DTB-DTW) and record as DWC.
11. Remove the probe from the well and decontaminate it.

6.4 Light Non-Aqueous Phase Liquids

Oil or other light non-aqueous phase liquids (LNAPL) may be floating on the water in selected wells. If so, measure the LNAPL level and the water level using an oil/water interface probe as follows:

1. Check for proper instrument response by inserting the probe in water. Instruments typically indicate LNAPL with a steady indicator light and tone, while water is indicated by an intermittent light and tone.
2. Unlock the well cover and remove the cap.
3. Locate the reference point on the riser pipe.
4. Don a pair of clean gloves.
5. Slowly lower the oil/water interface probe down the well until the signal indicates that LNAPL has been contacted (typically a steady indicator light and tone).
6. Record the reading at the reference point as DTNAPL.
7. Continue lowering the probe until the signal indicates that water has been contacted (typically an intermittent light and tone).
8. Record the reading at the reference point as DTW.
9. Determine the depth of LNAPL as (DTW-DTNAPL) and record it.
10. Withdraw the probe and repeat steps 5 & 6. Duplicate measurements should agree within 0.02 feet. If not, continue with measurements until 0.02 feet precision is achieved.
11. Lower the probe until the bottom of the well is reached, as indicated by slack in the line.
12. Pull slightly to remove the slack, measure at the reference point, and record as DTB.
13. Determine the water column length as (DTB-DTW) and record as DWC.
14. Remove the probe from the well and decontaminate it.

7. ATTACHMENTS

None.

8. FORMS

None.

STANDARD OPERATING PROCEDURE

Subject: Low Flow/Micro-Purge Well Sampling

1. PURPOSE

This procedure is intended to provide methods for low-flow sampling of groundwater from monitoring wells. Low-flow or micro-purge sampling is a method of collecting samples from a well that does not require the removal of large volumes of water from the well and therefore does not overly agitate the water and suspended particles or potentially aspirate VOCs. The method entails the removal of water directly from the screened interval without disturbing any stagnant water above the screen by pumping the well at low enough flow rates to maintain minimal drawdown of the water column followed by in-line sample collection. Typical flow rates for low-flow sampling range from 0.1 L/min to 0.5 L/min depending on site characteristics.

2. SCOPE

This procedure is applicable to all Shaw E & I projects where groundwater samples will be collected from a monitoring well using low-flow or micro-purge methods and where no project/program specific procedure is in use.

3. REFERENCES

- U.S. Army Corps of Engineers, 2001, *Requirements for the Preparation of Sampling and Analysis Plans*, Appendix C, Section C.2, EM200-1-3, Washington, D.C.
- American Society for Testing and Materials, D6771-02, *Standard practice for Low-Flow Purging and Sampling for Wells and Devices Used for Ground-Water Quality Investigations*, West Conshohocken, PA.
- American Society for Testing and Materials, D4448-01, *Standard Guide for Sampling Ground-Water Monitoring Wells*, West Conshohocken, PA .
- U.S. Environmental Protection Agency Region 1, 1996, *Low Stress (Low Flow) Purging and Sampling Procedure for the Collection of Ground Water Samples from Monitoring Wells*, SOP GW0001, Revision 2, July 30.

4. DEFINITIONS

- **Low Flow**—Refers to the velocity that is imparted during pumping to the formation adjacent to the well screen, not necessarily the flow rate of the water discharged by the pump at the surface.
- **Micro-purge**—Another term for low-flow sampling referred to as such due to the fact that pre-sampling groundwater removal (purging) is performed at flow rates 2 to 3 orders of magnitude less than typical bailer or pump methods.
- **Pump**—An electric, compressed air, or inert gas driven device that raises liquids by means of pressure or suction. The types of pumps used for well purging should be chosen based on the well size and depth, the type of contaminants, and the specific factors affecting the overall performance of the sampling effort. Low flow/micro-purge sampling is performed using

specially constructed pumps, usually of centrifugal, peristaltic, or centrifugal submersible design, with low draw rates (<1.0L/min).

- **Well Purging**—The action of removing groundwater using mechanical means from a monitoring well prior to collecting groundwater samples. Purging removes the stagnant groundwater from the column allowing the groundwater surrounding the well screen to enter the collection zone.

5. RESPONSIBILITIES

5.1 Procedure Responsibility

The Field Sampling Discipline Lead is responsible for maintenance, management, and revision of this procedure. Questions, comments, or suggestions regarding this technical SOP should be directed to the Field Sampling Discipline Lead.

5.2 Project Responsibility

Shaw employees performing this task, or any portion thereof, are responsible for meeting the requirements of this procedure and utilizing materials of a construction specified in the project plans or applicable to the contaminants of concern and other aspects of the sampling effort. These aspects may include well diameter, well construction materials, depth to water, and the presence of DNAPL or LNAPL contaminants. Shaw employees conducting technical review of task performance are also responsible for following appropriate portions of this SOP.

For those projects where the activities of this SOP are conducted, the Project Manager, or designee, is responsible for ensuring that those activities are conducted in accordance with this and other appropriate procedures. Project participants are responsible for documenting information in sufficient detail to provide objective documentation (checkprints, calculations, reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

6. PROCEDURE

Low-flow/micro-purge sampling involves removing water directly from the screened interval without disturbing any stagnant water above the screen or without lowering the water table. Since it is not based upon the removal of well volumes, it requires in-line monitoring of water quality parameters which may include pH, specific conductivity, temperature, dissolved oxygen, and redox potential to determine when the groundwater sample zone has stabilized. The sample is then collected using the same pump directly from the discharge tubing.

6.1 Considerations

The following variables should be reviewed in planning for low-flow purging and sampling:

- **Recharge capacity of each well:** The recharge capacity of a well will determine how fast the well should be purged. The purge rate should be no greater than the recharge rate of the groundwater zone to prevent water table drawdown.

- **Well construction details, including well depth, diameter, screened interval, screen size, material of construction, and depth to water table:** The diameter and well depth will determine the size of the pump and the location from which the pump will operate. Peristaltic and suction draw pumps are only viable at depths of less than 25 feet. The pump intake should be placed within the well screen.

- **Pump:** Low-flow purging and sampling can be used in any well that can be pumped at a constant rate of not more than 1.0 L/min. Continuous discharge and cycle discharge pumps with adjustable flow rate controls should be used to avoid causing continuous drawdown. Whenever possible, dedicated pumps should be installed to avoid disturbing the water column.

- **Groundwater quality, including type and concentration of chemical compounds present:** Low-flow methods can be used for all types of aqueous-phase contamination, including VOCs, SVOCs, metals, pesticides, PCBs, radionuclides, and microbiological constituents. Pump parts and tubing should be made of materials that are compatible with the analytes of interest.

6.2 Equipment

The following equipment is recommended for use in conducting well purging:

- Pump capable of <1.0L/min draw rates
- Discharge line constructed of material compatible with the contaminants of interest. Enough for a fresh line to be used at each well
- Water level indicator
- Flow-through Water Quality Meter (pH, specific conductance, temperature, optional Dissolved Oxygen, Redox potential)–calibrated
- Nephelometer–for turbidity measurement-calibrated (if required)
- Photoionization Detector (PID)–calibrated (if screening for VOCs is required)
- Drums or tanks to contain the purge water
- Field log book
- Calculator
- Plastic sheeting
- Sample containers and preservatives
- Ice and Ziploc-type bags

6.3 Pre-Sampling

To prevent cross-contamination of other wells on-site, upgradient and background wells should be addressed first. It is also a good idea to use fresh discharge line for each well as the low-flows make it difficult to flush contaminants between samples. The procedure for pre-sampling is as follows:

- Prepare the area surrounding the well by placing plastic sheeting on the ground surface to prevent potential cross-contamination of the pump and discharge hose or sample equipment and materials.
- Place and secure the drum, tank, or suitable purge water container in close proximity to the well for the collection and storage of purge water. *Purge water must be containerized and disposed of in the manner specified in the project/program plan or as the client directs.* ***Never*** *return purge water to the well.* If in doubt or where requirements are not specified, handle all purge water as waste and dispose of it accordingly.

- If performing VOC screening, measure and record the background organic vapors in the ambient air using a PID, in accordance with manufacturer recommendations.
- Open the well casing, remove the well cap, and immediately measure and record the organic vapor levels from the head space within the well casing using a PID, in accordance with manufacturer recommendations.
- Measure the depth to the static water level using the water level indicator in accordance with Procedure EI-FS108, *Water Level Measurements*.

6.4 Well Purging

The procedure for well purging is as follows:

- Review and understand the proper operating and maintenance instruction for each type of pump that is used prior to placing the pump in the well. Each pump type has specific operating procedures.
- Some wells may include a dedicated pump that is already placed in the well along the well screen. If this is the case, review well construction data to verify the proper placement of the pump intake. Inspect the location where the discharge line and pump support cable exit the well to determine that they are in the proper position (markings should be present at the well head to show this).
- Assemble the pump and clean discharge line in accordance with manufacturer instructions. Ensure the pump discharge line is long enough so that the pump intake can be located within the well screen area and the discharge end can reach the purge water container.
- Slowly lower the pump into the well until it is submerged and at the desired pumping depth.
- Connect the pump discharge to the flow-through water quality meter system in accordance with the manufacturer's procedure.
- Start the pump and begin monitoring discharge rates and volume collected. Adjust flows if necessary to remain in a range of 0.1 to 0.5L/min without exceeding the well discharge rate.
- Monitor and record the pH, conductivity, temperature, dissolved oxygen, redox potential, and turbidity at set intervals (2 to 10 minutes).
- Collect the sample following the procedure below when all monitored water quality parameters are stable, as indicated by three consecutive readings differing by less than 10 percent. For pH use +/-0.3 units as the standard.

6.5 Sample Collection

The procedure for sample collection is as follows:

- Prepare the sample bottles and preservatives required for the sampling.
- Don a pair of clean gloves.
- Collect the sample immediately after purging through the pump discharge line.
  - Fill VOA vials first (reduce the flow rate of the pump discharge) allowing the liquid to slowly fill the container without agitation and obtain a meniscus slightly above the top of the vial.
  - Cap and check all VOA vials for entrained air by slowly tipping and observing for bubbles. If any are present, discard the sample and collect again as above.

- Continue filling all required sample bottles.
- Add preservatives to the samples as needed, and place the sample bottles on ice. Note that most sample bottles come with preservatives already added. If such is the case, do not overfill the bottles.
- Replace the well cap, if required, and lock the cover.
- Record the sampling information.
- For a dedicated down-hole pumping system, do not decontaminate the pump but rinse the water quality meter's flow-cell and probes with distilled water.
- If using a non-dedicated pump and meter system, decontaminate the pump and meter.
  - Retrieve the pump and remove and dispose of the discharge line, including the line leading to and from the water quality meter system.
  - Rinse the water quality meter system with distilled water.
  - Attach a few feet of clean line to the pump and water quality meter system with a discharge end into the purge waste container.
  - Place the pump into a container of distilled water, adjust the flow to its maximum, and allow the entire system to flush with distilled water for at least 5 minutes or longer if the waste does not appear to be clean.
- Secure the area by removing equipment and materials, properly dispose of plastic sheeting and other disposable sampling materials, and close the purge water container(s).
- Proceed to the next well and repeat the process using clean discharge tubing for each well sampled.

7. ATTACHMENTS

None.

8. FORMS

None.

26672-88

• Iron, Ferrous, Test Kit

1,10 Phenanthroline Iron Reagent Method

• Trousse d'analyse fer ferreux

Méthode réactif fer 1, 10 Phéanthroline

• Eisen, 2wertig Test Kit

1,10 Phenanthrolin-Eisenreagenz Methode

• Kit de análisis para hierro ferroso

Método reactivo de fenatrolina de hierro 1,10

0.0 – 10.0 mg/L

• Mod. IR-18C

• # 26672-00

- To ensure accurate results, read carefully before proceeding.
- Pour obtenir des résultats exacts, lire attentivement le mode d'emploi avant d'utiliser la trousse.
- Um genaue Ergebnisse zu gewährleisten, lesen Sie das Folgende bitte aufmerksam durch, bevor Sie fortfahren.
- Para obtener resultados precisos, lea detenidamente las instrucciones antes de proceder al análisis.

WARNING

Handling chemical samples, standards, and reagents can be dangerous. Review the Material Safety Data Sheets before handling any chemicals.

ATTENTION

La manipulation des échantillons chimiques, étalons et réactifs peut être dangereuse. Lire les fiches de données de sécurité des produits avant de manipuler tout produit chimique.

WARNUNG

Die Handhabung chemischer Proben, Standards und Reagenzien kann gefährlich sein. Bitte gehen Sie die Materialsicherheitsdatenblätter durch, bevor Sie Chemikalien handhaben.

ADVERTENCIA

El manejo de sustancias químicas, patrones y reactivos, puede resultar peligroso. Lea las fichas de informaciones de seguridad de materiales antes de manipular cualquier producto químico.

HACH®

Introduction

The 1,10 phenanthroline indicator in the Ferrous Iron Reagent reacts with ferrous iron in the sample to form an orange color in proportion to the ferrous iron concentration. Ferric iron does not react. The ferric iron (Fe^{3+}) concentration can be determined by subtracting the ferrous iron concentration from the results of a total iron test.

Introduction

L'indicateur 1,10 phénanthroline dans le réactif fer ferreux réagit avec le fer ferreux présent dans l'échantillon pour former une coloration orange proportionnelle à la concentration de fer ferreux. Le fer ferrique ne réagit pas. La concentration de fer ferrique (Fe^{3+}) peut être déterminée en soustrayant la concentration de fer ferreux des résultats d'une analyse de fer total.

Einleitung

Der 1,10 Phenantrolin Indikator im Eisen(II)-Reagenz reagiert mit Eisen(II) in der Probe durch Bildungen einer orangen Farbe, proprotional zur Konzentration des zweiwertigen Eisens. Eisen(III) reagiert nicht. Die Konzentration des dreiwertigen Eisen (Fe^{3+}) kann bestimmt werden, indem man die Konzentration des zweiwertigen Eisens von den Ergebnissen eines Eisen Gesamt Tests subtrahiert.

Introducción

El indicador de 1,10-fenantrolina en el Reactivo para Hierro Ferroso reacciona con el hierro ferroso de la muestra para formar un color anaranjado en proporción con la concentración de hierro ferroso. El hierro férrico no reacciona. La concentración de hierro férrico (Fe^{3+}) puede ser determinada restando la concentración de hierro ferroso de el resultado de una prueba de hierro total.

Measuring Hints and General Test Information

- Wash all labware between tests. Contamination may alter test results. Clean with a non-abrasive detergent or a solvent such as isopropyl alcohol. Use a soft cloth for wiping or drying. Do not use paper towels or tissue on plastic tubes as this may scratch them. Rinse with clean water (preferably deionized water).
- Rinse all viewing tubes thoroughly with the sample water before testing.
- Use clippers to open plastic powder pillows.
- For critical testing, reagent accuracy should be checked with each new lot of reagents. Prepare a ferrous iron stock solution (100 mg/L Fe) by dissolving 0.702 grams of ferrous ammonium sulfate, hexahydrate, in one liter deionized water. Dilute 5.00 mL of this solution to 100 mL with deionized water to make a 5.0 mg/L standard solution. Prepare this immediately before use. Follow the ferrous iron test instructions using this solution instead of a water sample.

Conseils pour les mesures et informations générales sur l'analyse

- Laver toute la verrerie entre les analyses. La contamination peut fausser les résultats d'analyses. Laver avec un détergent non abrasif ou un solvant tel que l'isopropanol. Utiliser un tissu doux pour essuyer ou sécher. Ne pas utiliser de tissu ou papier d'essuyage sur les tubes en plastique pour ne pas les rayer. Rincer à l'eau propre (de préférence de l'eau désionisée).
- Rincer soigneusement tous les tubes colorimétriques avec l'échantillon d'eau avant l'analyse.
- Utiliser la pince coupante pour ouvrir les gélules en plastique.
- Pour des analyses critiques, l'exactitude du réactif doit être vérifiée pour chaque nouveau lot de réactifs. Préparer une solution-mère de fer ferreux (100 mg/L Fe) en dissolvant 0,702 grammes d'ammonium-fer (II) sulfate, hexahydrate, dans un litre d'eau désionisée. Diluer 3,00 mL de cette solution à 100 mL avec de l'eau désionisée pour obtenir une solution étalon à 3,0 mg/L. Préparer cette solution immédiatement avant emploi. Suivre les instructions d'analyse du fer ferreux en remplaçant l'échantillon par cette solution étalon.

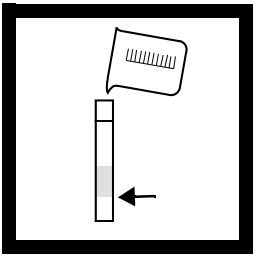
Meßtips und allgemeine Testinformationen

- Waschen Sie alle Laborartikel zwischen den Tests. Verunreinigung kann die Testergebnisse verfälschen. Reinigen Sie sie mit einem nicht scharfen Detergent oder einem Lösungsmittel wie zum Beispiel Isopropylalkohol. Verwenden Sie für das Abwischen oder Abtrocknen ein weiches Tuch. Verwenden Sie bei den Plastikröhrchen keine Papierhandtücher oder Tissue-Papier, da dieses sie zerkratzen kann. Spülen Sie mit sauberem Wasser (vorzugsweise entsalztes Wasser).
- Spülen Sie alle Prüfröhrchen vor dem Test gründlich mit dem Probenwasser.
- Verwenden Sie eine Schere zur Öffnung der Plastik-Pulverkissen.
- Um genaue Bestimungen zu erzielen, sollte die Genauigkeit der Reagenzien für jede neue Charge überprüft werden. Bereiten Sie eine Eisen-II Stammlösung (100mg/L Fe) auf, indem Sie 0,702 Gramm Eisen-II Ammoniumsulfat, hexahydrat, in einem Liter entsalzten Wasser lösen. 3,00 mL dieser Lösung werden mit 100 mL entsalztem Wasser verdünnt, so dass eine 3,0 mg/L Standardlösung entsteht. Diese Lösung wird unmittelbar vor Gebrauch angesetzt. Arbeiten Sie, unter Benutzung dieser Lösung anstelle einer Wasserprobe, gemäß den Anweisungen für den Eisen(II) Test.

Consejos para la medición e información general sobre el análisis

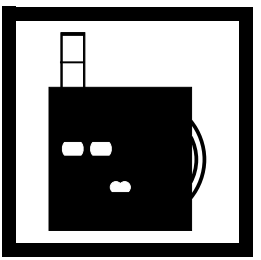
- Lavar todo el material de laboratorio entre los análisis. La contaminación puede alterar los resultados. Limpiar con un detergente no abrasivo o con un solvente como el alcohol isopropílico. Utilizar un paño suave para limpiar o secar. No utilizar ni toallitas ni pañuelos de papel para limpiar los tubos de plastico para no rayarlos. Aclarar con agua limpia (preferentemente agua desionizada).
- Enjuagar todos los tubos para colorimetría abundantemente con la muestra de agua antes de realizar el análisis.
- Utilice las pinzas cortantes para abrir las cápsulas de plástico.
- Para pruebas exigentes o difficiles, la precisión del reactivo debe ser verificada cada vez que se comienza con un nuevo lote. Preparar una solución de reserva de hierro ferroso (100 mg/L Fe), disolviendo 0,702 gs. de sulfato de amonio ferroso, hexahidrato, en un litro de agua desionizada. Diluya 3,00 mL de esta solución en 100 mL de agua desionizada para hacer una solución estándar de 3,00 mg/L. Esta debe ser preparada inmediatamente antes de usarla. Siga las instrucciones de la prueba de hierro ferroso empleando esta solución en vez de una muestra de agua.

• Procedure • Technique • Verfahren • Procedimiento



1. Fill a viewing tube to the first (5-mL) line with sample water. This is the blank.

- Remplir un tube colorimétrique jusqu'au premier trait (5 mL) avec l'échantillon d'eau. Ceci est le blanc.
- Füllen Sie ein Prüfröhrchen bis zur ersten (5 mL) Linie mit Probenwasser. Dieses ist die Blindprobe.
- Llene un tubo para colorimetría hasta la primera marca (5 mL) con la muestra de agua. Esto constituye el blanco.



2. Place this tube in the top left opening of the color comparator.

- Placer ce tube dans l'ouverture supérieure gauche du comparateur.
- Stellen Sie dieses Röhrchen in die obere linke Öffnung des Farbkomparators.
- Coloque este tubo en la abertura superior izquierda del comparador.

3. Fill the measuring vial to the 25-mL mark with sample water.

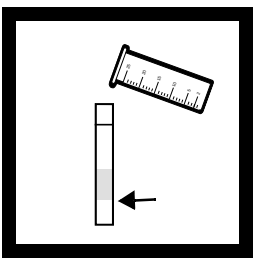
- Remplir le tube de mesure jusqu'au trait 25 mL avec l'échantillon d'eau.
- Füllen Sie das Messröhrchen bis zur 25 mL Markierung mit dem Probenwasser.
- Llene el frasco medidor hasta la marca de 25 mL con el agua de la muestra.

4. Add the contents of one Ferrous Iron Reagent Powder Pillow to the measuring vial.

- Ajouter le contenu d'une gélule de réactif du fer ferreux au tube de mesure.
- Geben Sie den Inhalt eines Eisen(II)-Reagenz-Pulverkissens in das Messröhrchen.
- Agregue el contenido de una cápsula del Reactivo para Hierro Ferroso al frasco medidor.

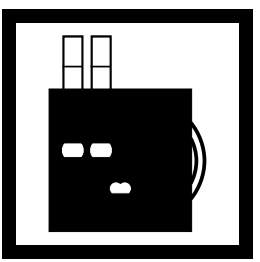
5. Swirl to mix. An orange color will develop if ferrous iron is present. Allow three minutes for full color development.

- Agiter pour mélanger. En présence de fer ferreux, une coloration orange se développe. Attendre le développement complet de la coloration.
- Schwenken Sie zum Vermischen. Ist Eisen(II) vorhanden, entwickelt sich eine orange Färbung. Warten Sie drei Minuten, bis sich die Farbe vollständig ausgebildet hat.
- Agite para mezclar. Se formará un color anaranjado en presencia de hierro ferroso. Deje pasar tres minutos para que el color se desarrolle completamente.



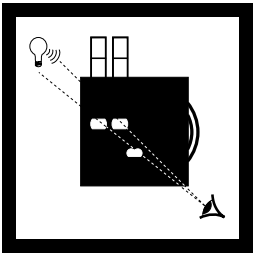
6. Fill another viewing tube to the first (5-mL) mark with the prepared sample.

- Remplir un autre tube jusqu'au premier trait (5 mL) avec l'échantillon préparé.
- Füllen Sie ein weiteres Prüfröhrchen bis zur ersten (5 mL-) Linie mit der vorbereiteten Probe.
- Llene otro tubo para colorimetría hasta la marca de 5mL con la muestra preparada en los puntos 4 y 5.



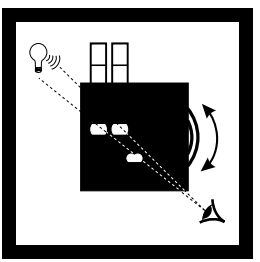
7. Place the second tube in the top right opening of the color comparator.

- Placer le second tube dans l'ouverture supérieure droite du comparateur.
- Setzen Sie das zweite Röhrchen in die obere rechte Öffnung des Farbkomparators.
- Coloque el segundo tubo en la abertura superior derecha del comparador.



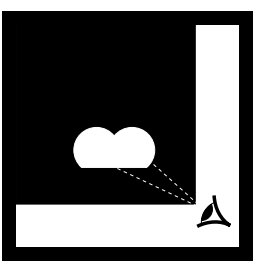
8. Hold comparator up to a light source such as the sky, a window or a lamp. Look through the openings in front.

- Tenir le comparateur face à une surface uniformément éclairée (ciel, lampe, fenêtre) et regarder par les ouvertures de la face antérieure du comparateur.
- Halten Sie den Komparator gegen eine Lichtquelle wie zum Beispiel den Himmel, ein Fenster oder eine Lampe. Sehen Sie durch die Öffnungen vorn.
- Lleve el comparador hasta una fuente de luz, tal como el cielo, una ventana o una lámpara. Mire a través de las aberturas frontales del comparador.



9. Rotate the color disc until the color matches in the two openings.

- Tourner le disque jusqu'à égalité des teintes dans les deux ouvertures.
- Drehen Sie die Farbscheibe, bis die Farbe in den beiden Öffnungen übereinstimmt.
- Haga girar el disco de color hasta que el color coincida en ambas aberturas.



10. Read the mg/L ferrous iron in the scale window.

- Lire la concentration du fer ferreux en mg/L dans la fenêtre de l'échelle.
- Lesen Sie die mg/L Eisen(II) im Skalenfenster ab.
- Lea la concentración de hierro ferroso en mg/L en la ventanilla graduada.

REPLACEMENTS

Description	Unit	Cat. No.
Clippers	each	968-00
Color Comparator	each	1732-00
Color Disc, Iron Phenanthroline	each	1874-00
Ferrous Iron Reagent Powder Pillows, 25 mL	100/pkg	1037-69
Instruction Card, IR-18C Test Kit	each	26672-88
Vial, measuring, with 2, 5, 10, 15, 20 and 25-mL marks	each	2193-00
Viewing Tube, plastic	4/pkg	46600-04
Water, deionized	4 L	272-56

REACTIFS ET PIECES DE RECHANGE

Désignation	Unité	Réf. Nº
Pince coupante pour gélules moyennes	1	968-00
Comparateur	1	1732-00
Disque coloré fer, phénanthroline	1	1874-00
Réactif du fer ferreux en gélules pour 25 mL	100/paq	1037-69
Mode d'emploi de la trousse IR-18C	1	26672-88
Tube de mesure marqué 2, 5, 10, 15, 20 et 25 mL	1	2193-00
Tube colorimétrique en plastique avec bouchon	4/paq	46600-04
Eau désionisée	4 L	272-56

VERBRAUCHSMATERIAL UND ERSATZTEILE

Beschreibung	Einheit	Kat. Nr.
Abschneider	1	968-00
Farbkomparator	1	1732-00
Farbscheibe, Eisenphenanthrolin	1	1874-00
Eisen(II) Reagenz-Pulverkissen, 25 mL	100/Stck	1037-69
Anleitungskarte, IR-18C Test Kit	1	26672-88
Messröhrchen m. 2, 5, 10, 15, 20 und 25 mL Markierungen	1	2193-00
Farbprüfröhrchen, Plastik, mit Kappe	4/Stck	46600-04
Entsalztes Wasser	4 L	272-56

REACTIVOS Y MATERIALES

Descripción	Unidad	Nº Ref.
Pinzas cortantes para cápsulas intermedias	1	968-00
Comparador de Colores	1	1732-00
Disco de colores, fenantrolina de hierro	1	1874-00
Reactivo para Hierro Ferroso, Bolsas de Polvo, 25 mL	100/lote	1037-69
Tarjeta de Instrucciones, Juego de Prueba IR-18C	1	26672-88
Frasco medidor, con marcas a 2, 5, 10, 15, 20 y 25 mL	1	2193-00
Tubo para colorimetría de plástico, con tapa protectora	4/lote	46600-04
Agua desionizada	4 L	272-56

OPTIONAL REAGENTS AND EQUIPMENT

Description	Unit	Cat. No.
Caps, for plastic Color Viewing Tubes 46600-04	4/pkg	46600-14
Ferrous Ammonium Sulfate, Hexahydrate	113 g	11256-14
Flask, volumetric, Class A, 100-mL	each	26366-42
Flask, volumetric, Class A, 1000-mL	each	26366-53
Pipet, volumetric, Class A, 5-mL	each	14515-37
Pipet Filler, safety bulb	each	14651-00

REACTIFS ET EQUIPEMENTS OPTIONNELS

Désignation	Unité	Réf. Nº
Bouchons pour tubes en plastique 46600-04	4/paq	46600-14
Ammonium, fer (II) sulfate, 6 H_2O ACS	113 g	11256-14
Fiole jaugée, classe A, 100ml	1	26366-42
Fiole jaugée, classe A, 1000 ml	1	26366-53
Pipette jaugée, classe A, 5,00ml	1	14515-37
Poire à pipetter	1	14651-00

ZUSÄTZLICHE REAGENZIEN UND ZUBEHÖR

Beschreibung	Einheit	Kat. Nr.
Kappen, für Plastik-Farbprüfröhrchen 46600-04	4/Stck	46600-14
Eisen(II)-Ammoniumsulfat, hexahydrat	113 g	11256-14
Messkolben, Klasse A, 100 mL	1	26366-42
Messkolben, Klasse A, 1000 mL	1	26366-53
Messpipette, Klasse A, 5mL	1	14515-37
Pipettenfüller, Sicherheitsball	1	14651-00

REACTIVOS Y EQUIPAMIENTO OPCIONALES

Descripción	Unidad	Nº Ref.
Tapas protectoras para tubos de plástico 46600-04	4/lote	46600-14
Sulfato de Amonio Ferroso, Hexahidratado	113 g	11256-14
Frasco volumétrico, clase A, 100-mL	1	26366-42
Frasco volumétrico, clase A, 1000-mL	1	26366-53
Pipeta volumétrica, clase A, 5-0 mL	1	14515-37
Bulbo de seguridad para llenador de pipeta.	1	14651-00

- **Pour assistance technique, informations de prix ou informations pour commander, contactez HACH Company ou votre distributeur HACH.**
- **Technische Unterstützung, aktuelle Preisauskünfte und Bestellhilfe erhalten Sie bei Ihrer HACH Vertretung.**
- **Para obtener asistencia técnica asi como información sobre los precios y pedidos, ponerse en contacto con HACH Company o la agencia local de distribución.**

HACH COMPANY
WORLD HEADQUARTERS
P.O. Box 389
Loveland, Colorado 80539-0389
Telephone : (970) 669-3050
FAX : (970) 669-2932
Telex : 160840

HACH EUROPE
Chaussée de Namur, 1
B-5150 Floriffoux (Namur), Belgium
Telephone : (32) (81) 44.71.71
FAX : (32) (81) 44.13.00

FOR TECHNICAL ASSISTANCE, PRICE INFORMATION AND ORDERING:
In the U.S.A. - **Call 800-227-4224 toll-free for more information.**
Outside the U.S.A. - **Contact the HACH office or distributor serving you.**

te/dk 5/97 1ed

MANGANESE TEST KIT
Range: 0-0.7 mg/L Mn
Model-MNPAN
Cat. No. 23508-00

TO ENSURE ACCURACY PLEASE READ CAREFULLY BEFORE PROCEEDING.

Rinsing glassware occasionally with *1:1 Nitric Acid Solution* followed by a demineralized water rinse will remove any manganese which would interfere in the test.

If the sample has been digested or preserved with acid, or if it is strongly acidic or alkaline, pH adjustment of the sample may be necessary. Adjust to pH 4-5 with Sodium Hydroxide or Sulfuric Acid Solution. Do not exceed pH 5, as manganese may precipitate.

Warning: The chemicals is this kit may be hazardous to the health and safety of the user if inappropriately handled. Please read all warnings before performing the test and use appropriate safety equipment.

HACH COMPANY, P.O. BOX 389, LOVELAND, COLORADO 80359
TELEPHONE: WITHIN U.S. 800-227-4224, OUTSIDE U.S. 970-669-3050, TELEX: 160840

Test Procedure

1. Fill a clean 25-mL mixing bottle to the 25-mL mark with demineralized water. This is the reagent blank.
2. Fill the second 25-mL mixing bottle to the 25-mL mark with sample. This is the prepared sample.
3. Add the contents of one Ascorbic Acid Reagent Powder Pillow to each bottle. Swirl to dissolve. For samples containing high hardness (greater than 300 mg/L as $CaCO_3$), add 10 drops of Rochelle Salt solution (Not included in kit.)
4. Add 1.0 mL of Alkaline-Cyanide Reagent to each bottle. Swirl to mix. (A turbidity may form, but will dissipate after Step 5.)
5. Using the 1-mL calibrated plastic dropper, dispense 1.0 mL of P.A.N. Indicator Solution, 0.1%, to each bottle. Swirl to mix. An orange color will develop if manganese is present.
6. Allow the color to develop for a minimum period of 2 minutes. (If the sample contains more than 5 mg/L of iron, allow 10 minutes.)
7. Pour at least 5 mL of the prepared solutions into two clean viewing tubes.
8. Insert the tube of prepared sample into the right top opening of the color comparator *(Prepared Sample Position in Figure 1).*

9. Insert the glass sample tube containing the reagent blank into the left top opening of the comparator. *(Untreated Sample Position in Figure 1).*

10. Hold the comparator up to a light source such as the sky, a window or lamp and view through the two openings in the front. Rotate the disc to obtain a color match.

11. Read the mg/L manganese (Mn) through the scale window.

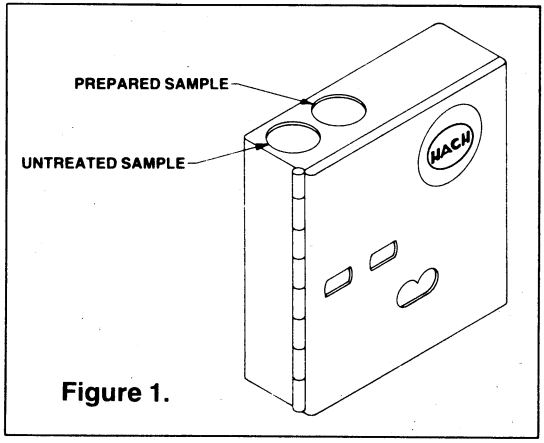


Figure 1.

NOTES

A. All cyanide-containing wastes should be disposed of properly according to the following procedure:

1. While stirring, pour the waste into a large beaker, containing a strongly alkaline solution (pH>11) of calcium hypochlorite or sodium hypochlorite (bleach). Use good ventilation or a fume hood.

2. Maintain a large excess of sodium hydroxide and calcium hypochlorite. Let the solution stand 24 hours.

3. With a large excess of water, flush the solution down the drain.

B. The following do not interfere in the test at the indicated concentrations:

$Fe^{+2,+3}$	25 mg/L
Zn^{+2}	15 mg/L
Ni^{+2}	40 mg/L
Co^{+2}	20 mg/L
Cu^{+2}	50 mg/L
Al^{+3}	20 mg/L
Cd^{+2}	10 mg/L
Pb^{+2}	0.5 mg/L
Ca^{+2}	1000 mg/L(as $CaCO_3$)
Mg^{+2}	300 mg/L(as $CaCO_3$)

C. A 0.5-mg/L manganese standard solution can be prepared by diluting 10.0 mL of a 5-mg/L working standard solution to 100 mL in a volumetric flask. The working stock solution should be prepared fresh daily by diluting 5.00 mL of Manganese Standard Solution, 1000 mg/L as Mn^{+2}, to 1000 mL with demineralized water.

D. To use the demineralizer bottle included in the kit, fill with tap water and shake briefly. The resin will demineralize about 100 bottles of normal tap water before replacement is necessary.

REPLACEMENTS

Cat. No.	Description	Unit
14577-99	Ascorbic Acid Powder Pillows	100/pkg
21223-37	Alkaline-Cyanide Reagent Solution	118 mL (4 oz) MDB*
21224-39	P.A.N. Indicator Solution, 0.1%	118 mL (4 oz) DB**
1732-00	Color Comparator	each
1926-00	Color Viewing Tube	each
17042-00	Bottle, Mixing, with 25 mL mark	each
968-00	Clippers	each
14299-00	Demineralizer Bottle, 177 mL	each
23509-00	Manganese (P.A.N.) Color Disc	each

OPTIONAL REAGENTS AND APPARATUS

2540-11	Nitric Acid Solution, 1:1	473 mL (pt)
1725-33	Rochelle Salt Reagent	30 mL (1 oz) DB**
2180-11	Sodium Hydroxide Solution, 50%	473 mL (pt)
500-53	Beaker, glass, 1000 mL	each
515-37	Pipet, volumetric, 5.0 mL	each
515-38	Pipet, volumetric, 10.0 mL	each
2450-37	Sodium Hydroxide Solution, 5*N*	118 mL (4 oz) MDB*
2449-37	Sulfuric Acid Solution, 5.2*N*	118 mL (4 oz) MDB*

*Marked Dropping Bottle
**Dropping Bottle

2/88

Colonie FUSRAP
Well Purging-Field Water Quality Measurements Form

Site Name _____ **Well Number** _____ **Date** _____
Sample Number _____ **Date** _____ **Sample Collection Time (use military time)** _____

Field Personnel _____ _____ **Additional Personnel** _____ _____
_____ _____ _____ _____

Physical Condition of Well _____ **Purge Method** _____
Depth to Water _____feet **Controller Settings:** **Recharge Rate** _____seconds
Depth to Bottom _____feet **Discharge Rate** _____ seconds
Well Diameter _____inches **Pressure** _____ PSI
Air Monitoring Results _____ppm **Pump Setting** _____ cycles/min.

Clock Time 24 HR	Water Depth ft. below MP	Pump Setting[1]	Purge Rate ml/min	Cum. Volume Purged liters/gal	pH	Spec. Cond. mS/cm	Turbidity NTU	DO mg/L	Temp. deg. C	ORP/Eh[2] mv	Comments

[1] Pump dial setting (e.g., hertz, cycles/min., etc.)

[2] Oxidation reduction potential (stand in for Eh)

Sample Description _____

Analytical Method(s) Requested _____

_____

_____

COLONIE FUSRAP

GROUNDWATER LOW-FLOW SAMPLING FORM

Monitoring Well No.:	Site ID:
Sample Collection Date:	Field Sample Number:
	Laboratory ID Number:

Date Developed (if applicable): _____ Field Sampling Crew: _____

Well Diameter (in): _____ _____

Depth to Screen (ft bgs): _____ PID Reading: (1) (2) _____
From Well Construction Diagram or existing information

Total Depth (ft bgs): _____ Height of Stickup (ft): _____
From Well Construction Diagram or previous well information Use survey stickup, otherwise use field measurement

Total Depth (ft TOC): _____ Actual Total Depth (ft bgs): _____
Measured in field from top of casing **after** sample has been collected Total Depth (ft TOC) - stickup

Depth to Water (ft TOC): _____ Actual depth to water (ft bgs): _____
Measured in field from top of casing Depth to Water (ft TOC) - stickup

Depth pump set at (ft TOC) _____ Time Purging Started: _____
Pump placed at middle of screened interval unless water level is below top of screen

Time Sampling Started: _____

Analytical Parameters	Required Sample Volume	Preservation[1]	Sample	Duplicate

1 - All samples kept cool, 4(+/-)2^{o}C, unless otherwise noted.

FINAL WATER QUALITY MEASUREMENTS

Calibration Reference: _____ ORP (mV): _____

Temperature (^{o}C): _____ DO (mg/L): _____

pH: _____ Turbidity (NTU): _____

Conductivity (μS/cm): _____

Ferrous Iron (mg/L): _____ (using Hach Field Test Kit, 8146 analysis)

Soluble Manganese (mg/L): _____ (using Hach Field Test Kit, 8149 analysis)

Appendix D
Laboratory Quality Assurance Plan and Accreditations
(Provided separately)

EMAX QUALITY SYSTEMS MANUAL 2006

BASED ON

NATIONAL ENVIRONMENTAL LABORATORY ACCREDITATION CONFERENCE (NELAC)
CHAPTER 5 (QUALITY SYSTEMS)
JUNE 2003

&
DEPARTMENT OF DEFENSE QUALITY SYSTEMS MANUAL FOR ENVIRONMENTAL LABORATORIES
VERSION 3 FINAL
JANUARY 2006

This manual is considered confidential within EMAX. The Quality Systems Manual is available for use by the laboratory personnel through the EMAX browser and by means of controlled distribution. The procedure for controlled distribution of this manual is detailed in EMAX-DM02, Controlled Documents. The manual must not be altered other than by a duly authorized representative of EMAX.

If the document has been provided to external users or regulators, it is for the exclusive purpose of reviewing EMAX quality systems. The external party(ies) shall not use it in any other way without the prior written permission of an authorized representative of EMAX Laboratories, Inc.

1835 W. 205TH ST., TORRANCE, CA 90501
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www.emaxlabs.com (web)

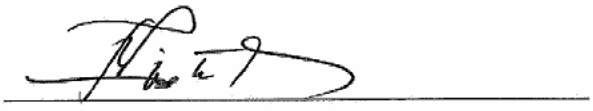
QUALITY SYSTEMS MANUAL

EFFECTIVE DATE: DECEMBER 4, 2006

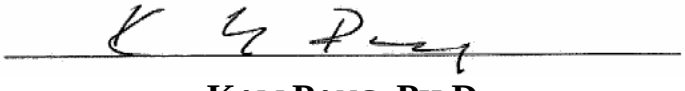
DOCUMENT ID: EMAX-QS00

REVISION 2

APPROVED BY:



KENETTE PIMENTEL
QUALITY ASSURANCE MANAGER



KAM PANG, PH.D.
CHIEF EXECUTIVE OFFICER & LAB DIRECTOR

INTRODUCTION

EMAX Laboratories, Inc., (***EMAX***) has provided comprehensive environmental laboratory services to governmental, state and local agencies since 1987. ***EMAX*** was founded to fill a need within the California marketplace for a flexible, reliable, and cost-effective analytical laboratory for consulting firms involved in the early stages of site investigation and remediation. ***EMAX*** provided fundamental services for the development of statewide and regional environmental compliance, enforcement, and remedial action programs.

Similarly, ***EMAX*** had the opportunity to provide large-scale analytical support to the initial and then burgeoning environmental restoration programs of the branches of the Department of Defense, the Department of Energy, and the United States Environmental Protection Agency. ***EMAX*** occupies a state-of-the-art, 27,000 square foot physical plant in Torrance, California.

The industry ***EMAX*** supports has undergone periods of growth, uncertainty, and consolidation. ***EMAX*** however, has maintained levels of stability and consistency. With a strong dedication to the continuation of our technical proficiency, we place extreme emphasis on in-house training, third-party review of procedures and protocols, and the audit and peer-review processes.

Over the years, ***EMAX*** has distinguished itself within the laboratory services industry by its stability in staff, its recognized technical proficiency, and its commitment to providing analytical deliverables in a wide variety of either agency-specified or client-developed reporting formats. We must share a large portion of our success in these areas with our clients, for it is a product of their dedication, input, and communication with us.

EMAX, a ***woman-owned business*** (***WBE/SDB*****),** has been evaluated and audited by numerous governmental agencies and private-sector clients, and has provided analytical services in support of the overall environmental programs of:

- The United States Environmental Protection Agency
- The United States Air Force, The Air Force Center for Environmental Excellence
- The United States Army, Army Corps of Engineers
- The United States Navy, and
- The United States Department of Energy

DOCUMENT FORMAT

This manual is designed to complement and implement the DoD QSM and the NELAC Chapter 5 (Quality Systems) where the NELAC Chapter 5 serves as the primary text for this manual. The section numbering is similar to the DoD QSM. For the same purpose as the DoD QSM the numbering has been slightly changed from that of NELAC Chapter 5, as the manual is meant to be a stand-alone document. The number 5 has been eliminated from all section and subsection headings. However, second-level numbering has been retained to maintain an organization parallel to the NELAC Quality Systems requirements. For instance, Section 5.4.2 in NELAC Chapter 5 is equivalent to Section 4.2 in this manual. In fulfillment of the DoD requirements, the DoD clarifications boxes are incorporated in this manual as well. In addition, NELAC appendices and DoD appendices are included.

ACRONYM LIST

°C	Degrees Celsius
ANSI/ASQC	American National Standards Institute/American Society for Quality Control
ASTM	American Society for Testing and Materials
CAS	Chemical Abstract Service
CCV	Continuing calibration verification
CFR	Code of Federal Regulations
CLP	Contract Laboratory Program
COC	Chain of custody
CV	Coefficient of variation
DO	Dissolved oxygen
DOC	Demonstration of capability
DoD	Department of Defense
DQOs	Data quality objectives
EC	Exposure concentration
EPA	Environmental Protection Agency
g/L	Grams per liter
GC/MS	Gas chromatography/mass spectrometry
ICP-MS	Inductively coupled plasma-mass spectrometer
ICV	Initial calibration verification
ID	Identifier
ISO/IEC	International Organization for Standardization /International Electro technical Commission
LC50	Lethal concentration at 50%
LCS	Laboratory control sample
MDL	Method detection limit
mg/kg	Milligrams per kilogram
MQO	Measurement quality objective
MS	Matrix spike
MSD	Matrix spike duplicate
NELAC	National Environmental Laboratory Accreditation Conference
NELAP	National Environmental Laboratory Accreditation Program

NIST	National Institute of Standards and Technology
NOEC	No-observable-effects concentration
OSHA	Occupational Safety and Health Administration
PC	Personal computer
PCBs	Polychlorinated biphenyls
PSR	Project Specific Requirement
PT	Proficiency testing
PTOB/PTPA	Proficiency Testing Oversight Body/Proficiency Testing Provider Accreditor
QA	Quality assurance
QAD	Quality Assurance Division (EPA)
QAMS	Quality Assurance Management Section
QAPP	Quality Assurance Project Plan
QC	Quality control
RL	Reporting limit
RPD	Relative percent difference
RSD	Relative standard deviation
SD	Serial dilutions
SMSD	Statistical minimum significant difference
SOP	Standard operating procedure
TAC	Test acceptability criteria
TSS	Total suspended solids
UV	Ultraviolet
VOC	Volatile organic compound
WET	Whole effluent toxicity

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1.0 SCOPE

1.1. EMAX Quality Systems provides requirements and guidance to competently carry out all of the specified environmental testing activities it undertakes. It also describes EMAX's overall management commitment to the Quality Systems, the various tests it performs using standard methods, non-standard methods, and laboratory-developed methods.

Where more stringent standards or requirements are included in a mandated test method or by regulation, EMAX shall perform demonstration of capability to meet the requirement. Where ambiguity exists, ***EMAX*** shall attempt to clarify the issue with the client, otherwise EMAX shall apply the reference method requirement or the regulation.

1.2. Requirements contained in this manual are enforced in the absence of project-specific requirements, Federal, State, and/or local regulations as well as Project/Contract requirements shall supersede this document.

1.3. This manual is an integral part of the Quality systems. The QA Manager maintains the Quality Manual. The manual is reviewed annually and revisions are issued as appropriate to keep it up to date. Retention time for obsolete versions is at least 5 years.

1.4. This document is based on the National Environmental Laboratory Accreditation Conference's (NELAC) Chapter 5 Quality Systems Standard, and the Department of Defense Quality Systems Manual. It is designed to serve as a standard reference for EMAX in implementing analytical services for environmental testing.

1.5. Compliance to regulatory and safety requirements EMAX health and safety plan is described in EMAX Health & Safety Manual and EMAX Radiation Safety Manual). In addition, safety procedures are included in the SOPs where applicable.

1.6. EMAX operates a quality system that meets the requirements of NELAC, the DoD and standards guided by ISO 9001, 9002 and 17025.

1.7. Data integrity procedures are integrated as part of EMAX quality systems. They are imbedded in its SOPs and practiced across the board. Data are produced of known and documented quality for whatever purpose it may serve. The following sections in this manual references data integrity procedures:

Management Responsibilities	4.2.6, 4.2.6.1, and 4.2.6.2
Training	5.2.7
Control and Documentation	4.15

2.0 REFERENCES

Refer to NELAC Appendix A DoD Attachment

3.0 TERMS AND DEFINITIONS

Refer to NELAC Appendix B DoD Attachment

4.0 MANAGEMENT REQUIREMENTS

4.1 Organization

4.1.1 ***EMAX*** Laboratories, Inc. is legally responsible for the activities and the data it produces. Its business license BUS-00757723 is issued by the city of Torrance and its consolidated permit/license to operate is issued by Los Angeles County certified unified program agency administered by Los Angeles County Fire Department.

4.1.2 ***EMAX*** is responsible to carry out its environmental testing activities in such a way as to meet the requirements of the NELAC Standard, and the DoD QSM, to satisfy the needs of the client, the regulatory authorities or organizations providing recognition.

4.1.3 ***EMAX*** management system shall cover all work carried out in the laboratory as well as its business constituents representing EMAX externally.

4.1.4 The facility of ***EMAX*** located at Torrance, CA is the only entity where environmental testing activities are performed. The responsibilities of key personnel that have an involvement or influence on the environmental testing activities are defined in order to identify potential conflicts of interest.

a) The organizational structure of ***EMAX*** is configured as such that functions of each department shall have no conflicting interests to prevent adverse influence on the laboratory's compliance with the requirements of the adopted Standards.

b) Likewise, ***EMAX*** promotes impartiality and its personnel attest that they are free from any undue commercial, financial and other pressures which might influence their technical judgment. ***EMAX*** does not engage in any activities that may endanger the trust in its independence of judgment and integrity in relation to its environmental testing activities.

4.1.5 ***EMAX*** employs:

a) Managerial and technical personnel with the authority and resources needed to carry out their duties and to identify the occurrence of departures from the quality system or from the procedures for performing environmental tests, and to initiate actions to prevent or minimize such departures (refer 5.2);

b) Processes to ensure that its management and personnel are free from any undue internal and external commercial, financial and other pressures and influences that may adversely affect the quality of their work; Refer to EMAX-QA10.

c) Policies and procedures to ensure the protection of its clients' confidential information and proprietary rights, including procedures for protecting the electronic storage and transmission of results; Refer to EMAX-QA10.

d) Policies and procedures to avoid involvement in any activities that would diminish confidence in its competence, impartiality, judgment or operational integrity; Refer to EMAX-QA10.

e) Policies defining the organization and management structure of EMAX and the relationships between quality management, technical operations and support services; Refer to EMAX Appendices for the organizational structure.

f) Specific responsibilities, authority and interrelationships of all personnel who manage, perform or verify work affecting the quality of the environmental tests; Refer to Section 4.2.3.e of this manual.

Documentation includes a clear description of the lines of responsibility in the laboratory and shall be proportioned such that adequate supervision is ensured.

g) Adequate supervision of environmental testing staff, including trainees, by persons familiar with methods and procedures, purpose of each environmental test, and with the assessment of the environmental test results;

h) Technical management which has overall responsibility for the technical operations and the provision of the resources needed to ensure the required quality of laboratory operations;

The technical director(s) shall certify that personnel with appropriate educational and/or technical background perform all tests for which the laboratory is accredited; such certification shall be documented.

The technical director(s) shall meet the requirements specified in the Accreditation Process (see 4.1.1.1 of NELAC).

i) A member of staff as quality assurance manager who, irrespective of other duties and responsibilities, shall have defined responsibility and authority for ensuring that the quality system is implemented and followed at all times; the quality manager shall have direct access to the highest level of management at which decisions are made on laboratory policy or resources;

Where staffing is limited, the quality manager may also be the technical director or deputy technical director.

The duties and responsibilities of the quality manager (and/or his/her designees) are listed in 4.2.3.3).

j) Deputies for key managerial personnel, including the technical director(s) and/or quality manager; and

k) Policy to participate in a proficiency test program as outlined in Chapter 2 of NELAC and procedures for corrective action to ensure effectiveness of the corrective action taken.

4.2 Quality System

4.2.1 ***EMAX*** quality system is established, implemented and maintained based on the required elements contained in NELAC Chapter 5, and DoD QSM. It is appropriate to the type, range and volume of environmental testing activities it undertakes. Its policies, systems, programs, procedures and instructions to the extent necessary are documented to assure the quality of the environmental test results. Its system's documentation is communicated to, understood by, available to, and implemented by the appropriate personnel. This documentation includes the quality systems manual, standard operating procedures (SOP), and other appropriate reference documents and texts.

4.2.2 The management team of ***EMAX*** is committed to assure that its quality system policies and objectives are habitually practiced and imbedded in its operations. The quality system policies and objectives include:

a) Commitment to good professional practice in servicing its clients such that contract agreement and project specific requirements are attentively employed.

b) Assurance to provide a standard practice that data collection and processing are precisely performed, accurately presented, scientifically valid, and legally defensible.

c) Quality Systems Objectives

1) Promote quality culture through leadership, quality management, and organizational learning;

2) Uphold data integrity by addressing ethical practices through employee training, and practicing impartiality among employees;

3) Provide a healthy work environment by maintaining a clean, well ventilated and lighted facility

4) Afford adequate equipment to produce reliable data.

5) Deliver client satisfaction by producing data of known quality on time.

6) Establish a continuous process of improvement through lessons learned, preventive measures, and quality control.

d) Require all personnel concerned with environmental testing activities within the laboratory to familiarize themselves with the quality documentation and implement the policies and procedures in their work; and

e) Commitment to comply with the adopted Standards.

4.2.3 The Quality Systems Manual (QSM) and related quality documentations describe the quality culture of ***EMAX*** and its entity.

a) To assure that the objectives of the quality system are achieved and to provide stability and consistency in its practice, Standard Operating Procedures (SOPs) are established. The SOPs are typified as follows:

1) Quality Assurances SOPs are established to manage and detail the execution to the overall quality assurance objectives and policies.

2) Supplemental Quality Control SOPs are established controls auxiliary to Analytical and Quality Assurance SOPs.

3) Sample Management SOPs are established policies and procedures for sample custody from cradle to grave.

4) Analytical SOPs are established tests manuals adopted from approved reference methods e.g., EPA Methods, Standard Methods, or other industry approved methods.

5) Data Management Procedures are established guidelines for data control from generation to archival.

6) Information Systems Procedures are guidelines to manage electronic media from software development to electronic data archival.

7) Radiation Safety SOPs are established policies and procedures for handling samples from DoE sponsored projects or samples suspected to have limited quantity of radioactive material.

EMAX manuals and SOPs are downloaded to the network for employees' easy access. SOP revisions are emailed to supervisors so that concerned personnel can review them accordingly. This manual and the SOPs are reviewed at least once a year and revised as necessary. Department Supervisors and/or Managers review SOPs pertinent to their Department to ensure that they are currently practiced as prescribed by approved methods and this manual. Reviews are documented in the document review form.

b) ***EMAX*** Organizational Structure ensures that its organization shall be able to function as expected by the industry standard. Its organizational chart is included in EMAX Appendices.

c) Relationship between management, technical operations, support services and the quality system are distinct with authority and resources to exemplify and discharge their duties as needed.

d) Document Control procedure is detailed in EMAX-DM02. This procedure describes the process of document control. It covers the generation of control numbers, distribution, control, and archival of controlled documents. The control process applies to Standard Operating Procedures (SOPs), Quality Assurance Manual, Laboratory Logbooks, and other related documents that have similar importance for the proper operation of the laboratory.

e) Listed below are the job descriptions of key staff and support staff

1. Executive Staffs

i. Chief Executive Officer & Laboratory Director

- Provide intellectual leadership in technical operations, project management and logistics of domain technical knowledge;
- Provide a healthy work environment
- Interface with Operations and Quality Assurance in the formulation and implementation of the Quality Systems;
- Ensuring clear and consistent communication, and coordinate a team of professionals and their respective departments to solve all encountered problems;
- Drive project management activities to influence quality output with the goal of enhancing customer satisfaction;
- Review the effectiveness of Quality Systems and instigate improvement accordingly;
- Delegate deputies in case of absence of the Laboratory Director, Technical Operations Manager and/or Quality Assurance Manger;

ii. Vice President & Information Systems Manager

- Assure data integrity and security;
- Design and develop software solutions to enhance and expand EMAX capabilities;
- Provide programming and technical support to Data Management in order to implement systems that meet customer requirements to include proactive and reactive incident resolution;
- Collaborating with Project Managers to clarify definition of client requirements;
- Ensure the quality and delivery of technical operations supporting the business in accordance with the adopted Standards and project requirements;
- Work closely with Data Management and Network Administration to understand recurring incidents impacting user population, help identify root cause, and initiate remedial measures

- Perform Capacity Planning to ensure appropriate storage and/or processing capability of Network within the technical infrastructure to support present and future initiatives.
- Provide hardware and software for information systems backup systems;
- Initiate improvements on design systems to meet the industry demand.

iii. Business Development Manager

- Responsible for all aspects of business development.
- Identify clients with whom EMAX can develop long-term relationships.
- Responsible for maintaining current clients as well as to attract new clients
- Oversees all aspects of proposals and customer relations.

iv. Operations Manager

- Provide direction in technical operations, guidance of project execution and assessment of operations capacity.
- Certify quality technical staff to perform the test methods specified in this manual.
- Plan and adjust work operations to meet various project requirements or quick turn-around-time without sacrificing the quality and quantity of work;
- Coordinate and integrate the work activities and resources of the different departments or organizational segments;
- Analyze organizational and operational problems and develop timely and economical solutions;
- Establish performance goals and assess progress toward their achievement;
- Deal effectively with the department supervisors and assume their tasks in their absence.
- Sign off on reports to clients in the absence of the Lab Director and perform secondary data review as necessary..
- Devise ways to accommodate work operations to new and changing programs or requirements such as method development and staffing

2. Quality Systems Director referred to as Quality Assurance Manager

- Serve as the focal point for QA/QC and be responsible for the oversight and/or review of quality control data;
- Have functions independent from laboratory operations for which they have quality assurance oversight;
- Be able to evaluate data objectively and perform assessments without outside (e.g., managerial) influence;
- Have documented training and/or experience in QA/QC procedures and be knowledgeable in the quality system as defined under NELAC;
- Have a general knowledge of the analytical test methods for which data review is performed;
- Arrange for or conduct internal audits as per 4.13 annually; and,

- Notify laboratory management of deficiencies in the quality system and monitor corrective action.
- Responsible for ensuring continuous improvement at the laboratory through the use of control charts and other method performance indicators (for example, proficiency testing (PT) samples and internal and external audits).
- Maintains the Quality Systems Manual.

3. Technical Directors

i. Laboratory Supervisors

- Assign and review the work of subordinates;
- Train and work effectively with subordinates;
- Accomplish the quantity of work expected within set limits of cost and time employing the quality systems of EMAX;
- Plan own work and carry out assignments effectively;
- Arrange for or conduct maintenance of instrumentation to produce quality data and minimize downtimes;
- Review and resolve reported anomalies when they are encountered;
- Communicate orally and in writing in working out solutions to problems or questions relating to the work and institute program(s) to prevent problem recurrence;
- Ensure initial and continuing demonstration of capability of subordinates;
- Review and revise test methods related to respective work as necessary;
- Understand and advance management goals as these affect day-to-day work operations; and
- Develop improvements or design new test methods through method development process;

4. Support Systems Directors

i. Project Managers

- Review project requirements;
- Generate technical summary of project specific requirements (PSR), including test methods, reporting limits, QC procedures and QC limits;
- Review data packages for completeness in accordance to PSR
- Maintain a line of communication and documentation of all transactions with the client.
- Initiate request for variance whenever necessary and disseminate project change orders to respective parties.

ii. Sample Management Supervisor

- Supervise sample management as described in the sample management SOPs;
- Check that the sample control room is within the prescribed condition as described in EMAX-QC03.
- Check and monitor the thermometer calibrations.

- Train and work effectively with subordinates;
- Accomplish the quantity of work expected within set limits of cost and time employing the quality systems of EMAX;
- Plan own work and carry out assignments effectively;
- Arrange for or conduct maintenance of instrumentation to produce quality data and minimize downtimes;
- Review and resolve reported anomalies when they are encountered;
- Communicate orally and in writing in working out solutions to problems or questions relating to the work and institute program(s) to prevent problem recurrence;
- Ensure initial and continuing demonstration of capability of subordinates;
- Review and revise test methods related to respective work as necessary;
- Understand and advance management goals as these affect day-to-day work operations; and
- Initiate improvements on sample management systems to meet the industry demand.

iii. Sample Preparation Supervisor

- Supervise sample preparation as described in the sample preparation SOPs;
- Prioritize work order in accordance to holding time and turn-around-time.
- Assign and review the work of subordinates;
- Check and monitor the thermometer calibrations.
- Train and work effectively with subordinates;
- Accomplish the quantity of work expected within set limits of cost and time employing the quality systems of EMAX;
- Plan own work and carry out assignments effectively;
- Arrange for or conduct maintenance of instrumentation to produce quality data and minimize downtimes;
- Review and resolve reported anomalies when they are encountered;
- Communicate orally and in writing in working out solutions to problems or questions relating to the work and institute program(s) to prevent problem recurrence;
- Ensure initial and continuing demonstration of capability of subordinates;
- Review and revise test methods related to respective work as necessary;
- Understand and advance management goals as these affect day-to-day work operations; and
- Initiate improvements on sample preparation systems to meet the industry demand.

iv. Data Management Supervisor

- Manage data processing, packaging and archiving employing project specific requirements and EMAX quality systems;

- Accomplish the quantity of work expected within set limits of cost and time;
- Schedule, assign and review the work of subordinates;
- Train and work effectively with subordinates;
- Plan own work and carry out assignments effectively;
- Review and resolve reported anomalies when they are encountered;
- Review and revise as necessary, all SOPs related to data management activities.
- Communicate orally and in writing in working out solutions to problems or questions relating to data management and information systems;
- Provide support in developing and maintaining programs for generating and validating electronic data acquisitions and processing and deliverables;
- Identify and advance management goals as these affect day-to-day work operations; and
- Initiate improvements on design systems to meet the industry demand.

v. Network Administrator

- Implement and administer network security policy as described in EMAX-IS08;
- Perform and monitor network backup jobs and process restore requests as well as perform configuration of workstations and mail server as described in EMAX-IS09;
- Manage network password and access control by establishing and maintaining users in regard to their files, rights, and account restrictions. Establish virus protection and perform virus disaster recovery as described in EMAX-IS10;
- Execute software or system releases as requested and maintain documentation of new hardware purchase as described in EAMX-IS12;
- Perform proactive review of systems performance and alerts to ensure event correlation and trend analysis are performed on a regular basis;
- Review system logs to identify signs of potential problems;
- Review and revise as necessary, all SOPs related to network activities.
- Stay current on technologies affecting current systems infrastructure issues
- Respond to users request on problems encountered regarding hardware, commercially purchased software or any other related network.
- Install, configure, and maintain software and applications needed by the operations.
- Initiate improvements on design systems to meet the industry demand.

vi. Purchasing Officer

- Monitor purchase order log;
- Authorize purchases and have them place accordingly as described in EMAX-QA09;

- Supervise verification of material received against requisitions and invoices to determine propriety of order and inspect articles for quality control purposes;
- Review and reconcile purchase order with packing slips;
- Discuss and return defective or unacceptable goods to vendors and obtain appropriate credit;
- Expedite delivery of goods to users;

vii. Analysts

- Complete initial demonstration of capability before assuming responsibility and ensure continuing demonstration of capability in accordance with the quality systems;
- Plan own work and carry out assignments effectively
- Review and employ appropriate test methods and SOPs related to respective works;
- Perform first level of 100% review on sample results in accordance to work order specifications, method requirements and as described in EMAX-DM01.
- Report anomalous circumstances to the Supervisor or the Technical Operations Manager; and
- Accomplish the quality and quantity of work expected within set limits of cost and time;

viii. Technicians

- Complete initial demonstration of capability before assuming responsibility and ensure continuing demonstration of capability in accordance with the quality systems;
- Plan own work and carry out assignments effectively
- Review and employ appropriate test methods and SOPs related to respective works;
- Report anomalous circumstances to the Supervisor or the Technical Operations Manager; and
- Accomplish the quality and quantity of work expected within set limits of cost and time;

f) ***EMAX*** approved signatories.

1) Kam Pang, the CEO & Lab Director is the primary signatory for EMAX.

2) In the absence of the Laboratory Director, the QA Manager and the Laboratory Operations Manager, assume the technical functions of the Laboratory Director. The assumption of this duty carries with it the responsibility to assure that all of their actions shall be in accordance but not limited to EMAX approved policies and procedures, EMAX Quality Systems, EMAX Standard Operating Procedures, Project Specific Requirements, Project Contract Specifications, and other directives related to EMAX laboratory activities.

3) Alternatively, the Project Managers, limited to the specific project(s) they handle may also assume the technical functions of the Laboratory Director. Likewise, this duty carries with it the responsibility to assure that all of their actions shall be in

accordance but not limited to EMAX approved policies and procedures, EMAX Quality Systems, EMAX Standard Operating Procedures, Project Specific Requirements, Project Contract Specifications, and other directives related to EMAX laboratory activities.

4) List of approved signatories is included in EMAX Appendices.

g) Procedures for achieving traceability of measurements are included in Section 5.6 (Measurement Traceability), Section 5.6.4 (Documentation and Labeling of Standards, Reagents, and Reference Materials), and Section 4.12 (Control of Records).

h) The list of all test methods under which the laboratory performs its accredited testing is included in EMAX Appendices.

i) Mechanisms for ensuring that the laboratory reviews all new work to ensure that it has the appropriate facilities and resources before commencing such work are detailed in Project Management SOP (EMAX-QA01).

j) Calibration and/or verification test procedures used included in every test method manual. Applicable calibration and verification in compliance to PSR are also attached to every analytical work order to assure that data quality objectives are followed.

k) Procedures for handling submitted samples are detailed in Sample Receiving SOP (EMAX-SM02)

l) The list of major equipment is included in EMAX Appendices.

Reference measurement standards, as well as facilities and services used by the laboratory in conducting tests, are described in the specific SOPs. These procedures are listed in 5.6.3.1.

m) Procedures for calibration, verification and maintenance of equipment are included in the analytical SOPs.

n) Verification practices include inter-laboratory comparisons through laboratory control samples, proficiency testing programs and internal quality control schemes (e.g., control charts, QA data review).

o) When testing discrepancies are detected or departures from documented policies and procedures occur due to unavoidable circumstances or allowable exceptions, procedures for feedback and corrective action are detailed in Corrective Action SOP (EMAX-QA08). Corrective action related to analytical procedure is also included in each of the analytical SOPs.

p) Departures from documented policies and procedures or from standard specifications should be saved, and if it unavailable the laboratory management will treat it on a case by case basis taking into consideration the impact of the quality of data.

Departures and deviations from SOP that are due to project DOQ/PRS are handled by the project management system. Other departures and deviations are classified as minor or major changes. When a departure and/or deviation from SOP will have no impact on data quality, the change is deemed to be a minor change requiring approval of either the immediate supervisor or the Technical Operations Manager. Any departure and/or deviation from SOP that may affect the quality of data is deemed a major change and requires the approval of both the Technical Director and the QA Manager. When granting such approval, the Laboratory Director and the QA Manager shall consider whether the justifying circumstances are of such significance that an addendum to the SOP, a revision of the SOP or a new SOP is needed

q) Procedures for dealing with complaints

EMAX shall treat customer satisfaction with high priority. All customer complaints shall be entertained and assessed appropriately. A Project Manager (PM) shall be designated as primary point of contact at the

inception of the project and shall serve as an interface between the customer and EMAX. The PM shall be responsible in resolving issues from the time sampling supplies are ordered to the time the data deliverables are delivered. The PM is also responsible for responding to future questions that may arise from submitted data, hard copy and/or electronic. EMAX-QA08 details the guidelines for taking care of customer complains.

r) Procedures for protecting confidentiality (including national security concerns), and proprietary rights

EMAX will not intentionally disclose to any person (other than the representative(s) designated by the client) services rendered or information received and/or generated by EMAX. Likewise, information known to be potentially endangering the national security or an entity's propriety rights will not be released.

All employees, upon joining EMAX are informed of the importance of the policy on protecting confidentiality and propriety rights. All data received and generated at EMAX shall remain confidential within EMAX Laboratories, Inc. Reports and other pertinent information is only disclosed by authorized personnel to the clients concerned. No one is permitted to remove or make copies of any EMAX records, reports or documents without prior management approval. Disclosure of confidential information could lead to dismissal.

s) Procedures for audits are detailed in SOP for Internal Assessment (EMAX-QA07). Procedures for conducting adequate data review are detailed in SOP for Data Flow and Review (EMAX-DM01).

t) Processes/procedures for establishing that personnel are adequately experienced in the duties they are expected to carry out and are receiving any needed training are detailed in SOP for Training (EMAX-QA05).

u) Procedures for reporting analytical results are integrated in analytical SOPs. Procedures for data packaging are detailed in SOP for Data Package Assembly and Archiving (EMAX-DM03).

v) Table of Contents and applicable lists of references and glossaries, and appendices are found in this manual.

4.2.4 The Technical Operations Manager and the Quality Assurance Manager are responsible for ensuring compliance with the adopted Standards.

4.2.5 The Quality Assurance Manger is responsible for maintaining the quality systems manual.

4.2.6 Procedures to establish and maintain data integrity are detailed in the Ethics Program SOP (EMAX-QA10). These procedures include the following elements: 1) data integrity training, 2) signed data integrity documentation for all laboratory employees, 3) in-depth, periodic monitoring of data integrity, and 4) data integrity procedure documentation. The procedures are signed and dated by senior management. These procedures and the associated implementation records are properly maintained and shall be made available for assessor review. The data integrity procedures are annually reviewed and updated by management.

4.2.6.1 Mechanism for confidential reporting of data integrity issues in their laboratory is also detailed in EMAX-QA10. The SOP also assures confidentiality and a receptive environment in which all employees may privately discuss ethical issues or report items of ethical concern.

4.2.6.2 In instances of ethical concern, the SOP includes a process whereby management determines the need for any further detailed investigation.

4.3 Document Control

4.3.1 General

EMAX established a standard operating procedure for writing SOP (EMAX-QA00) to standardize the process on generating, maintaining and controlling standard operating procedures. Document Control SOP (EMAX-

DM02) is established to cover document identification, filing, distribution, control, changes, retention, protection, preservation, archival, retrieval, and disposal of controlled documents.

Document control policies and procedures related to or supplementary to analytical processes (e.g. calibration of support instruments) are imbedded in the analytical SOPs or in SOPs specific to the activity being performed.

The control of data related to environmental testing is covered in 5.4.7. The control of records is covered in 4.12.

4.3.2 Document Approval and Issue

4.3.2.1 All documents in the laboratory as part of the quality system are reviewed and approved by authorized personnel for use prior to issue. EMAX Browser was established to provide an easy access to these documents for laboratory personnel. The QA Department controls the documents loaded in the Browser so that only the most recent edition is available for use to preclude the use of invalid and/or obsolete documents. A database is also maintained to list the SOPS, its current version and the latest document review date. Other distributions are recorded on the document control ledger kept with the original SOP.

4.3.2.2 The procedure(s) adopted ensure that:

a) authorized editions of appropriate documents are downloaded to EMAX Browser available at network computers located in the laboratory where they are easily accessed by laboratory personnel;

b) documents are periodically reviewed and, where necessary, revised to ensure continuing suitability and compliance with applicable requirements;

c) invalid or obsolete documents can not be accessed by the laboratory personnel.

d) obsolete documents are marked “VOID” and retained by the QA Department for either legal or knowledge preservation purposes.

4.3.2.3 Quality system documents are uniquely identified. Such identification includes the date of issue and/or revision identification, page numbering, the total number of pages, and the issuing authority(ies).

4.3.3 Document Changes

4.3.3.1 Changes to documents are reviewed and approved by the same function that performed the original review unless specifically designated otherwise. The designated personnel obtain pertinent background information upon which to base their review and approval.

4.3.3.2 Where practicable, addendum to the document is generated and the change is identified in the document or the appropriate attachments.

4.3.3.3 Where amendment of documents is done by hand, pending the re-issue of the documents, the QA Manager or the Laboratory Director authorizes the change and the EMAX Browser copy is updated accordingly. Amendments are clearly marked, initialed and dated. Revised documents are re-issued as soon as practicable.

4.3.3.4 Changes in documents maintained in computerized systems are controlled by the QA Department. Procedures for such changes are detailed in EMAX-DM02.

4.4 Review of Requests, Tenders and Contracts

4.4.1 EMAX Project Management SOP (EMAX-QA01) describes the procedures for the review of requests, tenders and contracts. The policies and procedures of this SOP includes:

a) Project Specific Requirements (PSR), including the methods to be used, quality control procedures, reporting formats, deliverables and other requirements to fulfill contract agreement.

b) A process to ensure that the laboratory has the capability and resources to meet the PSR;

Where new methods are to be developed or additional analytes are required by a project, the Operations Manager is consulted purposely to review capability that the laboratory possesses the necessary physical, personnel and information resources, and that the laboratory's personnel have the skills and expertise necessary for the performance of the environmental tests in question. The review process includes demonstration of capability, successful participation of proficiency testing (PT) and/or the running of trial environmental test programs using samples or items of known value in order to determine uncertainties of measurement, detection limits, confidence limits, or other essential quality control requirements. The Project Manager (PM) where applicable, reviews current accreditation status of the laboratory and informs the client of the results of this review if it indicates any potential conflict, deficiency, lack of appropriate accreditation status, or inability on the laboratory's part to complete the client's work.

c) Appropriate selection of environmental test method to meet the PSR.

Any differences between the request or tender and the contract are resolved before any work commences. Each contract shall be acceptable both to the laboratory and the client.

A contract may be any written or oral agreement to provide a client with environmental testing services. Oral agreements are followed by written statement (i.e., email, fax or letter) clarifying the agreement.

4.4.2 Records of reviews, including any significant changes, are maintained by the Project Managers. Discussions with a client relating to the client's requirements or the results of the work during the period of execution of the contract are maintained. Phone conversations providing instructions and/or changes are followed by a written statement (i.e., email, fax or letter) to demonstrate a clear understanding on how to proceed with the project.

Changes are initiated by the designated PM, and are initialed and dated. Where changes impact generation of deliverables (e.g. analyses, report forms, EDDs, etc.), the PM is required to discuss the matter with the Laboratory Director and the Operations Manager.

4.4.3 Where part of the project is subcontracted, the PM is responsible for the review of contract requirement and make sure that the sub-tier lab is capable of providing the requirements of the project.

4.4.4 The PM is responsible for informing the client of any deviation from the contract.

4.4.5 If a contract needs to be amended after work has commenced, PM performs the same contract review process and communicates any amendments to all affected personnel. The PM informs the client when suspension of accreditation, revocation of accreditation, or voluntary withdrawal of accreditation occurs.

4.5 Subcontracting of Environmental Tests

4.5.1 When work is subcontracted, this work is placed with an accredited laboratory that meets applicable statutory and regulatory requirements for performing the tests and submitting the results of tests performed. Where project requirement include NELAP accreditation, specific DoD Component laboratory approval process, or other program acceptance process is required, the laboratory performing the subcontracted work is indicated in

the final report and non-NELAP accredited work is clearly identified. Where on-site assessment is required, the PM arranges a schedule with the QA Manager, the client and the subcontractor representative.

4.5.2 The PM obtains project-specific approval from the client before work is subcontracted, preferably in writing. In the event that oral approval was provided, the PM shall send a written statement (i.e., email, fax or letter) confirming the verbal approval.

4.5.3 EMAX is responsible to the client for the subcontractor's work, except in the case where the client or a regulatory authority specifies which subcontractor is to be used.

4.5.4 A register of all subcontractors that EMAX uses for environmental tests and a record of the evidence of compliance are maintained by the designated PM.

4.6 Purchasing Services and Supplies

4.6.1 Purchasing SOP (EMAX-QA09) describes the policies and procedures for the selection and purchasing of services and supplies EMAX uses. This SOP includes the purchase, reception and storage of reagents and laboratory consumable materials relevant for the environmental tests.

4.6.2 Purchased supplies, reagents and consumable materials that affect the quality of environmental tests are not used until they have been inspected or otherwise verified as complying with standard specifications or requirements defined in the methods for the environmental tests concerned. Chemical QC SOP details the policies and procedures for acceptance/rejection of chemicals prior to its use. These services and supplies used are established and implemented to comply with specified requirements. Records of actions taken to check compliance are endorsed and maintained by the QA Department.

4.6.3 Purchase orders for items affecting the quality of laboratory output contain description of the services and supplies ordered. These purchasing documents are reviewed and approved for technical content prior to release.

These documents include date of receipt, expiration date (where applicable); source (i.e., provider or supplier), lot number, and calibration and verification records and certifications for whatever services and supplies may affect the quality of associated test results.

4.6.4 The Operations Manager evaluates suppliers of critical consumables, supplies and services which affect the quality of environmental testing, and maintains records of these evaluations and list those approved.

4.7 Service to the Client

A PM is designated for each project to clarify the client's request and to monitor the laboratory's performance in relation to the work performed. Where multi-projects are assigned to a PM, confidentiality to other clients is mandatory.

This service is also expected to provide proactive engagement. Client notification is observed when the following situations are encountered:

- Use of alternative method, technique, and/or monitoring analytes (e.g., surrogate standard, Internal Standard, etc.) other than specified by the project.
- The need to optimize methods to ensure achievement of QAPP (e.g. difficult matrix, poor performing analyte)
- Lack of project guidance documents, such as the QAPP, or the need for clarification of requirements in the document (e.g. action levels, detection and quantitation capabilities)

- Problems with samples or analysis that may impact results (e.g. sample preservation, holding time, turn-around-time)

4.8 Complaints

EMAX treats customer satisfaction with high priority. All customer complaints are entertained and assessed appropriately. The designated PM serves as an interface between the customer and EMAX. The PM is responsible in making sure that issues are resolved from the time sampling supplies are ordered to the time the data deliverables are delivered. The PM is also responsible for responding to future questions that may arise from submitted data, hard copy and/or electronic.

Corrective Action SOP (EMAX-QA08) includes policy and procedure for the resolution of complaints received from clients or other parties. Complaints are treated on a case by case basis. Lessons learned from these incidents are incorporated in the improvement process, where new policies may be implemented to prevent recurrence. Records are maintained of all complaints and of the investigations and corrective actions taken by the laboratory.

4.9 Control of Non-conforming Environmental Testing Work

4.9.1 When discrepancies or any aspect of the environmental testing work, or the results of this work, do not conform to its own procedures or the agreed requirements of the client occur, the following steps are implemented:

a) The Operations Manager informs the Project Manager of the nonconforming event with recommendation(s) on how to resolve the issue. Where data quality is affected, the QA Manager is also involved to provide guidance on how to proceed. Where necessary, work may be temporarily halted until issue of concern is resolved.

b) An evaluation of the significance of the nonconforming work is assessed.

c) Corrective action is taken in a timely manner

d) Where data quality is or may be impacted, the PM notifies the client.

e) When work was halted, resumption of work is authorized by the official that ordered it or the QA Manager.

4.9.2 Where the evaluation by either of the involved parties (The PM, The QA, and/or Operations) indicates that the non-conforming work could recur or that there is doubt about the compliance to policies and procedures launch corrective action as described in Section 4.10.

4.10 Corrective Action

4.10.1 General

When established corrective action policies and procedures do not rectify the non-conforming event or departures from the policies and procedures in the quality system or technical operations have been identified, a case study is initiated by the QA Manager.

4.10.2 Cause Analysis

The purpose of cause analysis is to explore and understand the root and/or rationale behind the noncompliant event.

4.10.3 Selection and Implementation of Corrective Actions

The cause analysis is expected to identify potential corrective actions. Selection of corrective action is based on the effectiveness to eliminate the problem and to prevent recurrence.

The extent of corrective actions is bounded to a degree appropriate to the magnitude and the risk of the problem.

The QA Manager maintains documentation of the entire case study and to include summary of the findings and any required changes resulting from corrective action investigations.

4.10.4 Monitoring of Corrective Actions

The Operations Manager is responsible for monitoring the implementation and effectiveness of the corrective action. In the event that corrective action implemented is unsuccessful, the Operations Manager confers with the QA Manager to revisit the issues of concern and find measures to resolve the issue.

4.10.5 Additional Audits

Where the identification of non-conformance or departures casts doubts on the laboratory's compliance with established policies and procedures or on its compliance with this manual, the QA Manager conducts an audit on appropriate areas of activity in accordance with Section 4.13 of this manual as soon as possible.

4.10.6 Technical Corrective Action

a) Analytical Quality Control Procedure (QCP) is incorporated in every work order. The QCP includes corrective action for quality control parameters. In the event that other anomalies occur or corrective action in the QCP does not resolve the problem, the Supervisor is informed and non-conformance report is initiated. This process is an integral part of Corrective Action SOP (EMAX-QA08) and it includes:

   1) Event description; corrective action recommendation (CAR) corrective action taken (CAT). The event description is initiated by the person that discovered the non-conforming event and informs the Supervisor or the responsible person for initiating CAR (e.g., the PM, if it requires client notification, the QA if it concerns data quality, PT). The CAR is initiated by the Supervisor or the responsible party. The CAT is initiated by the person responsible for implementing the CAR.

   2) The Supervisor is responsible in making sure that actions are taken in a timely manner as well as the acceptability of course of action. Where data quality is or maybe jeopardize, the PM is informed so that the client is notified.

   3) These non-conformance events are logged in a database maintained by the QA Department.

   4) The QA Manager performs a periodic review to check for appropriateness of the CAT and trending analysis or recurring problems. Where the QA Manager observes inappropriate CAT, trending or recurring events, the issue is brought to the Operations Manager and when necessary with the Laboratory Director for verification, evaluation and discuss probable cure to the existing concern.

b) To the extent possible, samples are reported only if all quality control measures are acceptable. If a quality control measure is found to be out of control, and the data is to be reported, all samples associated with the failed quality control measure are reported with the appropriate project specific defined data qualifier(s). Refer to appendices for specific program qualifiers.

4.11 Preventive Action

EMAX has established pro-active processes where identified potential sources of non-conformances or probable cause of problems may occur. These processes include but not limited to the following:

4.11.1 Standard Operating Procedures are established so that proper course of action is followed across the board.

4.11.2 Chemicals used are passed through quality control prior to its use to prevent accidental use of underrated or adulterated chemicals.

4.11.3 Operations capacity is verified prior to accepting work and turning down work when project specifications are not within EMAX capability.

4.11.4 Appropriate personnel training and adequacy of commissioned equipment.

4.11.5 Continuous quality systems improvement obtained from technical experience, customer satisfaction, and participation of performance testing, and internal and external assessments.

4.12 Control of Records

Laboratory logbooks are controlled and issued by the QA Department. These logbooks are uniquely identified, paginated, and bound with a seal. They are designed to suit particular laboratory activities and comply with any applicable regulation. They are primarily used to record original observations, calculations and derived data calibration records. These records are expected to produce unequivocal and accurate data. All of these laboratory records and copies of test reports are maintained for a minimum period of five years.

Sample custody documentations are based on client project specification. In the event that a new project specifies other than EMAX current Sample Management SOPs, addendum to the existing SOP or a new SOP shall be generated to comply with the requirement.

4.12.1 General

4.12.1.1 Every data package generated archives with it all pertinent information necessary for the entire data generation process. This data archive includes but not limited to a copy of the chain of custody, PSR for the work order, relevant logbook pages, calibrations, raw data, test reports, non-conformance report (if any), and review records, These records are identified by EMAX Control Number (ECN) and are chronologically archived and indexed according to the ECN. These documents are controlled and maintained by the Data Management Department. A logbook is used to record archiving, access and disposal of these records. Quality records are maintained by the QA Department. These records include reports from internal audits and management reviews as well as records of corrective and preventive actions.

4.12.1.2 All records are expected to be legible. They are stored and retained in such a way that they are readily retrievable in a suitable environment to prevent damage or deterioration and to prevent loss. These records are retained for a minimum period of five years.

4.12.1.3 Access to these records is limited to authorized personnel only. The records warehouse is held secured and in confidence.

4.12.1.4 Likewise, access controls to electronic records are established for LIMS and administrative files. All users of Company data must be authorized to access the appropriate systems and their resources. Access is controlled and monitored in accordance with Company policy. Copies of data, regardless of location, have the same data security and access control requirements as operational data. The elements involved in controlling and

monitoring this access include identification, authentication, and authorization. Access levels are determined by the user's or user group's data access privileges. Access is granted by means of a computer account, which serves as identification. A computer account is created based on an approved request for network account.

All critical LIMS and administrative data are backed up on a regular basis. Files stored in servers are backed up daily. Workstation data are backed up at a frequency established by the user who generates the data. This frequency is influenced by the rate of generation of new data, the rate with which the data changes and the effort required to recreate information, if it is lost. Backup and archival methods shall be defined for all data files. Backup data shall be used to recover data when files have been destroyed. Archived data shall be kept for future reference. Retention times shall be defined for archived data. Provisions shall be made for off-site storage of daily and archival back ups.

4.12.1.5 All laboratory activities are recorded to allow historical reconstruction of how the resultant sample analytical data was produced. Laboratory logbooks or forms related to the laboratory activity are integrated with the specific SOP. Internal chain of custody records the history of inter-laboratory transfers of samples and/or extracts. These records include:

a) The identity of personnel involved in sample endorsement/receipt, preparation, or testing.

b) Equipment identification, analytical test methods, and related laboratory activities, such as sample receipt, sample preparation, or data verification.

c) Data file names, electronic data location to facilitate the retrieval of all working files and archived records for inspection and verification purposes.

d) All changes to records signed or initialed by responsible staff clearly identifying the reason for the signature or initials, e.g. "prepared by," or "reviewed by."

e) All generated data except those that are generated by automated data collection systems, are recorded directly, promptly and legibly in permanent ink.

f) Entries in records are not be obliterated by methods such as erasures, overwritten files or markings. All corrections to record-keeping errors are made by one line marked through the error. The individual making the correction signs (or initials) and dates the correction. These criteria also shall apply to electronically maintained records where applicable.

g) Refer to 5.4.7.2 for Computer and Electronic Data.

4.12.2 Technical Records

4.12.2.1 Records of original observations, derived data and sufficient information to establish an audit trail, calibration records, staff records and a copy of each test report issued, are retained for a defined period. The records for each environmental test contain sufficient information to facilitate identification of factors affecting the uncertainty and to enable the environmental test to be repeated under conditions as close as possible to the original. The records include the identity of personnel responsible for the sample preparation, performance of each environmental test and checking of results.

4.12.2.2 Observations, data and calculations are recorded at the time they are made and are identifiable to the specific task.

4.12.2.3 When mistakes occur in records, each mistake are crossed out, not erased, made illegible or deleted, and the correct value entered alongside. All such alterations to records are signed or initialed by the person making the correction. In the case of records stored electronically, equivalent measures are taken, e.g., changes are noted in the laboratory logbook to avoid loss or change of original data.

When corrections are due to reasons other than transcription errors, the reasons for the correction are documented.

4.12.2.4 Records Management and Storage

a) All records (including those pertaining to test equipment), certificates and reports are safely stored, held secure and in confidence to the client. These records are available to the accrediting authority.

b) All records, including those specified in 4.12.2.5 are retained for a minimum of five years from generation of the last entry in the records. All information necessary for the historical reconstruction of data are maintained by EMAX. Records which are stored only on electronic media are supported by the hardware and software necessary for their retrieval.

c) Records that are stored or generated by computers or personal computers have hard copy or write-protected backup copies.

d) Record management system for control of laboratory notebooks, instrument logbooks, standards logbooks, and records for data reduction, validation, storage and reporting is integrated in SOPs relevant to the activity.

e) Access to archived information is documented with an access log. These records are protected against fire, theft, loss, environmental deterioration, vermin and, in the case of electronic records, electronic or magnetic sources.

f) In the event that EMAX transfers ownership or goes out of business, all records shall be transferred according to the client's instructions or as specified in Section 4.1.8.e of the NELAC Standard. In addition, in cases of bankruptcy, appropriate regulatory and state legal requirements concerning laboratory records shall be followed.

4.12.2.5 Laboratory Sample Tracking

4.12.2.5.1 Sample Handling

Sample Management SOPs details procedures of how samples are received, stored, maintained and disposed. These processes include but are not limited to all records pertaining to:

a) sample preservation including appropriateness of sample container and compliance with holding time requirement;

b) sample identification, receipt, acceptance or rejection and log-in;

c) sample storage and tracking including shipping receipts, sample transmittal forms (chain of custody form); and

d) procedures are documented for the receipt and retention of samples, including all provisions necessary to protect the integrity of samples.

4.12.2.5.2 Laboratory Support Activities

In addition to documenting all the above-mentioned activities, the following are retained:

a) all original raw data, whether hard copy or electronic, for calibrations, samples and quality control measures, including analysts' work sheets and data output records (chromatograms, strip charts, and other instrument response readout records);

b) a written description or reference to the specific test method used which includes a description of the specific computational steps used to translate parametric observations into a reportable analytical value;

c) copies of final reports;

d) archived SOPs;

e) correspondence relating to laboratory activities for a specific project;

f) all corrective action reports, audits and audit responses;

g) proficiency test results and raw data; and

h) results of data review, verification, and crosschecking procedures.

4.12.2.5.3 Analytical Records

The essential information associated with analysis, such as strip charts, tabular printouts, computer data files, analytical notebooks, and run logs, shall include:

a) EMAX sample =identification convention;

b) date and time of analysis and time of analysis or other critical steps that are essential to the validity of test results, e.g., extractions, and incubations;

c) instrumentation identification and instrument operating conditions/parameters (or reference to such data);

d) analysis type;

e) all manual calculations, e.g., manual integrations;

f) analyst's or operator's initials/signature;

g) sample preparation including cleanup, separation protocols, incubation periods or subculture, ID codes, volumes, weights, instrument printouts, meter readings, calculations, reagents;

h) sample analysis;

i) standard and reagent origin, receipt, preparation, and use;

j) calibration criteria, frequency and acceptance criteria;

k) data and statistical calculations, review, confirmation, interpretation, assessment and reporting conventions;

l) quality control protocols and assessment;

m) electronic data security, software documentation and verification, software and hardware audits, backups, and records of any changes to automated data entries; and

n) method performance criteria including expected quality control requirements.

4.12.2.5.4 Administrative Records

The following records are maintained:

a) personnel qualifications, experience and training records;

b) records of demonstration of capability for each analyst; and

c) a log of names, initials and signatures for all individuals who are responsible for signing or initialing any laboratory record.

4.13 Internal Audits

4.13.1 Internal audits include both technical and systems audits. Technical audits verify compliance with method-specific requirements, as well as operations related to the analytical process, data reduction, and data review. The process includes all actions related to data generation and the assurance of its quality. Systems audits verify compliance with the laboratory's quality system, based on the NELAC Quality System, DOD Quality System, and regulatory systems required to accomplish existing projects. Part of the systems audit would be a review of the policies and procedures for Quality Assurance, Quality Control, Sample Management, Data Management, Project Management, and Information Systems.

The QA Manager or a designee arranges internal audits to verify that EMAX operations continue to comply with the requirements of the laboratory's quality system. It is the responsibility of the QA Manager to plan and organize audits not only as required by a predetermined schedule but also as requested by management. Such audits shall be carried out by the QA Manager or qualified personnel who are, wherever resources permit, independent of the activity to be audited. Personnel shall not audit their own activities except when it can be demonstrated that an effective audit will be carried out.

Personnel performing an internal audit shall complete the audit under the direction of the quality manager, however named. To be considered "trained and qualified," the internal auditor shall be trained and qualified in conducting the type of audit under review

An audit schedule shall be established such that all elements/areas of the laboratory are reviewed over the course of one year.

4.13.2 Where the audit findings cast doubt on the correctness or validity of the laboratory's calibrations or test results, the laboratory shall take immediate corrective action and immediately notify in writing any client whose work may have been affected.

4.13.3 The area of activity audited, the audit findings, and corrective actions that arise from them are recorded. Refer to Internal Assessment SOP (EMAX-QA07) for procedures in documenting internal audit. The Operations Manager and the Laboratory Director receive a copy of the Internal assessment report. The Operations Manager is responsible that the corrective actions are discharged within the agreed time frame as indicated in the report. Time frame for corrective actions is based on the magnitude of the finding and its impact on the defensibility and use of data.

4.13.4 It is the responsibility of the QA Manager to follow-up, verify, and record the implementation and effectiveness of the corrective action taken. Where resolution or timeliness of the implementation of corrective actions is in question, the Operations Manager must inform the QA Manager and the Laboratory Director for re-evaluation and/or redirection.

4.14 Management Reviews

4.14.1 In preparation of management review, the members of executive management submit their annual report to the QA Manager. The QA Manager consolidates the annual management review and submits to the Laboratory Director. The Laboratory Director or a designee arranges an executive meeting to review the laboratory's

quality system and environmental testing activities, their continuing suitability and effectiveness, and to introduce necessary changes or improvements. The review shall take account of:

a) the suitability of policies and procedures;

b) reports from managerial and supervisory personnel;

c) the outcome of recent internal audits;

d) corrective and preventive actions;

e) assessments by external bodies;

f) the results of inter-laboratory comparisons or proficiency tests;

g) changes in the volume and type of the work;

h) client feedback;

i) complaints; and

j) other relevant factors, such as quality control activities, resources, and staff training.

4.14.2 Findings from management reviews and the actions that arise from them are included in the report.

The Laboratory Director presides the executive meeting and directs course of action where changes are necessary.

The Operations Manager is responsible to ensure that identified action items concerning operations (e.g., initiate hiring or reshuffling of personnel, purchase or repair of equipments, facility improvement or maintenance, and other action items related to operations) are carried out within an appropriate and agreed timescale.

The QA Manager is responsible to ensure that identified action items concerning quality systems (e.g., policies and procedures, trainings, quality controls, and other action items related to quality systems improvement) are carried out within an appropriate and agreed timescale.

4.14.3 As part of their overall internal auditing program, the management review is conducted with respect to any evidence of inappropriate actions or vulnerabilities related to data integrity.

Discovery of potential issues shall be handled in a confidential manner until such time as a follow up evaluation, full investigation, or other appropriate actions have been completed and the issues clarified.

All investigations that result in finding of inappropriate activity shall be documented and shall include any disciplinary actions involved, corrective actions taken, and all appropriate notifications of clients. All documentation of these investigation and actions taken shall be maintained for at least five years.

5.0 TECHNICAL REQUIREMENTS

5.1 General

5.1.1 Factors affecting correctness and reliability of environmental tests results.

a) human factors (5.2);

b) accommodation and environmental conditions (5.3);

c) environmental test methods and method validation (5.4);

d) equipment (5.5);

e) measurement traceability (5.6);

f) sampling (5.7); and

g) handling of samples (5.8).

5.1.2 The extent to which the factors contribute to the total uncertainty of measurement differs considerably between (types of) environmental tests. To minimize disparity of test results, EMAX established environmental test methods and procedures, standardized training, and qualification of personnel, and in conjunction to daily equipment check, subscribe to service contracts for major equipment. EMAX designed its facility considering factors that may effect stability of equipment, minimize probable sources of contamination, health and safety of its workers, and ease for maintaining tidiness and cleanliness.

5.2 Personnel

5.2.1 All of EMAX technical staff undergo training regardless of its educational attainment and/or experience. All who operate specific equipment, perform environmental tests, evaluate results, and sign test reports shall demonstrate competence prior to working on their own. Staff on training may participate in sample analysis, as long as appropriate supervision is provided. Personnel performing specific tasks are qualified on the basis of appropriate education, training, experience and/or demonstrated skills as required.

EMAX employs sufficient personnel with the necessary education, training, technical knowledge, and experience for their assigned functions.

All personnel are trained to be responsible for complying with all quality assurance/quality control requirements that pertain to their function may it be technical or non-technical. Each technical staff member is positioned to have a combination of experience and education to adequately demonstrate a specific knowledge of his or her particular function and a general knowledge of laboratory operations, test methods, quality assurance/quality control procedures, and records management.

Employed Technical Directors are qualified in accordance to the specification of the NELAC Standard[1] as well as the DoD QSM[2] (Grey box 26).

5.2.2 Training SOP (EMAX-QA05) details the general process of conducting training. The Supervisor formulates the goals with respect to the education, training and skills of the personnel and conducts the training or assigns a mentor. The Supervisor also identifies the SOPs needed for the training as well as all the necessary training needs to successfully execute and complete the training. In general, the training program is geared relevant to the present and anticipated tasks of the laboratory.

5.2.3 Most of EMAX personnel are employed fulltime. Where contracted and additional technical and key support personnel are used, they undergo the same training, supervision and qualification process as the fulltime employees and must work in accordance with the laboratory's quality system.

5.2.4 Current job descriptions for all personnel who manage, perform, or verify work affecting the quality of the environmental tests are maintained and evaluated periodically.

[1] Based On NELAC Voted Revision – 5 June 2003
[2] DoD Quality Systems Manual – Version 3 Final

5.2.5 Training records are forwarded to the QA Department for evaluation and certification to authorize specific personnel to perform particular types of environmental testing. The certification qualifies them to conduct the first level of review on test results, give opinions, and interpretations to test results, and to operate equipment specific to the test performed. The certification is approved by the Laboratory Director and the QA Manager.

Training records are maintained by the QA Department. These records include relevant authorization(s), competence, educational and professional qualifications, training, skills, and experience. This information shall be readily available and shall include the date on which authorization and/or competence is confirmed.

5.2.6 The management is responsible for:

a) hiring personnel to meet the defined minimum level of qualification, experience, and skills necessary for all positions in the laboratory. In addition to education and/or experience, basic laboratory skills such as using a balance, micropipette, thermometers, qualitative and quantitative techniques are considered;

b) ensuring that all technical laboratory staff have demonstrated capability in the activities for which they are responsible. Such demonstration is documented and maintained in their training files.

Note: Where a sample process (e.g. preparation, extraction, and analysis) is to be completed by a group of individuals to perform a method, otherwise known as a "work cell", each individual is certified to perform his or her specific task in order for the group working as a unit meets the above criteria. This demonstration of capability is documented in the individual training file.

c) ensuring that the training of each member of the technical staff is kept up-to-date as described in EMAX-QA05 where:

1) Evidence must be on file that demonstrates that each employee has read, understood, and is using the latest version of the laboratory's in-house quality documentation, which relates to his/her job responsibilities.

2) Training courses or workshops on specific equipment, analytical techniques or laboratory procedures are included in the training files.

3) Analyst training is considered up to date if an employee training file contains a certification that the technical personnel has read, understood, and agreed to perform the most recent version of the test method (the approved method or standard operating procedure as defined by the document control system, 4.2.3.d) and documentation of continued proficiency by at least one of the following per year:

   i. acceptable performance of a blind sample (single blind to the analyst). Note: successful analysis of a blind performance sample on a similar test method using the same technology (e.g., GC/MS volatiles by purge and trap for Methods 524.2, 624 or 5030/8260) would only require documentation for one of the test methods. The laboratory must determine the acceptable limits of the blind performance sample prior to analysis;

   ii. an initial measurement system evaluation or another demonstration of capability;

   iii. at least four consecutive laboratory control samples with acceptable levels of precision and accuracy. The laboratory must determine the acceptable limits for precision and accuracy prior to analysis; or

   iv. if i-iii cannot be performed, analysis of authentic samples with results statistically indistinguishable from those obtained by another trained analyst.

d) documenting all analytical and operational activities of the laboratory;

e) supervising all personnel employed by the laboratory;

f) ensuring that all sample acceptance criteria (Section 5.8) are verified and that samples are logged into the sample tracking system and properly labeled and stored; and

g) documenting the quality of all data reported by the laboratory;

5.2.7 Data integrity training is provided as a formal part of new employee orientation and provided on an annual basis for all current employees. Ethics Program SOP (EMAX-QA10) details EMAX business ethics, its policies and procedures, the critical need for honesty and full disclosure of analytical results, how and when to report data integrity issues, as well as record keeping. Employees are required to understand their obligations related to data integrity, that any infractions of the laboratory data integrity procedures will result in a detailed investigation that could lead to disciplinary action including immediate termination or be brought in the court of law. Data integrity trainings are authenticated by the participant's dated signature. Senior managers acknowledge their support of these procedures by 1) upholding the spirit and intent of the organization's data integrity procedures and 2) effectively implementing the specific requirements of the procedures.

Training shall include discussion regarding all data integrity procedures, data integrity training documentation, in-depth data monitoring, and data integrity procedure documentation.

Other relevant ethics training materials (e.g. examples of breaches of ethical behavior should be discussed including improper data manipulations, adjustments of instrument time clocks, and inappropriate changes in concentrations of standards) are developed by the QA Department to augment the Ethics Program SOP.

5.3 Accommodation and Environmental Conditions

5.3.1 Significance of every facet of the laboratory was taken into consideration when EMAX designed its facilities. Its energy sources, lighting and environmental conditions, are planned and constructed to facilitate correct performance of the environmental tests.

To ensure that environmental conditions do not invalidate the results or adversely affect the required quality of any measurement, controls are established and monitored. Fume hoods are adequately provided so that particular care when sub-sampling and environmental testing are undertaken. Technical requirements for accommodation and environmental conditions that can affect the results of environmental tests are monitored and documented.

5.3.2 All environmental conditions that require control are monitored and documented in accordance with the relevant specifications, methods and procedures or where they influence the quality of the results. Due attention are paid as appropriate to the technical activities concerned (e.g. Leaching requires controlled temperature, DoE lab requires frisking, etc.). Environmental tests shall be stopped when the environmental conditions jeopardize the results of the environmental tests.

In instances where monitoring or controls of any of the above-mentioned items are specified in a test method or by regulation, a course of action is included in the SOP relevant to the activity being performed to meet and document adherence to the laboratory facility requirements.

5.3.3 The laboratories were constructed to have effective separation between neighboring areas in which there are incompatible activities. Volatiles Laboratory is located farthest from the extraction lab and has independent mechanical controls; laboratories for DoE samples are isolated with independent mechanical controls and restricted entries.

All foreseen measures are taken to prevent cross-contamination. Sample storage for Volatiles is located in the Volatiles Laboratory. Samples from DoE sights that are identified as restricted samples are stored in the DoE Laboratory.

5.3.4 Access to and use of areas affecting the quality of the environmental tests are controlled. Specific areas in the lab can only be accessed by authorized personnel.

5.3.5 Measures are taken to ensure good housekeeping in the laboratory. The Supervisors are responsible to make sure that their work areas are properly maintained to prevent cross-contamination and/or health hazard to staff members.

5.3.6 Workspaces are available and workers assigned to specific areas are responsible to clear their respective work areas. Maintenance of work areas are enumerated below:

a) access and entryways to the laboratory are maintained clear by the Facilities Manager;

b) sample receipt areas are maintained by the Sample Management Department;

c) sample storage areas are maintained by the Sample Management Department;

d) chemical and waste storage areas are maintained by the Waste Management Unit.

e) data handling and storage areas are maintained by the Data Management Department.

5.4 Environmental Test Methods and Method Validation

5.4.1 General

EMAX has established appropriate methods and procedures for all environmental tests within its capability. These include handling, transport, storage, and preparation of samples, and, where appropriate, an estimation of the measurement uncertainty as well as statistical techniques for analysis of environmental test data.

Analytical SOPs have instructions on the use and operation of all relevant equipment, and on the handling and preparation of samples where the absence of such instructions could jeopardize the results of environmental tests. All instructions, standards, manuals and reference data relevant to the work of the laboratory are kept up to date and are readily available to personnel (see 4.3). Deviation from environmental test methods occur only if the deviation has been documented, technically justified, authorized, and accepted by the client. All SOPs are reviewed for accuracy and adequacy at least annually and whenever procedural method changes occur, they are updated as appropriate

5.4.1.1 Standard Operating Procedures (SOPs)

EMAX maintains SOPs that accurately reflect all phases of current laboratory activities such as assessing data integrity, corrective actions, handling customer complaints, and all test methods.

a) These documents contain adequate details to allow qualified personnel, other than the analyst, to reproduce the procedures to generate the test result.

b) In the absence of internally written analytical SOPs, copies of published methods maybe used as long as any changes or selected options in the methods are documented and included in the methods manual (see 5.4.1.2). For DoD projects, where existing methods are specified, requirements contained within that method shall be followed. Any modifications to existing method requirements require project-specific approval by DoD project representative.

c) Copies of all SOPs are downloaded in the EMAX Browser and are accessible to all personnel.

d) The SOPs are organized indicative of their use. The Sample Management SOPs are policies and procedures describing how to handle samples from cradle to grave. The Data Management SOPs are policies on procedures detailing data collection from sample receiving to data packaging. The Quality Assurance SOPs

and Quality Control SOPs are policies and procedures detailing execution and controls for the overall quality systems. The Information Systems SOPs are policies and procedures detailing handling and management of electronic media, from hardware and software administration to backup and restoration controls.

e) Each SOP clearly indicates the effective date of the document, the revision number and the signature(s) of the approving authority.

f) Analytical SOPs contain sufficient information to perform the tests. Any changes, including the use of a selected option must be documented and included in the specific analytical SOP in the form of an addendum. All SOPs shall be archived for historical reference in accordance to Section 4.12.

5.4.1.2 Laboratory Method Manual(s)

a) EMAX maintains laboratory method manuals referred to as analytical SOPs for each accredited analyte or test method.

b) The Analytical SOPs describe the process of producing analytical results from sub-sampling to data reduction and review. These SOPs are adaptations of referenced test methods. In cases where modifications to the published method have been made or where the referenced test method is ambiguous or provides insufficient detail, these changes or clarifications are clearly described. Each test method includes or reference where applicable:

1) identification of the test method;
2) applicable matrix or matrices;
3) detection limit;
4) scope and application, including components to be analyzed;
5) summary of the test method;
6) definitions;
7) interferences;
8) safety;
9) equipment and supplies;
10) reagents and standards;
11) sample collection, preservation, shipment and storage;
12) quality control;
13) calibration and standardization;
14) procedure;
15) data analysis and calculations;
16) method performance;
17) pollution prevention;
18) data assessment and acceptance criteria for quality control measures;
19) corrective actions for out of control data;
20) contingencies for handling out-of-control or unacceptable data;
21) waste management;
22) references; and

23) any table, diagram, flowchart, and validation data.

5.4.2 Selection of Methods

Project Management SOP (EMAX-QA01) describes how methods for environmental testing, including methods for sample preparation, are dispense to meet the needs of the client and which are appropriate for the environmental tests it undertakes.

5.4.2.1 Sources of Methods

a) Methods published in international, regional or national standards are preferably be used. EMAX ensures that it uses the latest valid edition of a standard unless it is not appropriate or possible to do so. When necessary, the standard shall be supplemented with additional details to ensure consistent application.

b) When the use of specific methods for a sample analysis are mandated or requested, only those methods are used.

c) When the client does not specify the method to be used or where methods employed are not required, the methods are fully documented and validated (see 5.4.2.2, 5.4.5, and Appendix C), and shall be available to the client and other recipients of the relevant reports. It is of EMAX's best interest to select appropriate methods that have been published either in international, regional or national standards, or by reputable technical organizations, or in relevant scientific texts or journals, or as specified by the manufacturer of the equipment. Where no reference method has been established, EMAX may develop methods appropriate for the intended use. These methods shall be fully validated and shall only be put to use with client's consent.

d) EMAX shall inform the client when the method proposed by the client is considered to be inappropriate or out of date.

5.4.2.2 Demonstration of Capability

Capability to perform environmental tests requires demonstration to confirm that it can be properly executed. Where method changes occur, the confirmation is repeated.

a) Prior to acceptance and institution of any method, satisfactory demonstration of method capability is performed. (See Appendix C and 5.2.6.b) In general, this demonstration does not test the performance of the method in real world samples, but in the applicable and available clean quality system matrix sample (a quality system matrix in which no target analytes or interferences are present at concentrations that impact the results of a specific test method), e.g., drinking water, solids and air. In addition, for analytes which do not lend themselves to spiking, the demonstration of capability may be performed using quality control samples. When available, demonstration of performance is determined using external source of information (e.g. published methods). In the absence of external source, EMAX shall use comparisons provided by the project sponsor or execute the process as specified by the project data quality objectives.

b) Thereafter, continuing demonstration of method performance, as per the quality control requirements in Appendix D (such as laboratory control samples) is performed.

   The initial and continuing demonstration of capability includes verification of method sensitivity checks (for example, through the use of quarterly method detection verification) and demonstrated measurements of accuracy and precision (such as the production and review of quality control charts). These requirements apply to each quality system matrix of concern.

c) For methods that were established before July 1999, and there have been no significant changes in instrument type, personnel or method, continuing demonstration of method performance and the analyst's documentation of continued proficiency is sufficient to demonstrate capability.

d) In all cases, the appropriate forms such as the Certification Statement (Appendix C) must be completed. All associated supporting data necessary to reproduce the analytical results summarized in the Certification Statement must be retained and be available upon request. (See Appendix C for Certification Statement.)

e) A demonstration of capability must be completed each time there is a change in instrument type, personnel, method, or sample matrix that may affect the precision, accuracy, sensitivity, and selectivity of the output.

f) Specialized "work cell(s)" (a group consisting of analysts with specifically defined tasks that together perform the test method who see a sample through the complete process of preparation, extraction, and analysis), each member of the group is certified specifically for his/her function in the unit. Demonstration of capability is fully documented.

g) Since every individual that work in work cells are certified when there are changes in the members of the cell, the new employee(s) is assigned to work with experienced analyst(s) in that area of the work cell where they are employed and no disruption of the unit's capability to perform is expected. The new member of the work cell must demonstrate acceptable performance through the same process.

h) Currently EMAX does not certify work cell(s) as a unit but rather each member is certified individually. In the event that EMAX decides to certify work cells as a unit, the performance of the group shall be linked to the training record of the individual members of the work cell (see section 5.2.6). When there are changes in the members of the cell, the performance of the unit shall be monitored. Such performance must be documented and the four preparation batches following the change in personnel must not result in the failure of any batch acceptance criteria, e.g., method blank and laboratory control sample, or the demonstration of capability must be repeated. In addition, if the entire work cell is changed or replaced, the work cell must perform the demonstration of capability.

5.4.3 Laboratory-Developed Methods

Method Development SOP (EMAX-QA03) details the policies and procedures to guide the users in planning the activity for the study they are about to develop as well as the documentation required to complete the qualification of the method. This activity shall be assigned to qualified personnel equipped with adequate resources.

Plans are updated as development proceeds and shall be corroborated through effective communication amongst all personnel involved and the intellectual resources of EMAX.

5.4.4 Non-Standard Methods

Non-Standard Methods shall only be employed when mandated by the project. It shall include clear specification of the client's requirements as stated by the project quality objectives. The method developed shall have been validated appropriately before use.

5.4.5 Validation of Methods

5.4.5.1 EMAX validates its methods by assessing objective evidence ensuring that the particular requirements for a specific intended use are fulfilled.

5.4.5.2 Validation of non-standard methods, in-house-designed/developed methods, standard methods used outside their published scope, and amplifications and modifications of standard methods shall confirm that the methods are fit for the intended use. The validation shall be as extensive as is necessary to meet the needs of the given application or field of application. Records of results obtained, the procedure used for the validation, and a statement as to whether the method is fit for the intended use is retained. At a minimum, requirements shall be the initial test method evaluation requirements given in Appendix C.3.

5.4.5.3 Where project requirements are known, (e.g., DoD QSM, or as stated through Basic Ordering Agreements), when validating methods the range and accuracy of the values (e.g. the uncertainty of the results, detection

limit, selectivity of the method, linearity, limit of repeatability and/or reproducibility, robustness against external influences and/or cross-sensitivity against interference from the matrix of the sample/test object), are assessed for the intended use and relevant to the clients' needs.

In cooperation of EMAX's clients, should the client elect to use EMAX as early as the planning phase of the project (QAPP preparation), EMAX shall ensure that the required methods are properly validated. Otherwise, the client shall be informed accordingly.

5.4.6 Estimation of Uncertainty of Measurement

5.4.6.1 Factors affecting measurement uncertainty is estimated based on the complexity of the process. Note that the analytical process is only a fraction of the total measurement uncertainty for a target analyte. Hence, EMAX can not make measurement uncertainty corrections on sample results.

Laboratory control samples (LCS) are subjected to all possible sources of measurement uncertainty, (e.g., sample sub-sampling, sample preparation, sensitivity of instrumentation, instrument calibrations, qualitative and quantitative evaluation). Hence, reasonable estimation of measurement uncertainty is revealed by the statistical evaluation of the LCS results and/or validation data.

In those cases where a well-recognized test method specifies limits to the values of the major sources of uncertainty of measurement and specifies the form of presentation of calculated results, it is considered to have established estimated measurement uncertainty.

5.4.6.2 When estimating the uncertainty of measurement is required by the project, EMAX shall secure guidance for estimating measurement uncertainty from the client to prevent misinterpretation of results.

5.4.7 Control of Data

5.4.7.1 Calculations and data transfers are subject to appropriate checks in a systematic manner. Data evaluation and review process is an integral part of every analytical SOP. In addition Data flow and Review SOP (EMAX-DM01) describes the general process of how data are generated and reviewed. These SOPs include policies and procedures:

a) to ensure that the reported data are free from transcription, omissions, mistakes and qualitative and quantitative identification errors.

b) to ensure that all quality control measures are reviewed, and evaluated before data are reported.

c) for manual calculations including manual integrations.

d) to ensure consistency with project-specific requirements (e.g., method requirements, calibration requirements, quality control procedures, project limits, etc.)

e) to generate case narrative that includes accurate explanation when anomalous results are encountered, the corrective actions taken and that affected data are flagged according to project specification.

5.4.7.2 Where EMAX uses computers, automated equipment, or microprocessors for the acquisition, processing, recording, reporting, storage or retrieval of environmental test data, controls are in place so that original electronic data acquired are retained. EMAX also developed Information Systems SOPs.

a) For computer software developed in-house, EMAX has established policies and procedures to ensure sufficient details for documentation and control. These SOPs include:

Software Documentation (EMAX-IS01)

Software Development Methodologies (EMAX-IS02)

Software Testing and Quality Assurance (EMAX-IS03)

Software Maintenance (EMAX-IS04)

b) Data Security SOP (EMAX-IS08) details the policies and procedures for protecting laboratory programs and electronic data. Furthermore, EMAX has developed Ethics Program (EMAX-Q10) to uphold integrity and confidentiality of data entry or collection, data storage, data transmission and data processing.

c) Hardware Maintenance SOP (EMAX-IS10) details computers attached to automated equipment are maintained to ensure proper functioning and are provided with the environmental and operating conditions necessary to maintain the integrity of environmental test data; and

d) Access controls, backup and archival, and routine disaster recovery are established and maintained by the Network Administrator to maintain security of data. Only unauthorized personnel can amend computer records.

Commercial off-the-shelf software (e.g. word processing, database and statistical programs) in general use within their designed application range is considered to be sufficiently validated. However, laboratory software configuration or modifications must be validated as in 5.4.7.2a.

5.5 Equipment

5.5.1 EMAX has all instrumentation and support equipment for the environmental tests it performs (including sub-sampling, preparation of samples, processing and analysis of environmental test data). These instruments are obtained and maintained to achieve the accuracy, precision, sensitivity, and selectivity required for the intended use of the generated data. Procedures for setup, maintenance, and adjustments to instrument operating parameters as well as documentation process are integrated with the SOPs where these instruments are used.

5.5.2 Equipment and its software (where applicable) are verified to comply with specifications relevant to the environmental tests requirements before being placed into service. Procedures for calibration and calibration verifications are imbedded with the SOPs where these instruments are utilized.

Calibration requirements are divided into two parts: (1) requirements for analytical support equipment, and 2) requirements for instrument calibration. In addition, the requirements for instrument calibration are divided into initial instrument calibration and continuing instrument calibration verification.

5.5.2.1 Support Equipment

Support equipments are devices that are necessary to support laboratory operations. These include but are not limited to: balances, ovens, refrigerators, freezers, incubators, water baths, temperature measuring devices, sample preparation devices, and volumetric dispensing devices if quantitative results are dependent on their accuracy, as in standard preparation and dispensing or dilution into a specified volume.

a) All support equipments are maintained in proper working order. The records of all repair and maintenance activities including service calls are kept.

b) All support equipments are calibrated or verified at least annually, using NIST traceable references when available, over the entire range of use. The results of such calibration or verification shall be within the specifications required of the application for which this equipment is used or:

1) the equipment is removed from service until repaired; or

2) maintain records of established correction factors to correct all measurements.

c) Raw data records are retained to document equipment performance.

d) Prior to use on each working day, balances, ovens, refrigerators, freezers, and water baths are checked in the expected use range, with NIST traceable references where commercially available. The acceptability for use or continued use shall be according to the needs of the analysis or application for which the equipment is being used.

e) Mechanical volumetric dispensing devices including burettes (except Class A glassware) are checked for accuracy on at least a quarterly use basis. Glass microliter syringes are to be considered in the same manner as Class A glassware, but must come with a certificate attesting to established accuracy otherwise, initial demonstration of accuracy is required.

5.5.2.2 Instrument Calibration

The essential elements that define the procedures and documentation for initial instrument calibration and continuing instrument calibration verification must ensure that the data is of known quality and appropriate for a given regulation or decision.

5.5.2.2.1 Initial Instrument Calibration

The following items are essential elements of initial instrument calibration:

a) Calibration procedures, how they are done, evaluated and use. These procedures are included in every EMAX Analytical SOP. These procedures shall only be superseded when other specifications are required by the project or mandated by regulation. Where instrument calibration are complex (e.g. calibration for multi-analytes analyzed by GC/MS, GC, or HPLC) a secondary review is required prior to its use. Initial calibration verification is also performed when applicable.

b) Raw data records. These records are retained to permit reconstruction of the initial instrument calibration, e.g., calibration date, test method, instrument, analysis date, each analyte name, analyst's initials or signature; concentration and response, calibration curve or response factor; or unique equation or coefficient used to reduce instrument responses to concentration.

When manual integrations are performed, the original and the manually integrated raw data records are retained and documented as described in Data Flow and Review SOP (EMAX-DM01). Where software of data acquisition permits, electronic data also includes complete audit trail for the manually integrated peaks.

c) Quantitation Technique. Sample result quantitation is based from the initial instrument calibration, unless otherwise required by regulation, method, program, or project.

d) Initial calibrations verification. Initial instrument calibration is verified with a standard obtained from a second manufacturer. The use of a standard from a second lot is acceptable when only one manufacturer of the calibration standard exists. Where commercially available, EMAX shall purchase standards that are certified and traceable to a national standard.

When method specific guidance does not exist, concentration of second source standard shall be at or near the middle of the calibration range.

Where stability of the standard has not been established, assessment of standard solution as well as degradation rate shall be observed from the standard preparation date when evaluating for its suitability for use.

e) Acceptance Criteria. Initial instrument calibration acceptance criteria are based on the method requirement, or project specific requirement e.g., correlation coefficient or relative standard deviation. The criteria used must be appropriate to the calibration technique employed.

Exclusion of initial calibration points without technical justification is not allowed.

Where problem analytes are known, deviation to acceptance criteria mandates EMAX to seek for client approval.

f) Limit of Quantitation (LOQ). LOQ is dependent on the sensitivity of the instrument. Where applicable, the lowest calibration standard determines the lowest concentration for which quantitative data are reported. For other instruments (e.g. pH meters), the reporting limit is based on the sensitivity of the instrument. Any data reported below the lower limit of quantitation is considered to have an increased quantitative uncertainty and shall be reported only when it is required by the project using defined qualifiers or flags as specified by the project or explained in the case narrative.

The reporting limit shall lie within the calibration range, at or above the LOQ. If the client requires a reporting limit that lies below the lowest standard of the calibration curve and below the LOQ, then method modification is required. For methods that require only one standard (i.e., lower limit of curve is the origin), the reporting limit shall be no lower than a low-level check standard, designed to verify the integrity of the curve at the lower limits

g) Quantitation Range. Where applicable, the highest calibration standard determines the highest concentration for which quantitative data are reported. Any data reported above this highest standard should be considered to have an increased quantitative uncertainty and shall be reported only when allowed by the project using defined qualifiers or flags specified by the project or explained in the case narrative.

The range of the accepted initial calibration curve reflects the quantitation range of the samples (i.e., only those sample results with concentrations contained within the range of the calibration curve are considered to be quantitative). Any data reported outside the calibration range shall be qualified as an estimated value (i.e., by a data qualifier “flag”) and explained in the case narrative.

When sample concentrations exceed the upper limit of the calibration curve, samples shall be diluted and re-analyzed (if possible) to bring them within the calibration curve. When sample concentrations exceed the upper limit of the calibration curve or fall below the lower limit of the calibration curve, the resulting data shall be qualified as having estimated values and shall be flagged.

h) Limit of Detection (LOD). The lowest calibration standard must be above the limit of detection. Noted exception: The following shall occur for instrument technology (such as ICP or ICP/MS) with validated techniques from manufacturers or methods employing standardization with a zero point and a single point calibration standard:

1) Linear Range is established as described in EMAX-6010 or EMAX-6020.

2) A two-point calibration (zero point and single point calibration standard) is analyzed with each analytical batch.

3) A standard corresponding to the limit of quantitation is analyzed with each analytical batch and evaluated to meet established acceptance criteria.

4) The linearity is verified at a frequency established by the method and/or the manufacturer.

i) Corrective Action. If the initial instrument calibration results are outside established acceptance criteria, corrective actions must be performed and all associated samples re-analyzed. If re-analysis of the samples is not possible, data associated with an unacceptable initial instrument calibration shall be reported with appropriate data qualifiers.

j) If a reference or mandated method does not specify the number of calibration standards, the minimum number is five contiguous calibration points for organics and three contiguous calibration points for inorganics (one of

which must be at the limit of quantitation), not including blanks or a zero standard with the noted exception of instrument technology for which it has been established by methodologies and procedures that a zero and a single point standard are appropriate for calibrations (see 5.5.2.2.1.h).

All reported target analytes and surrogates are included in the initial calibration. For multi-component analytes (e.g. PCBs, toxaphene), a separate initial calibration is performed.

5.5.3 Equipment are operated and maintained by authorized personnel only. Up-to-date instructions on the use and maintenance of equipment (including any relevant manuals provided by the manufacturer of the equipment) are readily available for use by the appropriate laboratory personnel.

All equipment are routinely maintained, inspected, and cleaned. Maintenance procedures are included in the specific SOPs where the instrument is used and performed maintenance is recorded in the instrument maintenance logbook.

5.5.4 Instruments and data acquired from each instrument are uniquely identified.

5.5.5 Major item of equipment and its software significant to the environmental tests performed is maintained. Records include the following:

a) Instrument ID and data acquisition software;

b) manufacturer's name, type identification, and serial number or other unique identification;

c) checks that equipment complies with the specification (see 5.5.2);

d) current location;

e) manufacturer's instructions, if available, or reference to their location;

f) dates, results and copies of reports and certificates of all calibrations, adjustments, acceptance criteria, and the due date of next calibration;

g) maintenance plan, where appropriate, and maintenance carried out to date; documentation on all routine and non-routine maintenance activities and reference material verifications.

h) any damage, malfunction, modification or repair to the equipment;

i) date received and date placed in service (if available); and

j) if available, condition when received (e.g., new, used, reconditioned);

5.5.6 Procedures for safe handling, transport, storage, use and planned maintenance of measuring equipment to ensure proper functioning and in order to prevent contamination or deterioration. Refer to specific SOPs where instruments are used.

5.5.7 Where equipment has been subjected to overloading or mishandling, gives suspect results, or has shown defective or non-compliant to requirements, it is taken out of service. It is either isolated to prevent its use or clearly labeled or marked as being out of service, until it has been repaired and shown by calibration or test to perform correctly. The laboratory shall examine the effect of the defect or departure from specified limits on previous environmental tests and shall institute the "Control of nonconforming work" procedure (see 4.9).

5.5.8 Support equipment requiring calibration are labeled and identified to indicate the status of calibration, the calibration reference (traceable to the equipment calibration record) and the next calibration due date.

Analytical instruments calibrations are performed as described in the analytical SOPs.

5.5.9 When, for whatever reason, equipment goes out-of-control, the instrument shall only be put back in use when its function and calibration status are verified to be in control.

5.5.10 Where applicable, validity of initial calibration is verified as specified by the analytical SOP or as required by the project. Analytical SOPs include:

a) The details of the continuing instrument calibration procedure, calculations and associated statistics.

b) Target analytes in the continuing instrument calibration verification. Multi-component analytes such as, Total Petroleum Hydrocarbons, or Toxaphene, a separate continuing calibration standard is analyzed. For Aroclors, a representative chemical related substance (e.g. 1016 and 1260) is used.

c) Frequency of Instrument calibration verification:

a. Where internal standards are employed, calibration verification is done at the beginning of each analytical run otherwise, calibration verification brackets the analytical sequence at the frequency that the method requires or as specified by the project. When the methods specify that calibration verification shall run at specific sample intervals (for example, every 10 samples), the count of these samples shall be of field samples only.

In the absence of method or project requirement, at a minimum, calibration verification is performed at beginning and end of each analytical batch;

b. Perform calibration verification whenever it is expected that the analytical system may be out of calibration or might not meet the verification acceptance criteria;

c. Perform calibration verification if the time period for calibration or the most previous calibration verification has expired (e.g. 12-hour analytical cycle or every 20 field samples); or

d. Perform calibration verification for all analytical systems that contain a calibration verification requirement.

d) Retention of Records. Sufficient raw data records are retained to permit reconstruction of the continuing instrument calibration verification, e.g., test method, instrument, analysis date, each analyte name, concentration and response, calibration curve or response factor, or unique equations or coefficients used to convert instrument responses into concentrations, analyst name. Continuing calibration verification records are uniquely identified to link with the initial instrument calibration identification. Refer to Analytical and QC Labeling SOP (EMAX-SM04) for details. Corrections to any of these records include a complete audit trail for those manipulations.

e) Acceptance Criteria. Continuing calibration verification (CCV) is evaluated in accordance to the method requirement or as required by the project data quality objectives. Where no method requirements exist, CCV standards are analyzed at or below the middle of the calibration range using the same source as the initial calibration and acceptance criteria is modeled on similar analytical technology.

When CCV is non-compliant, a second consecutive (immediate) calibration verification may be considered if the result is indicative that it is not due to instrumentation problem. When this option is exercised, refer to the project requirements for CCV concentration level (DoD QSM requires different levels within the original calibration curve). If the CCV still fails or a second attempt is not considered, execute the corrective actions suggested on the specific analytical SOP.

If routine corrective action procedures fail to meet the acceptance criteria, further instrument evaluation and/or maintenance is undertaken to the extent necessary to correct the problem. When the instrument's condition is restored to normal status, a new initial instrument calibration is established and validated. Samples affected by the non-compliant

CCVs are re-analyzed. Where re-analysis is not possible and results must be reported, data associated with non-compliant CCVs data are reported as specified by the project, otherwise the following conditions are implemented:

1) when the acceptance criteria for the continuing calibration verification exceeded high, i.e., high bias, and there are associated samples that are non-detects, then those non-detects may be reported. Otherwise the samples affected by the unacceptable calibration verification are flagged and explained in the case narrative

2) when the acceptance criteria for the continuing calibration verification exceeded low, i.e., low bias, those sample results may be reported if they exceed a maximum regulatory limit/decision level. Otherwise the samples affected by the unacceptable verification are flagged and explained in the case narrative.

5.5.11 Where calibrations give rise to a set of correction factors, new instrument parameter settings are posted with the affected instrumentation (e.g., in computer software) where it is routinely used as checklist for instrument parameter check prior to sample analysis.

5.5.12 Limited access to laboratories is instituted so that test equipment, including both hardware and software, are safeguarded from adjustments when authorized instrument users are not around.

5.6 Measurement Traceability

5.6.1 General

All equipment used for environmental tests, including equipment for subsidiary measurements (e.g., for environmental conditions) having a significant effect on the accuracy or validity of the result of the environmental test or sampling are calibrated before being put into service and on a continuing basis.

Quality control procedures are established systems for selecting, using, calibrating, checking controlling, and maintaining support equipment as well as the calibration standards, (e.g. standard weights, standard thermometers). The laboratory shall have an established program and procedure for the calibration of its equipment. Calibration procedures for analytical instruments are detailed in the analytical SOPs.

5.6.2 Analytical Laboratories

5.6.2.1 Equipment measurement accuracy is dependent on its sensitivity. Every measuring device has uncertainty of measurement and is derived from its deviation from expected value.

a) To ensure that measurements are traceable to national standards of measurement, analytical calibration standards used at EMAX are purchased traceable to NIST, calibration weights and calibration thermometers are sent to NIST calibration laboratories (or equivalent).

5.6.2.2 Where traceability of measurements to SI units is not possible and/or not relevant, the same requirements for traceability to, for example, certified reference materials, agreed methods and/or consensus standards, are used. To provide satisfactory evidence of correlation of results, EMAX participates in proficiency testing, or independent analysis.

5.6.3 Reference Standards and Reference Materials

5.6.3.1 Reference Standards

Reference standards (e.g., balance weights, traceable thermometers) are purchased traceable to national standard of measurement. These standards are calibrated by a NIST certified calibration laboratory (or equivalent) at least once a year. These standards are used for calibration purposes only.

5.6.3.2 Reference Materials

Where commercially available, all reference materials used at EMAX are purchased certified traceable to SI units of measurement, or to certified reference materials. Where possible, traceability shall be to national or international standards of measurement or to national or international standard reference materials. Internal reference materials are checked as far as is technically and economically practicable.

5.6.3.3 Intermediate Checks

Checks needed to maintain confidence in the status of reference, primary, transfer or working standards and reference materials are carried out according to defined procedures and schedules.

5.6.3.4 Transport and Storage

Procedures for safe handling, transport, storage, and use of reference standards and materials in order to prevent contamination or deterioration and in order to protect their integrity are also included in the relevant SOPs. Refer to QC procedures for details.

5.6.4 Documentation and Labeling of Standards, Reagents, and Reference Materials

SOP for Purchasing (EMAX-QA09) describes the procedures for the purchase, reception, and storage of consumable materials used for the technical operations.

a) Records are retained for all standards, reagents, reference materials, and media including the manufacturer/vendor, the manufacturer's Certificate of Analysis or purity (if supplied), the date of receipt, recommended storage conditions, and an expiration date after which the material shall not be used unless its reliability is verified by the user.

b) Original containers (such as provided by the manufacturer or vendor) are labeled with an expiration date.

c) Standards preparation logbooks are used to record standard and reference material preparation. These records are traceable to certificates of analysis from manufacturers indicating traceability to purchased stocks or neat compounds, reference to the method of preparation, lot numbers for the standard, date of preparation, expiration date and preparer's initials.

d) All containers of prepared standards and reference materials bear a unique identifier and expiration date and linked to the documentation requirements in 5.6.4.c above.

e) Analytical SOPs include the procedures for preparing reagents to meet the requirements of the test method. The source of reagents shall comply with 5.9.2a) 6) and D.1.4b).

f) All containers of prepared reagents bear identification a preparation date, expiration date, and the initials of the reagent preparer.

5.7 Sampling

5.7.1 Obtaining sample aliquots from a submitted sample is carried out as part of the test method. Procedures and appropriate techniques to obtain representative sub-samples are detailed in the analytical SOPs.

5.7.2 Where the client requires deviations, additions, or exclusions from the documented sub-sampling procedure, these are recorded referencing the source of instruction included in all documents containing environmental test results. These instructions are included in the work order distributed in the laboratory as part of the project specific requirement, and shall be communicated to the appropriate personnel.

5.7.3 Sub-sampling activities are documented in the appropriate laboratory logbook. Samples taken from the sample control room for sub-sampling are recorded in the internal chain of custody (ICOC). Aliquots taken are

recorded in the appropriate sample preparation or analytical log. The records also include the date and initials of the personnel that executed the sub-sampling.

5.8 Handling of Samples

To ensure the validity of EMAX's data the following procedures are established.

5.8.1 Sample Management SOPs. These procedures describe transportation, receipt, handling, protection, storage, retention and/or disposal of samples, including all provisions necessary to protect the integrity of the sample, and to protect the interests of EMAX, the community it serves and its clients.

5.8.2 EMAX-SM01 describes the system for identifying samples. The identification is retained throughout the life of the sample in the laboratory. The system is designed and operated so that each container is uniquely identified, and a storage address is provided as to ensure that samples cannot be confused physically or when referred to in records or other documents.

The sample storage system is designed for ease of storing and locating samples.

a) Sample Management SOPs also include a system for storing samples to ensure that there can be no confusion regarding the identity of such samples at any time. This system includes identification for all samples, sub-samples and subsequent extracts and/or digestates. Samples are labeled with a unique identification (ID) code for each sample container received in the laboratory.

b) This laboratory code is an unequivocal link with the unique field ID code assigned each container.

c) The laboratory ID code is placed on the sample container as a durable label.

d) The laboratory ID code is used in the laboratory records (see 5.8.3.1.d) as internal identification in sample transfers, sample preparation, sample analysis, sample disposal and other related laboratory activities. This identification is linked to the field sample ID through the electronic sample login. Reports shall bear the laboratory identification and the field sample ID.

e) In cases where the laboratory pre-assigns numbers to sample containers, the laboratory ID code may be the same as the field ID code.

5.8.3 SOP for sample receiving is detailed in EMAX-SM02. Upon receipt of the samples, the condition, including any abnormalities or departures from normal or specified conditions as described in the environmental test method, are recorded. When there is doubt as to the suitability of a sample for environmental test, or when a sample does not conform to the description provided, or the environmental test required is not specified in sufficient detail, the Project Manager is informed immediately so that the sample condition is communicated to the client for further instructions before proceeding. Discrepancies and instructions on how to proceed is recorded in the sample receipt form and/or attached documents to sample receipt forms.

5.8.3.1 Sample Receipt Protocols

a) All items specified in 5.8.3.2 below are checked.

1) All samples which require thermal preservation is considered acceptable if the arrival temperature is either within 2°C of the required temperature or the method specified range.

For samples with a specified temperature of 4°C, samples with a temperature ranging from just above the freezing temperature of water to 6°C shall be acceptable. Samples that are hand delivered to the laboratory on the same day that they are collected not meeting the thermal preservation requirement shall be considered acceptable if there is evidence that the chilling process has begun such as arrival on ice.

Temperature measurement, when provided, shall be verified through temperature blanks are included in the sample coolers.

2) Chemical preservation is checked using readily available techniques, such as pH or chlorine, during sample receiving. When sample chemical preservation cannot be checked (e.g., volatile samples) preservation is checked during analysis.

b) The results of all checks are recorded.

c) If the sample does not meet the sample receipt acceptance criteria listed in this standard, the laboratory shall either:

1) retain correspondence and/or records of conversations concerning the final disposition of rejected samples; or

2) fully document any decision to proceed with the analysis of samples not meeting acceptance criteria.

i. The conditions of these samples, at a minimum, are noted in the sample receipt forms or as specified in the project requirement.

ii. Records of instruction on how to proceed shall be retained and final report shall include these documentations when required by the project.

Where there is doubt as to the sample's suitability for testing, where the sample does not conform to the description provided, or where the test required is not fully specified, the client is consulted by the Project Manager at a timely manner for further instruction before proceeding.

d) Permanent chronological record such as a logbook and electronic login system is used to document receipt of all sample containers. Electronic data systems shall meet the requirements specified in Section 5.4.7.2.

1) The sample receipt form (SRF) includes but not limited to:

i. client/project name,

ii. date and time of laboratory receipt,

iii. unique laboratory ID code (see 5.8.2), and

iv. signature or initials of the person making the entries.

2) Samples are logged in such a way that all pertinent information linked to the sample is traceable. All the records generated during sample receiving become permanent records, easily retrievable upon request and readily available to individuals who will process the sample. The EMAX sample control number is linked to the following:

i. The field ID code which identifies each container

ii. The date and time of sample collection linked to the sample container to the date and time of receipt

iii. The requested analyses (including applicable approved test method numbers)

iv. Any comments resulting from inspection for sample rejection

e) All documentation, such as memos or transmittal forms, that are transmitted to the laboratory by the sample transmitter are retained in the master folder that contains all pertinent records related to a sample delivery batch.

f) The original chain of custody record form (Sections 4.12.2.5 and Appendix E), is included in the master folder. Internal chain of custody is recorded and maintained with the laboratory logbooks.

5.8.3.2 Sample Acceptance Policy

Prior to project commencement, capabilities to accept new samples are confirmed with the Operations. When additional project requirements concerning sample acceptance (e.g., safety caution, samples needs to be filtered and preserved, etc.), implementation process are discussed with the Operations by the Project Manger.

Policies and procedures for sample acceptance policy are detailed in EMAX-SM02. This SOP clearly outlines the circumstances under which samples are accepted or rejected. Data from any samples which do not meet the following criteria are noted in the sample receipt form (SRF) clearly defining the nature and substance of the discrepancy. This SOP is also made available to sample receiving personnel who are also trained to properly implement this SOP. Training includes, but is not limited to, the following areas of concern:

a) proper, full, and complete documentation, which shall include sample identification, the location, date and time of collection, collector's name, preservation type, sample type and any special remarks concerning the sample;

b) proper sample labeling to include unique identification and a labeling system for the samples with requirements concerning the durability of the labels (water resistant) use of indelible ink and laboratory label does not obscure field identification;

c) use of appropriate sample containers;

d) adherence to specified holding times;

e) adequate sample volume. Sufficient sample volume must be available to perform the necessary tests; and

f) course of action when samples show signs of damage, contamination, or inadequate preservation.

5.8.4 Samples received at EMAX are stored as specified by the method and/or project requirement. To prevent deterioration, contamination, loss or damage to the sample during storage, handling, preparation and testing, policies and procedures are established. Monitoring of sample storage is detailed in MEAX-QC03. Sample Handling for Highly Contaminated Samples is detailed in EMAX-QC08. In the event that special handling instructions are provided by the client, these instructions are incorporated as part of the work-order instructions. When samples have to be stored or conditioned under specified environmental conditions, these conditions are maintained, monitored and recorded.

All samples received at EMAX are held secured in the sample control room that protects the condition and integrity of the secured samples.

a) Samples are stored according to the conditions specified in EMAX-SM01:

1) Samples which require thermal preservation are stored under refrigeration which is +/-2 of the specified preservation temperature unless method specific criteria exist. For samples with a specified storage temperature of 4°C, samples are stored at a temperature above the freezing point of water to 6°C.

To ensure that samples remain within acceptable thermal preservation, temperature and sample storage are monitored twice a day, seven days a week.

2) Sample control room contains environmental field samples only. To prevent cross-contamination, pure products, PT samples or samples that are known to have high concentrations and/or highly contaminated are segregated from the regular samples.

b) Sample fractions, extracts, leachates and other sample preparation products are stored according to 5.8.4.a above or according to specifications in the test method.

1) Sample disposal for residual samples, digestates, leachates and extracts or other sample preparation products is detailed in EAMX-SM03. This SOP is in conformance with Federal, State and local regulations.

5.9 Assuring the Quality of Environmental Test and Calibration Results

5.9.1 General

Quality control procedures for monitoring the validity of environmental tests undertaken are included in the analytical SOPs. Quality control results are collected and evaluated according to EMAX-QA06, Control Chart SOP. Data is collected and appended on a database where a control chart can be plotted specific to inclusive dates. The resulting data is used to analyze for possible trends and statistical techniques are applied to review the results. Monitoring includes evaluation of the following:

a) Laboratory Control Samples;

b) Results of PT samples.

c) Replicate tests results from the same or different methods;

d) Retesting of retained samples;

e) Correlation of results for different characteristics of a sample (for example, total phosphate should be greater than or equal to orthophosphate).

Every work order includes project QC requirement. In the absence of project QC requirement, EMAX quality control procedures are applied. These requirements are monitored and evaluated on time while samples are analyzed to evaluate the quality and usability of data. Where QC requirement is not met and prescribed corrective action does not resolve the problem, the Supervisor and the PM are informed for further instruction. Where necessary, non-conformance report is generated. Supplemental review of these checks is performed during annual internal assessment.

5.9.2 Essential Quality Control Procedures

These general quality control principles are applied, where appropriate. The manner in which they are implemented is dependent on the types of tests performed (refer to Appendix D). Quality control actions should be both batch-specific and time-based (i.e., those required to be conducted at specific time periods, such as for tunes and detection limit verification. Batch-specific quality control actions include sample-specific quality control actions such as surrogate spikes, LCS, duplicate samples.

The standards for any given test type shall assure that the applicable principles are addressed:

a) Monitoring of basic quality controls to include:

1) positive and negative controls to monitor tests such as blanks, spikes, reference materials;

2) tests to define the variability and/or repeatability of the laboratory results such as replicates;

3) measures to assure the accuracy of the test method including calibration and/or continuing calibrations, use of certified reference materials, proficiency test samples, or other measures;

4) measures to evaluate test method capability, such as limit of detection and limit of quantitation or range of applicability such as linearity;

5) selection of appropriate formulae to reduce raw data to final results such as regression analysis, comparison to internal/external standard calculations, and statistical analyses;

6) selection and use of reagents and standards of appropriate quality;

7) measures to assure the selectivity of the test for its intended purpose; and

8) measures to assure constant and consistent test conditions (both instrumental and environmental) where required by the test method such as temperature, humidity, light, or specific instrument conditions.

b) On-going assessment and evaluation quality control measures and application of quality control acceptance criteria to determine the usability of the data.

c) Establish procedures for the development of acceptance/rejection criteria where no method or regulatory criteria exist. (See 5.8.3.2, Sample Acceptance Policy.)

d) Proper implementation of established quality control protocols specified in analytical SOPs (5.4.1.2). Essential standards outlined in Appendix D or mandated methods or regulations (whichever are more stringent) are incorporated in analytical SOPs. When it is not apparent which is more stringent the QC in the mandated method or regulations is followed. Project specific requirement other than specified in analytical SOPs are incorporated through project management.

The essential quality control measures for testing are found in Appendix D.

5.10 Reporting the Results

5.10.1 General

The results of each environmental test performed at EMAX are reported accurately, clearly, unambiguously and objectively, and in accordance with any specific instructions in the environmental test and project specific requirement.

EMAX data reporting system is designed to include all pertinent information. Deliverables include all of the information required by the project necessary for the interpretation of the environmental test results and all information required by the method used. For standard requirements, refer to 5.10.2 and 5.10.3.

Where the project requires simplified deliverables, EMAX delivers what is required and archives all information on how the environmental test is carried out readily available.

Where regulatory reporting requirements or formats are required, EMAX shall provide all the required information to their client use in preparing such regulatory reports.

5.10.2 Test Reports

Each test report includes at least the following information, unless there are valid reasons for not doing so:

a) a title – on EMAX data report submittal cover letter, it reads, Subject: “Laboratory Report “

b) EMAX name and address: EMAX Laboratories, Inc., 1835 W. 205th St., Torrance, CA 90501;

c) EMAX Batch Number as unique identification of the test report , and on each page an identification in order to ensure that the page is recognized as a part of the test report, and a clear identification of the end of the test report;

1) This requirement is presented as stated below:

i. A table of contents is created identifying the sub-sections and corresponding pages of the contents of the report.

ii. Each page is paginated as the table of contents specified.

d) the name and address of the client and project name if applicable;

e) identification of the method used;

f) a description and condition of, and unambiguous identification of the sample(s), including the client identification code;

g) the date of receipt of the sample(s) where this is critical to the validity and application of the results, date and time of sample collection, the date(s) and time of performance of the environmental test, date and time of sample preparation;

h) reference to procedures used by the laboratory relevant to the validity or application of the results;

i) the environmental test results with, where appropriate, the units of measurement, and any failures identified; identify whether data are calculated on a dry weight or wet weight basis; identify the reporting units such as µg/l or mg/kg;

j) the name(s), function(s), and signature(s) or equivalent electronic identification of person(s) authorizing the test report, and date of issue;

k) a statement to the effect that the results relate only to the samples;

l) the report cover letter includes the following statement:

"This report is confidential and intended solely for the use of the individual or entity to whom it is addressed. This report shall not be reproduced except in full or without the written approval of EMAX."

m) The report cover letter also include the following statement:

"EMAX certifies that the test results included in this report meet all NELAC requirements unless noted in the Case Narrative."

5.10.3 Supplemental Information for Test Reports

5.10.3.1 In addition to the requirements listed in 5.10.2, test reports, where necessary for the interpretation of the test results, include the following:

a) deviations from (such as failed quality control), additions to, or exclusions from the test method, and information on specific test conditions, such as environmental conditions and any non-standard conditions that may have affected the quality of results, including the use and definitions of data qualifiers;

b) where quality system requirements are not met, a statement of compliance/non-compliance with requirements and/or specifications, including identification of test results derived from any sample that did not meet NELAC sample acceptance requirements such as improper container, holding time, or temperature;

c) where applicable, a statement on the estimated uncertainty of measurement; information on uncertainty is needed, when a client's instruction so requires;

d) where appropriate and needed, opinions and interpretations (see 5.10.4);

e) additional information which may be required by specific methods, clients or groups of clients;

f) qualification of numerical results with values outside the working range.

5.10.3.2 In addition to the requirements listed in 5.10.2 and 5.10.3.1, when required, the Chain-of-Custody (COC) received with the samples is included as part of the report. In general the COC contains the following information which may be necessary for the interpretation of test results:

a) the date of sampling;

b) unambiguous identification of the substance, material or product sampled

c) the location of sampling, including depths when applicable;

d) safety precautions for sample handling

e) details of any environmental conditions during sampling that may affect the interpretation of the test results;

f) any standard or other specification or procedure, and deviations, additions to or exclusions from the specification that the lab needs to perform to satisfy the data quality objective of the delivered samples.

5.10.4 Opinions and Interpretations

When opinions and interpretations are included, the case narrative includes discussion of the basis upon which the opinions and interpretations have been made. Opinions and interpretations are clearly explained as such in a test report.

5.10.5 Environmental Testing Obtained from Subcontractors

When the test report contains results of tests performed by subcontractors, these results are reported as delivered in EMAX where it clearly identifies where the report came from. The subcontractor is required to report the results in writing or electronically as required by the project. EMAX retains a copy of the subcontractor’s report and stores it using EMAX archival system.

5.10.6 Electronic Transmission of Results

Where transmission of environmental test results is by facsimile, email or other electronic or electromagnetic means, the Standards set forth by this manual is applied and all reasonable steps are taken to preserve confidentiality (refer to Section 5.4.7).

5.10.7 Format of Reports

The format for each environmental test is designed to accommodate information on traceability, how the analysis is carried out, and to minimize the possibility of misunderstanding or misuse.

5.10.8 Amendments to Test Reports

Where amendments to a test report after issue are made the subject of the cover letter reads:

"Supplement to Test Report, [EMAX batch number]".

Where a part of the report is to replace a particular page, that page is numbered with the same number as the previous report stamped with "Revised Report". Where a page(s) is inadvertently missed and is to be added in the previous report, the table of contents is revised to include the missed page(s). The table of contents is stamped with "Revised Report" and the additional pages will be numbered according to the table of contents.

When it is necessary to issue a complete new test report, it must contain a unique identification referencing to the original that it replaces unless otherwise specified by the client.

APPENDICES

Appendix A

References

Appendix B

Glossary

Appendix C

Demonstration of Capability

Appendix D

Essential Quality Control Requirements

Appendix E

EMAX Appendices

APPENDIX

A

REFERENCES

REFERENCES

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APPENDIX

B

GLOSSARY

GLOSSARY

The following definitions are used in the text of Quality Systems. In writing this document, the following hierarchy of definition references was used: ISO 8402, ANSI/ASQC E-4, EPA's Quality Assurance Division Glossary of Terms, and finally definitions developed by NELAC. The source of each definition, unless otherwise identified, is the Quality Systems Committee.

Acceptance Criteria: Specified limits placed on characteristics of an item, process, or service defined in requirement documents. (ASQC)

Accreditation: The process by which an agency or organization evaluates and recognizes a laboratory as meeting certain predetermined qualifications or standards, thereby accrediting the laboratory. In the context of the National Environmental Laboratory Accreditation Program (NELAP), this process is a voluntary one. (NELAC)

Accrediting Authority: The Territorial, State, or Federal agency having responsibility and accountability for environmental laboratory accreditation and which grants accreditation. (NELAC) [1.4.2.3]

Accuracy: The degree of agreement between an observed value and an accepted reference value. Accuracy includes a combination of random error (precision) and systematic error (bias) components which are due to sampling and analytical operations; a data quality indicator. (QAMS)

Aliquot: A discrete, measured, representative portion of a sample taken for analysis. (DoD, EPA QAD Glossary)

Analyst: The designated individual who performs the "hands-on" analytical methods and associated techniques and who is the one responsible for applying required laboratory practices and other pertinent quality controls to meet the required level of quality. (NELAC)

Quality Systems Definitions: The Quality Systems Committee is the NELAC-appointed group that created and continues to modify NELAC Chapter 5 (Quality Systems). Terms not included in the NELAC Glossary, but defined by DoD, are included in gray text boxes throughout this Appendix.

Analyte: The specific chemicals or components for which a sample is analyzed; may be a group of chemicals that belong to the same chemical family, and which are analyzed together. (EPA Risk Assessment Guide for Superfund; OSHA Glossary)

Assessment: The evaluation process used to measure or establish the performance, effectiveness, and conformance of an organization and/or its systems to defined criteria (to the standards and requirements of NELAC). (NELAC)

Audit: A systematic evaluation to determine the conformance to quantitative and qualitative specifications of some operational function or activity. (EPA-QAD)

Batch: Environmental samples that are prepared and/or analyzed together with the same process and personnel, using the same lot(s) of reagents. A **preparation batch** is composed of one to 20 environmental samples of the same NELAC-defined matrix, meeting the above-mentioned criteria and with a maximum time between the start of processing of the first and last sample in the batch to be 24 hours. An **analytical batch** is composed of prepared environmental samples (extracts, digestates, or concentrates) which are analyzed together as a group. An analytical batch can include prepared samples originating from various environmental matrices and can exceed 20 samples. (NELAC Quality Systems Committee)

Blank: A sample that has not been exposed to the analyzed sample stream in order to monitor contamination during sampling, transport, storage, or analysis. The blank is subjected to the usual analytical and measurement process to establish a zero baseline or background value and is sometimes used to adjust or correct routine analytical results.

Blind Sample: A sub-sample for analysis with a composition known to the submitter. The analyst/ laboratory may know the identity of the sample but not its composition. It is used to test the analyst's or laboratory's proficiency in the execution of the measurement process. (NELAC)

Calibration: Set of operations that establish, under specified conditions, the relationship between values of quantities indicated by a measuring instrument or measuring system, or values represented by a material measure or a reference material, and the corresponding values realized by standards. (VIM: 6.11)

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1) In calibration of support equipment the values realized by standards are established through the use of Reference Standards that are traceable to the International System of Units (SI).

2) In calibration according to test methods, the values realized by standards are typically established through the use of Reference Materials that are either purchased by the laboratory with a certificate of analysis or purity, or prepared by the laboratory using support equipment that has been calibrated or verified to meet specifications.

Calibration Curve: The graphical relationship between the known values, such as concentrations, of a series of calibration standards and their instrument response. (NELAC)

Calibration Method: A defined technical procedure for performing a calibration. (NELAC)

Calibration Standard: A substance or reference material used to calibrate an instrument. (QAMS)

Certified Reference Material (CRM): A reference material whose one or more property values are certified by a technically valid procedure, accompanied by or traceable to a certificate or other documentation and which is issued by a certifying body. (ISO Guide 30 - 2.2)

Chain of Custody Form: A record that documents the possession of the samples from the time of collection to receipt in the laboratory. This record generally includes: the number and types of containers; the mode of collection; collector; time of collection; preservation; and requested analyses. (NELAC)

Chemical: Any element, compound, or mixture of elements and/or compounds. Frequently, chemical substances are classified by the CAS rules of nomenclature for the purposes of identification for a hazard evaluation. (OSHA Glossary)

Client: The party that has agreed to pay the bill for services rendered by the laboratory, and with whom the laboratory has a contractual relationship for that project. For a laboratory, this is typically the prime contractor who originally hires the laboratory for the project, and who signs the contract as the receiver of services and resulting data. In cases where the laboratory has a direct contractual relationship with DoD, the client shall be the Government's authorized contracting officer. The contracting officer, as the client, shall consult with the Government's authorized technical representative when dealing with laboratory technical issues. It is understood that typically other "Clients" are present at other levels of the project, but they may be removed from the day-to-day decision-making (for example, installation representatives, service center representatives, and other Government officials). Specific circumstances may require the direct notification of these other clients, in addition to the prime contractor or DoD representative; these circumstances shall be included as part of specific project requirements. (DoD)

Compound: A unique combination of chemical elements, existing in combination to form a single chemical entity. (DoD)

Confirmation: Verification of the identity of a component through the use of an approach with a different scientific principle from the original method. These may include, but are not limited to:

• Second column confirmation;

• Alternate wavelength;

• Derivatization;

• Mass spectral interpretation;

• Alternative detectors; or

• Additional cleanup procedures. (NELAC)

Conformance: An affirmative indication or judgment that a product or service has met the requirements of the relevant specifications, contract, or regulation; also the state of meeting the requirements. (ANSI/ ASQC E4-1994)

Corrective Action: The action taken to eliminate the causes of an existing nonconformity, defect or other undesirable situation in order to prevent recurrence. (ISO 8402)

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Data Audit: A qualitative and quantitative evaluation of the documentation and procedures associated with environmental measurements to verify that the resulting data are of acceptable quality (i.e., that they meet specified acceptance criteria). (NELAC)

Data Reduction: The process of transforming raw data by arithmetic or statistical calculations, standard curves, concentration factors, etc., and collation into a more useable form. (EPA-QAD)

Demonstration of Capability: A procedure to establish the ability of the analyst to generate acceptable accuracy. (NELAC)

Detection Limit: The lowest concentration or amount of the target analyte that can be identified, measured, and reported with confidence that the analyte concentration is not a false positive value. See Method Detection Limit. (NELAC)

Document Control: The act of ensuring that documents (and revisions thereto) are proposed, reviewed for accuracy, approved for release by authorized personnel, distributed properly and controlled to ensure use of the correct version at the location where the prescribed activity is performed. (ASQC)

Environmental Program: An organized effort that assesses environmental concerns and leads to the collection of data, either in the field or through laboratory analysis. (Variation on EPA QAD Glossary for Terms: Environmentally related measurement, environmental sample)

Consensus Standards: A protocol established by a recognized authority (for example, American Society for Testing and Materials [ASTM], American National Standards Institute [ANSI], or the Institute for Electrical and Electronic Engineers [IEEE]).

Definitive Data: Data that are generated using rigorous analytical methods, such as approved EPA reference methods. Data are analyte-specific, with confirmation of analyte identity and concentration. Methods produce tangible raw data in the form of paper printouts or electronic files. Data shall satisfy QA/QC requirements. For data to be definitive, either analytical or total measurement error shall be determined and documented. (Data Quality Objectives Process for Superfund)

Finding: An assessment conclusion referenced to a NELAC Standard and supported by objective evidence that identifies a deviation from a NELAC requirement.

Holding Times (Maximum Allowable Holding Times): The maximum times that samples may be held prior to analysis and still be considered valid or not compromised. (40 CFR Part 136)

Inspection: An activity such as measuring, examining, testing, or gauging one or more characteristics of an entity and comparing the results with specified requirements in order to establish whether conformance is achieved for each characteristic. (ANSI/ASQC E4-1994)

Internal Standard: A known amount of standard added to a test portion of a sample as a reference for evaluating and controlling the precision and bias of the applied analytical method. (NELAC)

International System of Units (SI): The coherent system of units adopted and recommended by the General Conference on Weights and Measures. (CCGPM) (VIM 1.12)

Instrument Blank: A clean sample (e.g., distilled water) processed through the instrumental steps of the measurement process; used to determine instrument contamination. (EPA-QAD)

Laboratory: A body that calibrates and/or tests. (ISO 25)

Laboratory Control Sample (however named, such as laboratory fortified blank, spiked blank, or QC check sample): A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes. It is generally used to establish intra-laboratory or analyst-specific precision and bias or to assess the performance of all or a portion of the measurement system. (NELAC).

Laboratory Duplicate: Aliquots of a sample taken from the same container under laboratory conditions and processed and analyzed independently. (NELAC)

GLOSSARY

Limit of Detection (LOD): An estimate of the minimum amount of a substance that an analytical process can reliably detect. An LOD is analyte-and-matrix-specific and may be laboratory-dependent.

Limits of Quantitation (LOQ): The minimum levels, concentrations, or quantities of a target variable (e.g., target analyte) that can be reported with a specified degree of confidence.

Key Staff: At a minimum, the following managerial and supervisory staff (however named) – executive staff (for example, Chief Executive Officer, Chief Operating Officer, laboratory director, technical director); technical directors/supervisors (for example, section supervisors for organics and inorganics); quality assurance systems directors/supervisors (for example, quality manager, quality auditors); and support systems directors/supervisors (for example, information systems supervisor, purchasing director, project manager).

Holding Times (DoD Clarification): The time elapsed from the time of sampling to the time of extraction or analysis, as appropriate.

Limit of Quantitation (DoD Clarification): For DoD, the lowest standard of the calibration establishes the LOQ, but it must be greater than or equal to 3 times the LOD.

Manager (however named): The individual designated as being responsible for the overall operation, all personnel, and the physical plant of the environmental laboratory. A supervisor may report to the manager. In some cases, the supervisor and the manager may be the same individual. (NELAC)

Matrix: The substrate of a test sample

Field of Accreditation Matrix: These matrix definitions shall be used when accrediting a laboratory.

- Drinking Water: Any aqueous sample that has been designated a potable or potential potable water source.
- Non-Potable Water: Any aqueous sample excluded from the definition of Drinking Water matrix. Includes surface water, groundwater, effluents, water treatment chemicals, and TCLP or other extracts.
- Solid and Chemical Materials: Includes soils, sediments, sludges, products and by-products of an industrial process that results in a matrix not previously defined.
- Biological Tissue: Any sample of a biological origin such as fish tissue, shellfish, or plant material. Such samples shall be grouped according to origin.
- Air and Emissions: Whole gas or vapor samples including those contained in flexible or rigid wall containers and the extracted concentrated analytes of interest from a gas or vapor that are collected with a sorbent tube, impinger solution, filter, or other device. (NELAC)

Quality System Matrix: These matrix definitions are an expansion of the field of accreditation matrices and shall be used for purposes of batch and quality control requirements (see Appendix D). These matrix distinctions shall be used:

- Aqueous: Any aqueous sample excluded from the definition of Drinking Water matrix or Saline/Estuarine source. Includes surface water, groundwater, effluents, and TCLP or other extracts.
- Drinking Water: Any aqueous sample that has been designated a potable or potential potable water source.
- Saline/Estuarine: Any aqueous sample from an ocean or estuary, or other salt water source such as the Great Salt Lake.
- Non-aqueous Liquid: Any organic liquid with <15% settleable solids.
- Biological Tissue: Any sample of a biological origin such as fish tissue, shellfish, or plant material. Such samples shall be grouped according to origin.
- Solids: Includes soils, sediments, sludges and other matrices with > 15% settleable solids.
- Chemical Waste: A product or by-product of an industrial process that results in a matrix not previously defined.

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- Air and Emissions: Whole gas or vapor samples including those contained in flexible or rigid wall containers and the extracted concentrated analytes of interest from a gas or vapor that are collected with a sorbent tube, impinger solution, filter or other device. (NELAC)

Matrix Spike (spiked sample or fortified sample): A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available. Matrix spikes are used, for example, to determine the effect of the matrix on a method's recovery efficiency. (QAMS)

Matrix Spike Duplicate (spiked sample or fortified sample duplicate): A second replicate matrix spike prepared in the laboratory and analyzed to obtain a measure of the precision of the recovery for each analyte. (QAMS)

May: Denotes permitted action, but not required action. (NELAC)

Measurement Quality Objectives (MQOs): The desired sensitivity, range, precision, and bias of a measurement.

Measurement System: A test method, as implemented at a particular laboratory, and which includes the equipment used to perform the test and the operator(s).

Method: 1. See Test Method. 2. Logical sequence of operations, described generically, used in the performance of measurements. (VIM 2.4)

Method Blank: A sample of a matrix similar to the batch of associated samples (when available) that is free from the analytes of interest and is processed simultaneously with and under the same conditions as samples through all steps of the analytical procedures, and in which no target analytes or interferences are present at concentrations that impact the analytical results for sample analyses. (NELAC)

Method Detection Limit: One way to establish a Limit of Detection defined as the minimum concentration of a substance (an analyte) that can be measured 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.

Must: Denotes a requirement that must be met. (Random House College Dictionary)

National Accreditation Database: The publicly accessible database listing the accreditation status of all laboratories participating in NELAP. (NELAC)

National Environmental Laboratory Accreditation Conference (NELAC): A voluntary organization of State and Federal environmental officials and interest groups purposed primarily to establish mutually acceptable standards for accrediting environmental laboratories. A subset of NELAP. (NELAC)

National Environmental Laboratory Accreditation Program (NELAP): The overall National Environmental Laboratory Accreditation Program of which NELAC is a part. (NELAC)

Negative Control: Measures taken to ensure that a test, its components, or the environment do not cause undesired effects, or produce incorrect test results. (NELAC)

Nonconformance: An indication or judgment that a product or service has not met the requirements of the relevant specifications, contract or regulation; also the state of failing to meet the requirements.

Performance Audit: The routine comparison of independently obtained qualitative and quantitative measurement system data with routinely obtained data in order to evaluate the proficiency of an analyst or laboratory. (NELAC)

Positive Control: Measures taken to ensure that a test and/or its components are working properly and producing correct or expected results from positive test subjects. (NELAC)

Precision: The degree to which a set of observations or measurements of the same property, obtained under similar conditions, conform to themselves; a data quality indicator. Precision is usually expressed as standard deviation, variance or range, in either absolute or relative terms. (NELAC)

Preservation: Refrigeration and/or reagents added at the time of sample collection (or later) to maintain the chemical and/or biological integrity of the sample. (NELAC)

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Proficiency Testing: A means of evaluating a laboratory's performance under controlled conditions relative to a given set of criteria through analysis of unknown samples provided by an external source. (NELAC) [2.1]

Proficiency Testing Oversight Body/Proficiency Testing Provider Accreditor (PTOB/PTPA): An organization with technical expertise, administrative capacity, and financial resources sufficient to implement and operate a national program of PT provider evaluation and oversight that meets the responsibilities and requirements established by NELAC standards. (NELAC)

Proficiency Testing Program: The aggregate of providing rigorously controlled and standardized environmental samples to a laboratory for analysis, reporting of results, statistical evaluation of the results, and the collective demographics and results summary of all participating laboratories. (NELAC)

Proficiency Testing Study Provider: Any person, private party, or government entity that meets stringent criteria to produce and distribute NELAC PT samples, evaluate study results against published performance criteria and report the results to the laboratories, primary accrediting authorities, PTOB/PTPA, and NELAP. (NELAC)

Proficiency Test Sample (PT): A sample, the composition of which is unknown to the analyst and is provided to test whether the analyst/laboratory can produce analytical results within specified acceptance criteria. (QAMS)

Protocol: A detailed written procedure for field and/or laboratory operation (e.g., sampling, analysis) which must be strictly followed. (EPA-QAD)

Quality Assurance: An integrated system of activities involving planning, quality control, quality assessment, reporting, and quality improvement to ensure that a product or service meets defined standards of quality with a stated level of confidence. (QAMS)

Quality Assurance (Project) Plan (QAPP): A formal document describing the detailed quality control procedures by which the quality requirements defined for the data and decisions pertaining to a specific project are to be achieved. (EPA-QAD)

Quality Control: The overall system of technical activities whose purpose is to measure and control the quality of a product or service so that it meets the needs of users. (QAMS)

Quality Control Sample: A sample used to assess the performance of all or a portion of the measurement system. QC samples may be Certified Reference Materials, a quality system matrix fortified by spiking, or actual samples fortified by spiking.

Quality Manual: A document stating the management policies, objectives, principles, organizational structure and authority, responsibilities, accountability, and implementation of an agency, organization, or laboratory, to ensure the quality of its product and the utility of its product to its users. (NELAC)

Quality System: A structured and documented management system describing the policies, objectives, principles, organizational authority, responsibilities, accountability, and implementation plan of an organization for ensuring quality in its work processes, products (items), and services. The quality system provides the framework for planning, implementing, and assessing work performed by the organization and for carrying out required QA and QC. (ANSI/ASQC E-4 1994)

Quantitation Range: DoD is concerned with both the upper and lower limits of quantitation. The quantitation range is defined by the low and high calibration standards.

Raw Data: Any original factual information from a measurement activity or study recorded in a laboratory notebook, worksheets, records, memoranda, notes, or exact copies thereof that are necessary for the reconstruction and evaluation of the report of the activity or study. Raw data may include photography, microfilm or microfiche copies, computer printouts, magnetic media, including dictated observations, and recorded data from automated instruments. If exact copies of raw data have been prepared (e.g., tapes which have been transcribed verbatim, data and verified accurate by signature), the exact copy or exact transcript may be submitted. (EPA-QAD)

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Reagent Blank (method reagent blank): A sample consisting of reagent(s), without the target analyte or sample matrix, introduced into the analytical procedure at the appropriate point and carried through all subsequent steps to determine the contribution of the reagents and of the involved analytical steps. (QAMS)

Reference Material: A material or substance of which one or more of its properties are sufficiently well established to be used for the calibration of an apparatus, the assessment of a measurement method, or for assigning values to materials. (ISO Guide 30-2.1)

Reference Standard: A standard, generally of the highest metrological quality, available at a given location, and from which measurements made at that location are derived. (VIM-6.08)

Reference Toxicant: The toxicant used in performing toxicity tests to indicate the sensitivity of a test organism and to demonstrate the laboratory's ability to perform the test correctly and obtain consistent results (see Appendix D, Section 2.1.f). (NELAC)

Replicate Analyses: The measurements of the variable of interest performed identically on two or more sub-samples of the same sample within a short time interval. (NELAC)

Reporting Limit: A data value specified by the client based on sensitivity requirements from project specific action levels. If initially set by the client below the laboratory's LOQ, method modification is required or the client will be required to accept the laboratory's LOQ as the lowest technically valid value that can be provided by the laboratory. For methods that require only one standard and a blank, a low level check standard shall be required to establish the LOQ. The reporting limit shall be no lower than this value. Note: There may be numbers reported to the client that are below the reporting limit. These numbers must be flagged appropriately. When the analysis demonstrates a non-detect at the LOD, the data shall be flagged with a "U." The value reported to the client is the LOD, adjusted by any dilution factor used in the analysis. When an analyte is detected between the LOQ and the LOD, the data shall be flagged with a "J." The value reported is an estimation.

Requirement: Denotes a mandatory specification; often designated by the term "shall". (NELAC)

Sample: Portion of material collected for analysis, identified by a single, unique alpha-numeric code. A sample may consist of portions in multiple containers, if a single sample is submitted for multiple or repetitive analysis.

Selectivity: (Analytical chemistry) The capability of a test method or instrument to respond to a target substance or constituent in the presence of non-target substances. (EPA-QAD)

Sensitivity: The capability of a method or instrument to discriminate between measurement responses representing different levels (e.g., concentrations) of a variable of interest. (NELAC)

Shall: Denotes a requirement that is mandatory, whenever the criterion for conformance with the specification requires, there be no deviation. This does not prohibit the use of alternative approaches or methods for implementing the specification so long as the requirement is fulfilled. (ANSI)

Should: Denotes a guideline or recommendation, whenever non-compliance with the specification, is permissible. (ANSI)

Spike: A known mass of target analyte added to a blank sample or sub-sample; used to determine recovery efficiency or for other quality control purposes. (NELAC)

Standard: The document describing the elements of laboratory accreditation that has been developed and established within the consensus principles of NELAC and meets the approval requirements of NELAC procedures and policies. (ASQC)

Standard Method: A test method issued by an organization generally recognized as competent to do so.

Standard Operating Procedure (SOP): A written document which details the method of an operation, analysis or action whose techniques and procedures are thoroughly prescribed and which is accepted as the method for performing certain routine or repetitive tasks. (QAMS)

GLOSSARY

Standardized Reference Material (SRM): A certified reference material produced by the U.S. National Institute of Standards and Technology or other equivalent organization and characterized for absolute content, independent of analytical method. (EPA-QAD)

Supervisor (however named): The individual(s) designated as being responsible for a particular area or category of scientific analysis. This responsibility includes direct day-to-day supervision of technical employees, supply and instrument adequacy and upkeep, quality assurance/quality control duties, and ascertaining that technical employees have the required balance of education, training, and experience to perform the required analyses. (NELAC)

Surrogate: A substance with properties that mimic the analyte of interest. It is unlikely to be found in environment samples and is added to them for quality control purposes. (QAMS)

Technical Director: Individual(s) who has overall responsibility for the technical operation of the environmental testing laboratory. (NELAC)

Test: A technical operation that consists of the determination of one or more characteristics or performance of a given product, material, equipment, organism, physical phenomenon, process or service according to a specified procedure. The result of a test is normally recorded in a document sometimes called a test report or a test certificate. (ISO/IEC Guide 2-12.1, amended)

Test Method: An adoption of a scientific technique for performing a specific measurement as documented in a laboratory SOP or as published by a recognized authority.

Testing Laboratory: A laboratory that performs tests. (ISO/ IEC Guide 2-12.4)

Test Sensitivity/Power: The minimum significant difference (MSD) between the control and test concentration that is statistically significant. It is dependent on the number of replicates per concentration, the selected significance level, and the type of statistical analysis (see Appendix D, Section 2.4.a). (NELAC)

Tolerance Chart: A chart in which the plotted quality control data is assessed via a tolerance level (e.g., +/- 10% of a mean) based on the precision level judged acceptable to meet overall quality/data use requirements instead of a statistical acceptance criteria (e.g., +/- 3 sigma) (applies to radiobioassay laboratories). (ANSI)

Traceability: The property of a result of a measurement whereby it can be related to appropriate standards, generally international or national standards, through an unbroken chain of comparisons. (VIM - 6.12)

Tune: An injected standard required by the method as a check on instrument performance for mass spectrometry.

Target Analytes: 1) Analytes specifically named by a client (also called project-specific analytes) or 2) if no project-specific analytes are provided, the target analytes will be the list found in Appendix DoD-C.

Validation: The confirmation by examination and provision of objective evidence that the particular requirements for a specific intended use are fulfilled.

Verification: Confirmation by examination and provision of evidence that specified requirements have been met. (NELAC)

NOTE: In connection with the management of measuring equipment, verification provides a means for checking that the deviations between values indicated by a measuring instrument and corresponding known values of a measured quantity are consistently smaller than the maximum allowable error defined in a standard, regulation or specification peculiar to the management of the measuring equipment.

The result of verification leads to a decision either to restore in service, to perform adjustment, to repair, to downgrade, or to declare obsolete. In all cases, it is required that a written trace of the verification performed shall be kept on the measuring instrument's individual record.

Work Cell: A well-defined group of analysts that together perform the method analysis. The members of the group and their specific functions within the work cell must be fully documented. (NELAC)

Sources:

GLOSSARY

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APPENDIX

C

DEMONSTRATION OF CAPABILITY

DEMONSTRATION OF CAPABILITY

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DEMONSTRATION OF CAPABILITY

C.1 PROCEDURE FOR DEMONSTRATION OF CAPABILITY

A demonstration of capability (DOC) must be made prior to using any test method, and at any time there is a change in instrument type, personnel or test method (see 5.4.2.2). Procedures for DOC are detailed in EMAX-QA05.

Capability – Change: "Change" refers to any change in personnel, instrumentation, test method, or sample matrix that potentially impacts the precision, accuracy, sensitivity, and selectivity of the output (for example, a change in the detector, column, or other components of the sample analytical system, or a method revision). All new analysts, regardless of experience on that instrument in another laboratory, shall complete a demonstration of capability.

Although in some areas of the laboratory, a group of individuals are needed to complete the entire analytical process, EMAX certifies its technical staff individually. Each member of the group demonstrates capability in his/her area of responsibility in the sequence.

Since majority of EMAX's field samples are aqueous and soil matrices, lab control sample (LCS) or PT samples are used for demonstration of capability. In addition, for analytes which do not lend themselves to spiking, e.g., TSS, the demonstration of capability may be performed using quality control samples.

All demonstrations are documented through the use of the form in this appendix. All data applicable to the demonstration are retained on a personnel file. When an analyte not currently found on the laboratory's list of accredited analytes is added to an existing accredited test method, an initial evaluation must be performed for that analyte.

General guidelines for demonstration of capability:

a) Where commercially available, quality samples used for demonstration of capability is obtained from a secondary source as certified solutions. If not available, the QC samples are prepared in-house using stock standards that are prepared independently from those used in instrument calibration.

b) The analyte(s) are spiked in a volume of clean quality system matrix sufficient to prepare four aliquots at the LCS concentration level, or if unspecified, to a concentration of 1-4 times the limit of quantitation.

c) At least four aliquots are prepared and analyzed according to the test method either concurrently or over a period of days.

d) The mean recovery and standard deviation of results are evaluated. When it is not possible to determine mean and standard deviations, such as for presence/absence and logarithmic values, the performance is assessed against the established and documented criteria.

   In the case where a new method is developed, acceptance criteria is determined using external source of information when available (e.g., published method). In the absence of external source of information, EMAX shall request from the project sponsor (e.g., DoD or DoE) for comparisons or guidance for acceptance criteria.

e) Results are accepted based on the acceptance criteria for precision and accuracy in the test method (if applicable) or the generated control limits (in the absence of established mandatory criteria). If all parameters meet the acceptance criteria, the analysis of actual samples may begin. If any one of the parameters does not meet the acceptance criteria, the performance is unacceptable for that parameter.

f) When one or more of the tested parameters fail at least one of the acceptance criteria, the analyst must :

   1) Locate and correct the source of the problem and repeat the test for all parameters of interest beginning with c) above; or

   2) Beginning with c) above, repeat the test for all parameters that failed to meet criteria.

   Repeated failure, however, confirms a general problem with the measurement system. If this occurs, locate and correct the source of the problem and repeat the test for all compounds of interest beginning with c).

DEMONSTRATION OF CAPABILITY

C.2 CERTIFICATION STATEMENT

The following certification statement is used to document the completion of each demonstration of capability. A copy of the certification statement is retained in the personnel records of each affected employee (see 5.2.5 and 4.12.2.5.4.b).

All repeated incidences of testing to meet a demonstration of capability is documented and included in the submittal of demonstration of capability.

Refer to EMAX-QA05 Figure 5 for DOC Certification Statement.

This certification form is completed each time a demonstration of capability study is completed with proof that it is:

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**.**

C.3 INITIAL TEST METHOD EVALUATION

For all test methods apply C.3.1 and C.3.2. For the evaluation of precision and bias (C.3.3), the requirements of C.3.3(a) apply to standard methods. The requirements of C.3.3(b) apply to the methods referenced therein.

C.3.1 Limit of Detection (LOD)

a) Where quantitation is derived from multi-calibration points and the analyte can be qualitatively identified at a concentration level of the lowest calibration point, the LOD is determined set at half of the lowest calibration point. All sample-processing steps of the analytical method are performed when verifying the LOD.

b) The validity of the LOD is confirmed by qualitative identification of the analyte(s) in a QC sample in each quality system matrix containing the analyte at no more than 2-3X the LOD for single analyte tests and 1-4X the LOD for multiple analyte tests. This verification is performed on every instrument that is to be used for analysis of samples and reporting of data. Qualitative identification is performed as specified in the analytical SOP.

c) Where an LOD study is not performed (any analyte for which spiking solutions or quality control samples are not available such as temperature, pH) or, when test results are not to be reported to the LOD, determination of LOD is not required.

C.3.2 Limit of Quantitation (LOQ)

a) Where quantitation is derived from multi-calibration points, the LOQ for each analyte of concern is the lowest calibration point. Otherwise, it is determined by the sensitivity of the analytical instrument.

b) The LOQ study is not required for any component or property for which spiking solutions or quality control samples are not commercially available or otherwise inappropriate (e.g., pH).

c) The validity of the LOQ is confirmed by successful analysis of a QC sample containing the analytes of concern in each quality system matrix 1-2 times the claimed LOQ. A successful analysis is one where the recovery of each analyte is within the established test method acceptance criteria or client data quality objectives for accuracy. This single analysis is not required if the bias and precision of the measurement system is evaluated at the LOQ.

DEMONSTRATION OF CAPABILITY

C.3.3 Evaluation of Precision and Bias

a) Standard methods – precision and bias of a standard method for each analyte of concern for each quality system matrix is established by evaluating a single-concentration of four-replicate recovery study, or LCS data collected over a period of time (e.g. a year or minimum of 20 data points).

b) Non-standard methods – precision and bias is established as defined at 5.4.3 and 5.4.4. Where the method is developed for a certain project, precision and bias is defined as guided by the project the data quality objectives of the project, with the criteria established by the client, or the criteria given in the reference method.

Precision and bias measurements are evaluated across the analytical calibration range of the method using the relevant quality system matrices and process the samples through the entire measurement system for each analyte of interest.

The mean percent recovery and standard deviation for the LCS for non-standard methods are calculated and compared to the project sponsor published LCS mean percent recovery and standard deviation (e.g. DoD-Appendix D). In the absence of project sponsor published LCS, the in-house generated limits should be used. In either case, the calculated mean and standard deviation must be at least as good as the DoD published limits, where they exist, or as good or better than the published limits for similar methods or technologies. In no case should the lower LCS control limit be less than 10%.

Guidelines for evaluating precision and bias:

Analyze QC samples in triplicate containing the analytes of concern at or near the limit of quantitation, at the upper-range of the calibration (upper 20%) and at a mid-range concentration.

Process these samples on different days as three sets of samples through the entire measurement system for each analyte of interest. Each day one QC sample at each concentration is analyzed. A separate method blank shall be subjected to the analytical method along with the QC samples on each of the three days. (Note that the three samples at the LOQ concentration can demonstrate sensitivity as well.) For each analyte, calculate the mean recovery for each day, for each level over days, and for all nine samples. Calculate the relative standard deviation for each of the separate means obtained. Compare the standard deviations for the different days and the standard deviations for the different concentrations. If the different standard deviations are all statistically insignificant (e.g., F-test), then compare the overall mean and standard deviation with the established criteria from above.

A validation protocol such as the Tier I, Tier II, and Tier III requirements in US EPA Office of Water's Alternate Test Procedure (ATP) approval process.

C.3.4 Evaluation of Selectivity

Evaluate selectivity by following the checks established within the method, which may include mass spectral tuning, second column confirmation, ICP inter-element interference checks, chromatography retention time windows, sample blanks, spectrochemical absorption or fluorescence profiles, co-precipitation evaluations, and electrode response factors.

New Matrix: Prior to initial analysis of a new or unknown sample matrix, a minimum of 3 MS/MSD samples in said matrix must be analyzed. The spike concentration should be within a range of 1-4 times the estimated concentration of the environmental samples, if known, otherwise, at the regulatory limit or mid-point of the calibration range, whichever is lower. The percent mean recoveries and standard deviations for each analyte recovered in the new matrix must be compared to the project LCS means and control limits generated for clean matrices and should be at least as good as those published by the project sponsor.

Selectivity for Non-Standard Methods: When a historic selectivity check has not been identified, the most common selectivity check for a similar method or what is most typically used for the specific instrument or technology is applied.

APPENDIX

D

ESSENTIAL QUALITY CONTROL REQUIREMENTS

ESSENTIAL QUALITY CONTROL REQUIREMENTS

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ESSENTIAL QUALITY CONTROL REQUIREMENTS

The quality control protocols specified by the analytical SOPs (5.4.1.2) are applied unless otherwise a different requirement is specified by the project. Essential standards outlined in Appendix D are incorporated into the analytical SOPs.

All quality control measures are assessed and evaluated on an on-going basis and quality control acceptance criteria used to determine the validity of the data is distributed with every work order. Likewise, all procedures developed at EMAX shall have established acceptance/rejection criteria where no method or regulatory criteria exists.

The requirements from 5.9.2, apply to all types of testing. The specific manner in which they are implemented is detailed in each of the following section.

DoD Quality Control Requirements: Appendix DoD-D contains tables that consolidate DoD data quality requirements that apply to EPA's *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* (SW-846). In addition, introductory material identifies definitions of QC checks and clarifies DoD's interpretation of method requirements. This appendix follows all the NELAC appendices.

D.1. CHEMICAL TESTING

D.1.1 Positive and Negative Controls

D.1.1.1 Negative Control - Method Performance

a) Purpose: The method blank is used to assess the preparation batch for possible contamination during the preparation and processing steps. The method blank is processed along with and under the same conditions as the associated samples to include all steps of the analytical procedure. Procedures are in place to determine if a method blank is contaminated. Any affected samples associated with a contaminated method blank are reprocessed for analysis or the results reported with appropriate data qualifying codes.

b) Frequency: The method blank is analyzed at a minimum of 1 per preparation batch. In those instances for which no separate preparation method is used (example: volatiles in water) the batch is defined as environmental samples that are analyzed together with the same method and personnel, using the same lots of reagents, not to exceed the analysis of 20 environmental samples.

c) Composition: The method blank is a quality system matrix that is similar to the associated samples and is known to be free of the analytes of interest.

d) Evaluation Criteria and Corrective Action: While the goal is to have no detectable contaminants, each method blank must be critically evaluated as to the nature of the interference and the effect on the analysis of each sample within the batch. The concentration of a targeted analyte in the blank is at or above the reporting limit as established by the test method or by regulation, AND is greater than 1/10 of the amount measured in any sample.

For DoD sponsored projects, if the method blank contamination exceeds **one-half** the reporting limit, evaluate whether reprocessing of the samples is necessary based on the above criteria.

The concentrations of common laboratory contaminants shall not exceed the reporting limit.

Any sample associated with a blank that fail these criteria checks shall be reprocessed in a subsequent preparation batch, except when the sample analysis resulted in a non-detect. The source of contamination shall be investigated and measures are taken to minimize or eliminate the problem and affected samples reprocessed or data shall be appropriately qualified if:

1) If no sample volume remains for reprocessing, the results shall be reported with appropriate data qualifying codes

2) The blank contamination otherwise affects the sample results as per the test method requirements or the individual project data quality objectives.

ESSENTIAL QUALITY CONTROL REQUIREMENTS

3) When quality control measures fail the acceptance criteria, corrective action shall be taken based on project-specific requirements or project sponsor requirements and the magnitude of the problem. Where applicable, corrective actions may include:

- Determining the source of the problem
- Notifying the client,
- Reprocessing samples,
- Using data qualifiers to "flag" data, and
- Adding commentary in the case narrative.

D.1.1.2 Positive Control - Method Performance

D.1.1.2.1 Laboratory Control Sample (LCS)

a) Purpose: The LCS is used to evaluate the performance of the total analytical system, including all preparation and analysis steps. Results of the LCS are compared to established criteria. LCS found outside of these criteria indicates that the analytical system is "out of control". Any affected samples associated with an out of control LCS are reprocessed for re-analysis or the results are reported with appropriate data qualifying codes.

b) Frequency: The LCS is analyzed at a minimum of 1 per preparation batch. Exceptions would be for those analytes for which no spiking solutions are available such as total suspended solids, total dissolved solids, total volatile solids, total solids, pH, color, odor, temperature, dissolved oxygen or turbidity. In those instances for which no separate preparation method is used (example: volatiles in water) the batch shall be defined as environmental samples that are analyzed together with the same method and personnel, using the same lots of reagents, not to exceed the analysis of 20 environmental samples.

c) Composition: The LCS is a quality system matrix, known to be free of analytes of interest, spiked with known and verified concentrations of analytes. NOTE: the matrix spike may be used in place of this control as long as the acceptance criteria are as stringent as for the LCS. Alternatively the LCS may consist of a media containing known and verified concentrations of analytes or as Certified Reference Material (CRM). All analyte concentrations shall be within the calibration range of the methods. The following shall be used in choosing components for the spike mixtures:

The components to be spiked are as specified by the mandated test method or other regulatory requirement or as requested by the client. In the absence of specified spiking components the laboratory shall spike per the following:

For those components that interfere with an accurate assessment such as spiking simultaneously with technical chlordane, toxaphene and PCBs, the spike should be chosen that represents the chemistries and elution patterns of the components to be reported.

For those test methods that have extremely long lists of analytes, a representative number may be chosen unless otherwise specified by the project. The analytes selected are representative of all analytes reported. The following criteria are used for determining the minimum number of analytes to be spiked.

1) For methods that include 1-10 targets, spike all components;

2) For methods that include 11-20 targets, spike at least 10 or 80%, whichever is greater;

3) For methods with more than 20 targets, spike at least 16 components.

To ensure that all targeted components are included in the spike mixture over a 2- year period, include all target analytes when performing PT samples.

Spiking Compounds for DoD sponsored projects:

ESSENTIAL QUALITY CONTROL REQUIREMENTS

- All target analytes must be spiked in the LCS. Target analytes are defined by the project or in Appendix DoD-C. For evaluation and acceptance criteria see Appendices DoD-B and DoD-D.
- For multi-component analytes (e.g. PCBs), the LCS should be spiked with the same constituents as the calibration standard. Multiple samples may be necessary to avoid interference.
- The concentration of the spiked compounds shall be at or below the midpoint of the calibration range or at the appropriate level of concern.

d) Evaluation Criteria and Corrective Action: The results of the individual batch LCS are calculated in percent recovery unless otherwise specified by the project or the method. Calculations are documented and reported as specified by the project.

The individual LCS is compared to the acceptance criteria as published in the mandated test method. Where there are no established criteria, the laboratory shall determine internal criteria and document the method used to establish the limits or utilize client specified assessment criteria.

DoD Laboratory Control Sample (LCS): The acceptability of LCS results within a preparatory batch shall be determined using project-specified limits or the DoD limits (refer to Appendix DoD-D) If DoD limits are not available for certain analytes, LCS acceptability shall be based on its in-house limits.

Control limits are evaluated at mean ± 3 times the standard deviation of LCS percent recovery. In addition, control charts are maintained and used to detect trends and prevent out of control conditions. Control limits are continually monitored for shifts in mean recovery, changes in standard deviation, and development of trends. Refer to EMAX-QA06 for generation and updating procedures of control limits and control chart evaluation.

A LCS that is determined to be within the criteria effectively establishes that the analytical system is in control and validates system performance for the samples in the associated batch. Samples analyzed along with a LCS determined to be “out of control” is considered questionable requiring the samples reprocessed and re-analyzed or the data reported with appropriate data qualifying codes.

e) Application of Marginal Exceedance Limits (ME): If a large number of analytes are in the LCS, it becomes statistically likely that a few will be outside control limits. This may not indicate that the system is out of control; therefore corrective action may not be necessary. Upper and lower marginal exceedance (ME) limits can be established to determine when corrective action is necessary. A ME is defined as being beyond the LCS control limit (3 standard deviations), but within the ME limits. ME limits is 4 standard deviations around the mean.

The number of allowable marginal exceedances is based on the number of analytes in the LCS.

If more analytes exceed the LCS control limits than is allowed, or if any one analyte exceeds the ME limits, the LCS fails and corrective action is necessary. This marginal exceedance approach is relevant for methods with long lists of analytes. It will not apply to target analyte lists with fewer than 11 analytes.

The number of allowable marginal exceedances is as follows:

1) >90 analytes in LCS, 5 analytes allowed in ME of the LCS control limit;
2) 71-90 analytes in LCS, 4 analytes allowed in ME of the LCS control limit;
3) 51-70 analytes in LCS, 3 analytes allowed in ME of the LCS control limit;
4) 31-50 analytes in LCS, 2 analytes allowed in ME of the LCS control limit;
5) 11-30 analytes in LCS, 1 analytes allowed in ME of the LCS control limit;
6) <11 analytes in LCS, no analytes allowed in ME of the LCS control limit;

For DoD sponsored projects, application of ME does not allow any project-specific analytes of concern to exceed its LCS control limits, even marginally. In addition, DoD does not feel it is appropriate to control batch acceptance on poor performing analytes.

ESSENTIAL QUALITY CONTROL REQUIREMENTS

Marginal exceedances must be random. If the same analyte exceeds the LCS control limit repeatedly, it is an indication of a systemic problem. The source of the error must be located and corrective action taken. All LCS results are collected and monitored including those that fall within marginal exceedance allowance to ensure random behavior. However, the same analyte exceeding the LCS control limit 2 out of 3 consecutive LCS is considered indicative of non-random behavior.

D.1.1.3 Sample Specific Controls

Where applicable, the effect of the sample matrix on method performance is determined with the analytical batch. These procedures relate to the analyses of matrix specific Quality Control (QC) samples and are designed as data quality indicators for a specific sample using the designated test method.

Matrix specific QC include: Matrix Spike (MS); Matrix Spike Duplicate (MSD); sample duplicates; and surrogate spikes. Evaluation of matrix managing, and handling matrix specific QC criteria including spiking appropriate components at appropriate concentrations, calculating recoveries and relative percent difference, evaluating and reporting results based on performance of the QC samples.

D.1.1.3.1 Matrix Spike : Matrix Spike Duplicates

a) Purpose: Matrix specific QC samples indicate the effect of the sample matrix on the precision and accuracy of the results generated using the selected method. The information from these controls is sample/matrix specific and would not normally be used to determine the validity of the entire batch.

b) Frequency: The frequency of the analysis of matrix specific samples is dependent on the Data Quality Objectives of the project unless otherwise mandated by the test method. When sample amount is not adequate it shall be noted on the case narrative.

c) Composition: The components of the spike are specified in the analytical SOPs unless otherwise specified by the project. Any permit specified analytes, as specified by regulation or client requested analytes shall also be included.

For DoD projects all target analytes must be spiked in the project-specific MS and MSD.

For multi-component analytes (e.g., PCBs), the project-specific MS and MSD should be spiked with the same constituents as the calibration standard. Multiple samples may be necessary to avoid interference.

The concentration of the spiked compounds shall be at or below the midpoint of the calibration range or at the appropriate level of concern.

d) Evaluation Criteria and Corrective Action: The results from matrix spike/matrix spike duplicate are primarily designed to assess the precision and accuracy of analytical results in a given matrix and are expressed as percent recovery (%R), relative percent difference (RPD), or as specified by the project. Calculations for %R and RPD are detailed in the analytical SOPs.

Results are compared to project acceptance criteria. Where there are no established acceptance criteria, the in-house statistically generated MS/MSD control limits are applied.

Results and calculations are reviewed and data are archived with the data package. MS/MSD recoveries outside the project limits are discussed in the case narrative unless otherwise other corrective action is mandated by the project.

D.1.1.3.2 Matrix Duplicates

a) Purpose: Matrix duplicates are defined as replicate aliquots of the same sample taken through the entire analytical procedure. The results from this analysis indicate the precision of the results for the specific sample using the selected method. The matrix duplicate provides a usable measure of precision only when target analytes are found in the sample chosen for duplication.

ESSENTIAL QUALITY CONTROL REQUIREMENTS

b) Frequency: The frequency of the analysis of matrix duplicates is also dependent on the Data Quality Objectives of the project unless otherwise mandated by the test method. Methods that do not require MS duplicate analysis should be performed at a minimum frequency of once per preparatory batch per matrix type. When sample amount is not adequate it shall be noted on the case narrative

c) Composition: Matrix duplicates are performed on replicate aliquots of actual samples. The composition is usually not known.

d) Evaluation Criteria and Corrective Action: The results from matrix duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD) or another statistical treatment (e.g., absolute differences). Calculations for RPD are detailed in the analytical SOPs.

Results are compared to the acceptance criteria specified in the analytical SOPs unless specified by the project.

Matrix duplicates results outside established criteria are discussed in the case narrative or as specified by the project.

D.1.1.3.3 Surrogate Spikes

a) Purpose: Surrogates are used most often in organic chromatography test methods and are chosen to reflect the chemistries of the targeted components of the method. Added prior to sample preparation/extraction, they provide a measure of recovery for every sample matrix.

b) Frequency: Except where the matrix precludes its use or when not commercially available, surrogate compounds must be added to all samples, standards, and blanks for all appropriate test methods.

c) Composition: Surrogate compounds chosen to represent the various chemistries of the target are specified in the analytical SOPs.

d) Evaluation Criteria and Corrective Action: The results are compared to project-specific acceptance criteria. Where there are no established criteria, the in-house statistically generated surrogate control limits are applied.

Surrogates outside the acceptance criteria are evaluated for the effect indicated for the individual sample results. The appropriate corrective action applied is guided by the data quality objectives or other site specific requirements. Results reported from analyses with surrogate recoveries outside the acceptance criteria are qualified per project requirement.

D.1.2 Limit of Detection and Limit of Quantitation

All documentation for generating and verifying LOD and LOQ are retained and reviewed by the Operations Manager. Documents shall include all supporting data, sample preparation information, raw data, calculations and reviews. These documents are also reviewed during internal assessment and shall be available for external assessment.

D.1.2.1 Limit of Detection (LOD)

LOD is established as described in C.3.1. For projects requiring Method Detection Limit Study, refer to EMAX-QA04. Where applicable, results are reported at LOD with appropriate data flagging.

Where analytes are identified by a recognizable pattern (for example, PCBs, toxaphene, technical-chlordane), the limit of detection is based on the concentration of the mixture at which the pattern becomes qualitatively identified.

D.1.2.2 Limit of Quantitation (LOQ)

a) Any established LOQ must be above the LOD.

ESSENTIAL QUALITY CONTROL REQUIREMENTS

b) The LOQ is verified annually for each quality system matrix, method and analyte according to the procedure specified in C.3 or according to the frequency specified by the project.

D.1.3 Data Reduction

The procedures for data reduction, such as use of linear regression, are detailed in the analytical SOPs. In-house developed software for automated data processing are tested and validated. Refer to Software Testing and Quality Assurance SOP (EMAX-IS03) for details. This process involves a sample data test set test and verify the correct operation of these data reduction software that include data capture, manipulation, transfer, and reporting. This process is done every time the programming code is modified or otherwise manipulated.

D.1.4 Quality of Standards and Reagents

a) The source of standards shall comply with 5.6.2.2. Where available, standards are purchased as certified standard solutions traceable to NIST.

b) Analytical SOPs specifies the quality of reagents required for the analysis. In addition, reagent and water quality are checked prior to use.

1) Reagents – Reagents are purchased as reagent grade or better. Reagents undergo quality control testing prior to use. EMAX-QC01 details the process of quality control for chemicals. Chemicals/reagents that have passed the QC acceptance criteria shall bear a “QC PASSED” sticker, indicating the QC reference number traceable to the QC documentation. Reagents that do not pass the QC acceptance criteria shall be returned to the vendor.

2) Water - Reagent Water produced in-house is monitored daily as described in EMAX-QC01. A logbook is used to record the daily monitoring. Commercially purchased reagent water undergoes the same test as any chemical/reagent and shall conform to the method specified requirements.

3) Concentration of titrants is verified in accordance with specific analytical procedures.

D.1.5 Selectivity

a) Selectivity of qualitative determination for each target analytes is based on the requirement of the analytical method and instrument detector. Analyte identification is detailed in every analytical SOP.

Gas and liquid chromatography shall use peak absolute retention time as qualitative identification requiring tentatively identified analyte confirmation by another column or another detector. Both tentative and confirmation results shall be maintained and properly documented.

Retention time window study is based on three non-consecutive measurements of retention time for each analyte within a 72-hour period. The standard deviation (SD) and the mean retention time are calculated. The magnitude of retention time window is established by + 3 x SD.

New retention time study is established when new column is installed or when there is a major change in the instrument parameter setup.

b) Where test methods require confirmation, compound identification is confirmed through a second column or detector when positive results are detected on a sample. Such confirmations shall be performed on organic tests such as pesticides, herbicides, or acid extractable or when recommended by the analytical test method except when the analysis involves the use of a mass spectrometer.

Confirmation may be waived by the client in cases of periodic monitoring of well-characterized media. For data that are required to be confirmed, all results reported are confirmed or unconfirmed. If unconfirmed data are reported, they shall be identified separately in the report, with a narrative explaining why the data were not

ESSENTIAL QUALITY CONTROL REQUIREMENTS

confirmed. Evaluation criteria for the confirmation of results shall be specified by the method, unless otherwise specified by the client. If method-specific requirements do not exist, EMAX shall develop and document acceptance criteria for the confirmation of results. Confirmation is required unless stipulated in writing by the client. All confirmation shall be documented.

c) When analyzing an analytes using chromatography equipped with mass spectrometry, confirmation shall be evaluated by comparing the sample mass spectrum with characteristic ions in the reference mass spectrum. Mass spectral tuning shall be performed prior to daily calibration. Acceptance criteria are specified in the related test method SOPs.

D.1.6 Constant and Consistent Test Conditions

a) To maintain constant and consistent test conditions, EMAX performs assessment and evaluation of all quality control measures on an on-going basis. Quality control acceptance criteria determine the usability of the data. Refer to Appendix 1 of analytical procedures list the Summary of Quality Control Procedures for the essential testing measures. These Quality Control Procedures are also detailed in each of the analytical SOP.

The quality control protocols are attached to every work order distributed in the laboratory in the absence of project specific requirement.

Analytical instruments undergo routine daily maintenance and calibration check prior to sample analysis. Instrument blanks are analyzed to rule-out and document probable environment and instrument contamination.

D.1.6.1.1 GC/MS Performance Check

Mass spectrometer performance is monitored every 12 hours of operation period by measuring the mass/ion distribution of BFB (volatiles) or DFTPP (semi-volatiles). The mass/ion distribution of these compounds has to fulfill the method project's specific requirements before analysis can start. Furthermore, mass assignments are checked periodically by using perfluorobutylamine to ensure that mass number is properly assigned.

D.1.6.1.2 Pesticide Performance Evaluation

Pesticide analysis is subjected to the following additional QC to ensure the quality of data. A mixture of DDT and Endrin is analyzed at the beginning of analysis and at a 12-hour interval. Individual breakdown and the combined breakdown of Endrin and DDT should be less than predetermined criteria for the system to be acceptable.

D.1.6.1.3 Temperature Controlled Analyses

Analyses dependent on temperature controlled environment (e.g., leaching procedures, GPC, etc.) are performed in work cells where temperature are controlled by a thermostat and temperature is recorded in the analytical log.

b) Glassware Cleaning. All reusable labwares are decontaminated prior to reuse. A copy of the SOP for glassware cleaning is posted in the glassware cleaning area.

APPENDIX

E

EMAX APPENDICES

EMAX APPENDICES

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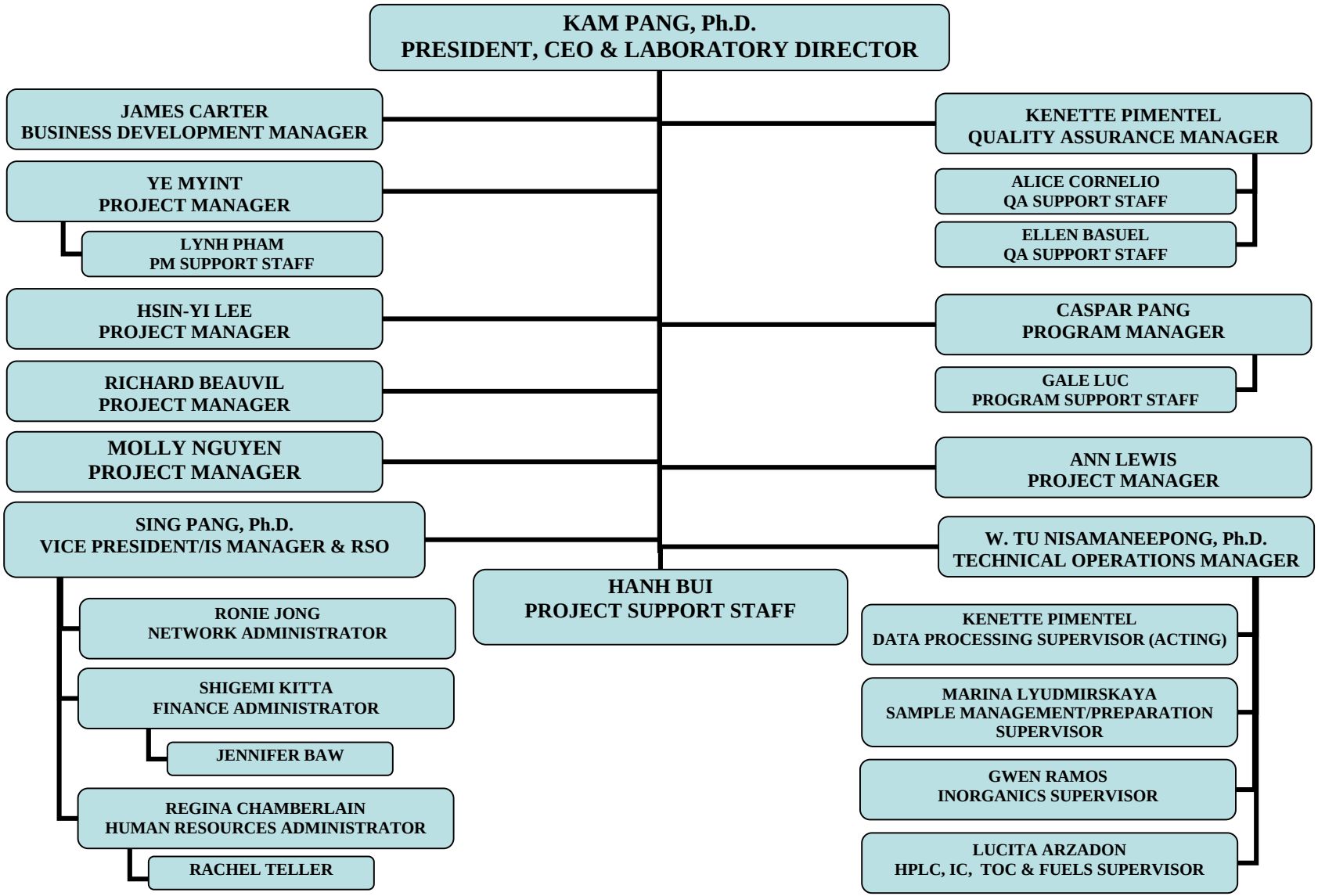
APPENDIX

E-1

EMAX ORGANIZATIONAL CHART & MINUMUM PERSONNEL QUALIFICATIONS

EMAX ORGANIZATIONAL CHART



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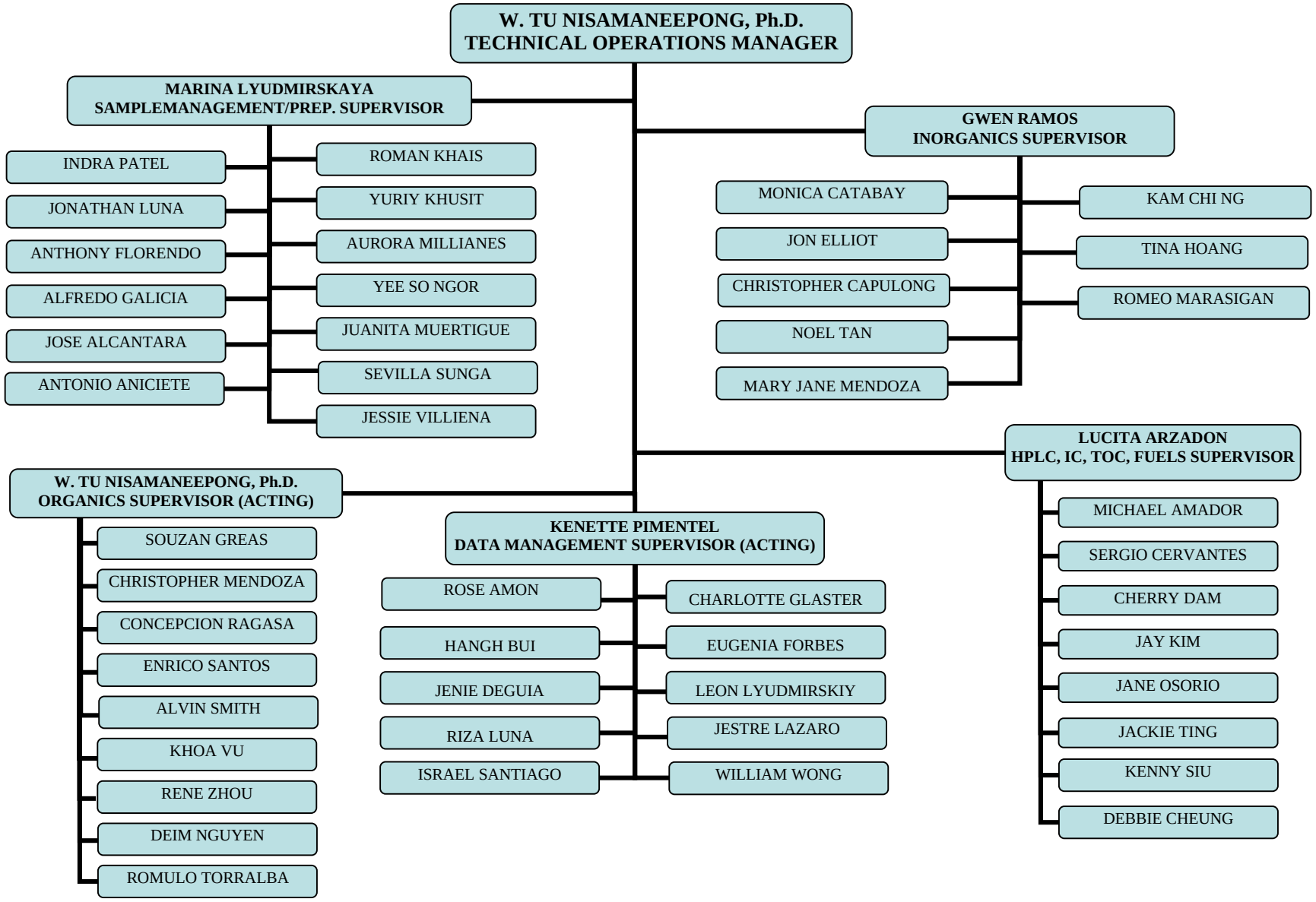
EMAX LABORATORY STRUCTURE



Approved: _____ Date: 11/14/06

E-1. MINIMUM QUALIFICATIONS

E-1.1 TECHNICAL DIRECTOR

- Bachelor's degree in chemistry or any science/engineering discipline.
- Five years of laboratory experience directly related to environmental testing, including at least three years of supervisory experience.

E-1.2 TECHNICAL OPERATIONS MANAGER

- Bachelor's degree in chemistry or any science/engineering discipline.
- Five years of laboratory experience in analytical field, including at least three years of supervisory experience.

E-1.3 QA MANAGER

- Bachelor's degree in chemistry or any science/engineering discipline.
- Five years of laboratory experience, including at least one year of applied experience dealing with QA principles and practices in an analytical laboratory.

E-1.4 PROJECT MANAGER

- Bachelor's degree in chemistry or any science/engineering discipline.
- Three years of analytical laboratory experience including sample analysis, data validation, and QA activities.

E-1.5 DEPARTMENT SUPERVISORS

- Bachelor's degree in chemistry or any science/engineering discipline.
- Three years of analytical laboratory experience, including at least one year of supervisory experience.

E-1.6 ANALYSTS

- Bachelor's degree in chemistry or any science/engineering discipline or in lieu of minimum education requirement, two additional years experience in operating and maintenance in the related field of service.
- Two years experience in related field of service, such as GC/MS, GC, ICP, etc.

E-1.7 TECHNICIANS

- High school diploma and a college level course in general chemistry.
- One-year experience of laboratory work.

E-1.8 LABORATORY INFORMATION MANAGER

- Bachelor's degree with advanced training in programming, information management, database management systems, or systems requirements analysis.
- Three years experience in data or systems management or programming, including one year of experience in laboratory information management system operations.

E-1.9 DATA PROCESSING SUPERVISOR

- Bachelor's degree with course work in management and advanced training in computer software applications.
- Three years experience in data processing

E-1.10 ELECTRONIC DATA DELIVERABLES SUPERVISOR

- Bachelor's degree with advanced training in programming, information management, information systems, database management systems or systems requirements analysis.
- Two years experience in systems or applications programming, including one-year experience of data management and EDD generation.

E-1.11 SAMPLE MANAGEMENT SUPERVISOR

- Bachelor's degree in chemistry or any science/engineering discipline.
- Two years of laboratory experience in sample management and at least one year of supervisory experience.

E-1.12 HEALTH AND SAFETY OFFICER

- Bachelor's degree in chemistry or any science/engineering discipline, with 40-hour training on Hazardous Waste Management.
- One-year experience in administering health and safety regulations.

APPENDIX

E-2

EMAX FACILITIES

E2 EMAX FACILITIES

E2-1 LABORATORIES

E2-1.1 VOLATILES LAB

The Volatiles Lab is in an area of about 3,200 square feet. This laboratory consists of the main Volatiles Lab, DOE Volatiles Lab, the Supervisor's room, and the volatiles sample storage room. This laboratory is isolated from the rest of EMAX's operations and has its own mechanical controls.

The main Volatiles Lab has a total of 104Lft. of workbench with two sinks, both equipped with a reagent water filtration system. There are two freezers dedicated for analytical standards.

The sample control room is furnished with nine sample storage refrigerators and a total of 18Lft of workbench, a fume hood and one analytical balance.

The DOE Volatiles lab has its own mechanical controls independent from the main Volatiles Lab. This lab has a total of 18Lft. of workbench with one sink equipped with reagent water filtration system. This lab houses its own sample storage refrigerator.

E2-1.2 MAIN LAB

The Main Lab is a separate area of about 6,000 square feet and includes three Supervisors' offices, the Project Managers' offices and a Standards Preparation room. This Lab has a total of 240Lft. of workbench with a possibility for an 80Lft expansion. This laboratory consists of the Semi-volatile Lab, Fuels & HPLC Lab, and General Chemistry laboratories.

The Standards Preparation room has three (3) fume hoods and three (3) standards storage refrigerators.

E2-1.3 METALS LAB

The Metals Laboratory is a separate area of about 1,100 square feet. This Lab is consists of a Digestion Lab, the Metals Analysis Lab and the Supervisor's Office.

The Digestion Lab has two acid resistant fume hoods with four hot plates and one fume hood for Standards preparation. The Metals Analysis Lab has two ICPs, one Mercury Analyzer and two GFAA instruments.

E2-1.4 EXTRACTION LAB

The Extraction Lab occupies an area of about 2,500 square feet. This Lab consists of the main Extraction Lab, the TCLP Lab and the Supervisor's office.

The main Extraction Lab has twelve (12) fume hoods, four (4) sonicators, six (6) concentrators, eighty (80) units of continuous liquid-liquid extractors, eighty (80) units of soxhlet extractors, and one reagent water system. The TCLP Lab has two (2) twelve-position TCLP extractors, three (3) GPC instruments, and one explosive extractor.

E2-1.5 DOE LAB

The DOE Lab is a separate area of about 1,200 square feet. This lab has its own mechanical controls independent from the rest of the laboratories. This room is designed to have negative pressure so that no air coming from this room migrates to the other labs. This lab has its own extraction lab, semi-volatile lab and metals lab. It has a total of 42Lft of workbench, three acid resistant hoods, one ASE extractor, eighteen (18) continuous liquid-liquid extractors, one concentrator, one sonicator, one GC/MS, one GC with dual ECD detectors, one GC with FID detector, one ICP and one Mercury Analyzer.

E2-2 SUPPORT FACILITIES

E2-2.1 DATA PROCESSING LAB

The Data Processing Lab occupies a space of about 850 square feet and includes a Supervisor's office. This lab has seven computers dedicated to data processing, one printer and two copiers.

E2-2.2 Sample Receipt, Sample Storage and Waste Storage Area

The Sample Receipt Area is about 500 square feet. It has a fume hood and cooler storage shelves.

The Sample Storage Area is about 1,000 square feet with one bottle preparation room and one office. It has eight sample storage refrigerators and 12Lft. of workbench.

The Waste Storage Area is an enclosed 200 square feet shed constructed outside the building.

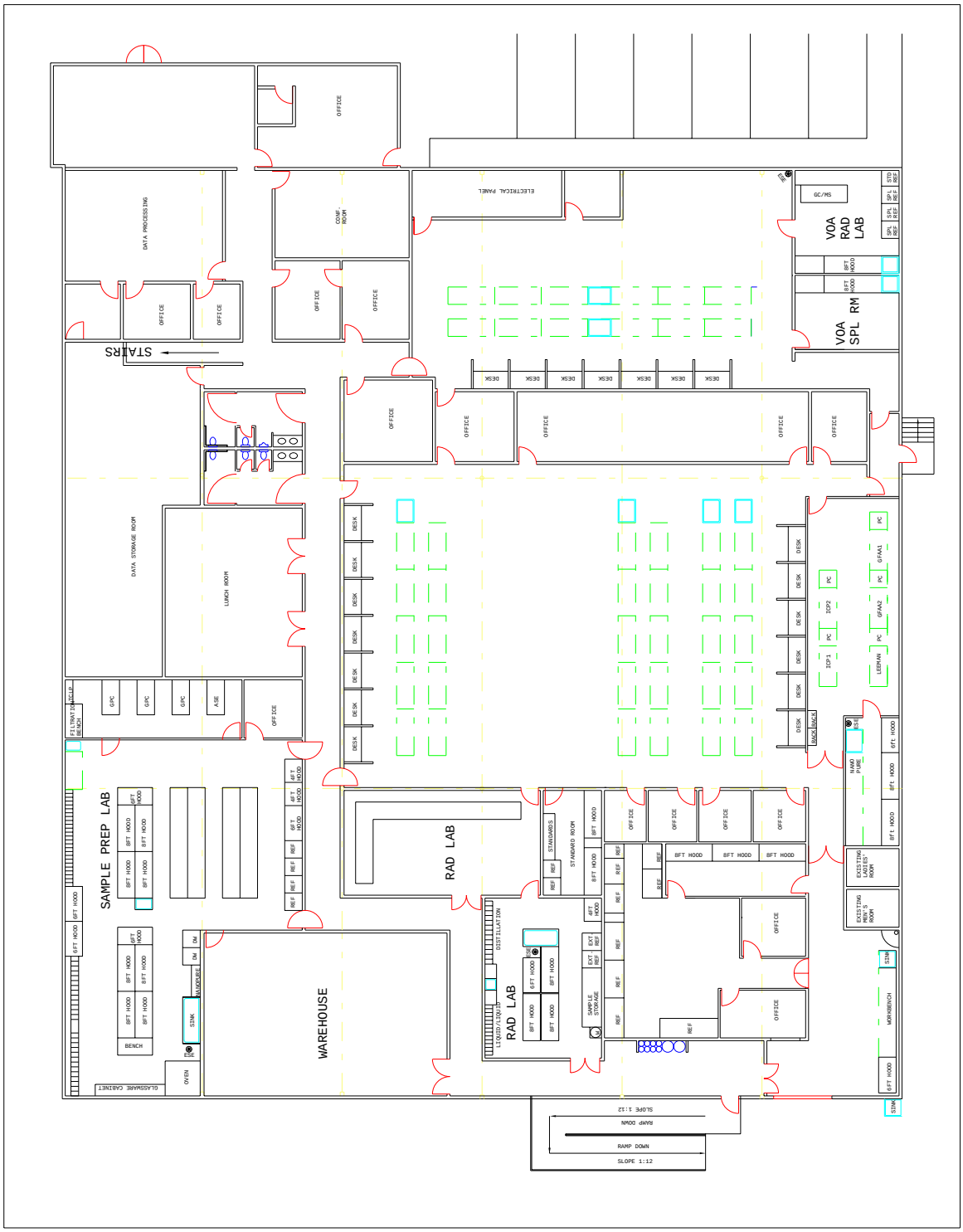
E2-2.2.1 Data Storage Room

The data storage room is about 1,200 square feet. This room houses archived data packages, laboratory logbooks, and other documents related to the activities of EMAX.

E2-2.2.2 Warehouse

The warehouse is about 1,200 square feet. The warehouse stores the laboratory supplies, solvents and reagents in appropriate cabinets.

E2-2.2.3 EMAX Floor Plan



APPENDIX

E-3

EMAX LIST OF MAJOR EQUIPMENT

EMAX LABORATORIES, INC.

LIST OF MAJOR ANALYTICAL EQUIPMENT

No.	Type	Detector	Use	Manufacturer	Model	Location	Date Acquired
1	GC	MS	524 624 8260	Hewlett Packard	5890/5970	VOLATILES	6/1/1996
2	GC	MS	524 624 8260	Hewlett Packard	5890/5970	SEMIVOLATILES	6/1/1996
3	GC	MS	524 624 8260	Hewlett Packard	5890/5870	VOLATILES	6/1/1996
5	GC	MS	524 624 8260	Hewlett Packard	5890/5870	VOLATILES	6/1/1996
6	GC	MS	524 624 8260	Hewlett Packard	5890/5870	VOLATILES	6/1/1996
8	GC	Dual ECD	8081 8082	Hewlett Packard	5891 II	SEMIVOLATILES	6/1/1996
9	GC	Dual ECD	8151	Hewlett Packard	5892 II	SEMIVOLATILES	6/1/1996
10	GC	FID	RSK175	Varian	3400	HPLC & FUELS	6/1/1996
12	GC	NPD FPD	8141	Hewlett Packard	5890	SEMIVOLATILES	6/1/1996
13	GC	ELCD/ PID	8021	Hewlett Packard	5890	HPLC & FUELS	6/1/1996
16	GC	Dual ECD	8081 8082	Hewlett Packard	5890	SEMIVOLATILES	6/1/1996
17	HPLC	UV/F	8310 8330	Hewlett Packard	1050	HPLC & FUELS	6/1/1996
20	GFAA	GFAA	7000	Varian	Zeeman SpectAA 400	METALS	6/1/1996
24	ICP	Polychromator	6010	Thermo Jarell Ash	61E	METALS	6/1/1996
26	TOC Analyzer	IR	415.1 9060	Shimadzu	TOC-500	GENERAL CHEMISTRY	6/1/1996
28	Flash Point	Thermometer	1010	Pensky Martens	Semi-Automatic	GENERAL CHEMISTRY	6/1/1996
29	Conductivity	Conductivity	120.1	CSI	HYDAC	GENERAL CHEMISTRY	6/1/1996
30	Turbidimeter	NA	180.1	HF Scientific	DRT-153	GENERAL CHEMISTRY	6/1/1996
31	ICP	Polychromator	6010	Thermo Jarell Ash	Trace	METALS	6/1/1996
33	pH Meter	Conductivity	150.1 9040 9045	Hach One	N/A	GENERAL CHEMISTRY	6/1/1996
34	HPLC	UV/F	8310 8330	Waters	LC Module 1 Plus	HPLC & FUELS	6/1/1996
39	GC	FID/PID	8015G 8021(BTEXM)	Hewlett Packard	5890	HPLC & FUELS	6/1/1996
41	GC	MS	8270 625	Hewlett Packard	5890/5970		6/1/1996
42	GC	MS	524 624 8260	Hewlett Packard	5890/5970	SEMIVOLATILES	6/1/1996
43	GC	FID	8015B	Hewlett Packard	5890	HPLC & FUELS	6/1/1996
47	Mercury Analyzer	Cold Vapor	245.1 245.5 7470 7471	Leeman PS-200II	200II	METALS	10/26/1999
48	GC	MS	524 624 8260	Shimadzu	QP 5000 Ver. 2	SEMIVOLATILES	8/20/1999
50	GC	FID	8015B	Hewlett Packard	5890	HPLC & FUELS	6/1/1996

EMAX LABORATORIES, INC.

LIST OF MAJOR ANALYTICAL EQUIPMENT

No.	Type	Detector	Use	Manufacturer	Model	Location	Date Acquired
52	GC	MS	524 624 8260	Shimadzu	QP 5000 Ver. 2	SEMIVOLATILES	4/1/2000
53	pH Meter	Conductivity	150.1 9040 9045	Orion	420A	GENERAL CHEMISTRY	4/1/2000
55	GC	FID/PID	8015G	Hewlett Packard	5890	HPLC & FUELS	8/1/2000
56	Turbidimeter	NA	180.1	La Motte	2008	GENERAL CHEMISTRY	9/1/2000
57	IC	Conductivity	300.0	Dionex	LC25	GENERAL CHEMISTRY	9/28/2000
58	BOD Meter	Conductivity	405.1	Orion	N/A	GENERAL CHEMISTRY	9/1/2000
59	IC	AD25/M	218.6	Dionex	LC20	GENERAL CHEMISTRY	6/1/1996
61	TRPH	IR	413.2 418.1 1664	Buck Scientific	HC404	SEMIVOLATILES	6/1/1996
62	TOC Analyzer	IR	415.1 9060	Shimadzu	TOC-V-CSN	GENERAL CHEMISTRY	9/1/2001
63	pH Meter	Conductivity	150.1 9040 9045	CMS Labcraft	PH102	GENERAL CHEMISTRY	4/1/2001
64	pH Meter	Conductivity	150.1 9040 9045	VWR		GENERAL CHEMISTRY	6/1/1996
65	TRPH	IR	413.2 418.1 1664	Buck Scientific	HC404	SEMIVOLATILES	6/1/1996
67	GC	MS	524 624 8260	Hewlett Packard	5890 II/5971B	VOLATILES	9/1/2001
70	Spectrometer	IR	420.1 9014	Thermo Spectronic	Spectronic 20D	GENERAL CHEMISTRY	12/1/2001
71	GC	Dual ECD	8081 8082	Hewlett Packard	5890 II	DOE	12/18/2001
72	GC	FID	8015B	Hewlett Packard	5890 II	DOE	12/18/2001
73	ICP	Polychromator	6010	Thermo Jarell Ash	Trace II	DOE	12/1/2001
74	Mercury Analyzer	Cold Vapor	245.1 245.5 7470 7471	Leeman PS	HYDRA-AA	DOE	12/1/2001
81	HPLC	UV/F	8310 8330	Waters	717 Plus	HPLC & FUELS	6/7/2002
83	GC	MS	TO14	VARIAN	SATURN 2000	VOLATILES	9/25/2002
84	GC	FID	TO3	VARIAN	3800/3380	VOLATILES	9/25/2002
94	GC	MS	524 624 8260	Hewlett Packard	5890A	VOLATILES	3/24/2003
96	pH Meter	Conductivity	150.1 9040 9045	Thermo Ion	210A	GENERAL CHEMISTRY	6/7/2002
97	pH Meter	Conductivity	150.1 9040 9045	Thermo Ion	420A PLUS	GENERAL CHEMISTRY	7/10/2003
98	ICP	MS	6020A	Agilent	7500	METALS	9/15/2003
100	IC	Conductivity	300.0	Metrohm	761 Compact IC	GENERAL CHEMISTRY	4/11/2005
103	GC	MS	524 624 8260	AGILENT	5890 SII	VOLATILES	9/16/2005
104	Conductivity Meter	PLATIMUM	120.1 2510B	TRACEABLE	61161	GENERAL CHEMISTRY	1/2/2006

EMAX LABORATORIES, INC.

LIST OF MAJOR ANALYTICAL EQUIPMENT

No.	Type	Detector	Use	Manufacturer	Model	Location	Date Acquired
105	GC	FID	8015B	AGILENT	G1530N,G1540N	HPLC & FUELS	4/5/2006
106	IC	Conductivity and Absorbance	300.0/9056 218.6/7199	Dionex	ICS-1000 with AS50 Autosampler		5/8/2006
107	IC	Conductivity	300.0/300.0M	Metrohm		GENERAL CHEMISTRY	10/4/2006
108	ICP	AES	200.7 6010B	THERMO	ICAP 6500	METALS	12/1/2006

APPENDIX

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EMAX
LIST
OF
STANDARD
OPERATING
PROCEDURES

EMAX STANDARD OPERATING PROCEDURES

ANALYTICAL

SOP #	TITLE	REV.#	Effective Date
EMAX-1010	IGNITABILITY	1	7/18/2002
EMAX-110.2	COLOR	1	6/26/2004
EMAX-120.1	SPECIFIC CONDUCTANCE	2	6/25/2004
EMAX-130.2	HARDNESS	2	4/5/2002
EMAX-150.1	pH	3	7/9/2002
EMAX-160.1	RESIDUE, FILTERABLE (TDS)	3	6/21/2004
EMAX-160.2	RESIDUE, NON-FILTERABLE (TSS)	2	6/28/2004
EMAX-160.3	RESIDUE, TOTAL	1	3/15/2002
EMAX-1664	OIL AND GREASE (HEM & SGT-HEM)	3	9/15/2004
EMAX-180.1	TURBIDITY BY NEPHELOMETRIC METHOD	3	10/9/2006
EMAX-200.7	DETERMINATION OF METALS AND TRACE ELEMENTS BY	0	7/16/2004
EMAX-200.8	DETERMINATION OF TRACE ELEMENTS IN WATER AND	0	8/4/2004
EMAX-2130B	TURBIDITY	1	7/15/2002
EMAX-218.6	HEXAVALENT CHROMIUM	3	7/1/2004
EMAX-2310B	ACIDITY	0	4/10/2002
EMAX-2320B	ALKALINITY	1	11/1/2004
EMAX-2340B	HARDNESS BY CALCULATION	1	4/11/2004
EMAX-2340C	HARDNESS (EDTA TITRATION METHOD)	1	4/8/2002
EMAX-245.2	MERCURY AUTOMATED COLD VAPOR	0	7/13/2004
EMAX-2510B	CONDUCTIVITY	0	4/11/2002
EMAX-2540C	RESIDUE, FILTERABLE (TDS)	1	7/11/2002
EMAX-2540D	RESIDUE, NONFILTERABLE (TSS)	0	4/8/2002
EMAX-300.0	ION CHROMATOGRAPHY ANALYSIS	4	6/24/2004
EMAX-300.0M	ION CHROMATOGRAPHY ANALYSIS FOR ORGANIC ACIDS	0	4/30/2004
EMAX-305.1	ACIDITY	0	4/4/2002
EMAX-310.1	ALKALINITY	3	11/1/2004
EMAX-314.0	ION CHROMATOGRAPHY ANALYIS	1	4/5/2002
EMAX-330.3	CHLORINE, TOTAL RESIDUAL	1	7/19/2004

EMAX STANDARD OPERATING PROCEDURES

ANALYTICAL

SOP #	TITLE	REV.#	Effective Date
EMAX-335.1	CYANIDE AMENABLE TO CHLORINATION	0	3/13/2002
EMAX-335.2	CYANIDE, TOTAL	2	6/15/2006
EMAX-340.2	FLUORIDE (ION SELECTIVE ELECTRODE)	1	9/19/2002
EMAX-350.2	AMMONIA-N	2	6/27/2002
EMAX-351.3	KJELDAHL NITROGEN	3	11/30/2006
EMAX-353.3	NITROGEN, NITRATE-NITRITE BY COPPER-CADMIUM RED	1	9/15/2004
EMAX-365.2	PHOSPHORUS (COLORIMETRIC), ALL FORMS	3	11/30/2006
EMAX-370.1	SILICA	1	11/15/2004
EMAX-375.4	SULFATE (TURBIDIMETRIC)	0	6/1/2005
EMAX-376.1	SULFIDE (TITRIMETRIC, IODINE)	2	8/10/2006
EMAX-376.2	SULFIDE (COLORIMETRY)	0	5/1/2003
EMAX-377.1	SULFITE (TITRIMETRIC, IODINE)	1	5/29/2002
EMAX-405.1	BIOCHEMICAL OXYGEN DEMAND (BOD)	2	7/15/2002
EMAX-410.4	CHEMICAL OXYGEN DEMAND (COD)	1	10/29/2002
EMAX-413.1	TOTAL RECOVERABLE OIL AND GREASE	2	7/12/2002
EMAX-413.2	OIL AND GREASE	0	6/18/2003
EMAX-413.2M	OIL AND GREASE	1	4/6/2002
EMAX-415.1	TOTAL ORGANIC CARBON (TOC)	1	4/3/2002
EMAX-418.1	TOTAL RECOVERABLE PETROLEUM HYDROCARBONS	3	7/8/2002
EMAX-420.1	TOTAL PHENOLS BY SPECTROPHOTOMETRY	1	4/4/2002
EMAX-425.1	ORGANICS: METHYLENE BLUE ACTIVE SUBSTANCES (MBA	0	10/9/2002
EMAX-4500F	FLUORIDE (ION SELECTIVE ELECTRODE)	0	9/19/2002
EMAX-4500H	pH MEASUREMENT	0	4/11/2002
EMAX-504.1	EDB/DBCP	2	7/24/2002
EMAX-5210B	BIOCHEMICAL OXYGEN DEMAND (BOD)	1	7/15/2002
EMAX-5220B	CHEMICAL OXYGEN DEMAND (COD)	0	4/8/2002
EMAX-524.2	VOLATILE ORGANIC COMPOUNDS	3	9/20/2002
EMAX-5310B	DISSOLVED OXYGEN (DOC)	0	4/8/2002

EMAX STANDARD OPERATING PROCEDURES

ANALYTICAL

SOP #	TITLE	REV.#	Effective Date
EMAX-5520	OIL AND GREASE	0	4/8/2002
EMAX-6010	TRACE METALS BY ICP	5	6/15/2006
EMAX-6020	TRACE METALS BY ICP-MS	3	11/15/2006
EMAX-608	ORGANOCHLORINE PESTICIDES & PCBs	0	8/1/2005
EMAX-624	VOLATILE ORGANICS BY GCMS	1	5/30/2002
EMAX-625	SEMIVOLATILE ORGANICS BY GC/MS	0	8/1/2005
EMAX-7000	TRACE METALS BY GFAA	3	9/19/2002
EMAX-7196	CHROMIUM(VI)	2	7/9/2002
EMAX-7199	CHROMIUM(VI)	1	9/16/2003
EMAX-7470	MERCURY	3	1/8/2003
EMAX-7471	MERCURY	3	1/8/2003
EMAX-8011	EDB/DBCP	2	7/9/2002
EMAX-8015D	DIESEL RANGE ORGANICS (DRO)	3	4/1/2004
EMAX-8015G	GASOLINE RANGE ORGANICS (GRO)	1	11/1/2001
EMAX-8015G	PROPYLENE GLYCOL/ETHYLENE GLYCOL BY GC	0	6/7/2006
EMAX-8015O	ALCOHOLS BY GC	0	6/7/2006
EMAX-8015S	STODDARD SOLVENT	1	8/22/2001
EMAX-8081	ORGANOCHLORINE PESTICIDES BY GAS CHROMATOGRA	5	11/1/2006
EMAX-8082	POLYCHLORINATED BIPHENYLS(PCB) BY GAS CHROMAT	1	4/8/2002
EMAX-8141	ORGANOPHOSPHORUS COMPOUNDS BY GC	1	9/20/2002
EMAX-8151	CHLORINATED HERBICIDES	2	12/1/2003
EMAX-8260	VOLATILE ORGANIC COMPOUNDS BY GC/MS	3	11/16/2006
EMAX-8270	SEMIVOLATILE ORGANICS BY GC/MS	3	7/15/2006
EMAX-8270SI	SEMIVOLATILE ORGANICS BY GC/MS	1	11/15/2006
EMAX-8310	POLYNUCLEAR AROMATIC HYDROCARBONS	4	10/1/2003
EMAX-8330	NITROAROMATICS & NITAMINES BY HPLC	3	10/1/2003
EMAX-8332	NITROGLYCERINE & NITROGUANIDINE	0	8/1/2000
EMAX-9010	CYANIDE DISTILLATION	1	3/18/2002

EMAX STANDARD OPERATING PROCEDURES

ANALYTICAL

SOP #	TITLE	REV.#	Effective Date
EMAX-9014	CYANIDE, TOTAL	1	2/7/2002
EMAX-9030	ACID SOLUBLE AND ACID INSOLUBLE SULFIDES: DISTILL	0	3/15/2004
EMAX-9034	SULFIDES, TOTAL	0	3/15/2004
EMAX-9040	pH DETERMINATION – CORROSIVITY	3	7/9/2002
EMAX-9045	pH, SOLID AND WASTE SAMPLES	0	3/9/2001
EMAX-9056	ION CHROMATOGRAPHY ANALYSIS	2	7/9/2002
EMAX-9060	TOTAL ORGANIC CARBON (TOC)	1	4/5/2002
EMAX-9065	PHENOLICS BY SPECTROPHOTOMETRY, MANUAL 4-AAP W	1	9/15/2004
EMAX-9095	PAINT FILTER LIQUID TEST	0	4/9/2001
EMAX-9253	CHLORIDE (TITRIMETRIC SILVER NITRATE)	1	9/15/2004
EMAX-BTEX	AROMATIC VOLATILE ORGANICS BY GAS CHROMATOGRA	1	3/15/2002
EMAX-D1385	TEST METHOD FOR HYDRAZINE	0	7/13/2004
EMAX-LUFT	TOTAL VOLATILE PETROLEUM HYDROCARBON	1	1/15/2002
EMAX-LUFT	TOTAL PETROLEUM HYDROCARBON BY EXTRACTION	3	6/10/2004
EMAX-M8270	1,4-DIOXANE BY GC/MS, MODIFIED METHOD 8270SIM	1	5/10/2004
EMAX-MCD	MOISTURE CONTENT DETERMINATION	2	5/10/2006
EMAX-RCN	REACTIVE CYANIDE	0	10/8/2002
EMAX-RSE	REACTIVE SULFIDE	0	10/8/2002
EMAX-RSK17	DISSOLVED GASES	1	4/1/2004
EMAX-TO14	DETERMINATION VOLATILE ORGANIC COMPOUNDS IN A	0	5/16/2003
EMAX-TO15	DETERMINATION VOLATILE ORGANIC COMPOUNDS IN A	0	11/16/2003
EMAX-TOCW	TOTAL ORGANIC CARBON (TOC) BY WALKLEY BLACK ME	0	5/12/2003

EMAX STANDARD OPERATING PROCEDURES

DATA MANAGEMENT

SOP #	TITLE	REV.#	Effective Date
EMAX-DM01	DATA FLOW AND REVIEW	2	7/15/2002
EMAX-DM02	DOCUMENT CONTROL	1	12/5/2002
EMAX-DM03	DATA PACKAGE ASSEMBLY AND ARCHIVAL	2	1/12/2004
EMAX-DM04	MANAGEMENT OF LIMS RAW DATA	0	8/30/2002

EMAX STANDARD OPERATING PROCEDURES

INFORMATION SYSTEMS

SOP #	TITLE	REV.#	Effective Date
EMAX-IS01	SOFTWARE DOCUMENTATION	2	3/1/2004
EMAX-IS02	SOFTWARE DEVELOPMENT METHODOLOGY	1	9/24/2001
EMAX-IS03	SOFTWARE TESTING AND QUALITY ASSURANCE	0	9/24/2001
EMAX-IS04	SOFTWARE MAINTENANCE	1	3/1/2004
EMAX-IS05	EDD GENERATION AND VALIDATION	1	10/30/2001
EMAX-IS06	HISTORICAL FILE MAINTENANCE	0	3/1/2004
EMAX-IS07	ACQUISITION OF SOFTWARE PACKAGES	2	3/1/2004
EMAX-IS08	DATA SECURITY	3	5/17/2005
EMAX-IS09	BACKING UP FILES	2	5/17/2005
EMAX-IS10	VIRUS PROTECTION	2	5/17/2005
EMAX-IS11	PROJECT SUPPORT FILES	1	10/25/2002
EMAX-IS12	HARDWARE MAINTENANCE	0	2/20/2002

EMAX STANDARD OPERATING PROCEDURES

QUALITY ASSURANCE

SOP #	TITLE	REV.#	Effective Date
EMAX-QA00	WRITING STANDARD OPERATING PROCEDURES	1	12/8/2003
EMAX-QA01	PROJECT MANAGEMENT	3	1/15/2004
EMAX-QA02	UTILIZATION OF SUBCONTRACT LABORATORIES	1	6/5/2006
EMAX-QA03	METHOD DEVELOPMENT	1	11/15/2005
EMAX-QA04	METHOD DETECTION LIMIT STUDY	2	5/21/2004
EMAX-QA05	TRAINING	3	9/1/2006
EMAX-QA06	CONTROL CHART	3	11/1/2003
EMAX-QA07	INTERNAL ASSESSMENT	1	6/5/2006
EMAX-QA08	CORRECTIVE ACTION	2	9/16/2003
EMAX-QA09	PURCHASING	1	9/26/2002
EMAX-QA10	ETHICS PROGRAM	0	9/1/2006
EMAX-QS00	QUALITY SYSTEMS MANUAL	2	12/4/2006

EMAX STANDARD OPERATING PROCEDURES

QUALITY CONTROL

SOP #	TITLE	REV.#	Effective Date
EMAX-QC01	QUALITY CONTROL FOR CHEMICALS	1	5/2/2005
EMAX-QC02	ANALYTICAL STANDARD PREPARATION	1	5/2/2005
EMAX-QC03	REFRIGERATOR CONTROL	2	6/20/2004
EMAX-QC04	BALANCE CALIBRATION	1	9/17/2001
EMAX-QC05	THERMOMETER CALIBRATION	1	6/1/2004
EMAX-QC06	MICROPIPET CALIBRATION	1	9/17/2001
EMAX-QC07	GLASSWARE CLEANING	1	4/15/2005
EMAX-QC08	HANDLING HIGHLY CONTAMINATED SAMPLES	0	9/25/2002
EMAX-QC09	FUME HOOD INSPECTION PROGRAM	0	10/31/2004

EMAX STANDARD OPERATING PROCEDURES

SAMPLE MANAGEMENT

SOP #	TITLE	REV.#	Effective Date
EMAX-SM01	SAMPLE MANAGEMENT	3	1/15/2004
EMAX-SM02	SAMPLE RECEIVING	4	1/15/2004
EMAX-SM03	WASTE DISPOSAL	2	1/15/2004
EMAX-SM04	ANALYTICAL AND QC LABELING	0	3/12/2001
EMAX-SM05	SAMPLE CONTAINERS, HANDLING AND SHIPPING	0	1/12/2000
EMAX-SM06	TRIP BLANK PREPARATION	0	10/11/2000

EMAX STANDARD OPERATING PROCEDURES

SAMPLE PREPARATION

SOP #	TITLE	REV.#	Effective Date
EMAX-3005	ACID DIGESTION, TOTAL RECOVERABLE OR DISSOLVED	4	12/31/2005
EMAX-3010	ACID DIGESTION, TOTAL METALS FOR AQUEOUS	3	12/31/2005
EMAX-3020	ACID DIGESTION, TOTAL METALS FOR GFAA	3	12/31/2005
EMAX-3050	ACID DIGESTION, TOTAL METALS SOLIDS	3	9/7/2004
EMAX-3520	EXTRACTION, CONTINUOUS LIQUID LIQUID	2	11/15/2005
EMAX-3545	EXTRACTION, PRESSURIZED FLUID	1	3/26/2002
EMAX-3550	EXTRACTION, SONICATION	2	11/27/2006
EMAX-5030	PURGE & TRAP	1	3/14/2002
EMAX-5035	PURGE & TRAP, CLOSED SYSTEM	1	5/20/2002

APPENDIX

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EMAX ACCREDITATIONS

Agency	Certificate Number	Expiration Date	Notes
State of Arizona	AZ0465	March 6, 2007	In good standing.
State of California	2168	August 31, 2007	In good standing.
State of Connecticut	PH-0239	March 31, 2007	In good standing.
State of Florida	970153	June 30, 2007	Renewal is dependent on NELAP accreditation.
State of Kansas	E-10272	October 31, 2007	Renewal is dependent on NELAP accreditation.
State of Massachusetts	M-CA291	June 30, 2007	In good standing.
State of South Carolina	87012	August 31, 2007	Renewal is dependent on Arizona and NELAP accreditation.
State of Utah	CKY1	August 31, 2007	Renewal is dependent on NELAP accreditation.
State of Washington	C227	August 13, 2007	In good standing
USACE	NA	NA	In good standing.
NFESC	NA	January 19, 2007	In good standing.
AFCEE	NA	Until Revoked	In good standing.
USDA Permit to Remove Soil	S-57253	June 30, 2007	In good standing.
City of Torrance Business License	5294 Miscellaneous Business Date Issued: 1/21/97	Until Revoked	Annual tax due January 1st of each year, delinquent if not paid by 31st. Void if there's a change in ownership or address.

Arizona Department of Health Services

ENVIRONMENTAL LABORATORY LICENSE

Issued to:

Laboratory Director: **Kam Y. Pang, Ph.D**
Owner/Representative: **Kam Y. Pang, Ph.D.**

EMAX Laboratories, Inc.
AZ0465

is in compliance with Environmental Laboratory's applicable standards for the State of Arizona and maintains on file a List of Parameters for which the laboratory is certified to perform analysis.

PERIOD OF LICENSURE FROM: 03/07/2006 TO: 03/06/2007

Steven D. Baker, Chief
Office of Laboratory Services
Bureau of State Laboratory Services

Arizona Department of Health Services
Office of Laboratory Licensure, Certification & Training
250 North 17th Avenue, Phoenix, AZ 85007

Tuesday, January 24 2006

AZ License: AZ0465

Lab Director: Dr. Kam Y. Pang

Lab Name: Emax Laboratories, Inc.
Phone: (310) 618-8889
Fax: (310) 618-0818

Program HW

Parameter	EPA Method	Billing Code	Cert Date
Perchlorate	EPA 314.0	NIIIA1	02/18/04
1,2-Dibromoethane & 1,2-Dibromo-3-Chloropropane	EPA 8011	SOC5	02/18/04
Aluminum	EPA 6010B	MTL3	06/11/98
Aluminum	EPA 6020	MTL7	01/21/05
Antimony	EPA 6010B	MTL3	06/11/98
Antimony	EPA 6020	MTL7	01/05/51
Arsenic	EPA 6010B	MTL3	06/11/98
Arsenic	EPA 6020	MTL7	01/21/05
Arsenic	EPA 7060A	MTL2	03/11/98
Barium	EPA 6010B	MTL3	06/11/98
Barium	EPA 6020	MTL7	01/21/05
Beryllium	EPA 6010B	MTL3	06/11/98
Beryllium	EPA 6020	MTL7	01/21/05
Boron	EPA 6010B	MTL3	02/18/04
Bromide	EPA 9056	NIIIA1	02/18/04
C10-C32 Hydrocarbons	8015AZ	VOC4	05/29/98
Cadmium	EPA 6010B	MTL3	06/11/98
Cadmium	EPA 6020	MTL7	01/21/05
Calcium	EPA 6010B	MTL3	06/11/98
Chloride	EPA 9056	NIIIA1	02/18/04
Chlorinated Herbicides	EPA 8151A	SOC3	06/11/98
Chromium Total	EPA 6010B	MTL3	06/11/98
Chromium, Hexavalent	EPA 7196A	MTL4	02/10/95
Chromium, Hexavalent	EPA 7199	MISC24	02/18/04
Cobalt	EPA 6010B	MTL3	06/11/98
Cobalt	EPA 6020	MTL7	01/21/05
Continuous Liquid-Liquid Extraction	EPA 3520C	*	02/18/04
Copper	EPA 6010B	MTL3	06/11/98
Copper	EPA 6020	MTL7	01/21/05
Corrosivity Ph Determination	EPA 9040B	NIA6	12/06/02
Cyanide	EPA 9010B	MISC7	06/11/98
Cyanide	EPA 9014	MISC7	04/08/03
Fluoride	EPA 9056	NIIIA1	02/18/04
Gel-Permeation Cleanup	EPA 3640A	*	02/15/00
Hydrogen Ion (Ph)	EPA 9040B	NIA6	03/11/98
Hydrogen Ion (Ph)	EPA 9045C	NIA6	02/18/04
Ignitability (Flash Point)	EPA 1010	HAZ2	02/02/94
Iron	EPA 6010B	MTL3	06/11/98
Lead	EPA 6010B	MTL3	06/11/98

AZ License: AZ0465 **Lab Name: Emax Laboratories, Inc.**

Program HW

Parameter	EPA Method	Billing Code	Cert Date
Lead	EPA 6020	MTL7	01/21/05
Magnesium	EPA 6010B	MTL3	06/11/98
Manganese	EPA 6010B	MTL3	06/11/98
Manganese	EPA 6020	MTL7	01/21/05
Mercury	EPA 7470A	MTL5	02/02/94
Mercury	EPA 7471A	MTL5	02/10/95
Molybdenum	EPA 6010B	MTL3	06/11/98
Nickel	EPA 6010B	MTL3	06/11/98
Nickel	EPA 6020	MTL7	01/21/05
Nitrate	EPA 9056	NIIIA1	02/18/04
Nitrite	EPA 9056	NIIIA1	02/18/04
Nitroaromatics And Nitramines	EPA 8330	SOC7	03/11/99
Oil And Grease	EPA 1664A	MISC6	02/18/04
Organochlorine Pesticides	EPA 8081A	SOC9	06/11/98
Organophosphorus Pesticides	EPA 8141A	SOC10	03/11/98
Ortho-Phosphate	EPA 9056	NIIIA1	02/18/04
Phosphorous	EPA 365.3	MISC24	01/21/05
Phosphorus	EPA 6010B	MTL3	02/18/04
Polychlorinated Biphenyls	EPA 8082	SOC9	04/08/98
Polynuclear Aromatic Hydrocarbons	EPA 8310	SOC13	02/02/94
Potassium	EPA 6010B	MTL3	06/11/98
Purge And Trap	EPA 5030B	*	06/11/98
Purge And Trap	EPA 5035	*	02/18/04
Reactivity	REACTIVITY	HAZ3	02/02/94
Sediments, Sludges And Soils	EPA 3050B	*	02/18/04
Selenium	EPA 6010B	MTL3	06/11/98
Semivolatile Organics	EPA 8270C	SOC16	06/11/98
Silver	EPA 6010B	MTL3	06/11/98
Silver	EPA 6020	MTL7	01/21/05
Sodium	EPA 6010B	MTL3	06/11/98
Sonication Extraction	EPA 3550B	*	06/11/98
Strontium	EPA 6010B	MTL3	06/11/98
Sulfate	EPA 9056	NIIIA1	02/18/04
Sulfide	EPA 9030B	MISC11	06/11/98
Sulfide	EPA 9034	MISC11	04/08/03
Sulfur Cleanup	EPA 3660B	*	02/18/04
Sulfuric Acid/Permanganate Cleanup	EPA 3665A	*	01/21/05
Synthetic Precipitation Leaching Procedure (Splp)	EPA 1312	HAZ6	03/11/98
Thallium	EPA 6010B	MTL3	06/11/98
Thallium	EPA 6020	MTL7	01/21/05
Tin	EPA 6010B	MTL3	02/18/04

AZ License: AZ0465 **Lab Name: Emax Laboratories, Inc.**

Program HW

Parameter	EPA Method	Billing Code	Cert Date
Titanium	EPA 6010B	MTL3	02/18/04
Total Metals	EPA 3010A	*	02/15/00
Total Organic Carbon	EPA 9060	MISC1	02/02/94
Total Petroleum Hydrocarbons In Soil	418.1AZ	MISC5	04/08/98
Toxicity Characteristics Leaching Procedure	EPA 1311	HAZ5	02/02/94
Vanadium	EPA 6010B	MTL3	06/11/98
Volatile Organics	EPA 8260B	VOC8	06/11/98
Waste Dilution	EPA 3580A	*	02/18/04
Zinc	EPA 6010B	MTL3	06/11/98
Zinc	EPA 6020	MTL7	01/21/05

Total Licensed Parameters in this Program: 90

Program SDW

Parameter	EPA Method	Billing Code	Cert Date
Bromate	EPA 300.1	NIIIA1	03/10/05
Perchlorate	EPA 314.0	MISC24	02/18/04

Total Licensed Parameters in this Program: 2

Program WW

Parameter	EPA Method	Billing Code	Cert Date
Aluminum	EPA 200.7	MTL3	01/21/05
Antimony	EPA 200.7	MTL3	01/21/05
Arsenic	EPA 200.7	MTL3	01/21/05
Barium	EPA 200.7	MTL3	01/21/05
Beryllium	EPA 200.7	MTL3	01/21/05
Cadmium	EPA 200.7	MTL3	01/21/05
Chloride	EPA 300.0	NIIIA1	03/07/96
Chromium Total	EPA 200.7	MTL3	01/21/05
Cobalt	EPA 200.7	MTL3	01/21/05
Copper	EPA 200.7	MTL3	01/21/05
Cyanide, Total	EPA 335.2	MISC7	02/02/94
Fluoride	EPA 300.0	NIIIA1	02/18/04
Hardness	EPA 130.1	NIA5	02/02/94
Hardness	EPA 130.2	NIA5	02/18/04
Hydrogen Ion (Ph)	EPA 150.1	NIA6	02/02/94
Hydrogen Ion (Ph)	SM 4500-H B	NIA6	02/18/04
Iron	EPA 200.7	MTL3	01/21/05
Iron	SM 3500-FE D	MTL4	01/24/06
Kjeldahl Nitrogen	EPA 351.3	NIIB3	03/11/98
Lead	EPA 200.7	MTL3	01/21/05
Magnesium	EPA 200.7	MTL3	01/21/05

AZ License: AZ0465 **Lab Name: Emax Laboratories, Inc.**

Program WW

Parameter	EPA Method	Billing Code	Cert Date
Manganese	EPA 200.7	MTL3	01/21/05
Mercury	EPA 245.1	MTL5	02/18/04
Mercury	EPA 245.2	MTL5	02/18/04
Molybdenum	EPA 200.7	MTL3	01/21/05
Nickel	EPA 200.7	MTL3	01/21/05
Nitrate	EPA 300.0	NIIIA1	02/02/94
Nitrate	EPA 353.3	NIB1	02/18/04
Nitrite	EPA 300.0	NIIIA1	02/02/94
Oil And Grease	EPA 1664	MISC6	02/18/04
Oil And Grease	EPA 413.1	MISC6	02/02/94
Organic Carbon, Total	EPA 415.1	MISC1	02/02/94
Ortho-Phosphate	EPA 300.0	NIIIA1	02/18/04
Ortho-Phosphate	EPA 365.2	NIIB5	03/11/98
Phenols	EPA 420.1	MISC8	02/18/04
Residue Filterable	EPA 160.1	NIA8	02/02/94
Residue Nonfilterable	EPA 160.2	NIIA5	02/02/94
Selenium	EPA 200.7	MTL3	01/21/05
Silver	EPA 200.7	MTL3	01/21/05
Specific Conductance	EPA 120.1	NIA7	02/02/94
Sulfate	EPA 300.0	NIIIA1	02/02/94
Sulfide	EPA 376.1	MISC11	03/11/98
Thallium	EPA 200.7	MTL3	01/21/05
Total Organic Carbon	SM 5310B	MISC1	02/18/04
Vanadium	EPA 200.7	MTL3	01/21/05
Zinc	EPA 200.7	MTL3	01/21/05

Total Licensed Parameters in this Program: 46

Instruments	Quantity	Date
GAS CHROMATOGRAPH	2	02/15/00
GAS CHROMATOGRAPH/MASS SPECTROMETER	2	02/10/03
ATOMIC ABSORPTION SPECTROPHOTOMETER	1	02/10/03
HIGH PERFORMANCE LIQUID CHROMATOGRAPH	1	02/15/00
ION CHROMATOGRAPH	1	03/07/96
INDUCTIVELY COUPLED PLASMA SPECTROMETER	1	02/10/03
MERCURY ANALYZER	1	02/10/03
INDUCTIVELY COUPLED PLASMA/MASS SPECTROMETER	1	01/21/05

Softwares
EZ CHROM - GC
ENVIROQUANT - GCMS

AZ License: AZ0465 **Lab Name: Emax Laboratories, Inc.**

EZ CHROM - HPLC
EZ CHROM - IC
VARIAN - AA
PS 200 SOFTWARE - MERCURY ANALYZER
THERMOSPEC VERSION 6.20 - ICP
AGILENT - ICP/MS

STATE OF CALIFORNIA
DEPARTMENT OF HEALTH SERVICES
ENVIRONMENTAL LABORATORY ACCREDITATION PROGRAM

NELAP - RECOGNIZED

ACCREDITATION

Is hereby granted to

EMAX LABORATORIES, INC.

1835 WEST 205th STREET

TORRANCE, CA 90501

Scope of accreditation is limited to the
"NELAP Fields of Accreditation"
which accompanies this Certificate.

Continued accredited status depends on successful
ongoing participation in the program.

This Certificate is granted in accordance with provisions of
Section 100825, et seq. of the Health and Safety Code.

Certificate No.: **02116CA**

Expiration Date: **08/31/2007**

Effective Date: **08/31/2006**

Richmond, California
subject to forfeiture or revocation

George C. Kulasingam, Ph.D.
Program Chief
Environmental Laboratory Accreditation Program

CALIFORNIA DEPARTMENT OF HEALTH SERVICES

ENVIRONMENTAL LABORATORY ACCREDITATION PROGRAM - NELAP RECOGNIZED

Fields of Accreditation

EMAX LABORATORIES, INC.

Lab Phone (310) 618-8889

1835 WEST 205th STREET
TORRANCE, CA 90501

Certificate No: 02116CA Renew Date: 08/31/2007

102 - Inorganic Chemistry of Drinking Water			
102.030	001	EPA 300.0	Bromide
102.030	002	EPA 300.0	Chlorate
102.030	003	EPA 300.0	Chloride
102.030	005	EPA 300.0	Fluoride
102.030	006	EPA 300.0	Nitrate
102.030	007	EPA 300.0	Nitrite
102.030	008	EPA 300.0	Phosphate, Ortho
102.030	010	EPA 300.0	Sulfate
102.040	004	EPA 300.1	Bromate
102.045	001	EPA 314.0	Perchlorate
102.100	001	SM2320B	Alkalinity
102.120	001	SM2340B	Hardness
102.121	001	SM2340C	Hardness
102.130	001	SM2510B	Conductivity
102.140	001	SM2540C	Total Dissolved Solids
102.145	001	EPA 160.1	Total Dissolved Solids
102.150	001	SM4110B	Chloride
102.150	002	SM4110B	Fluoride
102.150	003	SM4110B	Nitrate
102.150	004	SM4110B	Nitrite
102.150	005	SM4110B	Phosphate, Ortho
102.150	006	SM4110B	Sulfate
102.200	001	SM4500-F C	Fluoride
102.260	001	SM5310B	Total Organic Carbon
102.261	001	SM5310B	DOC
102.270	001	SM5540C	Surfactants
102.520	001	EPA 200.7	Calcium
102.520	002	EPA 200.7	Magnesium
102.520	003	EPA 200.7	Potassium
102.520	004	EPA 200.7	Silica
102.520	005	EPA 200.7	Sodium
103 - Toxic Chemical Elements of Drinking Water			
103.130	001	EPA 200.7	Aluminum

As of 09/20/2006, this list supersedes all previous lists for this certificate number.
Customers: Please verify the current accreditation standing with the State.

103.130	003	EPA 200.7	Barium
103.130	004	EPA 200.7	Beryllium
103.130	005	EPA 200.7	Cadmium
103.130	007	EPA 200.7	Chromium
103.130	008	EPA 200.7	Copper
103.130	009	EPA 200.7	Iron
103.130	011	EPA 200.7	Manganese
103.130	012	EPA 200.7	Nickel
103.130	015	EPA 200.7	Silver
103.130	017	EPA 200.7	Zinc
103.140	001	EPA 200.8	Aluminum
103.140	002	EPA 200.8	Antimony
103.140	003	EPA 200.8	Arsenic
103.140	004	EPA 200.8	Barium
103.140	005	EPA 200.8	Beryllium
103.140	006	EPA 200.8	Cadmium
103.140	007	EPA 200.8	Chromium
103.140	008	EPA 200.8	Copper
103.140	009	EPA 200.8	Lead
103.140	010	EPA 200.8	Manganese
103.140	011	EPA 200.8	Mercury
103.140	012	EPA 200.8	Nickel
103.140	013	EPA 200.8	Selenium
103.140	014	EPA 200.8	Silver
103.140	015	EPA 200.8	Thallium
103.140	016	EPA 200.8	Zinc
103.161	001	EPA 245.2	Mercury

104 - Volatile Organic Chemistry of Drinking Water

104.030	001	EPA 504.1	1,2-Dibromoethane
104.030	002	EPA 504.1	1,2-Dibromo-3-chloropropane
104.040	000	EPA 524.2	Volatile Organic Compounds
104.040	001	EPA 524.2	Benzene
104.040	002	EPA 524.2	Bromobenzene
104.040	003	EPA 524.2	Bromochloromethane
104.040	006	EPA 524.2	Bromomethane
104.040	007	EPA 524.2	n-Butylbenzene
104.040	008	EPA 524.2	sec-Butylbenzene
104.040	009	EPA 524.2	tert-Butylbenzene
104.040	010	EPA 524.2	Carbon Tetrachloride
104.040	011	EPA 524.2	Chlorobenzene
104.040	012	EPA 524.2	Chloroethane

104.040	014	EPA 524.2	Chloromethane
104.040	015	EPA 524.2	2-Chlorotoluene
104.040	016	EPA 524.2	4-Chlorotoluene
104.040	018	EPA 524.2	Dibromomethane
104.040	019	EPA 524.2	1,3-Dichlorobenzene
104.040	020	EPA 524.2	1,2-Dichlorobenzene
104.040	021	EPA 524.2	1,4-Dichlorobenzene
104.040	022	EPA 524.2	Dichlorodifluoromethane
104.040	023	EPA 524.2	1,1-Dichloroethane
104.040	024	EPA 524.2	1,2-Dichloroethane
104.040	025	EPA 524.2	1,1-Dichloroethene
104.040	026	EPA 524.2	cis-1,2-Dichloroethene
104.040	027	EPA 524.2	trans-1,2-Dichloroethene
104.040	028	EPA 524.2	Dichloromethane
104.040	029	EPA 524.2	1,2-Dichloropropane
104.040	030	EPA 524.2	1,3-Dichloropropane
104.040	031	EPA 524.2	2,2-Dichloropropane
104.040	032	EPA 524.2	1,1-Dichloropropene
104.040	033	EPA 524.2	cis-1,3-Dichloropropene
104.040	034	EPA 524.2	trans-1,3-Dichloropropene
104.040	035	EPA 524.2	Ethylbenzene
104.040	036	EPA 524.2	Hexachlorobutadiene
104.040	037	EPA 524.2	Isopropylbenzene
104.040	038	EPA 524.2	4-Isopropyltoluene
104.040	039	EPA 524.2	Naphthalene
104.040	040	EPA 524.2	Nitrobenzene
104.040	041	EPA 524.2	N-propylbenzene
104.040	042	EPA 524.2	Styrene
104.040	043	EPA 524.2	1,1,1,2-Tetrachloroethane
104.040	044	EPA 524.2	1,1,2,2-Tetrachloroethane
104.040	045	EPA 524.2	Tetrachloroethene
104.040	046	EPA 524.2	Toluene
104.040	047	EPA 524.2	1,2,3-Trichlorobenzene
104.040	048	EPA 524.2	1,2,4-Trichlorobenzene
104.040	049	EPA 524.2	1,1,1-Trichloroethane
104.040	050	EPA 524.2	1,1,2-Trichloroethane
104.040	051	EPA 524.2	Trichloroethene
104.040	052	EPA 524.2	Trichlorofluoromethane
104.040	053	EPA 524.2	1,2,3-Trichloropropane
104.040	054	EPA 524.2	1,2,4-Trimethylbenzene
104.040	055	EPA 524.2	1,3,5-Trimethylbenzene

104.040	056	EPA 524.2	Vinyl Chloride
104.040	057	EPA 524.2	Xylenes, Total
104.045	001	EPA 524.2	Bromodichloromethane
104.045	002	EPA 524.2	Bromoform
104.045	003	EPA 524.2	Chloroform
104.045	004	EPA 524.2	Dibromochloromethane
104.045	005	EPA 524.2	Trihalomethanes
104.050	002	EPA 524.2	Methyl tert-butyl Ether (MTBE)
104.050	004	EPA 524.2	tert-Amyl Methyl Ether (TAME)
104.050	005	EPA 524.2	Ethyl tert-butyl Ether (ETBE)
104.050	006	EPA 524.2	Trichlorotrifluoroethane

108 - Inorganic Chemistry of Wastewater

108.016	001	EPA 110.2	Color
108.020	001	EPA 120.1	Conductivity
108.030	001	EPA 130.1	Hardness
108.040	001	EPA 130.2	Hardness
108.050	001	EPA 150.1	pH
108.060	001	EPA 160.1	Residue, Filterable
108.070	001	EPA 160.2	Residue, Non-filterable
108.080	001	EPA 160.3	Residue, Total
108.090	001	EPA 160.4	Residue, Volatile
108.100	001	EPA 160.5	Residue, Settleable
108.110	001	EPA 180.1	Turbidity
108.112	001	EPA 200.7	Boron
108.112	002	EPA 200.7	Calcium
108.112	004	EPA 200.7	Magnesium
108.112	005	EPA 200.7	Potassium
108.112	006	EPA 200.7	Silica
108.112	007	EPA 200.7	Sodium
108.120	001	EPA 300.0	Bromide
108.120	002	EPA 300.0	Chloride
108.120	003	EPA 300.0	Fluoride
108.120	004	EPA 300.0	Nitrate
108.120	005	EPA 300.0	Nitrite
108.120	006	EPA 300.0	Nitrate-nitrite, Total
108.120	007	EPA 300.0	Phosphate, Ortho
108.120	008	EPA 300.0	Sulfate
108.130	001	EPA 305.1	Acidity
108.140	001	EPA 310.1	Alkalinity
108.172	001	EPA 330.3	Chlorine Residual, Total
108.181	001	EPA 335.2	Cyanide, Total

108.191	001	EPA 340.2	Fluoride
108.201	001	EPA 350.2	Ammonia
108.212	001	EPA 351.3	Kjeldahl Nitrogen
108.234	001	EPA 353.3	Nitrate-nitrite, Total
108.235	001	EPA 353.3	Nitrate calc.
108.262	001	EPA 365.2	Phosphate, Ortho
108.263	001	EPA 365.2	Phosphorus, Total
108.270	001	EPA 370.1	Dissolved Silica
108.290	001	EPA 376.1	Sulfide
108.291	001	EPA 376.2	Sulfide
108.300	001	EPA 377.1	Sulfite
108.310	001	EPA 405.1	Biochemical Oxygen Demand
108.323	001	EPA 410.4	Chemical Oxygen Demand
108.330	001	EPA 413.1	Oil and Grease
108.340	001	EPA 415.1	Total Organic Carbon
108.350	001	EPA 418.1	Total Recoverable Petroleum Hydrocarbons
108.360	001	EPA 420.1	Phenols, Total
108.370	001	EPA 425.1	Surfactants
108.380	001	EPA 1664	Oil and Grease
108.390	001	SM2130B	Turbidity
108.400	001	SM2310B	Acidity
108.410	001	SM2320B	Alkalinity
108.420	001	SM2340B	Hardness (calc.)
108.421	001	SM2340C	Hardness
108.430	001	SM2510B	Conductivity
108.440	001	SM2540B	Residue, Total
108.441	001	SM2540C	Residue, Filterable
108.442	001	SM2540D	Residue, Non-filterable
108.443	001	SM2540F	Residue, Settleable
108.480	001	SM4500-F C	Fluoride
108.490	001	SM4500-H+ B	pH
108.590	001	SM5210B	Biochemical Oxygen Demand
108.602	001	SM5220D	Chemical Oxygen Demand
108.610	001	SM5310B	Total Organic Carbon
108.630	001	SM5520B	Oil and Grease

109 - Toxic Chemical Elements of Wastewater

109.010	001	EPA 200.7	Aluminum
109.010	002	EPA 200.7	Antimony
109.010	003	EPA 200.7	Arsenic
109.010	004	EPA 200.7	Barium
109.010	005	EPA 200.7	Beryllium

109.010	007	EPA 200.7	Cadmium
109.010	009	EPA 200.7	Chromium
109.010	010	EPA 200.7	Cobalt
109.010	011	EPA 200.7	Copper
109.010	012	EPA 200.7	Iron
109.010	013	EPA 200.7	Lead
109.010	015	EPA 200.7	Manganese
109.010	016	EPA 200.7	Molybdenum
109.010	017	EPA 200.7	Nickel
109.010	019	EPA 200.7	Selenium
109.010	021	EPA 200.7	Silver
109.010	023	EPA 200.7	Thallium
109.010	024	EPA 200.7	Tin
109.010	025	EPA 200.7	Titanium
109.010	026	EPA 200.7	Vanadium
109.010	027	EPA 200.7	Zinc
109.020	001	EPA 200.8	Aluminum
109.020	002	EPA 200.8	Antimony
109.020	003	EPA 200.8	Arsenic
109.020	004	EPA 200.8	Barium
109.020	005	EPA 200.8	Beryllium
109.020	006	EPA 200.8	Cadmium
109.020	007	EPA 200.8	Chromium
109.020	008	EPA 200.8	Cobalt
109.020	009	EPA 200.8	Copper
109.020	010	EPA 200.8	Lead
109.020	011	EPA 200.8	Manganese
109.020	012	EPA 200.8	Molybdenum
109.020	013	EPA 200.8	Nickel
109.020	014	EPA 200.8	Selenium
109.020	015	EPA 200.8	Silver
109.020	016	EPA 200.8	Thallium
109.020	017	EPA 200.8	Vanadium
109.020	018	EPA 200.8	Zinc
109.104	001	EPA 218.6	Chromium (VI)

110 - Volatile Organic Chemistry of Wastewater

110.040	001	EPA 624	Benzene
110.040	002	EPA 624	Bromodichloromethane
110.040	003	EPA 624	Bromoform
110.040	004	EPA 624	Bromomethane
110.040	005	EPA 624	Carbon Tetrachloride

110.040	006	EPA 624	Chlorobenzene
110.040	007	EPA 624	Chloroethane
110.040	008	EPA 624	2-Chloroethyl Vinyl Ether
110.040	009	EPA 624	Chloroform
110.040	010	EPA 624	Chloromethane
110.040	011	EPA 624	Dibromochloromethane
110.040	012	EPA 624	1,2-Dichlorobenzene
110.040	013	EPA 624	1,3-Dichlorobenzene
110.040	014	EPA 624	1,4-Dichlorobenzene
110.040	015	EPA 624	1,1-Dichloroethane
110.040	016	EPA 624	1,2-Dichloroethane
110.040	017	EPA 624	1,1-Dichloroethene
110.040	018	EPA 624	trans-1,2-Dichloroethene
110.040	019	EPA 624	1,2-Dichloropropane
110.040	020	EPA 624	cis-1,3-Dichloropropene
110.040	021	EPA 624	trans-1,3-Dichloropropene
110.040	022	EPA 624	Ethylbenzene
110.040	023	EPA 624	Methylene Chloride
110.040	024	EPA 624	1,1,2,2-Tetrachloroethane
110.040	025	EPA 624	Tetrachloroethene
110.040	026	EPA 624	Toluene
110.040	027	EPA 624	1,1,1-Trichloroethane
110.040	028	EPA 624	1,1,2-Trichloroethane
110.040	029	EPA 624	Trichloroethene
110.040	030	EPA 624	Trichlorofluoromethane
110.040	031	EPA 624	Vinyl Chloride
110.040	042	EPA 624	Oxygenates

111 - Semi-volatile Organic Chemistry of Wastewater

111.100	001	EPA 625	Acenaphthene
111.100	002	EPA 625	Acenaphthylene
111.100	003	EPA 625	Anthracene
111.100	004	EPA 625	Benzidine
111.100	005	EPA 625	Benz(a)anthracene
111.100	006	EPA 625	Benzo(b)fluoranthene
111.100	007	EPA 625	Benzo(k)fluoranthene
111.100	008	EPA 625	Benzo(g,h,i)perylene
111.100	009	EPA 625	Benzo(a)pyrene
111.100	010	EPA 625	Benzyl Butyl Phthalate
111.100	011	EPA 625	Bis(2-chloroethoxy)methane
111.100	012	EPA 625	Bis(2-chloroethyl) Ether
111.100	013	EPA 625	Bis(2-chloroisopropyl) Ether

111.100	014	EPA 625	Di(2-ethylhexyl) Phthalate
111.100	015	EPA 625	4-Bromophenyl Phenyl Ether
111.100	016	EPA 625	4-Chloro-3-methylphenol
111.100	017	EPA 625	2-Chloronaphthalene
111.100	018	EPA 625	2-Chlorophenol
111.100	019	EPA 625	4-Chlorophenyl Phenyl Ether
111.100	020	EPA 625	Chrysene
111.100	021	EPA 625	Dibenz(a,h)anthracene
111.100	022	EPA 625	1,2-Dichlorobenzene
111.100	023	EPA 625	1,3-Dichlorobenzene
111.100	024	EPA 625	1,4-Dichlorobenzene
111.100	025	EPA 625	3,3'-Dichlorobenzidine
111.100	026	EPA 625	2,4-Dichlorophenol
111.100	027	EPA 625	Diethyl Phthalate
111.100	028	EPA 625	2,4-Dimethylphenol
111.100	029	EPA 625	Dimethyl Phthalate
111.100	030	EPA 625	Di-n-butyl phthalate
111.100	031	EPA 625	Di-n-octyl phthalate
111.100	032	EPA 625	2,4-Dinitrophenol
111.100	033	EPA 625	2,4-Dinitrotoluene
111.100	034	EPA 625	2,6-Dinitrotoluene
111.100	035	EPA 625	Fluoranthene
111.100	036	EPA 625	Fluorene
111.100	037	EPA 625	Hexachlorobenzene
111.100	038	EPA 625	Hexachlorobutadiene
111.100	039	EPA 625	Hexachlorocyclopentadiene
111.100	040	EPA 625	Hexachloroethane
111.100	041	EPA 625	Indeno(1,2,3-c,d)pyrene
111.100	042	EPA 625	Isophorone
111.100	043	EPA 625	2-Methyl-4,6-dinitrophenol
111.100	044	EPA 625	Naphthalene
111.100	045	EPA 625	Nitrobenzene
111.100	046	EPA 625	2-Nitrophenol
111.100	047	EPA 625	4-Nitrophenol
111.100	048	EPA 625	N-nitrosodimethylamine
111.100	049	EPA 625	N-nitrosodi-n-propylamine
111.100	050	EPA 625	N-nitrosodiphenylamine
111.100	051	EPA 625	Pentachlorophenol
111.100	052	EPA 625	Phenanthrene
111.100	053	EPA 625	Phenol
111.100	054	EPA 625	Pyrene

111.100	055	EPA 625	1,2,4-Trichlorobenzene
111.100	056	EPA 625	2,4,6-Trichlorophenol
111.170	001	EPA 608	Aldrin
111.170	002	EPA 608	a-BHC
111.170	003	EPA 608	b-BHC
111.170	004	EPA 608	d-BHC
111.170	005	EPA 608	g-BHC (Lindane)
111.170	006	EPA 608	Chlordane
111.170	007	EPA 608	4,4'-DDD
111.170	008	EPA 608	4,4'-DDE
111.170	009	EPA 608	4,4'-DDT
111.170	010	EPA 608	Dieldrin
111.170	011	EPA 608	Endosulfan I
111.170	012	EPA 608	Endosulfan II
111.170	013	EPA 608	Endosulfan Sulfate
111.170	014	EPA 608	Endrin
111.170	015	EPA 608	Endrin Aldehyde
111.170	016	EPA 608	Heptachlor
111.170	017	EPA 608	Heptachlor Epoxide
111.170	018	EPA 608	Toxaphene
111.170	019	EPA 608	PCB-1016
111.170	020	EPA 608	PCB-1221
111.170	021	EPA 608	PCB-1232
111.170	022	EPA 608	PCB-1242
111.170	023	EPA 608	PCB-1248
111.170	024	EPA 608	PCB-1254
111.170	025	EPA 608	PCB-1260
111.170	031	EPA 608	PCBs

114 - Inorganic Chemistry of Hazardous Waste

114.010	001	EPA 6010B	Antimony
114.010	002	EPA 6010B	Arsenic
114.010	003	EPA 6010B	Barium
114.010	004	EPA 6010B	Beryllium
114.010	005	EPA 6010B	Cadmium
114.010	006	EPA 6010B	Chromium
114.010	007	EPA 6010B	Cobalt
114.010	008	EPA 6010B	Copper
114.010	009	EPA 6010B	Lead
114.010	010	EPA 6010B	Molybdenum
114.010	011	EPA 6010B	Nickel
114.010	012	EPA 6010B	Selenium

114.010	013	EPA 6010B	Silver
114.010	014	EPA 6010B	Thallium
114.010	015	EPA 6010B	Vanadium
114.010	016	EPA 6010B	Zinc
114.020	001	EPA 6020	Antimony
114.020	002	EPA 6020	Arsenic
114.020	003	EPA 6020	Barium
114.020	004	EPA 6020	Beryllium
114.020	005	EPA 6020	Cadmium
114.020	006	EPA 6020	Chromium
114.020	007	EPA 6020	Cobalt
114.020	008	EPA 6020	Copper
114.020	009	EPA 6020	Lead
114.020	010	EPA 6020	Molybdenum
114.020	011	EPA 6020	Nickel
114.020	012	EPA 6020	Selenium
114.020	013	EPA 6020	Silver
114.020	014	EPA 6020	Thallium
114.020	015	EPA 6020	Vanadium
114.020	016	EPA 6020	Zinc
114.103	001	EPA 7196A	Chromium (VI)
114.106	001	EPA 7199	Chromium (VI)
114.140	001	EPA 7470A	Mercury
114.141	001	EPA 7471A	Mercury
114.222	001	EPA 9014	Cyanide
114.230	001	EPA 9034	Sulfides, Total
114.240	001	EPA 9040B	Corrosivity - pH Determination
114.241	001	EPA 9045C	Corrosivity - pH Determination
114.250	001	EPA 9056	Fluoride
115 - Extraction Test of Hazardous Waste			
115.020	001	EPA 1311	Toxicity Characteristic Leaching Procedure (TCLP)
115.030	001	CCR Chapter11, Article 5, Appendix II	Waste Extraction Test (WET)
115.040	001	EPA 1312	Synthetic Precipitation Leaching Procedure (SPLP)
116 - Volatile Organic Chemistry of Hazardous Waste			
116.010	001	EPA 8011	1,2-Dibromoethane
116.010	002	EPA 8011	Dibromochloropropane
116.020	011	EPA 8015B	Ethylene Glycol
116.030	001	EPA 8015B	Gasoline-range Organics
116.040	002	EPA 8021B	Benzene
116.040	039	EPA 8021B	Ethylbenzene
116.040	041	EPA 8021B	Methyl tert-butyl Ether (MTBE)

116.040	047	EPA 8021B	Toluene
116.040	056	EPA 8021B	Xylenes, Total
116.080	001	EPA 8260B	Acetone
116.080	002	EPA 8260B	Acetonitrile
116.080	003	EPA 8260B	Acrolein
116.080	004	EPA 8260B	Acrylonitrile
116.080	005	EPA 8260B	Allyl Alcohol
116.080	006	EPA 8260B	Allyl Chloride
116.080	007	EPA 8260B	Benzene
116.080	009	EPA 8260B	Bromoacetone
116.080	010	EPA 8260B	Bromochloromethane
116.080	011	EPA 8260B	Bromodichloromethane
116.080	012	EPA 8260B	Bromoform
116.080	013	EPA 8260B	Bromomethane
116.080	014	EPA 8260B	n-Butyl Alcohol
116.080	015	EPA 8260B	Carbon Disulfide
116.080	016	EPA 8260B	Carbon Tetrachloride
116.080	018	EPA 8260B	Chlorobenzene
116.080	019	EPA 8260B	Chloroethane
116.080	020	EPA 8260B	2-Chloroethyl Vinyl Ether
116.080	021	EPA 8260B	Chloroform
116.080	022	EPA 8260B	Chloromethane
116.080	023	EPA 8260B	Chloroprene
116.080	024	EPA 8260B	3-Chloropropionitrile
116.080	025	EPA 8260B	Crotonaldehyde
116.080	026	EPA 8260B	Dibromochloromethane
116.080	027	EPA 8260B	Dibromochloropropane
116.080	028	EPA 8260B	1,2-Dibromoethane
116.080	030	EPA 8260B	Dibromomethane
116.080	031	EPA 8260B	1,2-Dichlorobenzene
116.080	032	EPA 8260B	1,3-Dichlorobenzene
116.080	033	EPA 8260B	1,4-Dichlorobenzene
116.080	034	EPA 8260B	cis-1,4-Dichloro-2-butene
116.080	035	EPA 8260B	trans-1,4-Dichloro-2-butene
116.080	036	EPA 8260B	Dichlorodifluoromethane
116.080	037	EPA 8260B	1,1-Dichloroethane
116.080	038	EPA 8260B	1,2-Dichloroethane
116.080	039	EPA 8260B	1,1-Dichloroethene
116.080	040	EPA 8260B	trans-1,2-Dichloroethene
116.080	041	EPA 8260B	cis-1,2-Dichloroethene
116.080	042	EPA 8260B	1,2-Dichloropropane

116.080	043	EPA 8260B	1,3-Dichloropropane
116.080	044	EPA 8260B	2,2-Dichloropropane
116.080	045	EPA 8260B	1,1-Dichloropropene
116.080	046	EPA 8260B	cis-1,3-Dichloropropene
116.080	047	EPA 8260B	trans-1,3-Dichloropropene
116.080	048	EPA 8260B	1,3-Dichloro-2-propanol
116.080	049	EPA 8260B	1,2,3,4-Diepoxybutane
116.080	050	EPA 8260B	1,4-Dioxane
116.080	053	EPA 8260B	Ethylbenzene
116.080	055	EPA 8260B	Ethyl Methacrylate
116.080	056	EPA 8260B	Hexachlorobutadiene
116.080	058	EPA 8260B	2-Hexanone (MBK)
116.080	059	EPA 8260B	Iodomethane
116.080	060	EPA 8260B	Isobutyl Alcohol
116.080	061	EPA 8260B	Malononitrile
116.080	062	EPA 8260B	Methacrylonitrile
116.080	064	EPA 8260B	Methyl tert-butyl Ether (MTBE)
116.080	065	EPA 8260B	Methylene Chloride
116.080	066	EPA 8260B	Methyl Ethyl Ketone
116.080	067	EPA 8260B	Methyl Methacrylate
116.080	068	EPA 8260B	4-Methyl-2-pentanone (MIBK)
116.080	069	EPA 8260B	Naphthalene
116.080	070	EPA 8260B	Nitrobenzene
116.080	072	EPA 8260B	N-nitrosodi-n-butylamine
116.080	074	EPA 8260B	Pentachloroethane
116.080	075	EPA 8260B	Pentafluorobenzene
116.080	076	EPA 8260B	2-Picoline
116.080	078	EPA 8260B	Propionitrile
116.080	079	EPA 8260B	N-propylamine
116.080	080	EPA 8260B	Pyridine
116.080	081	EPA 8260B	1,1,1,2-Tetrachloroethane
116.080	082	EPA 8260B	1,1,2,2-Tetrachloroethane
116.080	083	EPA 8260B	Tetrachloroethene
116.080	084	EPA 8260B	Toluene
116.080	086	EPA 8260B	1,2,3-Trichlorobenzene
116.080	087	EPA 8260B	1,2,4-Trichlorobenzene
116.080	088	EPA 8260B	1,1,1-Trichloroethane
116.080	089	EPA 8260B	1,1,2-Trichloroethane
116.080	090	EPA 8260B	Trichloroethene
116.080	091	EPA 8260B	Trichlorofluoromethane
116.080	092	EPA 8260B	1,2,3-Trichloropropane

116.080	093	EPA 8260B	Vinyl Acetate
116.080	094	EPA 8260B	Vinyl Chloride
116.080	095	EPA 8260B	Xylenes, Total
116.080	096	EPA 8260B	tert-Amyl Methyl Ether (TAME)
116.080	097	EPA 8260B	tert-Butyl Alcohol (TBA)
116.080	098	EPA 8260B	Ethyl tert-butyl Ether (ETBE)
116.080	099	EPA 8260B	Bromobenzene
116.080	100	EPA 8260B	n-Butylbenzene
116.080	101	EPA 8260B	sec-Butylbenzene
116.080	102	EPA 8260B	tert-Butylbenzene
116.080	103	EPA 8260B	2-Chlorotoluene
116.080	104	EPA 8260B	4-Chlorotoluene
116.080	105	EPA 8260B	Isopropylbenzene
116.080	106	EPA 8260B	N-propylbenzene
116.080	107	EPA 8260B	Styrene
116.080	108	EPA 8260B	1,2,4-Trimethylbenzene
116.080	109	EPA 8260B	1,3,5-Trimethylbenzene

117 - Semi-volatile Organic Chemistry of Hazardous Waste

117.010	001	EPA 8015B	Diesel-range Total Petroleum Hydrocarbons
117.015	001	LUFT GC/MS	Diesel-range Total Petroleum Hydrocarbons
117.016	001	LUFT	Diesel-range Total Petroleum Hydrocarbons
117.017	001	EPA 418.1	TRPH Screening
117.110	001	EPA 8270C	Acenaphthene
117.110	002	EPA 8270C	Acenaphthylene
117.110	003	EPA 8270C	Acetophenone
117.110	004	EPA 8270C	2-Acetylaminofluorene
117.110	005	EPA 8270C	1-Acetyl-2-thiourea
117.110	006	EPA 8270C	4-Aminobiphenyl
117.110	007	EPA 8270C	Aniline
117.110	008	EPA 8270C	Anthracene
117.110	010	EPA 8270C	Benzidine
117.110	011	EPA 8270C	Benz(a)anthracene
117.110	012	EPA 8270C	Benzo(b)fluoranthene
117.110	013	EPA 8270C	Benzo(k)fluoranthene
117.110	014	EPA 8270C	Benzo(g,h,i)perylene
117.110	015	EPA 8270C	Benzo(a)pyrene
117.110	016	EPA 8270C	Benzoic Acid
117.110	017	EPA 8270C	p-Benzoquinone
117.110	018	EPA 8270C	Benzyl Alcohol
117.110	019	EPA 8270C	Benzyl Butyl Phthalate
117.110	020	EPA 8270C	Bis(2-chloroethoxy)methane

117.110	021	EPA 8270C	Bis(2-chloroethyl) Ether
117.110	022	EPA 8270C	Bis(2-chloroisopropyl) Ether
117.110	023	EPA 8270C	Di(2-ethylhexyl) Phthalate
117.110	024	EPA 8270C	4-Bromophenyl Phenyl Ether
117.110	025	EPA 8270C	Carbazole
117.110	026	EPA 8270C	4-Chloroaniline
117.110	027	EPA 8270C	4-Chloro-3-methylphenol
117.110	029	EPA 8270C	2-Chloronaphthalene
117.110	030	EPA 8270C	2-Chlorophenol
117.110	031	EPA 8270C	4-Chlorophenyl Phenyl Ether
117.110	032	EPA 8270C	Chrysene
117.110	033	EPA 8270C	2-Cyclohexyl-4,6-dinitrophenol
117.110	034	EPA 8270C	2,4-Diaminotoluene
117.110	036	EPA 8270C	Dibenz(a,h)anthracene
117.110	037	EPA 8270C	Dibenzofuran
117.110	038	EPA 8270C	Dibenzo(a,e)pyrene
117.110	039	EPA 8270C	1,2-Dichlorobenzene
117.110	040	EPA 8270C	1,3-Dichlorobenzene
117.110	041	EPA 8270C	1,4-Dichlorobenzene
117.110	042	EPA 8270C	3,3'-Dichlorobenzidine
117.110	043	EPA 8270C	2,4-Dichlorophenol
117.110	044	EPA 8270C	2,6-Dichlorophenol
117.110	045	EPA 8270C	Diethyl Phthalate
117.110	050	EPA 8270C	p-Dimethylaminoazobenzene
117.110	051	EPA 8270C	7,12-Dimethylbenz(a)anthracene
117.110	052	EPA 8270C	a,a-Dimethylphenethylamine
117.110	053	EPA 8270C	2,4-Dimethylphenol
117.110	054	EPA 8270C	Dimethyl Phthalate
117.110	055	EPA 8270C	Di-n-butyl phthalate
117.110	056	EPA 8270C	Di-n-octyl phthalate
117.110	060	EPA 8270C	2,4-Dinitrophenol
117.110	061	EPA 8270C	2,4-Dinitrotoluene
117.110	062	EPA 8270C	2,6-Dinitrotoluene
117.110	063	EPA 8270C	Diphenylamine
117.110	064	EPA 8270C	1,2-Diphenylhydrazine
117.110	066	EPA 8270C	Ethyl Methanesulfonate
117.110	067	EPA 8270C	Fluoranthene
117.110	068	EPA 8270C	Fluorene
117.110	069	EPA 8270C	Hexachlorobenzene
117.110	070	EPA 8270C	Hexachlorobutadiene
117.110	071	EPA 8270C	Hexachlorocyclopentadiene

117.110	072	EPA 8270C	Hexachloroethane
117.110	073	EPA 8270C	Hexachlorophene
117.110	074	EPA 8270C	Hexachloropropene
117.110	075	EPA 8270C	Indeno(1,2,3-c,d)pyrene
117.110	076	EPA 8270C	Isophorone
117.110	077	EPA 8270C	Isosafrole
117.110	078	EPA 8270C	Maleic Anhydride
117.110	079	EPA 8270C	3-Methylcholanthrene
117.110	080	EPA 8270C	2-Methyl-4,6-dinitrophenol
117.110	082	EPA 8270C	Methyl Methanesulfonate
117.110	083	EPA 8270C	2-Methylnaphthalene
117.110	084	EPA 8270C	2-Methylphenol
117.110	085	EPA 8270C	3-Methylphenol
117.110	086	EPA 8270C	4-Methylphenol
117.110	087	EPA 8270C	Naphthalene
117.110	088	EPA 8270C	1,4-Naphthoquinone
117.110	089	EPA 8270C	1-Naphthylamine
117.110	090	EPA 8270C	2-Naphthylamine
117.110	091	EPA 8270C	Nicotine
117.110	092	EPA 8270C	2-Nitroaniline
117.110	093	EPA 8270C	3-Nitroaniline
117.110	094	EPA 8270C	4-Nitroaniline
117.110	095	EPA 8270C	Nitrobenzene
117.110	096	EPA 8270C	2-Nitrophenol
117.110	097	EPA 8270C	4-Nitrophenol
117.110	098	EPA 8270C	N-nitrosodi-n-butylamine
117.110	099	EPA 8270C	N-nitrosodiethylamine
117.110	100	EPA 8270C	N-nitrosodimethylamine
117.110	101	EPA 8270C	N-nitrosodi-n-propylamine
117.110	102	EPA 8270C	N-nitrosodiphenylamine
117.110	103	EPA 8270C	N-nitrosomethylethylamine
117.110	104	EPA 8270C	N-nitrosomorpholine
117.110	105	EPA 8270C	N-nitrosopiperidine
117.110	106	EPA 8270C	N-nitrosopyrrolidine
117.110	107	EPA 8270C	5-Nitro-o-toluidine
117.110	108	EPA 8270C	Pentachlorobenzene
117.110	109	EPA 8270C	Pentachloronitrobenzene
117.110	110	EPA 8270C	Pentachlorophenol
117.110	111	EPA 8270C	Phenacetin
117.110	112	EPA 8270C	Phenanthrene
117.110	113	EPA 8270C	Phenol

117.110	116	EPA 8270C	2-Picoline
117.110	119	EPA 8270C	Pyrene
117.110	120	EPA 8270C	Pyridine
117.110	122	EPA 8270C	Safrole
117.110	124	EPA 8270C	1,2,4,5-Tetrachlorobenzene
117.110	125	EPA 8270C	2,3,4,6-Tetrachlorophenol
117.110	128	EPA 8270C	o-Toluidine
117.110	129	EPA 8270C	1,2,4-Trichlorobenzene
117.110	130	EPA 8270C	2,4,5-Trichlorophenol
117.110	131	EPA 8270C	2,4,6-Trichlorophenol
117.110	132	EPA 8270C	1,3,5-Trinitrobenzene
117.111	025	EPA 8270C	Dimethoate
117.111	026	EPA 8270C	Dinoseb
117.111	036	EPA 8270C	Famphur
117.111	039	EPA 8270C	Isodrin
117.111	040	EPA 8270C	Kepone
117.111	054	EPA 8270C	Parathion Ethyl
117.111	055	EPA 8270C	Parathion Methyl
117.111	056	EPA 8270C	Phorate
117.111	058	EPA 8270C	Sulfotepp
117.111	061	EPA 8270C	O,O,O-triethyl Phosphorothioate
117.140	001	EPA 8310	Acenaphthene
117.140	002	EPA 8310	Acenaphthylene
117.140	003	EPA 8310	Anthracene
117.140	004	EPA 8310	Benz(a)anthracene
117.140	005	EPA 8310	Benzo(a)pyrene
117.140	006	EPA 8310	Benzo(b)fluoranthene
117.140	007	EPA 8310	Benzo(k)fluoranthene
117.140	008	EPA 8310	Benzo(g,h,i)perylene
117.140	009	EPA 8310	Chrysene
117.140	010	EPA 8310	Dibenz(a,h)anthracene
117.140	011	EPA 8310	Fluoranthene
117.140	012	EPA 8310	Fluorene
117.140	013	EPA 8310	Indeno(1,2,3-c,d)pyrene
117.140	014	EPA 8310	Naphthalene
117.140	015	EPA 8310	Phenanthrene
117.140	016	EPA 8310	Pyrene
117.170	001	EPA 8330	4-Amino-2,6-dinitrotoluene
117.170	002	EPA 8330	2-Amino-4,6-dinitrotoluene
117.170	003	EPA 8330	1,3-Dinitrobenzene
117.170	004	EPA 8330	2,4-Dinitrotoluene

117.170	005	EPA 8330	2,6-Dinitrotoluene
117.170	006	EPA 8330	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)
117.170	007	EPA 8330	Methyl-2,4,6-trinitrophenylnitramine
117.170	008	EPA 8330	Nitrobenzene
117.170	009	EPA 8330	2-Nitrotoluene
117.170	010	EPA 8330	3-Nitrotoluene
117.170	011	EPA 8330	4-Nitrotoluene
117.170	012	EPA 8330	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine
117.170	013	EPA 8330	1,3,5-Trinitrobenzene
117.170	014	EPA 8330	2,4,6-Trinitrotoluene
117.190	001	EPA 8332	Nitroglycerine
117.210	001	EPA 8081A	Aldrin
117.210	002	EPA 8081A	a-BHC
117.210	003	EPA 8081A	b-BHC
117.210	004	EPA 8081A	d-BHC
117.210	005	EPA 8081A	g-BHC (Lindane)
117.210	007	EPA 8081A	a-Chlordane
117.210	008	EPA 8081A	g-Chlordane
117.210	009	EPA 8081A	Chlordane (tech.)
117.210	010	EPA 8081A	Chlorobenzilate
117.210	011	EPA 8081A	Chloroneb
117.210	012	EPA 8081A	Chlorothalonil
117.210	013	EPA 8081A	4,4'-DDD
117.210	014	EPA 8081A	4,4'-DDE
117.210	015	EPA 8081A	4,4'-DDT
117.210	016	EPA 8081A	Diallate
117.210	020	EPA 8081A	Dieldrin
117.210	021	EPA 8081A	Endosulfan I
117.210	022	EPA 8081A	Endosulfan II
117.210	023	EPA 8081A	Endosulfan Sulfate
117.210	024	EPA 8081A	Endrin
117.210	025	EPA 8081A	Endrin Aldehyde
117.210	026	EPA 8081A	Endrin Ketone
117.210	027	EPA 8081A	Heptachlor
117.210	028	EPA 8081A	Heptachlor Epoxide
117.210	029	EPA 8081A	Hexachlorobenzene
117.210	033	EPA 8081A	Methoxychlor
117.210	039	EPA 8081A	Toxaphene
117.220	001	EPA 8082	PCB-1016
117.220	002	EPA 8082	PCB-1221
117.220	003	EPA 8082	PCB-1232

117.220	004	EPA 8082	PCB-1242
117.220	005	EPA 8082	PCB-1248
117.220	006	EPA 8082	PCB-1254
117.220	007	EPA 8082	PCB-1260
117.220	008	EPA 8082	2-Chlorobiphenyl
117.220	009	EPA 8082	2,3-Dichlorobiphenyl
117.220	010	EPA 8082	2,2',5-Trichlorobiphenyl
117.220	011	EPA 8082	2,4',5-Trichlorobiphenyl
117.220	012	EPA 8082	2,2',3,5'-Tetrachlorobiphenyl
117.220	013	EPA 8082	2,2',5,5'-Tetrachlorobiphenyl
117.220	014	EPA 8082	2,3',4,4'-Tetrachlorobiphenyl
117.220	015	EPA 8082	2,2',3,4,5'-Pentachlorobiphenyl
117.220	016	EPA 8082	2,2',4,5,5'-Pentachlorobiphenyl
117.220	017	EPA 8082	2,3,3',4',6-Pentachlorobiphenyl
117.220	018	EPA 8082	2,2',3,4,4',5'-Hexachlorobiphenyl
117.220	019	EPA 8082	2,2',3,4,5,5'-Hexachlorobiphenyl
117.220	020	EPA 8082	2,2',3,5,5',6-Hexachlorobiphenyl
117.220	021	EPA 8082	2,2',4,4',5,5'-Hexachlorobiphenyl
117.220	022	EPA 8082	2,2',3,3',4,4',5-Heptachlorobiphenyl
117.220	023	EPA 8082	2,2',3,4,4',5,5'-Heptachlorobiphenyl
117.220	024	EPA 8082	2,2',3,4,4',5',6-Heptachlorobiphenyl
117.220	025	EPA 8082	2,2',3,4',5,5',6-Heptachlorobiphenyl
117.220	026	EPA 8082	2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl
117.240	001	EPA 8141A	Atrazine
117.240	002	EPA 8141A	Azinphos Methyl
117.240	004	EPA 8141A	Chlorfenvinphos
117.240	005	EPA 8141A	Chlorpyrifos
117.240	006	EPA 8141A	Chlorpyrifos Methyl
117.240	007	EPA 8141A	Demeton-O
117.240	008	EPA 8141A	Demeton-S
117.240	009	EPA 8141A	Diazinon
117.240	010	EPA 8141A	Dimethoate
117.240	012	EPA 8141A	EPN
117.240	013	EPA 8141A	Ethion
117.240	014	EPA 8141A	Famphur
117.240	015	EPA 8141A	Malathion
117.240	016	EPA 8141A	Mevinphos
117.240	017	EPA 8141A	Naled
117.240	018	EPA 8141A	Parathion Ethyl
117.240	019	EPA 8141A	Parathion Methyl
117.240	020	EPA 8141A	Phorate

117.240	022	EPA 8141A	Ronnel
117.240	024	EPA 8141A	Sulfotepp
117.240	026	EPA 8141A	Thionazin
117.250	001	EPA 8151A	2,4-D
117.250	002	EPA 8151A	2,4-DB
117.250	003	EPA 8151A	2,4,5-T
117.250	004	EPA 8151A	2,4,5-TP
117.250	006	EPA 8151A	Dalapon
117.250	007	EPA 8151A	Dichlorprop
117.250	008	EPA 8151A	Dinoseb
117.250	009	EPA 8151A	MCPA
117.250	010	EPA 8151A	MCPP
117.250	011	EPA 8151A	4-Nitrophenol
117.250	012	EPA 8151A	Pentachlorophenol
117.250	013	EPA 8151A	Picloram
117.250	014	EPA 8151A	Dicamba
117.250	015	EPA 8151A	3,5-Dichlorobenzoic Acid
117.250	016	EPA 8151A	Acifluorfen
117.250	017	EPA 8151A	Bentazon
117.250	018	EPA 8151A	Chloramben
117.250	019	EPA 8151A	DCPA

120 - Physical Properties of Hazardous Waste

120.010	001	EPA 1010	Ignitability
120.040	001	Section 7.3 SW-846	Reactive Cyanide
120.050	001	Section 7.3 SW-846	Reactive Sulfide
120.070	001	EPA 9040B	Corrosivity - pH Determination
120.080	001	EPA 9045C	Corrosivity - pH Determination

State of Connecticut, Department of Public Health

Approved Environmental Laboratory

THIS IS TO CERTIFY THAT THE LABORATORY DESCRIBED BELOW HAS BEEN APPROVED BY THE STATE DEPARTMENT OF PUBLIC HEALTH PURSUANT TO APPLICABLE PROVISIONS OF THE PUBLIC HEALTH CODE AND GENERAL STATUTES OF CONNECTICUT, FOR MAKING THE EXAMINATIONS, DETERMINATIONS OR TESTS SPECIFIED BELOW WHICH HAVE BEEN AUTHORIZED IN WRITING BY THAT DEPARTMENT.

EMAX LABORATORIES, INC.

LOCATED AT 1835 West 205th Street IN Torrance, CA 90501

AND REGISTERED IN THE NAME OF KAM Y. PANG, PH.D.

THIS CERTIFICATE IS ISSUED IN THE NAME OF KAM Y. PANG, PH.D WHO HAS BEEN DESIGNATED

BY THE REGISTRANT TO BE IN CHARGE OF THE LABORATORY WORK COVERED BY THIS CERTIFICATE OF APPROVAL AS FOLLOWS:

DRINKING WATER, NON-POTABLE WATER/WASTEWATER, SOIL/SOLID WASTE
Examination for:
INORGANIC CHEMICALS
ORGANIC CHEMICALS

SEE COMPUTER PRINT-OUT FOR SPECIFIC TESTS APPROVED

THIS CERTIFICATE EXPIRES March 31, 2007 AND IS REVOCABLE FOR CAUSE BY THE STATE DEPARTMENT OF PUBLIC HEALTH

DATED AT HARTFORD, CONNECTICUT, THIS 7th DAY OF April 2005

Registration No.

PH-0239

Ellen J. Blaschinski

DIRECTOR, DIVISION OF ENVIRONMENTAL HEALTH

STATE OF CONNECTICUT

DEPARTMENT OF PUBLIC HEALTH

DIVISION OF ENVIRONMENTAL HEALTH
ENVIRONMENTAL LABORATORY CERTIFICATION PROGRAM

APPROVED ANALYTES REPORT

FOR ALL MATRICES

EMAX Laboratories, Inc.

CT-APP-NUM PH-0239

LOCATION

1835 W. 205TH STREET

Torrance CA 90501-

PHONE (310)-618-8889

REGISTERED OWNER/
AUTHORIZED AGENT Kam Y. Pang, Ph.D.

DIRECTOR Kam Y. Pang, Ph.D.

CO DIRECTOR(S)

APPROVED BY Jeffrey C. Curran DATE 04/07/2005 10:52:58 AM

LABORATORY APPROVAL EXPIRATION DATE 03/31/2007

LABORATORY STATUS **APPROVED**

ANY QUESTIONS CONCERNING THIS DOCUMENT SHOULD BE ADDRESSED TO
THE ENVIRONMENTAL LABORATORY CERTIFICATION PROGRAM AT (860) 509-7389

DRINKING WATER (SDWA)

STATUS REPORTED ON 04/07/2005

SOC: REGULATED SYNTHETIC ORGANIC CHEMICAL
WITH MINIMUM MDL REQUIREMENTS

ANALYTE NAME

PHYSICALS

PH

TURBIDITY

CONDUCTIVITY

MINERALS

ALKALINITY

CHLORIDE

FLUORIDE

HARDNESS, TOTAL

SULFATE

NUTRIENTS

NITRATE

NITRITE

METALS

ALUMINUM

ANTIMONY

ARSENIC

BARIUM

BERYLLIUM

CADMIUM

CHROMIUM

COPPER

IRON

LEAD

MANGANESE

MERCURY

NICKEL

SELENIUM

SILVER

THALLIUM

ZINC

RESIDUE

TOTAL DISSOLVED SOLIDS

DEMANDS

TOTAL ORGANIC CARBON

MISCELLANEOUS

FOAMING AGENTS (MBAS)

INORGANIC DISINFECTION BY-PRODUCTS

BROMATE

BROMIDE

CHLORATE

PERCHLORATE

THMs & VOCs

VOLATILE ORGANICS - 524.2 (SOC)

1,2 - DIBROMO-3-CHLOROPROPANE (DBCP) (SOC)

TOTAL TRIHALOMETHANES 524.2 (SOC)

ETHYLENE DIBROMIDE (EDB) (SOC)

NON-POTABLE WATER/ WASTEWATER

STATUS REPORTED ON 04/07/2005

ANALYTE NAME

PHYSICALS

COLOR

PH

TURBIDITY

CONDUCTIVITY

MINERALS

ACIDITY

ALKALINITY

CHLORIDE

CHLORINE, TOTAL & FREE RESIDUAL

CHLORINE, FREE RESIDUAL

FLUORIDE

HARDNESS, TOTAL

SILICA

SULFATE

SULFIDE

SULFITE

NUTRIENTS

AMMONIA

KJELDAHL NITROGEN

NITRATE

NITRITE

O-PHOSPHATE

TOTAL PHOSPHOROUS

METALS

CALCIUM

CHROMIUM - Hexavalent

MAGNESIUM

POTASSIUM

SODIUM

RESIDUE

TOTAL RESIDUE (SOLIDS)

TOTAL DISSOLVED SOLIDS

TOTAL SUSPENDED SOLIDS (non-filterable)

DEMANDS

BOD

COD

TOTAL ORGANIC CARBON

MISCELLANEOUS

CYANIDE (TOTAL)

PHENOLICS

FOAMING AGENTS (MBAS)

INORGANIC DISINFECTION BY-PRODUCTS

BROMIDE

SOLVENTS

OIL AND GREASE

TOTAL PETROLEUM HYDROCARBONS

NON-POTABLE WATER\WASTEWATER ORG.

VOLATILE ORGANICS (ALL)

SOLID WASTE/SOIL

STATUS REPORTED ON 04/07/2005

ANALYTE NAME

PHYSICALS

PH

MINERALS

SULFIDE

METALS

ANTIMONY
ARSENIC
BARIUM
BERYLLIUM
CADMIUM
CHROMIUM
CHROMIUM - Hexavalent
COBALT
COPPER
LEAD
MERCURY
MOLYBDENUM
NICKEL
SELENIUM
SILVER
THALLIUM
VANADIUM
ZINC

MISCELLANEOUS

CYANIDE (TOTAL)
IGNITABILITY
CORROSIVITY
TCLP LEACH (1311)
SPLP LEACH (1312)
REACTIVITY

PCBs

AROCLOR 1016/1242
AROCLOR 1221
AROCLOR 1232
AROCLOR 1248
AROCLOR 1254
AROCLOR 1260
PCB IN OIL

HERBICIDES

DALAPON
DICAMBA
DINOSEB
PENTACHLOROPHENOL
2,4-D
2,4-DB
2,4,5-T
2,4,5- TP (SILVEX)
DICHLOROPROP
MCPA
MCPP
4-NITROPHENOL

SOLID WASTE ORGANICS

VOLATILE ORGANICS (SW)
ACID EXTRACTABLES (PHENOLS) (SW)
BENZIDINES (SW)
PHTHALATES (SW)
NITROSOAMINES (SW)
ORGANOCHLORINE PESTICIDES (SW)
NITROAROMATICS & CYCLIC KETONES (SW)
PAH's (SW)
HALOETHERS (SW)
CHLORINATED HYDROCARBONS (SW)
CARBAZOLE (SW)
DIBENZOFURAN (SW)

END OF SECTION FOR EMAX Laboratories, Inc.

REPORT PROFILE

Report Printed on:	04/07/2005 10:52:58 AM
Report Name:	APPROVED TESTS_ALT_NEW
Printed by:	jeff
Report published from:	CERTIFICATION REPORTS screen #3

lab code = ID1105P
test code = *
matrix code = *
matrix selection = ALL OR SOME MATRICES SELECTED
certifications approved or provisional on 04/07/2005

THIS IS THE LAST PAGE OF THE REPORT

FLORIDA DEPARTMENT OF HEALTH

State of Florida
Department of Health, Bureau of Laboratories

This is to certify that

E87825
EMAX LABORATORIES, INC.
1835 W. 205TH STREET
TORRANCE, CA 90501

has complied with Florida Administrative Code 64E-1,
for the examination of Environmental samples in the following categories

DRINKING WATER - GROUP II UNREGULATED CONTAMINANTS, DRINKING WATER - OTHER REGULATED CONTAMINANTS, DRINKING WATER - PRIMARY INORGANIC CONTAMINANTS, DRINKING WATER - SECONDARY INORGANIC CONTAMINANTS, DRINKING WATER - SYNTHETIC ORGANIC CONTAMINANTS, NON-POTABLE WATER - GENERAL CHEMISTRY, SOLID AND CHEMICAL MATERIALS - EXTRACTABLE ORGANICS, SOLID AND CHEMICAL MATERIALS - PESTICIDES-HERBICIDES-PCB'S, SOLID AND CHEMICAL MATERIALS - GENERAL CHEMISTRY, SOLID AND CHEMICAL MATERIALS - METALS, SOLID AND CHEMICAL MATERIALS - VOLATILE ORGANICS

Continued certification is contingent upon successful on-going compliance with the NELAC Standards and FAC Rule 64E-1 regulations. Specific methods and analytes certified are cited on the Laboratory Scope of Accreditation for this laboratory and are on file at the Bureau of Laboratories, P. O. Box 210, Jacksonville, Florida 32231. Clients and customers are urged to verify with this agency the laboratory's certification status in Florida for particular methods and analytes.

EFFECTIVE July 01, 2006 THROUGH June 30, 2007

Dian Sharma, Ph.D.
Acting Chief, Bureau of Laboratories
Florida Department of Health
DH Form 1697, 7/04
NON-TRANSFERABLE E87825-02-7/1/2006

Laboratory Scope of Accreditation

Attachment to Certificate #: E87825-02, expiration date June 30, 2007. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: E87825 **EPA Lab Code: CA00029** **(310) 618-8889**

E87825
EMAX Laboratories, Inc.
1835 W. 205th Street
Torrance, CA 90501

Matrix: Drinking Water

Analyte	Method/Tech	Category	Certification Type	Effective Date
1,1,1,2-Tetrachloroethane	EPA 524.2	Group II Unregulated Contaminants	NELAP	1/2/2003
1,1,1-Trichloroethane	EPA 524.2	Other Regulated Contaminants	NELAP	1/2/2003
1,1,2,2-Tetrachloroethane	EPA 524.2	Group II Unregulated Contaminants	NELAP	1/2/2003
1,1,2-Trichloroethane	EPA 524.2	Other Regulated Contaminants	NELAP	1/2/2003
1,1-Dichloroethane	EPA 524.2	Group II Unregulated Contaminants	NELAP	1/2/2003
1,1-Dichloroethylene	EPA 524.2	Other Regulated Contaminants	NELAP	1/2/2003
1,1-Dichloropropene	EPA 524.2	Group II Unregulated Contaminants	NELAP	1/2/2003
1,2,3-Trichlorobenzene	EPA 524.2	Group II Unregulated Contaminants	NELAP	1/2/2003
1,2,3-Trichloropropane	EPA 524.2	Group II Unregulated Contaminants	NELAP	1/2/2003
1,2,4-Trichlorobenzene	EPA 524.2	Group II Unregulated Contaminants	NELAP	1/2/2003
1,2,4-Trimethylbenzene	EPA 524.2	Group II Unregulated Contaminants	NELAP	12/4/2003
1,2-Dibromo-3-chloropropane (DBCP)	EPA 504.1	Synthetic Organic Contaminants	NELAP	1/2/2003
1,2-Dibromoethane (EDB, Ethylene dibromide)	EPA 504.1	Synthetic Organic Contaminants	NELAP	1/2/2003
1,2-Dichlorobenzene	EPA 524.2	Other Regulated Contaminants	NELAP	1/2/2003
1,2-Dichloroethane	EPA 524.2	Other Regulated Contaminants	NELAP	1/2/2003
1,2-Dichloropropane	EPA 524.2	Other Regulated Contaminants	NELAP	1/2/2003
1,3,5-Trimethylbenzene	EPA 524.2	Group II Unregulated Contaminants	NELAP	1/2/2003
1,3-Dichlorobenzene	EPA 524.2	Group II Unregulated Contaminants	NELAP	1/2/2003
1,3-Dichloropropane	EPA 524.2	Group II Unregulated Contaminants	NELAP	1/2/2003
1,4-Dichlorobenzene	EPA 524.2	Other Regulated Contaminants	NELAP	1/2/2003
2,2-Dichloropropane	EPA 524.2	Group II Unregulated Contaminants	NELAP	1/2/2003
2-Chlorotoluene	EPA 524.2	Group II Unregulated Contaminants	NELAP	1/2/2003
4-Chlorotoluene	EPA 524.2	Group II Unregulated Contaminants	NELAP	1/2/2003
4-Isopropyltoluene	EPA 524.2	Group II Unregulated Contaminants	NELAP	1/2/2003
Benzene	EPA 524.2	Other Regulated Contaminants	NELAP	1/2/2003
Bromate	EPA 300.1	Primary Inorganic Contaminants	NELAP	12/4/2003
Bromobenzene	EPA 524.2	Group II Unregulated Contaminants	NELAP	1/2/2003
Bromochloromethane	EPA 524.2	Group II Unregulated Contaminants	NELAP	1/2/2003
Bromodichloromethane	EPA 524.2	Group II Unregulated Contaminants	NELAP	1/2/2003
Bromoform	EPA 524.2	Group II Unregulated Contaminants	NELAP	1/2/2003
Carbon tetrachloride	EPA 524.2	Other Regulated Contaminants	NELAP	1/2/2003
Chlorate	EPA 300.0	Secondary Inorganic Contaminants	NELAP	12/4/2003
Chloride	EPA 300.0	Secondary Inorganic Contaminants	NELAP	1/2/2003
Chloride	SM 4110 B	Secondary Inorganic Contaminants	NELAP	1/2/2003
Chlorobenzene	EPA 524.2	Other Regulated Contaminants	NELAP	1/2/2003
Chloroethane	EPA 524.2	Group II Unregulated Contaminants	NELAP	1/2/2003

Laboratory Scope of Accreditation

Attachment to Certificate #: E87825-02, expiration date June 30, 2007. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: E87825 **EPA Lab Code: CA00029** **(310) 618-8889**

E87825
EMAX Laboratories, Inc.
1835 W. 205th Street
Torrance, CA 90501

Matrix: Drinking Water

Analyte	Method/Tech	Category	Certification Type	Effective Date
Chloroform	EPA 524.2	Group II Unregulated Contaminants	NELAP	1/2/2003
cis-1,2-Dichloroethylene	EPA 524.2	Other Regulated Contaminants	NELAP	12/4/2003
cis-1,3-Dichloropropene	EPA 524.2	Group II Unregulated Contaminants	NELAP	1/2/2003
Conductivity	SM 2510 B	Primary Inorganic Contaminants	NELAP	1/2/2003
Dibromochloromethane	EPA 524.2	Group II Unregulated Contaminants	NELAP	1/2/2003
Dibromomethane	EPA 524.2	Group II Unregulated Contaminants	NELAP	1/2/2003
Dichlorodifluoromethane	EPA 524.2	Group II Unregulated Contaminants	NELAP	1/2/2003
Dichloromethane (DCM, Methylene chloride)	EPA 524.2	Other Regulated Contaminants	NELAP	1/2/2003
Ethylbenzene	EPA 524.2	Other Regulated Contaminants	NELAP	1/2/2003
Fluoride	EPA 300.0	Primary Inorganic Contaminants,Secondary Inorganic Contaminants	NELAP	1/2/2003
Fluoride	SM 4110 B	Primary Inorganic Contaminants,Secondary Inorganic Contaminants	NELAP	1/2/2003
Hexachlorobutadiene	EPA 524.2	Group II Unregulated Contaminants	NELAP	1/2/2003
Isopropylbenzene	EPA 524.2	Group II Unregulated Contaminants	NELAP	1/2/2003
Methyl bromide (Bromomethane)	EPA 524.2	Group II Unregulated Contaminants	NELAP	1/2/2003
Methyl chloride (Chloromethane)	EPA 524.2	Group II Unregulated Contaminants	NELAP	1/2/2003
Methyl tert-butyl ether (MTBE)	EPA 524.2	Group II Unregulated Contaminants	NELAP	1/2/2003
Naphthalene	EPA 524.2	Group II Unregulated Contaminants	NELAP	1/2/2003
n-Butylbenzene	EPA 524.2	Group II Unregulated Contaminants	NELAP	1/2/2003
Nitrate	SM 4110 B	Primary Inorganic Contaminants	NELAP	1/2/2003
Nitrate as N	EPA 300.0	Primary Inorganic Contaminants	NELAP	1/2/2003
Nitrite	SM 4110 B	Primary Inorganic Contaminants	NELAP	1/2/2003
Nitrite as N	EPA 300.0	Primary Inorganic Contaminants	NELAP	1/2/2003
Nitrobenzene	EPA 524.2	Group II Unregulated Contaminants	NELAP	1/2/2003
n-Propylbenzene	EPA 524.2	Group II Unregulated Contaminants	NELAP	1/2/2003
Perchlorate	EPA 300.0	Secondary Inorganic Contaminants	NELAP	1/2/2003
Perchlorate	EPA 314.0	Secondary Inorganic Contaminants	NELAP	12/4/2003
pH	SM 4500-H B	Primary Inorganic Contaminants,Secondary Inorganic Contaminants	NELAP	1/2/2003
Residue-filterable (TDS)	SM 2540 C	Secondary Inorganic Contaminants	NELAP	1/2/2003
sec-Butylbenzene	EPA 524.2	Group II Unregulated Contaminants	NELAP	1/2/2003
Styrene	EPA 524.2	Other Regulated Contaminants	NELAP	1/2/2003
Sulfate	EPA 300.0	Primary Inorganic Contaminants,Secondary Inorganic Contaminants	NELAP	1/2/2003

Laboratory Scope of Accreditation

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State Laboratory ID: E87825 **EPA Lab Code: CA00029** **(310) 618-8889**

E87825
EMAX Laboratories, Inc.
1835 W. 205th Street
Torrance, CA 90501

Matrix: Drinking Water

Analyte	Method/Tech	Category	Certification Type	Effective Date
tert-Butylbenzene	EPA 524.2	Group II Unregulated Contaminants	NELAP	1/2/2003
Tetrachloroethylene (Perchloroethylene)	EPA 524.2	Other Regulated Contaminants	NELAP	1/2/2003
Toluene	EPA 524.2	Other Regulated Contaminants	NELAP	1/2/2003
Total nitrate-nitrite	EPA 300.0	Primary Inorganic Contaminants	NELAP	1/2/2003
Total nitrate-nitrite	SM 4110 B	Primary Inorganic Contaminants	NELAP	1/2/2003
Total trihalomethanes	EPA 524.2	Other Regulated Contaminants	NELAP	1/2/2003
trans-1,2-Dichloroethylene	EPA 524.2	Other Regulated Contaminants	NELAP	1/2/2003
trans-1,3-Dichloropropylene	EPA 524.2	Group II Unregulated Contaminants	NELAP	1/2/2003
Trichloroethene (Trichloroethylene)	EPA 524.2	Other Regulated Contaminants	NELAP	1/2/2003
Trichlorofluoromethane	EPA 524.2	Group II Unregulated Contaminants	NELAP	1/2/2003
Turbidity	EPA 180.1	Secondary Inorganic Contaminants	NELAP	1/2/2003
Vinyl chloride	EPA 524.2	Other Regulated Contaminants	NELAP	1/2/2003
Xylene (total)	EPA 524.2	Other Regulated Contaminants	NELAP	1/2/2003

Laboratory Scope of Accreditation

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State Laboratory ID: E87825 **EPA Lab Code: CA00029** **(310) 618-8889**

E87825
EMAX Laboratories, Inc.
1835 W. 205th Street
Torrance, CA 90501

Matrix: Non-Potable Water

Analyte	Method/Tech	Category	Certification Type	Effective Date
Acidity, as CaCO3	EPA 305.1	General Chemistry	NELAP	1/2/2003
Acidity, as CaCO3	SM 2310 B (4A)	General Chemistry	NELAP	1/2/2003
Alkalinity as CaCO3	EPA 310.1	General Chemistry	NELAP	1/2/2003
Alkalinity as CaCO3	SM 2320 B	General Chemistry	NELAP	1/2/2003
Amenable cyanide	EPA 335.1	General Chemistry	NELAP	12/4/2003
Ammonia as N	EPA 350.2	General Chemistry	NELAP	1/2/2003
Biochemical oxygen demand	EPA 405.1	General Chemistry	NELAP	1/2/2003
Bromide	EPA 300.0	General Chemistry	NELAP	1/2/2003
Chemical oxygen demand	EPA 410.4	General Chemistry	NELAP	1/2/2003
Chloride	EPA 300.0	General Chemistry	NELAP	1/2/2003
Chromium VI	EPA 218.6	General Chemistry	NELAP	12/4/2003
Color	EPA 110.2	General Chemistry	NELAP	12/4/2003
Conductivity	EPA 120.1	General Chemistry	NELAP	1/2/2003
Conductivity	SM 2510 B	General Chemistry	NELAP	1/2/2003
Fluoride	EPA 300.0	General Chemistry	NELAP	1/2/2003
Hardness	EPA 130.1	General Chemistry	NELAP	1/2/2003
Hardness	SM 2340 B	General Chemistry	NELAP	1/2/2003
Hardness	SM 2340 C	General Chemistry	NELAP	1/2/2003
Kjeldahl nitrogen - total	EPA 351.3	General Chemistry	NELAP	1/2/2003
Nitrate as N	EPA 300.0	General Chemistry	NELAP	1/2/2003
Nitrite as N	EPA 300.0	General Chemistry	NELAP	1/2/2003
Oil & Grease	EPA 1664	General Chemistry	NELAP	1/2/2003
Oil & Grease	EPA 413.1	General Chemistry	NELAP	1/2/2003
Orthophosphate as P	EPA 300.0	General Chemistry	NELAP	1/2/2003
Orthophosphate as P	EPA 365.2	General Chemistry	NELAP	1/2/2003
pH	EPA 150.1	General Chemistry	NELAP	1/2/2003
pH	SM 4500-H B	General Chemistry	NELAP	1/2/2003
Phosphorus, total	EPA 365.2	General Chemistry	NELAP	1/2/2003
Residue-filterable (TDS)	EPA 160.1	General Chemistry	NELAP	1/2/2003
Residue-filterable (TDS)	SM 2540 C	General Chemistry	NELAP	1/2/2003
Residue-nonfilterable (TSS)	EPA 160.2	General Chemistry	NELAP	1/2/2003
Residue-nonfilterable (TSS)	SM 2540 D	General Chemistry	NELAP	1/2/2003
Residue-settleable	SM 2540 F	General Chemistry	NELAP	1/2/2003
Residue-total	EPA 160.3	General Chemistry	NELAP	1/2/2003
Residue-total	SM 2540 B	General Chemistry	NELAP	1/2/2003
Silica-dissolved	EPA 370.1	General Chemistry	NELAP	1/2/2003

Laboratory Scope of Accreditation

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State Laboratory ID: E87825 **EPA Lab Code:** CA00029 **(310) 618-8889**

E87825
EMAX Laboratories, Inc.
1835 W. 205th Street
Torrance, CA 90501

Matrix: Non-Potable Water

Analyte	Method/Tech	Category	Certification Type	Effective Date
Sulfate	EPA 300.0	General Chemistry	NELAP	1/2/2003
Sulfide	EPA 376.2	General Chemistry	NELAP	12/4/2003
Sulfite-SO3	EPA 377.1	General Chemistry	NELAP	12/4/2003
Surfactants - MBAS	EPA 425.1	General Chemistry	NELAP	12/4/2003
Total cyanide	EPA 335.2	General Chemistry	NELAP	12/4/2003
Total nitrate-nitrite	EPA 300.0	General Chemistry	NELAP	1/2/2003
Total organic carbon	EPA 415.1	General Chemistry	NELAP	1/2/2003
Total phenolics	EPA 420.1	General Chemistry	NELAP	12/4/2003
Total recoverable petroleum hydrocarbons (TRPH)	EPA 418.1	General Chemistry	NELAP	1/2/2003
Total residual chlorine	EPA 330.3	General Chemistry	NELAP	1/2/2003
Turbidity	EPA 180.1	General Chemistry	NELAP	1/2/2003
Turbidity	SM 2130 B	General Chemistry	NELAP	1/2/2003

Laboratory Scope of Accreditation

Attachment to Certificate #: E87825-02, expiration date June 30, 2007. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: E87825 **EPA Lab Code: CA00029** **(310) 618-8889**

E87825
EMAX Laboratories, Inc.
1835 W. 205th Street
Torrance, CA 90501

Matrix: Solid and Chemical Materials

Analyte	Method/Tech	Category	Certification Type	Effective Date
1,1,1,2-Tetrachloroethane	EPA 8260	Volatile Organics	NELAP	1/2/2003
1,1,1-Trichloroethane	EPA 8260	Volatile Organics	NELAP	1/2/2003
1,1,2,2-Tetrachloroethane	EPA 8260	Volatile Organics	NELAP	1/2/2003
1,1,2-Trichloroethane	EPA 8260	Volatile Organics	NELAP	1/2/2003
1,1-Dichloroethane	EPA 8260	Volatile Organics	NELAP	1/2/2003
1,1-Dichloroethylene	EPA 8260	Volatile Organics	NELAP	1/2/2003
1,1-Dichloropropene	EPA 8260	Volatile Organics	NELAP	1/2/2003
1,2,3-Trichlorobenzene	EPA 8260	Volatile Organics	NELAP	1/2/2003
1,2,3-Trichloropropane	EPA 8260	Volatile Organics	NELAP	1/2/2003
1,2,4,5-Tetrachlorobenzene	EPA 8270	Extractable Organics	NELAP	1/2/2003
1,2,4-Trichlorobenzene	EPA 8260	Volatile Organics	NELAP	1/2/2003
1,2,4-Trichlorobenzene	EPA 8270	Extractable Organics	NELAP	1/2/2003
1,2,4-Trimethylbenzene	EPA 8260	Volatile Organics	NELAP	12/4/2003
1,2-Dibromo-3-chloropropane (DBCP)	EPA 8011	Volatile Organics	NELAP	1/2/2003
1,2-Dibromo-3-chloropropane (DBCP)	EPA 8260	Volatile Organics	NELAP	1/2/2003
1,2-Dibromoethane (EDB, Ethylene dibromide)	EPA 8011	Volatile Organics	NELAP	1/2/2003
1,2-Dibromoethane (EDB, Ethylene dibromide)	EPA 8260	Volatile Organics	NELAP	1/2/2003
1,2-Dichlorobenzene	EPA 8260	Volatile Organics	NELAP	1/2/2003
1,2-Dichlorobenzene	EPA 8270	Extractable Organics	NELAP	1/2/2003
1,2-Dichloroethane	EPA 8260	Volatile Organics	NELAP	1/2/2003
1,2-Dichloropropane	EPA 8260	Volatile Organics	NELAP	1/2/2003
1,2-Diphenylhydrazine	EPA 8270	Extractable Organics	NELAP	1/2/2003
1,3,5-Trimethylbenzene	EPA 8260	Volatile Organics	NELAP	12/4/2003
1,3,5-Trinitrobenzene (1,3,5-TNB)	EPA 8270	Extractable Organics	NELAP	1/2/2003
1,3,5-Trinitrobenzene (1,3,5-TNB)	EPA 8330	Extractable Organics	NELAP	1/2/2003
1,3-Dichlorobenzene	EPA 8260	Volatile Organics	NELAP	1/2/2003
1,3-Dichlorobenzene	EPA 8270	Extractable Organics	NELAP	1/2/2003
1,3-Dichloropropane	EPA 8260	Volatile Organics	NELAP	1/2/2003
1,3-Dinitrobenzene (1,3-DNB)	EPA 8330	Extractable Organics	NELAP	1/2/2003
1,4-Dichlorobenzene	EPA 8260	Volatile Organics	NELAP	1/2/2003
1,4-Dichlorobenzene	EPA 8270	Extractable Organics	NELAP	1/2/2003
1,4-Dioxane (1,4-Diethyleneoxide)	EPA 8260	Volatile Organics	NELAP	1/2/2003
1,4-Naphthoquinone	EPA 8270	Extractable Organics	NELAP	1/2/2003
1-Naphthylamine	EPA 8270	Extractable Organics	NELAP	1/2/2003
2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl (BZ 206)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	1/2/2003
2,2',3,3',4,4',5-Heptachlorobiphenyl (BZ 170)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	1/2/2003

Laboratory Scope of Accreditation

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State Laboratory ID: E87825 **EPA Lab Code: CA00029** **(310) 618-8889**

E87825
EMAX Laboratories, Inc.
1835 W. 205th Street
Torrance, CA 90501

Matrix: Solid and Chemical Materials

Analyte	Method/Tech	Category	Certification Type	Effective Date
2,2',3,4,4',5',6-Heptachlorobiphenyl (BZ 183)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	1/2/2003
2,2',3,4,4',5'-Hexachlorobiphenyl (BZ 138)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	1/2/2003
2,2',3,4',5,5',6-Heptachlorobiphenyl (BZ 187)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	1/2/2003
2,2',3,4,5,5'-Hexachlorobiphenyl (BZ 141)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	1/2/2003
2,2',3,4,5'-Pentachlorobiphenyl (BZ 87)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	1/2/2003
2,2',3,5,5',6-Hexachlorobiphenyl (BZ 151)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	1/2/2003
2,2',3,5'-Tetrachlorobiphenyl (BZ 44)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	1/2/2003
2,2',4,4',5,5'-Hexachlorobiphenyl (BZ 153)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	1/2/2003
2,2',4,5,5'-Pentachlorobiphenyl (BZ 101)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	1/2/2003
2,2',5,5'-Tetrachlorobiphenyl (BZ 52)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	1/2/2003
2,2',5-Trichlorobiphenyl (BZ 18)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	1/2/2003
2,2-Dichloropropane	EPA 8260	Volatile Organics	NELAP	1/2/2003
2,3,3',4',6-Pentachlorobiphenyl (BZ 110)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	1/2/2003
2,3',4,4'-Tetrachlorobiphenyl (BZ 66)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	1/2/2003
2,3,4,6-Tetrachlorophenol	EPA 8270	Extractable Organics	NELAP	1/2/2003
2,3-Dichlorobiphenyl (BZ 5)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	1/2/2003
2,4,5-T	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	1/2/2003
2,4',5-Trichlorobiphenyl (BZ 31)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	1/2/2003
2,4,5-Trichlorophenol	EPA 8270	Extractable Organics	NELAP	1/2/2003
2,4,6-Trichlorophenol	EPA 8270	Extractable Organics	NELAP	1/2/2003
2,4,6-Trinitrotoluene (2,4,6-TNT)	EPA 8330	Extractable Organics	NELAP	1/2/2003
2,4-D	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	1/2/2003
2,4-DB	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	1/2/2003
2,4-Dichlorophenol	EPA 8270	Extractable Organics	NELAP	1/2/2003
2,4-Dimethylphenol	EPA 8270	Extractable Organics	NELAP	1/2/2003
2,4-Dinitrophenol	EPA 8270	Extractable Organics	NELAP	1/2/2003
2,4-Dinitrotoluene (2,4-DNT)	EPA 8270	Extractable Organics	NELAP	1/2/2003
2,4-Dinitrotoluene (2,4-DNT)	EPA 8330	Extractable Organics	NELAP	1/2/2003
2,6-Dichlorophenol	EPA 8270	Extractable Organics	NELAP	1/2/2003
2,6-Dinitrotoluene (2,6-DNT)	EPA 8270	Extractable Organics	NELAP	1/2/2003
2,6-Dinitrotoluene (2,6-DNT)	EPA 8330	Extractable Organics	NELAP	1/2/2003
2-Acetylaminofluorene	EPA 8270	Extractable Organics	NELAP	1/2/2003
2-Amino-4,6-dinitrotoluene (2-am-dnt)	EPA 8330	Extractable Organics	NELAP	1/2/2003
2-Butanone (Methyl ethyl ketone, MEK)	EPA 8260	Volatile Organics	NELAP	1/2/2003
2-Chlorobiphenyl (BZ 1)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	1/2/2003
2-Chloroethyl vinyl ether	EPA 8260	Volatile Organics	NELAP	1/2/2003

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E87825
EMAX Laboratories, Inc.
1835 W. 205th Street
Torrance, CA 90501

Matrix: Solid and Chemical Materials

Analyte	Method/Tech	Category	Certification Type	Effective Date
2-Chloronaphthalene	EPA 8270	Extractable Organics	NELAP	1/2/2003
2-Chlorophenol	EPA 8270	Extractable Organics	NELAP	1/2/2003
2-Chlorotoluene	EPA 8260	Volatile Organics	NELAP	12/4/2003
2-Hexanone	EPA 8260	Volatile Organics	NELAP	1/2/2003
2-Methyl-4,6-dinitrophenol	EPA 8270	Extractable Organics	NELAP	1/2/2003
2-Methylnaphthalene	EPA 8270	Extractable Organics	NELAP	1/2/2003
2-Methylphenol (o-Cresol)	EPA 8270	Extractable Organics	NELAP	1/2/2003
2-Nitroaniline	EPA 8270	Extractable Organics	NELAP	1/2/2003
2-Nitrophenol	EPA 8270	Extractable Organics	NELAP	1/2/2003
2-Nitrotoluene	EPA 8330	Extractable Organics	NELAP	1/2/2003
2-Picoline (2-Methylpyridine)	EPA 8260	Volatile Organics	NELAP	1/2/2003
3,5-Dichlorobenzoic acid	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	12/4/2003
3-Methylcholanthrene	EPA 8270	Extractable Organics	NELAP	1/2/2003
3-Methylphenol (m-Cresol)	EPA 8270	Extractable Organics	NELAP	1/2/2003
3-Nitroaniline	EPA 8270	Extractable Organics	NELAP	1/2/2003
3-Nitrotoluene	EPA 8330	Extractable Organics	NELAP	1/2/2003
4,4'-DDD	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	1/2/2003
4,4'-DDE	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	1/2/2003
4,4'-DDT	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	1/2/2003
4-Amino-2,6-dinitrotoluene (4-am-dnt)	EPA 8330	Extractable Organics	NELAP	1/2/2003
4-Aminobiphenyl	EPA 8270	Extractable Organics	NELAP	1/2/2003
4-Bromophenyl phenyl ether	EPA 8270	Extractable Organics	NELAP	1/2/2003
4-Chloro-3-methylphenol	EPA 8270	Extractable Organics	NELAP	1/2/2003
4-Chloroaniline	EPA 8270	Extractable Organics	NELAP	1/2/2003
4-Chlorophenyl phenylether	EPA 8270	Extractable Organics	NELAP	1/2/2003
4-Chlorotoluene	EPA 8260	Volatile Organics	NELAP	12/4/2003
4-Dimethyl aminoazobenzene	EPA 8270	Extractable Organics	NELAP	1/2/2003
4-Methyl-2-pentanone (MIBK)	EPA 8260	Volatile Organics	NELAP	1/2/2003
4-Methylphenol (p-Cresol)	EPA 8270	Extractable Organics	NELAP	1/2/2003
4-Nitroaniline	EPA 8270	Extractable Organics	NELAP	1/2/2003
4-Nitrophenol	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	12/4/2003
4-Nitrophenol	EPA 8270	Extractable Organics	NELAP	1/2/2003
4-Nitrotoluene	EPA 8330	Extractable Organics	NELAP	1/2/2003
5-Hydroxydicamba	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	1/2/2003
5-Nitro-o-toluidine	EPA 8270	Extractable Organics	NELAP	1/2/2003
7,12-Dimethylbenz(a) anthracene	EPA 8270	Extractable Organics	NELAP	1/2/2003

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Torrance, CA 90501

Matrix: Solid and Chemical Materials

Analyte	Method/Tech	Category	Certification Type	Effective Date
a-a-Dimethylphenethylamine	EPA 8270	Extractable Organics	NELAP	1/2/2003
Acenaphthene	EPA 8270	Extractable Organics	NELAP	1/2/2003
Acenaphthene	EPA 8310	Extractable Organics	NELAP	1/2/2003
Acenaphthylene	EPA 8270	Extractable Organics	NELAP	1/2/2003
Acenaphthylene	EPA 8310	Extractable Organics	NELAP	1/2/2003
Acetone	EPA 8260	Volatile Organics	NELAP	1/2/2003
Acetonitrile	EPA 8260	Volatile Organics	NELAP	1/2/2003
Acetophenone	EPA 8270	Extractable Organics	NELAP	1/2/2003
Acifluorfen	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	12/4/2003
Acrolein (Propenal)	EPA 8260	Volatile Organics	NELAP	1/2/2003
Acrylonitrile	EPA 8260	Volatile Organics	NELAP	1/2/2003
Aldrin	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	1/2/2003
Allyl chloride (3-Chloropropene)	EPA 8260	Volatile Organics	NELAP	1/2/2003
alpha-BHC (alpha-Hexachlorocyclohexane)	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	1/2/2003
alpha-Chlordane	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	1/2/2003
Aniline	EPA 8270	Extractable Organics	NELAP	1/2/2003
Anthracene	EPA 8270	Extractable Organics	NELAP	1/2/2003
Anthracene	EPA 8310	Extractable Organics	NELAP	1/2/2003
Antimony	EPA 6010	Metals	NELAP	1/2/2003
Antimony	EPA 7041	Metals	NELAP	1/2/2003
Aroclor-1016 (PCB-1016)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	1/2/2003
Aroclor-1221 (PCB-1221)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	1/2/2003
Aroclor-1232 (PCB-1232)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	1/2/2003
Aroclor-1242 (PCB-1242)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	1/2/2003
Aroclor-1248 (PCB-1248)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	1/2/2003
Aroclor-1254 (PCB-1254)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	1/2/2003
Aroclor-1260 (PCB-1260)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	1/2/2003
Arsenic	EPA 6010	Metals	NELAP	1/2/2003
Arsenic	EPA 7060	Metals	NELAP	1/2/2003
Atrazine	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	12/4/2003
Azinphos-methyl (Guthion)	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	1/2/2003
Barium	EPA 6010	Metals	NELAP	1/2/2003
Bentazon	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	12/4/2003
Benzene	EPA 8021	Volatile Organics	NELAP	1/2/2003
Benzene	EPA 8260	Volatile Organics	NELAP	1/2/2003
Benzidine	EPA 8270	Extractable Organics	NELAP	12/4/2003

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Matrix: Solid and Chemical Materials

Analyte	Method/Tech	Category	Certification Type	Effective Date
Benzo(a)anthracene	EPA 8270	Extractable Organics	NELAP	1/2/2003
Benzo(a)anthracene	EPA 8310	Extractable Organics	NELAP	1/2/2003
Benzo(a)pyrene	EPA 8270	Extractable Organics	NELAP	1/2/2003
Benzo(a)pyrene	EPA 8310	Extractable Organics	NELAP	1/2/2003
Benzo(b)fluoranthene	EPA 8270	Extractable Organics	NELAP	1/2/2003
Benzo(b)fluoranthene	EPA 8310	Extractable Organics	NELAP	1/2/2003
Benzo(g,h,i)perylene	EPA 8270	Extractable Organics	NELAP	1/2/2003
Benzo(g,h,i)perylene	EPA 8310	Extractable Organics	NELAP	1/2/2003
Benzo(k)fluoranthene	EPA 8270	Extractable Organics	NELAP	1/2/2003
Benzo(k)fluoranthene	EPA 8310	Extractable Organics	NELAP	1/2/2003
Benzoic acid	EPA 8270	Extractable Organics	NELAP	1/2/2003
Benzyl alcohol	EPA 8270	Extractable Organics	NELAP	1/2/2003
Beryllium	EPA 6010	Metals	NELAP	1/2/2003
beta-BHC (beta-Hexachlorocyclohexane)	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	1/2/2003
beta-Naphthylamine	EPA 8270	Extractable Organics	NELAP	1/2/2003
bis(2-Chloroethoxy)methane	EPA 8270	Extractable Organics	NELAP	1/2/2003
bis(2-Chloroethyl) ether	EPA 8270	Extractable Organics	NELAP	1/2/2003
bis(2-Chloroisopropyl) ether (2,2'-Oxybis(1-chloropropane))	EPA 8270	Extractable Organics	NELAP	1/2/2003
bis(2-Ethylhexyl) phthalate (DEHP)	EPA 8270	Extractable Organics	NELAP	1/2/2003
Bromoacetone	EPA 8260	Volatile Organics	NELAP	1/2/2003
Bromobenzene	EPA 8260	Volatile Organics	NELAP	12/4/2003
Bromochloromethane	EPA 8260	Volatile Organics	NELAP	1/2/2003
Bromodichloromethane	EPA 8260	Volatile Organics	NELAP	1/2/2003
Bromoform	EPA 8260	Volatile Organics	NELAP	1/2/2003
Butyl benzyl phthalate	EPA 8270	Extractable Organics	NELAP	1/2/2003
Cadmium	EPA 6010	Metals	NELAP	1/2/2003
Cadmium	EPA 7131	Metals	NELAP	1/2/2003
Carbazole	EPA 8270	Extractable Organics	NELAP	1/2/2003
Carbon disulfide	EPA 8260	Volatile Organics	NELAP	1/2/2003
Carbon tetrachloride	EPA 8260	Volatile Organics	NELAP	1/2/2003
Chloramben	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	12/4/2003
Chlordane (tech.)	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	1/2/2003
Chlorfenvinphos	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	1/2/2003
Chlorobenzene	EPA 8260	Volatile Organics	NELAP	1/2/2003
Chloroethane	EPA 8260	Volatile Organics	NELAP	1/2/2003
Chloroform	EPA 8260	Volatile Organics	NELAP	1/2/2003

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Analyte	Method/Tech	Category	Certification Type	Effective Date
Chloroprene	EPA 8260	Volatile Organics	NELAP	1/2/2003
Chlorpyrifos	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	1/2/2003
Chlorpyrifos methyl	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	1/2/2003
Chromium	EPA 6010	Metals	NELAP	1/2/2003
Chromium VI	EPA 7196	General Chemistry	NELAP	1/2/2003
Chromium VI	EPA 7199	Metals	NELAP	1/2/2003
Chrysene	EPA 8270	Extractable Organics	NELAP	1/2/2003
Chrysene	EPA 8310	Extractable Organics	NELAP	1/2/2003
cis-1,2-Dichloroethylene	EPA 8260	Volatile Organics	NELAP	1/2/2003
cis-1,3-Dichloropropene	EPA 8260	Volatile Organics	NELAP	1/2/2003
cis-1,4-Dichloro-2-butene	EPA 8260	Volatile Organics	NELAP	1/2/2003
Cobalt	EPA 6010	Metals	NELAP	1/2/2003
Copper	EPA 6010	Metals	NELAP	1/2/2003
Copper	EPA 7211	Metals	NELAP	1/2/2003
Dalapon	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	1/2/2003
delta-BHC	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	1/2/2003
Demeton-o	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	1/2/2003
Demeton-s	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	1/2/2003
Diazinon	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	1/2/2003
Dibenz(a,h) anthracene	EPA 8270	Extractable Organics	NELAP	1/2/2003
Dibenz(a,h) anthracene	EPA 8310	Extractable Organics	NELAP	1/2/2003
Dibenzo(a,e) pyrene	EPA 8270	Extractable Organics	NELAP	1/2/2003
Dibenzofuran	EPA 8270	Extractable Organics	NELAP	1/2/2003
Dibromochloromethane	EPA 8260	Volatile Organics	NELAP	1/2/2003
Dibromomethane	EPA 8260	Volatile Organics	NELAP	1/2/2003
Dicamba	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	12/4/2003
Dichlorodifluoromethane	EPA 8260	Volatile Organics	NELAP	1/2/2003
Dieldrin	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	1/2/2003
Diethyl phthalate	EPA 8270	Extractable Organics	NELAP	1/2/2003
Dimethoate	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	1/2/2003
Dimethyl phthalate	EPA 8270	Extractable Organics	NELAP	1/2/2003
Di-n-butyl phthalate	EPA 8270	Extractable Organics	NELAP	1/2/2003
Di-n-octyl phthalate	EPA 8270	Extractable Organics	NELAP	1/2/2003
Dinoseb (2-sec-butyl-4,6-dinitrophenol, DNBP)	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	1/2/2003
Endosulfan I	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	1/2/2003
Endosulfan II	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	1/2/2003

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Matrix: Solid and Chemical Materials

Analyte	Method/Tech	Category	Certification Type	Effective Date
Endosulfan sulfate	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	1/2/2003
Endrin	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	1/2/2003
Endrin aldehyde	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	1/2/2003
Endrin ketone	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	1/2/2003
EPN	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	1/2/2003
Ethion	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	1/2/2003
Ethyl methacrylate	EPA 8260	Volatile Organics	NELAP	1/2/2003
Ethyl methanesulfonate	EPA 8270	Extractable Organics	NELAP	1/2/2003
Ethylbenzene	EPA 8021	Volatile Organics	NELAP	1/2/2003
Ethylbenzene	EPA 8260	Volatile Organics	NELAP	1/2/2003
Famphur	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	1/2/2003
Fluoranthene	EPA 8270	Extractable Organics	NELAP	1/2/2003
Fluoranthene	EPA 8310	Extractable Organics	NELAP	1/2/2003
Fluorene	EPA 8270	Extractable Organics	NELAP	1/2/2003
Fluorene	EPA 8310	Extractable Organics	NELAP	1/2/2003
Fluoride	EPA 9056	General Chemistry	NELAP	1/2/2003
gamma-BHC (Lindane, gamma-Hexachlorocyclohexane)	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	1/2/2003
gamma-Chlordane	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	1/2/2003
Heptachlor	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	1/2/2003
Heptachlor epoxide	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	1/2/2003
Hexachlorobenzene	EPA 8270	Extractable Organics,Pesticides-Herbicides-PCB's	NELAP	1/2/2003
Hexachlorobutadiene	EPA 8260	Volatile Organics	NELAP	1/2/2003
Hexachlorobutadiene	EPA 8270	Extractable Organics	NELAP	1/2/2003
Hexachlorocyclopentadiene	EPA 8270	Extractable Organics,Pesticides-Herbicides-PCB's	NELAP	1/2/2003
Hexachloroethane	EPA 8270	Extractable Organics	NELAP	1/2/2003
Hexachlorophene	EPA 8270	Extractable Organics	NELAP	1/2/2003
Hexachloropropene	EPA 8270	Extractable Organics	NELAP	1/2/2003
Ignitability	EPA 1010	General Chemistry	NELAP	1/2/2003
Indeno(1,2,3-cd)pyrene	EPA 8270	Extractable Organics	NELAP	1/2/2003
Indeno(1,2,3-cd)pyrene	EPA 8310	Extractable Organics	NELAP	1/2/2003
Iodomethane (Methyl iodide)	EPA 8260	Volatile Organics	NELAP	1/2/2003
Isobutyl alcohol (2-Methyl-1-propanol)	EPA 8260	Volatile Organics	NELAP	1/2/2003
Isophorone	EPA 8270	Extractable Organics	NELAP	1/2/2003

Attachment to Certificate #: E87825-02, expiration date June 30, 2007. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: E87825 **EPA Lab Code: CA00029** **(310) 618-8889**

E87825
EMAX Laboratories, Inc.
1835 W. 205th Street
Torrance, CA 90501

Matrix: Solid and Chemical Materials

Analyte	Method/Tech	Category	Certification Type	Effective Date
Isopropylbenzene	EPA 8260	Volatile Organics	NELAP	12/4/2003
Isosafrole	EPA 8270	Extractable Organics	NELAP	1/2/2003
Lead	EPA 6010	Metals	NELAP	1/2/2003
Lead	EPA 7421	Metals	NELAP	1/2/2003
Malathion	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	1/2/2003
MCPA	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	1/2/2003
MCPP	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	1/2/2003
Mercury	EPA 7470	Metals	NELAP	1/2/2003
Mercury	EPA 7471	Metals	NELAP	1/2/2003
Methacrylonitrile	EPA 8260	Volatile Organics	NELAP	1/2/2003
Methoxychlor	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	1/2/2003
Methyl bromide (Bromomethane)	EPA 8260	Volatile Organics	NELAP	1/2/2003
Methyl chloride (Chloromethane)	EPA 8260	Volatile Organics	NELAP	1/2/2003
Methyl methacrylate	EPA 8260	Volatile Organics	NELAP	1/2/2003
Methyl methanesulfonate	EPA 8270	Extractable Organics	NELAP	1/2/2003
Methyl parathion (Parathion, methyl)	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	1/2/2003
Methyl tert-butyl ether (MTBE)	EPA 8021	Volatile Organics	NELAP	1/2/2003
Methyl tert-butyl ether (MTBE)	EPA 8260	Volatile Organics	NELAP	1/2/2003
Methylene chloride	EPA 8260	Volatile Organics	NELAP	1/2/2003
Mevinphos	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	1/2/2003
Molybdenum	EPA 6010	Metals	NELAP	1/2/2003
Naled	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	1/2/2003
Naphthalene	EPA 8260	Volatile Organics	NELAP	1/2/2003
Naphthalene	EPA 8270	Extractable Organics	NELAP	1/2/2003
Naphthalene	EPA 8310	Extractable Organics	NELAP	1/2/2003
n-Butyl alcohol	EPA 8260	Volatile Organics	NELAP	1/2/2003
n-Butylbenzene	EPA 8260	Volatile Organics	NELAP	12/4/2003
Nickel	EPA 6010	Metals	NELAP	1/2/2003
Nitrobenzene	EPA 8260	Volatile Organics	NELAP	1/2/2003
Nitrobenzene	EPA 8270	Extractable Organics	NELAP	1/2/2003
Nitrobenzene	EPA 8330	Extractable Organics	NELAP	1/2/2003
n-Nitrosodiethylamine	EPA 8270	Extractable Organics	NELAP	1/2/2003
n-Nitrosodimethylamine	EPA 8270	Extractable Organics	NELAP	1/2/2003
n-Nitroso-di-n-butylamine	EPA 8260	Volatile Organics	NELAP	1/2/2003
n-Nitroso-di-n-butylamine	EPA 8270	Extractable Organics	NELAP	1/2/2003
n-Nitrosodi-n-propylamine	EPA 8270	Extractable Organics	NELAP	1/2/2003

Laboratory Scope of Accreditation

Attachment to Certificate #: E87825-02, expiration date June 30, 2007. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: E87825 **EPA Lab Code: CA00029** **(310) 618-8889**

E87825
EMAX Laboratories, Inc.
1835 W. 205th Street
Torrance, CA 90501

Matrix: Solid and Chemical Materials

Analyte	Method/Tech	Category	Certification Type	Effective Date
n-Nitrosodiphenylamine	EPA 8270	Extractable Organics	NELAP	1/2/2003
n-Nitrosomethylethylamine	EPA 8270	Extractable Organics	NELAP	1/2/2003
n-Nitrosomorpholine	EPA 8270	Extractable Organics	NELAP	1/2/2003
n-Nitrosopiperidine	EPA 8270	Extractable Organics	NELAP	1/2/2003
n-Nitrosopyrrolidine	EPA 8270	Extractable Organics	NELAP	1/2/2003
n-Propylbenzene	EPA 8260	Volatile Organics	NELAP	12/4/2003
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	EPA 8330	Extractable Organics	NELAP	12/4/2003
o-Toluidine	EPA 8270	Extractable Organics	NELAP	1/2/2003
Parathion, ethyl	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	1/2/2003
Pentachlorobenzene	EPA 8270	Extractable Organics	NELAP	1/2/2003
Pentachloroethane	EPA 8260	Volatile Organics	NELAP	1/2/2003
Pentachloronitrobenzene	EPA 8270	Extractable Organics,Pesticides-Herbicides-PCB's	NELAP	1/2/2003
Pentachlorophenol	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	12/4/2003
Pentachlorophenol	EPA 8270	Extractable Organics	NELAP	1/2/2003
pH	EPA 9040	General Chemistry	NELAP	1/2/2003
pH	EPA 9045	General Chemistry	NELAP	1/2/2003
Phenacetin	EPA 8270	Extractable Organics	NELAP	1/2/2003
Phenanthrene	EPA 8270	Extractable Organics	NELAP	1/2/2003
Phenanthrene	EPA 8310	Extractable Organics	NELAP	1/2/2003
Phenol	EPA 8270	Extractable Organics	NELAP	1/2/2003
Phorate	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	1/2/2003
Picloram	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	12/4/2003
Propionitrile (Ethyl cyanide)	EPA 8260	Volatile Organics	NELAP	1/2/2003
Pyrene	EPA 8270	Extractable Organics	NELAP	1/2/2003
Pyrene	EPA 8310	Extractable Organics	NELAP	1/2/2003
Pyridine	EPA 8260	Volatile Organics	NELAP	1/2/2003
Pyridine	EPA 8270	Extractable Organics	NELAP	1/2/2003
RDX (hexahydro-1,3,5-trinitro-1,3,5-triazine)	EPA 8330	Extractable Organics	NELAP	1/2/2003
Reactive cyanide	EPA 7.3.3.2	General Chemistry	NELAP	1/2/2003
Reactive sulfide	EPA 7.3.4.2	General Chemistry	NELAP	1/2/2003
Ronnel	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	1/2/2003
Safrole	EPA 8270	Extractable Organics	NELAP	1/2/2003
sec-Butylbenzene	EPA 8260	Volatile Organics	NELAP	12/4/2003
Selenium	EPA 6010	Metals	NELAP	1/2/2003

Laboratory Scope of Accreditation

Attachment to Certificate #: E87825-02, expiration date June 30, 2007. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: E87825 **EPA Lab Code: CA00029** **(310) 618-8889**

E87825
EMAX Laboratories, Inc.
1835 W. 205th Street
Torrance, CA 90501

Matrix: Solid and Chemical Materials

Analyte	Method/Tech	Category	Certification Type	Effective Date
Selenium	EPA 7740	Metals	NELAP	1/2/2003
Silver	EPA 6010	Metals	NELAP	1/2/2003
Silver	EPA 7761	Metals	NELAP	1/2/2003
Silvex (2,4,5-TP)	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	1/2/2003
Styrene	EPA 8260	Volatile Organics	NELAP	12/4/2003
Sulfotepp	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	1/2/2003
Synthetic Precipitation Leaching Procedure	EPA 1312	General Chemistry	NELAP	1/2/2003
tert-Butyl alcohol	EPA 8260	Volatile Organics	NELAP	12/4/2003
tert-Butylbenzene	EPA 8260	Volatile Organics	NELAP	12/4/2003
Tetrachloroethylene (Perchloroethylene)	EPA 8260	Volatile Organics	NELAP	1/2/2003
Tetryl (methyl-2,4,6-trinitrophenylnitramine)	EPA 8330	Extractable Organics	NELAP	1/2/2003
Thallium	EPA 6010	Metals	NELAP	1/2/2003
Thallium	EPA 7841	Metals	NELAP	1/2/2003
Thionazin (Zinophos)	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	1/2/2003
Toluene	EPA 8021	Volatile Organics	NELAP	1/2/2003
Toluene	EPA 8260	Volatile Organics	NELAP	1/2/2003
Total cyanide	EPA 9010	General Chemistry	NELAP	1/2/2003
Total cyanide	EPA 9010/9014	General Chemistry	NELAP	12/4/2003
Toxaphene (Chlorinated camphene)	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	1/2/2003
Toxicity Characteristic Leaching Procedure	EPA 1311	General Chemistry	NELAP	1/2/2003
trans-1,2-Dichloroethylene	EPA 8260	Volatile Organics	NELAP	1/2/2003
trans-1,3-Dichloropropylene	EPA 8260	Volatile Organics	NELAP	1/2/2003
trans-1,4-Dichloro-2-butene	EPA 8260	Volatile Organics	NELAP	1/2/2003
Trichloroethene (Trichloroethylene)	EPA 8260	Volatile Organics	NELAP	1/2/2003
Trichlorofluoromethane	EPA 8260	Volatile Organics	NELAP	1/2/2003
Vanadium	EPA 6010	Metals	NELAP	1/2/2003
Vinyl acetate	EPA 8260	Volatile Organics	NELAP	1/2/2003
Vinyl chloride	EPA 8260	Volatile Organics	NELAP	1/2/2003
Xylene (total)	EPA 8021	Volatile Organics	NELAP	1/2/2003
Xylene (total)	EPA 8260	Volatile Organics	NELAP	1/2/2003
Zinc	EPA 6010	Metals	NELAP	1/2/2003

STATE OF KANSAS

DEPARTMENT OF HEALTH AND ENVIRONMENT

CERTIFICATE

This is to certify that Certificate No. E-10272

EMAX Laboratories, Inc.
1835 W 205th Street
Torrance, CA 90501

has been accredited in accordance with K.S.A. 65-1,109a for performing environmental analyses for the parameters listed on the attached form. Continuous accreditation depends on successful, ongoing participation in the program. Clients are urged to verify with this agency the laboratory's certification status for particular methods and analytes.

EFFECTIVE DATE: 11/01/2006 EXPIRATION DATE: 10/31/2007

Secretary
Department of Health and Environment

Environmental Laboratory Certification Officers

LITHO. IN U.S.A.

KANSAS DEPARTMENT OF HEALTH AND ENVIRONMENT
ENVIRONMENTAL LABORATORY CERTIFICATION
DRINKING WATER CERTIFICATION - PARAMETER LIST

This certificate supersedes all previous certificates

EMAX Laboratories, Inc.
1835 W 205th Street
Torrance, CA 90501

Certificate Number: E-10272
Effective Date: 11/01/2006
Expiration Date: 10/31/2007
Reciprocity: CA

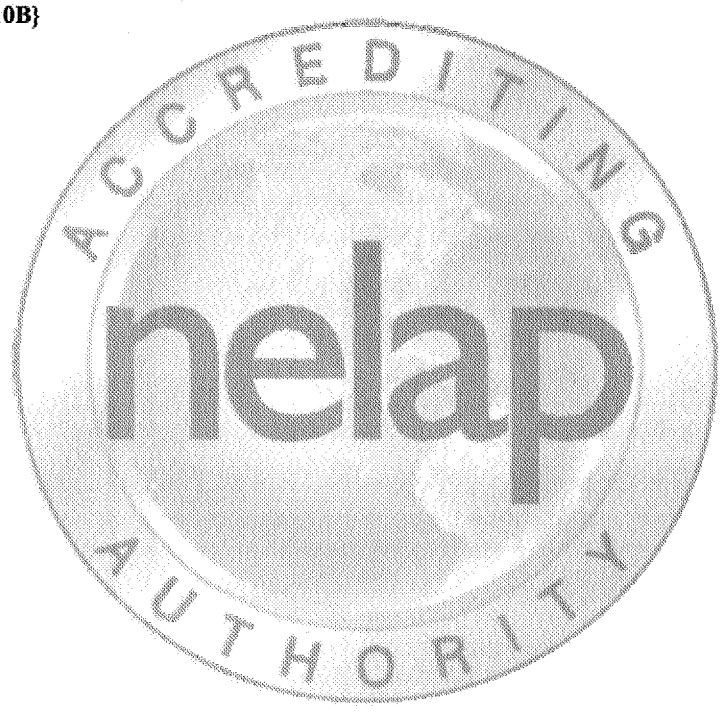
The laboratory listed above is hereby approved for environmental laboratory certification in accordance with K.S.A. 65-1,109a for performing drinking water analysis for the following parameters:

****DEMANDS**
Dissolved Organic Carbon {SM 5310B}
Total Organic Carbon {SM 5310B}

****INORGANIC**
Phosphate, Ortho {EPA 300.0}
Phosphate, Ortho {SM 4110B}

****METALS**
Aluminum {EPA 200.7}
Aluminum {EPA 200.8}
Antimony {EPA 200.8}
Arsenic {EPA 200.8}
Barium {EPA 200.7}
Barium {EPA 200.8}
Beryllium {EPA 200.7}
Beryllium {EPA 200.8}
Cadmium {EPA 200.7}
Cadmium {EPA 200.8}
Calcium {EPA 200.7}
Chromium {EPA 200.7}
Chromium {EPA 200.8}
Copper {EPA 200.7}
Copper {EPA 200.8}
Iron {EPA 200.7}
Lead {EPA 200.8}
Manganese {EPA 200.7}
Manganese {EPA 200.8}
Mercury {EPA 200.8}
Mercury {EPA 245.2}
Nickel {EPA 200.7}
Nickel {EPA 200.8}
Selenium {EPA 200.8}
Silica {EPA 200.7}
Silver {EPA 200.7}
Silver {EPA 200.8}
Sodium {EPA 200.7}
Thallium {EPA 200.8}
Zinc {EPA 200.7}
Zinc {EPA 200.8}

****MINERALS**
Alkalinity {SM 2320B}
Chloride {EPA 300.0}
Chloride {SM 4110B}
Fluoride {EPA 300.0}
Fluoride {SM 4110B}
Fluoride {SM 4500-F C}
Hardness {SM 2340B}
Hardness {SM 2340C}



NELAP-Recognized

Sulfate {EPA 300.0}
Sulfate {SM 4110B}

**MISCELLANEOUS
Bromate {EPA 300.1}
Bromide {EPA 300.0}
Chlorate {EPA 300.0}
Specific Conductance {SM 2510B}
Surfactants (MBAS) {SM 5540C}

**NUTRIENTS
Nitrate {EPA 300.0}
Nitrate {SM 4110B}
Nitrite {EPA 300.0}
Nitrite {SM 4110B}

**ORGANIC CHEMISTRY DBCP/EDB
{EPA 504.1} 1,2-Dibromo-3-Chloropropane (DBCP)
{EPA 504.1} 1,2-Dibromoethane (EDB, Ethylene dibromide)

**ORGANIC CHEMISTRY VOLATILES
{EPA 524.2} 1,1-Dichloroethylene
{EPA 524.2} 1,1,1-Trichloroethane
{EPA 524.2} 1,1,2-Trichloroethane
{EPA 524.2} 1,2-Dichlorobenzene
{EPA 524.2} 1,2-Dichloroethane
{EPA 524.2} 1,2-Dichloropropane
{EPA 524.2} 1,2,4-Trichlorobenzene
{EPA 524.2} 1,4-Dichlorobenzene
{EPA 524.2} Benzene
{EPA 524.2} Carbon Tetrachloride
{EPA 524.2} Chlorobenzene
{EPA 524.2} cis-1,2-Dichloroethylene
{EPA 524.2} Dichloromethane (Methylene chloride)
{EPA 524.2} Ethylbenzene
{EPA 524.2} Styrene
{EPA 524.2} Tetrachloroethylene
{EPA 524.2} Toluene
{EPA 524.2} trans-1,2-Dichloroethylene
{EPA 524.2} Trichloroethylene
{EPA 524.2} Vinyl Chloride
{EPA 524.2} Xylene

**RESIDUES
Residue, Filterable (TDS) {SM 2540C}

**TRIHALOMETHANES
{EPA 524.2} Bromodichloromethane
{EPA 524.2} Bromoform
{EPA 524.2} Chloroform
{EPA 524.2} Dibromochloromethane

**UNREGULATED ORGANIC COMPOUNDS
{EPA 524.2} 1,1-Dichloroethane
{EPA 524.2} 1,1-Dichloropropene
{EPA 524.2} 1,1,1,2-Tetrachloroethane
{EPA 524.2} 1,1,2,2-Tetrachloroethane
{EPA 524.2} 1,2,3-Trichlorobenzene
{EPA 524.2} 1,2,3-Trichloropropane
{EPA 524.2} 1,2,4-Trimethylbenzene
{EPA 524.2} 1,3-Dichlorobenzene

{EPA 524.2} 1,3-Dichloropropane
{EPA 524.2} 1,3,5-Trimethylbenzene
{EPA 524.2} 2-Chlorotoluene
{EPA 524.2} 2,2-Dichloropropane
{EPA 524.2} 4-Chlorotoluene
{EPA 524.2} 4-Isopropyltoluene
{EPA 524.2} Bromobenzene
{EPA 524.2} Bromochloromethane
{EPA 524.2} Bromomethane
{EPA 524.2} Chloroethane
{EPA 524.2} Chloromethane
{EPA 524.2} cis-1,3-Dichloropropene
{EPA 524.2} Dibromomethane
{EPA 524.2} Dichlorodifluoromethane
{EPA 524.2} Hexachlorobutadiene
{EPA 524.2} Isopropylbenzene
{EPA 524.2} Methyl-t-butyl ether
{EPA 524.2} n-Butylbenzene
{EPA 524.2} n-Propylbenzene
{EPA 524.2} Naphthalene
{EPA 524.2} Nitrobenzene
{EPA 524.2} sec-Butylbenzene
{EPA 524.2} tert-Butylbenzene
{EPA 524.2} trans-1,3-Dichloropropene
{EPA 524.2} Trichlorofluoromethane

End of Parameter List

NELAP-Recognized

KANSAS DEPARTMENT OF HEALTH AND ENVIRONMENT
ENVIRONMENTAL LABORATORY CERTIFICATION
WASTE WATER CERTIFICATION - PARAMETER LIST

This certificate supersedes all previous certificates

EMAX Laboratories, Inc.
1835 W 205th Street
Torrance, CA 90501

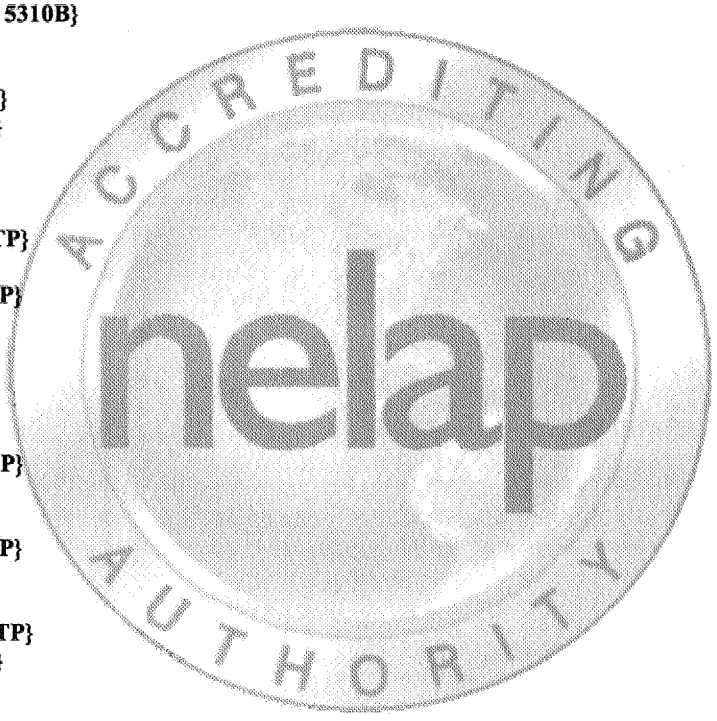
Certificate Number: E-10272
Effective Date: 11/01/2006
Expiration Date: 10/31/2007
Reciprocity: CA

The laboratory listed above is hereby approved for environmental laboratory certification in accordance with K.S.A. 65-1,109a for performing waste water analysis for the following parameters:

****DEMANDS**
BOD {EPA 405.1}
BOD {SM 5210B}
COD {EPA 410.4}
COD {SM 5220D}
Total Organic Carbon {EPA 415.1}
Total Organic Carbon {SM 5310B}

****INORGANIC**
Chlorine - total {EPA 330.3}
Cyanide, Total {EPA 335.2}

****METALS**
Aluminum {EPA 200.7}
Aluminum {EPA 200.8 - ATP}
Antimony {EPA 200.7}
Antimony {EPA 200.8 - ATP}
Arsenic {EPA 200.7}
Arsenic {EPA 200.8 - ATP}
Barium {EPA 200.7}
Barium {EPA 200.8 - ATP}
Beryllium {EPA 200.7}
Beryllium {EPA 200.8 - ATP}
Boron {EPA 200.7}
Cadmium {EPA 200.7}
Cadmium {EPA 200.8 - ATP}
Calcium {EPA 200.7}
Chromium {EPA 200.7}
Chromium {EPA 200.8 - ATP}
Chromium, VI {EPA 218.6}
Cobalt {EPA 200.7}
Cobalt {EPA 200.8 - ATP}
Copper {EPA 200.7}
Iron {EPA 200.7}
Lead {EPA 200.7}
Lead {EPA 200.8 - ATP}
Magnesium {EPA 200.7}
Manganese {EPA 200.7}
Manganese {EPA 200.8 - ATP}
Molybdenum {EPA 200.7}
Molybdenum {EPA 200.8 - ATP}
Nickel {EPA 200.7}
Nickel {EPA 200.8 - ATP}
Potassium {EPA 200.7}
Selenium {EPA 200.7}
Selenium {EPA 200.8 - ATP}
Silica {EPA 200.7}
Silica {EPA 370.1}
Silver {EPA 200.7}
Silver {EPA 200.8 - ATP}



NELAP-Recognized

Sodium {EPA 200.7}
Thallium {EPA 200.7}
Thallium {EPA 200.8 - ATP}
Tin {EPA 200.7}
Titanium {EPA 200.7-ATP}
Vanadium {EPA 200.7}
Vanadium {EPA 200.8 - ATP}
Zinc {EPA 200.7}
Zinc {EPA 200.8 - ATP}

**METALS - 503 Regs
Arsenic {EPA 6010B}
Arsenic {EPA 6020}
Cadmium {EPA 6010B}
Cadmium {EPA 6020}
Chromium, Total {EPA 6010B}
Chromium, Total {EPA 6020}
Copper {EPA 6010B}
Copper {EPA 6020}
Lead {EPA 6010B}
Lead {EPA 6020}
Mercury {EPA 7470}
Mercury {EPA 7471}
Molybdenum {EPA 6010B}
Molybdenum {EPA 6020}
Nickel {EPA 6010B}
Nickel {EPA 6020}
Selenium {EPA 6010B}
Selenium {EPA 6020}
Zinc {EPA 6010B}
Zinc {EPA 6020}

**MINERALS
Acidity {EPA 305.1}
Acidity {SM 2310B}
Alkalinity {EPA 310.1}
Alkalinity {SM 2320B}
Chloride {EPA 300.0}
Fluoride {EPA 300.0}
Fluoride {EPA 340.2}
Fluoride {SM 4500-F C}
Hardness {EPA 130.1}
Hardness {EPA 130.2}
Hardness {SM 2340B}
Hardness {SM 2340C}
Sulfate {EPA 300.0}
Sulfide {EPA 376.1}
Sulfide {EPA 376.2}
Sulfite {EPA 377.1}

**MISCELLANEOUS
Bromide {EPA 300.0}
Color {EPA 110.2}
Hydrogen Ion (pH) {EPA 150.1}
Hydrogen Ion (pH) {SM 4500-H+ B}
Oil & Grease {EPA 1664}
Oil & Grease {EPA 413.1}
Oil & Grease {SM 5520B}
Phenolics {EPA 420.1}
Specific Conductance {EPA 120.1}
Specific Conductance {SM 2510B}

NELAP-Recognized

Surfactants (MBAS) {EPA 425.1}
Turbidity {EPA 180.1}
Turbidity {SM 2130B}

****NUTRIENTS**
Ammonia {EPA 350.2}
K Nitrogen {EPA 351.3}
Nitrate-Nitrite {EPA 300.0}
Nitrate-Nitrite {EPA 353.3}
Nitrate {EPA 300.0}
Nitrate {EPA 353.3}
Nitrite {EPA 300.0}
O-Phosphate {EPA 300.0}
O-Phosphate {EPA 365.2}

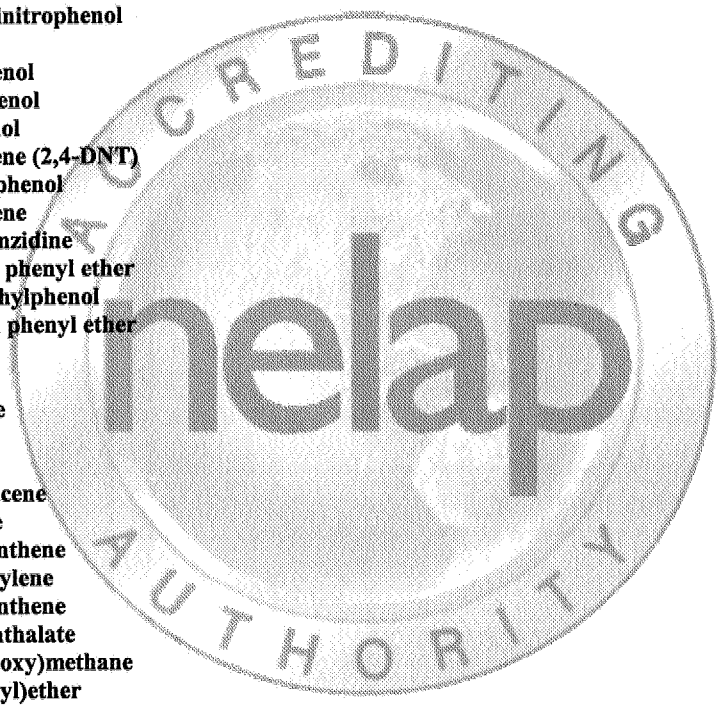
****ORGANIC CHEMISTRY VOLATILES (MEASUREMENT BY GC/MS)**
{EPA 624} 1,1-Dichloroethane
{EPA 624} 1,1-Dichloroethylene
{EPA 624} 1,1,1-Trichloroethane
{EPA 624} 1,1,2-Trichloroethane
{EPA 624} 1,1,2,2-Tetrachloroethane
{EPA 624} 1,2-Dichlorobenzene
{EPA 624} 1,2-Dichloroethane
{EPA 624} 1,2-Dichloropropane
{EPA 624} 1,3-Dichlorobenzene
{EPA 624} 1,4-Dichlorobenzene
{EPA 624} 2-Chloroethyl vinyl ether
{EPA 624} Benzene
{EPA 624} Bromodichloromethane
{EPA 624} Bromoform
{EPA 624} Bromomethane
{EPA 624} Carbon Tetrachloride
{EPA 624} Chlorobenzene
{EPA 624} Chloroethane
{EPA 624} Chloroform
{EPA 624} Chloromethane
{EPA 624} cis-1,3-Dichloropropene
{EPA 624} Dibromochloromethane
{EPA 624} Dichloromethane (Methylene chloride)
{EPA 624} Ethylbenzene
{EPA 624} Tetrachloroethylene
{EPA 624} Toluene
{EPA 624} trans-1,2-Dichloroethylene
{EPA 624} trans-1,3-Dichloropropene
{EPA 624} Trichloroethylene
{EPA 624} Trichlorofluoromethane
{EPA 624} Vinyl Chloride

NELAP-Recognized

****ORGANIC CHEMISTRY (MEASUREMENT BY GC)**
{EPA 608} alpha-BHC (alpha-Hexachlorocyclohexane)
{EPA 608} beta-BHC (beta-Hexachlorocyclohexane)
{EPA 608} Chlordane
{EPA 608} delta-BHC
{EPA 608} Dieldrin
{EPA 608} Endosulfan I
{EPA 608} Endosulfan II
{EPA 608} Endosulfan Sulfate
{EPA 608} Endrin
{EPA 608} Endrin aldehyde
{EPA 608} gamma-BHC (Lindane, gamma-Hexachlorocyclohexane)
{EPA 608} Heptachlor

{EPA 608} Heptachlor epoxide
{EPA 608} PCB-1016
{EPA 608} PCB-1221
{EPA 608} PCB-1232
{EPA 608} PCB-1242
{EPA 608} PCB-1248
{EPA 608} PCB-1254
{EPA 608} PCB-1260
{EPA 608} Toxaphene (Chlorinated camphene)

**ORGANIC CHEMISTRY (MEASUREMENT BY GC/MS)
{EPA 625} 1,2-Dichlorobenzene
{EPA 625} 1,2,4-Trichlorobenzene
{EPA 625} 1,3-Dichlorobenzene
{EPA 625} 1,4-Dichlorobenzene
{EPA 625} 2-Chloronaphthalene
{EPA 625} 2-Chlorophenol
{EPA 625} 2-Methyl-4,6-Dinitrophenol
{EPA 625} 2-Nitrophenol
{EPA 625} 2,4-Dichlorophenol
{EPA 625} 2,4-Dimethylphenol
{EPA 625} 2,4-Dinitrophenol
{EPA 625} 2,4-Dinitrotoluene (2,4-DNT)
{EPA 625} 2,4,6-Trichlorophenol
{EPA 625} 2,6-Dinitrotoluene
{EPA 625} 3,3'-Dichlorobenzidine
{EPA 625} 4-Bromophenyl phenyl ether
{EPA 625} 4-Chloro-3-methylphenol
{EPA 625} 4-Chlorophenyl phenyl ether
{EPA 625} 4-Nitrophenol
{EPA 625} Acenaphthene
{EPA 625} Acenaphthylene
{EPA 625} Anthracene
{EPA 625} Benzidine
{EPA 625} Benzo(a)anthracene
{EPA 625} Benzo(a)pyrene
{EPA 625} Benzo(b)fluoranthene
{EPA 625} Benzo(g,h,i)perylene
{EPA 625} Benzo(k)fluoranthene
{EPA 625} Benzyl butyl phthalate
{EPA 625} Bis(2-chloroethoxy)methane
{EPA 625} Bis(2-chloroethyl)ether
{EPA 625} bis(2-Chloroisopropyl)ether
{EPA 625} Bis(2-ethylhexyl)phthalate
{EPA 625} Chrysene
{EPA 625} Di-n-butyl phthalate
{EPA 625} Di-n-octyl phthalate
{EPA 625} Dibenzo(a,h)anthracene
{EPA 625} Diethyl phthalate
{EPA 625} Dimethyl phthalate
{EPA 625} Fluoranthene
{EPA 625} Fluorene
{EPA 625} Hexachlorobenzene
{EPA 625} Hexachlorobutadiene
{EPA 625} Hexachlorocyclopentadiene
{EPA 625} Hexachloroethane
{EPA 625} Indeno(1,2,3-c,d)pyrene
{EPA 625} Isophorone
{EPA 625} N-Nitrosodi-n-propylamine
{EPA 625} N-Nitrosodimethylamine
{EPA 625} N-Nitrosodiphenylamine



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{EPA 625} Naphthalene
{EPA 625} Nitrobenzene
{EPA 625} Pentachlorophenol
{EPA 625} Phenanthrene
{EPA 625} Phenol
{EPA 625} Pyrene

****RESIDUES**
Residue, Filterable (TDS) {EPA 160.1}
Residue, Filterable (TDS) {SM 2540C}
Residue, Non Filterable (TSS) {EPA 160.2}
Residue, Non Filterable (TSS) {SM 2540D}
Residue, Settleable {EPA 160.5}
Residue, Settleable {SM 2540F}
Residue, Total {EPA 160.3}
Residue, Total {SM 2540B}
Residue, Volatile {EPA 160.4}

End of Parameter List

NELAP-Recognized

KANSAS DEPARTMENT OF HEALTH AND ENVIRONMENT
ENVIRONMENTAL LABORATORY CERTIFICATION
SOLID/HAZARDOUS WASTE CERTIFICATION - PARAMETER LIST

This certificate supersedes all previous certificates

EMAX Laboratories, Inc.
1835 W 205th Street
Torrance, CA 90501

Certificate Number: E-10272
Effective Date: 11/01/2006
Expiration Date: 10/31/2007
Reciprocity: CA

The laboratory listed above is hereby approved for environmental laboratory certification in accordance with K.S.A. 65-1,109a for performing solids and/or hazardous waste analysis for the following parameters:

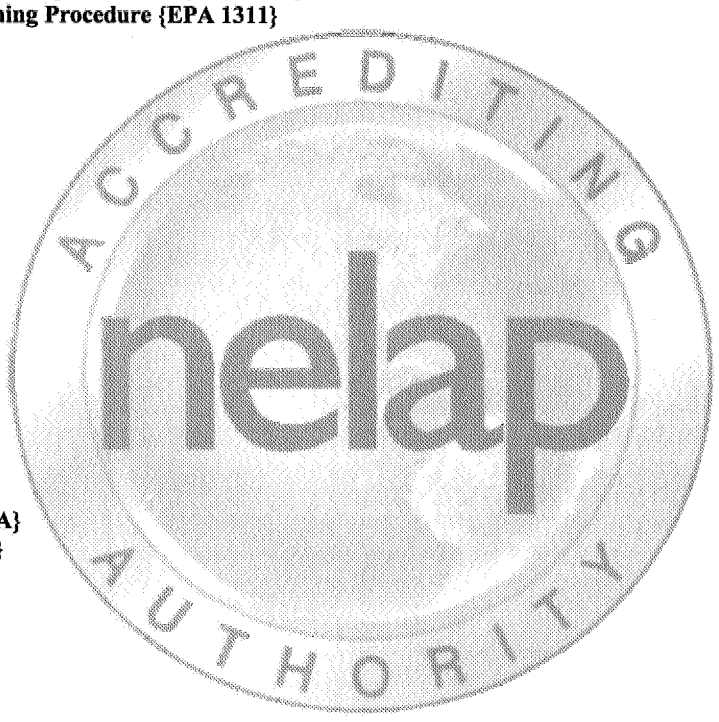
****CHARACTERISTICS**
Ignitability {EPA 1010}
Reactive Cyanide {CHAP 7, SEC. 7.3}
Reactive Sulfide {CHAP 7, SEC. 7.3}
Synthetic Precipitation Leaching Procedure {EPA 1312}
Toxic Characteristic Leaching Procedure {EPA 1311}

****INORGANIC**
Cyanide {EPA 9014}

****METALS**
Antimony {EPA 6010B}
Antimony {EPA 6020}
Arsenic {EPA 6010B}
Arsenic {EPA 6020}
Barium {EPA 6010B}
Barium {EPA 6020}
Beryllium {EPA 6010B}
Beryllium {EPA 6020}
Cadmium {EPA 6010B}
Cadmium {EPA 6020}
Chromium {EPA 6010B}
Chromium {EPA 6020}
Chromium, VI {EPA 7196A}
Chromium, VI {EPA 7199}
Cobalt {EPA 6010B}
Cobalt {EPA 6020}
Copper {EPA 6010B}
Copper {EPA 6020}
Lead {EPA 6010B}
Lead {EPA 6020}
Mercury {EPA 7470A}
Mercury {EPA 7471A}
Molybdenum {EPA 6010B}
Nickel {EPA 6010B}
Nickel {EPA 6020}
Selenium {EPA 6010B}
Silver {EPA 6010B}
Thallium {EPA 6010B}
Thallium {EPA 6020}
Vanadium {EPA 6010B}
Zinc {EPA 6010B}
Zinc {EPA 6020}

****MINERALS**
Fluoride {EPA 9056}
Sulfide {EPA 9034}

****MISCELLANEOUS**



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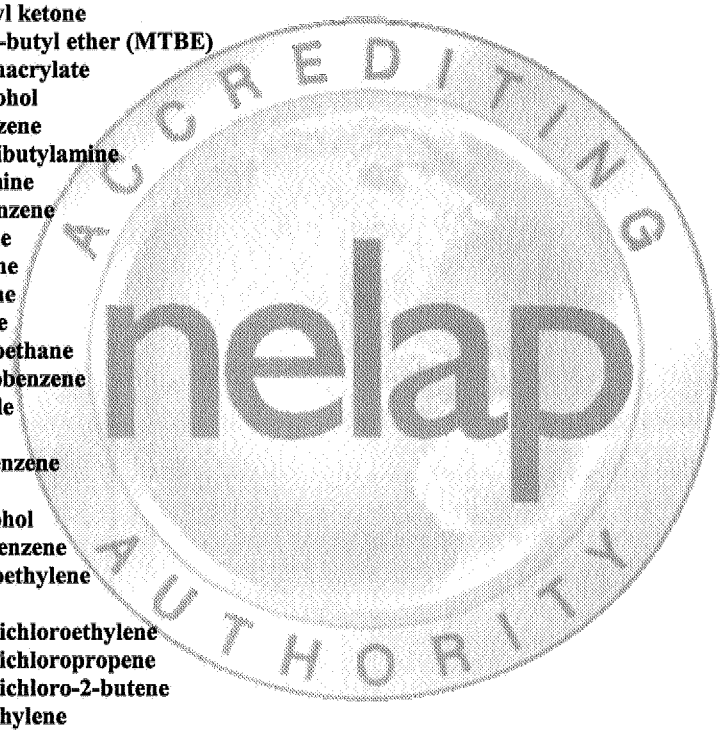
Hydrogen Ion (pH) {EPA 9040B}
Hydrogen Ion (pH) {EPA 9045C}

**ORGANIC CHEMISTRY VOLATILES (MEASUREMENT BY GC)
{EPA 8015B} Ethylene glycol
{EPA 8021B} Benzene
{EPA 8021B} Ethylbenzene
{EPA 8021B} meta-Xylene
{EPA 8021B} ortho-Xylene
{EPA 8021B} para-Xylene
{EPA 8021B} Toluene

**ORGANIC CHEMISTRY VOLATILES (MEASUREMENT BY GC/MS)
{EPA 8260B} 1,1-Dichloroethane
{EPA 8260B} 1,1-Dichloroethylene
{EPA 8260B} 1,1-Dichloropropene
{EPA 8260B} 1,1,1-Trichloroethane
{EPA 8260B} 1,1,1,2-Tetrachloroethane
{EPA 8260B} 1,1,2-Trichloroethane
{EPA 8260B} 1,1,2,2-Tetrachloroethane
{EPA 8260B} 1,2-Dibromoethane (EDB, Ethylene dibromide)
{EPA 8260B} 1,2-Dichlorobenzene
{EPA 8260B} 1,2-Dichloropropane
{EPA 8260B} 1,2,3-Trichlorobenzene
{EPA 8260B} 1,2,3-Trichloropropane
{EPA 8260B} 1,2,3,4-Diepoxybutane
{EPA 8260B} 1,2,4-Trichlorobenzene
{EPA 8260B} 1,2,4-Trimethylbenzene
{EPA 8260B} 1,3-Dichloro-2-propanol
{EPA 8260B} 1,3-Dichlorobenzene
{EPA 8260B} 1,3-Dichloropropane
{EPA 8260B} 1,3,5-Trimethylbenzene
{EPA 8260B} 1,4-Dichlorobenzene
{EPA 8260B} 1,4-Dioxane
{EPA 8260B} 2-Chloroethyl vinyl ether
{EPA 8260B} 2-Chlorotoluene
{EPA 8260B} 2-Hexanone
{EPA 8260B} 2-Picoline
{EPA 8260B} 2,2-Dichloropropane
{EPA 8260B} 3-Chloropropionitrile
{EPA 8260B} 4-Chlorotoluene
{EPA 8260B} 4-Methyl-2-Pentanone (MIBK)
{EPA 8260B} Acetone
{EPA 8260B} Acetonitrile
{EPA 8260B} Acrolein
{EPA 8260B} Acrylonitrile
{EPA 8260B} Allyl alcohol
{EPA 8260B} Allyl Chloride
{EPA 8260B} Benzene
{EPA 8260B} Bromoacetone
{EPA 8260B} Bromobenzene
{EPA 8260B} Bromochloromethane
{EPA 8260B} Bromodichloromethane
{EPA 8260B} Bromoform
{EPA 8260B} Bromomethane
{EPA 8260B} Carbon disulfide
{EPA 8260B} Carbon Tetrachloride
{EPA 8260B} Chlorobenzene
{EPA 8260B} Chloroethane
{EPA 8260B} Chloroform
{EPA 8260B} Chloromethane

{EPA 8260B} cis-1,2-Dichloroethylene
{EPA 8260B} cis-1,3-Dichloropropene
{EPA 8260B} Crotonaldehyde
{EPA 8260B} Dibromochloromethane
{EPA 8260B} Dibromochloropropane
{EPA 8260B} Dibromomethane
{EPA 8260B} Dichlorodifluoromethane
{EPA 8260B} Dichloromethane (Methylene chloride)
{EPA 8260B} Ethyl methacrylate
{EPA 8260B} Ethylbenzene
{EPA 8260B} Hexachlorobutadiene
{EPA 8260B} Iodomethane
{EPA 8260B} Isobutyl Alcohol
{EPA 8260B} Isopropylbenzene
{EPA 8260B} Malononitrile
{EPA 8260B} meta-Xylene
{EPA 8260B} Methacrylonitrile
{EPA 8260B} Methyl ethyl ketone
{EPA 8260B} Methyl tert-butyl ether (MTBE)
{EPA 8260B} Methylmethacrylate
{EPA 8260B} n-Butyl alcohol
{EPA 8260B} n-Butylbenzene
{EPA 8260B} N-Nitrosodibutylamine
{EPA 8260B} n-Propylamine
{EPA 8260B} n-Propylbenzene
{EPA 8260B} Naphthalene
{EPA 8260B} Nitrobenzene
{EPA 8260B} ortho-Xylene
{EPA 8260B} para-Xylene
{EPA 8260B} Pentachloroethane
{EPA 8260B} Pentafluorobenzene
{EPA 8260B} Propionitrile
{EPA 8260B} Pyridine
{EPA 8260B} sec-Butylbenzene
{EPA 8260B} Styrene
{EPA 8260B} t-Butyl alcohol
{EPA 8260B} tert-Butylbenzene
{EPA 8260B} Tetrachloroethylene
{EPA 8260B} Toluene
{EPA 8260B} trans-1,2-Dichloroethylene
{EPA 8260B} trans-1,3-Dichloropropene
{EPA 8260B} trans-1,4-Dichloro-2-butene
{EPA 8260B} Trichloroethylene
{EPA 8260B} Trichlorofluoromethane
{EPA 8260B} Vinyl Acetate
{EPA 8260B} Vinyl Chloride



NELAP-Recognized

**ORGANIC CHEMISTRY (MEASUREMENT BY GC)
{EPA 8011} 1,2-Dibromoethane (EDB, Ethylene dibromide)
{EPA 8011} Dibromochloropropane
{EPA 8081A} 4,4'-DDD
{EPA 8081A} 4,4'-DDE
{EPA 8081A} 4,4'-DDT
{EPA 8081A} Aldrin
{EPA 8081A} alpha-BHC (alpha-Hexachlorocyclohexane)
{EPA 8081A} alpha-Chlordane
{EPA 8081A} beta-BHC (beta-Hexachlorocyclohexane)
{EPA 8081A} Chlordane (Tech)
{EPA 8081A} Chlorobenzilate
{EPA 8081A} Chloroneb
{EPA 8081A} Chlorothalonil

{EPA 8081A} delta-BHC
{EPA 8081A} Diallate
{EPA 8081A} Dieldrin
{EPA 8081A} Endosulfan I
{EPA 8081A} Endosulfan II
{EPA 8081A} Endosulfan Sulfate
{EPA 8081A} Endrin
{EPA 8081A} Endrin aldehyde
{EPA 8081A} Endrin ketone
{EPA 8081A} g-Chlordane
{EPA 8081A} gamma-BHC (Lindane, gamma-Hexachlorocyclohexane)
{EPA 8081A} Heptachlor
{EPA 8081A} Heptachlor Epoxide
{EPA 8081A} Hexachlorobenzene
{EPA 8081A} Methoxychlor
{EPA 8081A} Toxaphene (Chlorinated camphene)
{EPA 8082} 2-Chlorobiphenyl
{EPA 8082} 2,2',3,3',4,4',5-Heptachlorobiphenyl
{EPA 8082} 2,2',3,3',4,4',5,5',6-Nonachlorobipheny
{EPA 8082} 2,2',3,4',5,5',6-Heptachlorobiphenyl
{EPA 8082} 2,2',3,4,4',5'-Hexachlorobiphenyl
{EPA 8082} 2,2',3,4,4',5',6-Heptachlorobiphenyl
{EPA 8082} 2,2',3,4,4',5,5'-Heptachlorobiphenyl
{EPA 8082} 2,2',3,4,5'-Pentachlorobiphenyl
{EPA 8082} 2,2',3,4,5,5'-Hexachlorobiphenyl
{EPA 8082} 2,2',3,5'-Tetrachlorobiphenyl
{EPA 8082} 2,2',3,5,5',6-Hexachlorobiphenyl
{EPA 8082} 2,2',4,4',5,5'-Hexachlorobiphenyl
{EPA 8082} 2,2',4,5,5'-Pentachlorobiphenyl
{EPA 8082} 2,2',5-Trichlorobiphenyl
{EPA 8082} 2,2',5,5'-Tetrachlorobiphenyl
{EPA 8082} 2,3',4,4'-Tetrachlorobiphenyl
{EPA 8082} 2,3-Dichlorobiphenyl
{EPA 8082} 2,3,3',4',6-Pentachlorobiphenyl
{EPA 8082} 2,4',5-Trichlorobiphenyl
{EPA 8082} PCB-1016
{EPA 8082} PCB-1221
{EPA 8082} PCB-1232
{EPA 8082} PCB-1242
{EPA 8082} PCB-1248
{EPA 8082} PCB-1254
{EPA 8082} PCB-1260
{EPA 8141A} Atrazine
{EPA 8141A} Azinphos-methyl (Guthion)
{EPA 8141A} Chlorfenvinphos
{EPA 8141A} Chlorpyrifos
{EPA 8141A} Chlorpyrifos methyl
{EPA 8141A} Demeton-o
{EPA 8141A} Demeton-s
{EPA 8141A} Diazinon
{EPA 8141A} Dimethoate
{EPA 8141A} EPN
{EPA 8141A} Ethion
{EPA 8141A} Famphur
{EPA 8141A} Malathion
{EPA 8141A} Mevinphos
{EPA 8141A} Naled
{EPA 8141A} Parathion ethyl
{EPA 8141A} Parathion methyl
{EPA 8141A} Phorate
{EPA 8141A} Ronnel

{EPA 8141A} Thionazine
{EPA 8151A} 2,4-D
{EPA 8151A} 2,4-DB
{EPA 8151A} 2,4,5-T
{EPA 8151A} 2,4,5-TP
{EPA 8151A} 3,5-Dichlorobenzoic acid
{EPA 8151A} 4-Nitrophenol
{EPA 8151A} Aciflurofen
{EPA 8151A} Bentazon
{EPA 8151A} Chloramben
{EPA 8151A} Dalapon
{EPA 8151A} DCPA Di-Acid
{EPA 8151A} Dicamba
{EPA 8151A} Dichlorprop
{EPA 8151A} Dinoseb (2-sec-butyl-4,6-dinitrophenol, DNBP)
{EPA 8151A} MCPA
{EPA 8151A} MCPP
{EPA 8151A} Pentachlorophenol
{EPA 8151A} Picloram

**ORGANIC CHEMISTRY (MEASUREMENT BY GC/MS)
{EPA 8270C} 1-Acetyl-2-thiourea
{EPA 8270C} 1-Naphthylamine
{EPA 8270C} 1,2-Dichlorobenzene
{EPA 8270C} 1,2-Diphenylhydrazine
{EPA 8270C} 1,2,4-Trichlorobenzene
{EPA 8270C} 1,2,4,5-Tetrachlorobenzene
{EPA 8270C} 1,3-Dichlorobenzene
{EPA 8270C} 1,3,5-Trinitrobenzene
{EPA 8270C} 1,4-Dichlorobenzene
{EPA 8270C} 1,4-Naphthoquinone
{EPA 8270C} 2-Acetylaminofluorene
{EPA 8270C} 2-Chloronaphthalene
{EPA 8270C} 2-Chlorophenol
{EPA 8270C} 2-Cyclohexyl-4,6-dinitrophenol
{EPA 8270C} 2-Methyl-4,6-Dinitrophenol
{EPA 8270C} 2-Methylnaphthalene
{EPA 8270C} 2-Methylphenol (o-Cresol)
{EPA 8270C} 2-Naphthylamine
{EPA 8270C} 2-Nitroaniline
{EPA 8270C} 2-Nitrophenol
{EPA 8270C} 2-Picoline
{EPA 8270C} 2,3,4,6-Tetrachlorophenol
{EPA 8270C} 2,4-Diamininotoluene
{EPA 8270C} 2,4-Dichlorophenol
{EPA 8270C} 2,4-Dimethylphenol
{EPA 8270C} 2,4-Dinitrophenol
{EPA 8270C} 2,4-Dinitrotoluene (2,4-DNT)
{EPA 8270C} 2,4,5-Trichlorophenol
{EPA 8270C} 2,4,6-Trichlorophenol
{EPA 8270C} 2,6-Dichlorophenol
{EPA 8270C} 2,6-Dinitrotoluene
{EPA 8270C} 3-Methylcholanthrene
{EPA 8270C} 3-Methylphenol (m-Cresol)
{EPA 8270C} 3-Nitroaniline
{EPA 8270C} 3,3'-Dichlorobenzidine
{EPA 8270C} 4-Aminobiphenyl
{EPA 8270C} 4-Bromophenyl phenyl ether
{EPA 8270C} 4-Chloro-3-methylphenol
{EPA 8270C} 4-Chloroaniline
{EPA 8270C} 4-Chlorophenyl phenyl ether

{EPA 8270C} 4-Methylphenol (p-Cresol)
{EPA 8270C} 4-Nitroaniline
{EPA 8270C} 4-Nitrophenol
{EPA 8270C} 5-Nitro-o-toluidine
{EPA 8270C} 7,12-Dimethylbenz(a)anthracene
{EPA 8270C} Acenaphthene
{EPA 8270C} Acenaphthylene
{EPA 8270C} Acetophenone
{EPA 8270C} alpha-alpha-Dimethylphenethylamine
{EPA 8270C} Aniline
{EPA 8270C} Anthracene
{EPA 8270C} Benzidine
{EPA 8270C} Benzoic acid
{EPA 8270C} Benzo(a)anthracene
{EPA 8270C} Benzo(a)pyrene
{EPA 8270C} Benzo(b)fluoranthene
{EPA 8270C} Benzo(g,h,i)perylene
{EPA 8270C} Benzo(k)fluoranthene
{EPA 8270C} Benzyl alcohol
{EPA 8270C} Bis(2-chloroethoxy)methane
{EPA 8270C} Bis(2-chloroethyl)ether
{EPA 8270C} Bis(2-chloroisopropyl)ether
{EPA 8270C} Butyl benzyl phthalate
{EPA 8270C} Chrysene
{EPA 8270C} Di-n-butyl phthalate
{EPA 8270C} Di-n-octyl phthalate
{EPA 8270C} Dibenzofuran
{EPA 8270C} Dibenzo(a,e)pyrene
{EPA 8270C} Dibenzo(a,h)anthracene
{EPA 8270C} Diethyl phthalate
{EPA 8270C} Dimethoate
{EPA 8270C} Dimethyl phthalate
{EPA 8270C} Dimethylaminoazobenzene
{EPA 8270C} Dinoseb (2-sec-butyl-4,6-dinitrophenol, DNBP)
{EPA 8270C} Diphenylamine
{EPA 8270C} Ethyl methanesulfonate
{EPA 8270C} Famphur
{EPA 8270C} Fluoranthene
{EPA 8270C} Fluorene
{EPA 8270C} Hexachlorobenzene
{EPA 8270C} Hexachlorobutadiene
{EPA 8270C} Hexachlorocyclopentadiene
{EPA 8270C} Hexachloroethane
{EPA 8270C} Hexachlorophene
{EPA 8270C} Hexachloropropene
{EPA 8270C} Indeno(1,2,3-c,d)pyrene
{EPA 8270C} Isodrin
{EPA 8270C} Isophorone
{EPA 8270C} Isosafrole
{EPA 8270C} Kepone
{EPA 8270C} Malic anhydride
{EPA 8270C} Methylmethanesulfonate
{EPA 8270C} N-Nitrosodi-n-butylamine
{EPA 8270C} N-Nitrosodi-n-propylamine
{EPA 8270C} N-Nitrosodiethylamine
{EPA 8270C} N-Nitrosodimethylamine
{EPA 8270C} N-Nitrosodiphenylamine
{EPA 8270C} N-Nitrosomethylethylamine
{EPA 8270C} N-Nitrosomorpholine
{EPA 8270C} N-Nitrosopiperidine
{EPA 8270C} N-Nitrosopyrrolidine

{EPA 8270C} Naphthalene
{EPA 8270C} o-Toluidine
{EPA 8270C} O,O,O-Triethylphosphorothioate
{EPA 8270C} p-Benzoquinone
{EPA 8270C} Parathion ethyl
{EPA 8270C} Parathion methyl
{EPA 8270C} Pentachlorobenzene
{EPA 8270C} Pentachloronitrobenzene
{EPA 8270C} Pentachlorophenol
{EPA 8270C} Phenacetin
{EPA 8270C} Phenanthrene
{EPA 8270C} Phenol
{EPA 8270C} Phorate
{EPA 8270C} Pyrene
{EPA 8270C} Pyridine
{EPA 8270C} Safrole
{EPA 8270C} Tetraethyl dithiopyrophosphate (Sulfotepp)

**ORGANIC CHEMISTRY (MEASUREMENT BY HPLC)
{EPA 8310} Acenaphthene
{EPA 8310} Acenaphthylene
{EPA 8310} Benzo(a)anthracene
{EPA 8310} Benzo(a)pyrene
{EPA 8310} Benzo(b)fluoranthene
{EPA 8310} Benzo(g,h,i)perylene
{EPA 8310} Benzo(k)fluoranthene
{EPA 8310} Chrysene
{EPA 8310} Dibenzo(a,h)anthracene
{EPA 8310} Fluoranthene
{EPA 8310} Fluorene
{EPA 8310} Indeno(1,2,3-c,d)pyrene
{EPA 8310} Naphthalene
{EPA 8310} Phenanthrene
{EPA 8310} Pyrene
{EPA 8330} 1,3-Dinitrobenzene
{EPA 8330} 1,3,5-Trinitrobenzene
{EPA 8330} 2-Amino-4,6-dinitrotoluene
{EPA 8330} 2,4-Dinitrotoluene (2,4-DNT)
{EPA 8330} 2,4,6-Trinitrotoluene
{EPA 8330} 2,6-Dinitrotoluene
{EPA 8330} 4-Amino-2,6-dinitrotoluene
{EPA 8330} HMX
{EPA 8330} meta-Nitrotoluene
{EPA 8330} Methyl-2,4,6-trinitrophenylnitramine
{EPA 8330} Nitrobenzene
{EPA 8330} ortho-Nitrotoluene
{EPA 8330} para-Nitrotoluene
{EPA 8330} RDX
{EPA 8332} Nitroglycerine

**TOTAL PETROLEUM HYDROCARBONS
{EPA 8015B} GRO

End of Parameter List

KANSAS
DEPARTMENT OF HEALTH & ENVIRONMENT
KATHLEEN SEBELIUS, GOVERNOR
Roderick L. Bremby, Secretary

NELAP-Recognized

MEMORANDUM

DATE: December 4, 2006

TO: Kennette Pimentel
Emax Laboratories, Inc.
1835 West 205th Street
Torrance, CA 90501

FROM: Jack R. McKenzie and Aurora Shields
Laboratory Improvement Specialists

Enclosed please find your updated parameter list(s). Please check parameters and methodology for accuracy.

If there are any questions concerning the parameters listed, contact this office at (785) 296-1639-Jack or (785) 296-6198-Aurora. If there are any changes, please notify this office in writing.

Enclosure/s

JRM/APS/gnm

Division of Health and Environmental Laboratories
Forbes Field, Bldg. 740; Topeka, KS 66620-0001
http://www.kdhe.state.ks.us/lipo

Telephone: Jack McKenzie (785) 296-1639
Aurora Shields (785) 296-6198
FAX (785) 296-1638

Committed to Excellence in Analytical Laboratory Science

The Commonwealth of Massachusetts

Department of Environmental Protection

Division of Environmental Analysis
Senator William X. Wall Experiment Station

certifies

M-CA291

EMAX LABORATORIES INC
1835 205TH ST
TORRANCE, CA 90501-0000

Laboratory Director: **Kam Y. PANG, PH.D.**

for the analysis of **POTABLE WATER (CHEMISTRY)**
NON POTABLE WATER (CHEMISTRY)

pursuant to 310 CMR 42.00

This certificate supersedes all previous Massachusetts certificates issued to this laboratory. The laboratory is regulated by and shall be responsible for being in compliance with Massachusetts regulations at 310 CMR 42.00.

This certificate is valid only when accompanied by the latest dated Certified Parameter List as issued by the Massachusetts D.E.P. Contact the Division of Environmental Analysis to verify the current certification status of the laboratory.

Certification is no guarantee of the validity of the data. This certification is subject to unannounced laboratory inspections.

Issued: **01 JUL 2006**

Expires: **30 JUN 2007**

Oscar C. Parcells

Director, Division of Environmental Analysis

COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Certified Parameter List as of: 01 JUL 2006

M-CA291 EMAX LABORATORIES INC
TORRANCE CA

NON POTABLE WATER (CHEMISTRY) **Effective Date** **01 JUL 2006** **Expiration Date** **30 JUN 2007**

Analytes	Methods
PH	EPA 150.1
SPECIFIC CONDUCTIVITY	EPA 120.1
TOTAL DISSOLVED SOLIDS	EPA 160.1
HARDNESS (CACO3), TOTAL	SM 2340B
ALKALINITY, TOTAL	EPA 310.1
CHLORIDE	EPA 300.0
SULFATE	EPA 300.0
AMMONIA-N	EPA 350.2
NITRATE-N	EPA 300.0
ORTHOPHOSPHATE	EPA 365.2
ORTHOPHOSPHATE	EPA 300.0
PHOSPHORUS, TOTAL	EPA 365.2
BIOCHEMICAL OXYGEN DEMAND	EPA 405.1
TOTAL ORGANIC CARBON	EPA 415.1
NON-FILTERABLE RESIDUE	EPA 160.2
OIL AND GREASE	EPA 413.1
OIL AND GREASE	EPA 1664
VOLATILE HALOCARBONS	EPA 624
VOLATILE AROMATICS	EPA 624

POTABLE WATER (CHEMISTRY) **Effective Date** **01 JUL 2006** **Expiration Date** **30 JUN 2007**

Analytes	Methods
NITRITE-N	EPA 300.0
FLUORIDE	EPA 300.0
SULFATE	EPA 300.0
VOLATILE ORGANIC COMPOUNDS	EPA 524.2
1,2-DIBROMOETHANE	EPA 504.1
1,2-DIBROMO-3-CHLOROPROPANE	EPA 504.1

D H E C

PROMOTE PROTECT PROSPER

South Carolina Department of Health and Environmental Control

Environmental Laboratory Certification Program

In accordance with the provisions of Regulation 61 - 81, entitled "State Environmental Laboratory Certification Regulation,"

EMAX LABORATORIES INC
1835 W 205TH ST
TORRANCE, CALIFORNIA 90501-1510

is hereby certified to perform analyses as documented on the attached parameter list(s). This certification does not guarantee validity of data generated, but indicates the laboratory's adherence to prescribed methodology, quality control, records keeping, and reporting procedures. This certificate is the property of S.C. DHEC and must be surrendered upon demand. This certificate is non-transferable and is valid only for the parameters and methodology listed on the attached parameter list(s).

Laboratory Director: KAM Y PANG PH D
Certifying Authority: CA
Date of Issue: September 14, 2006
Date of Expiration: August 31, 2007
Certificate Number: 87012001

Carl T. Smith

Director
Office of Environmental Laboratory Certification

SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL
ENVIRONMENTAL LABORATORY CERTIFICATION PROGRAM

EMAX LABORATORIES INC (Laboratory ID 87012)
Laboratory Director: KAM Y PANG PH D
Certifying Authority: CA
Certificate Number: 87012001

Date of Issue: September 14, 2006
Expiration Date: August 31, 2007

CLEAN WATER ACT

INORGANIC - DEMAND

BIOCHEMICAL OXYGEN DEMAND(BOD)	EPA 405.1
TOTAL ORGANIC CARBON (TOC)	EPA 415.1

INORGANIC - MINERAL

ACIDITY	EPA 305.1
ALKALINITY	EPA 310.1
CHLORIDE	EPA 300.0
HYDROGEN-ION CONC. (PH)	EPA 150.1
SPECIFIC CONDUCTANCE	EPA 120.1
SULFATE	EPA 300.0

INORGANIC - MISCELLANEOUS

BROMIDE	EPA 300.0
OIL & GREASE	EPA 413.1
SULFIDE	EPA 376.1
TURBIDITY	EPA 180.1

INORGANIC - NUTRIENT

AMMONIA-NITROGEN	EPA 350.2
KJELDAHL-NITROGEN	EPA 351.3
NITRATE-NITRITE (N02&N03)	EPA 300.0
NITRATE-NITROGEN	EPA 300.0
NITRITE-NITROGEN	EPA 300.0
ORTHOPHOSPHATE	EPA 300.0
PHOSPHORUS	EPA 365.2

SAFE DRINKING WATER ACT

INORGANIC - MINERAL

CHLORIDE	EPA 300.0
SULFATE	EPA 300.0

INORGANIC - MISCELLANEOUS

SURFACTANTS (MBAS)	SM 5540C

INORGANIC - NUTRIENT

NITRATE-NITROGEN	EPA 300.0
NITRITE-NITROGEN	EPA 300.0

SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL
ENVIRONMENTAL LABORATORY CERTIFICATION PROGRAM

EMAX LABORATORIES INC (Laboratory ID 87012)
Laboratory Director: KAM Y PANG PH D
Certifying Authority: CA
Certificate Number: 87012001

Date of Issue: September 14, 2006
Expiration Date: August 31, 2007

SAFE DRINKING WATER ACT

INORGANIC - RESIDUE

RESIDUE, FILTERABLE (TDS)	SM 2540C

D H E C
PROMOTE PROTECT PROSPER

C. Earl Hunter, Commissioner

Promoting and protecting the health of the public and the environment.

September 14, 2006

KAM Y PANG PH D
EMAX LABORATORIES INC
1835 W 205TH ST
TORRANCE, CALIFORNIA 90501-1510

Laboratory I. D. 87012

Dear Kam Y Pang Ph D:

Your amended certificate and associated parameter list(s) are enclosed. These documents now represent the certificate of record for your laboratory. Any certificate(s) and associated parameter list(s) received prior to your receipt of these documents are now null and void and should be destroyed. Please be reminded that all environmental data submitted to the Department is reviewed to ensure that the reporting laboratory possesses the necessary certification. Data reported by laboratories without the proper certification will be addressed by the affected enforcement programs.

If you have any questions, or problems are detected concerning your certificate, please contact this office within ten (10) working days.

Sincerely,

Carol F. Smith

Carol F. Smith, Director
Office of Environmental Laboratory Certification
Bureau of Environmental Services

CFS:ic

Enclosures

D H E C

PROMOTE PROTECT PROSPER

South Carolina Department of Health and Environmental Control

Environmental Laboratory Certification Program

In accordance with the provisions of Regulation 61 - 81, entitled "State Environmental Laboratory Certification Regulation,"

EMAX LABORATORIES INC
1835 W 205TH ST
TORRANCE, CALIFORNIA 90501-1510

is hereby certified to perform analyses as documented on the attached parameter list(s). This certification does not guarantee validity of data generated, but indicates the laboratory's adherence to prescribed methodology, quality control, records keeping, and reporting procedures. This certificate is the property of S.C. DHEC and must be surrendered upon demand. This certificate is non-transferable and is valid only for the parameters and methodology listed on the attached parameter list(s).

Laboratory Director: KAM Y PANG PH D
Certifying Authority: AZ
Date of Issue: June 02, 2006
Date of Expiration: March 06, 2007
Certificate Number: 87012002

Carol F. Smith

Director
Office of Environmental Laboratory Certification

SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL
ENVIRONMENTAL LABORATORY CERTIFICATION PROGRAM

EMAX LABORATORIES INC (Laboratory ID 87012)
Laboratory Director: KAM Y PANG PH D
Certifying Authority: AZ
Certificate Number: 87012002

Date of Issue: June 02, 2006
Expiration Date: March 06, 2007

SOLID & HAZARDOUS WASTES

INORGANIC - HAZARDOUS WASTE CHARACTERISTICS

IGNITABILITY (PENSKY MARTENS)	EPA 1010	
TCLP - BOTTLE EXTRACTION	EPA 1311	
TCLP - ZERO HEADSPACE	EPA 1311	

INORGANIC - MISCELLANEOUS

CYANIDE DISTILLATION	EPA 9010B	
SULFIDE DISTILLATION	EPA 9030B	

INORGANIC - TRACE METAL

ANTIMONY	EPA 6010B	
ARSENIC	EPA 6010B	
CADMIUM	EPA 6010B	
CHROMIUM, HEXAVALENT	EPA 7196A	
COPPER	EPA 6010B	
LEAD	EPA 6010B	
MERCURY	EPA 7470A	
MERCURY	EPA 7471A	
SELENIUM	EPA 6010B	
SILVER	EPA 6010B	
THALLIUM	EPA 6010B	

PCBS AND PESTICIDES

ORGANOCHLORINE PESTICIDES BY GC: CAP.COL.	EPA 8081A	EPA 3520C
ORGANOCHLORINE PESTICIDES BY GC: CAP.COL.	EPA 8081A	EPA 3550B
POLYCHLORINATED BIPHENYLS BY GC	EPA 8082	EPA 3520C
POLYCHLORINATED BIPHENYLS BY GC	EPA 8082	EPA 3550B

SEMI-VOLATILES

POLYNUCLEAR AROMATIC HYDROCARBONS BY HPLC	EPA 8310	EPA 3550B
SEMIVOLATILE ORGANICS BY GC/MS:CAP. COL.	EPA 8270C	EPA 3550B

SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL
ENVIRONMENTAL LABORATORY CERTIFICATION PROGRAM

EMAX LABORATORIES INC (Laboratory ID 87012)
Certifying Authority: AZ **Date of Issue: June 02, 2006**
Certificate Number: 87012002 **Expiration Date: March 06, 2007**

SOLID & HAZARDOUS WASTES

--------PCBS AND PESTICIDES--------

EPA 8081A
EPA 3520C

4,4'-DDD
4,4'-DDE
4,4'-DDT
ALDRIN
ALPHA-BHC
ALPHA-CHLORDANE
BETA-BHC
DELTA-BHC
DIELDRIN
ENDOSULFAN I
ENDOSULFAN II
ENDOSULFAN SULFATE
ENDRIN
ENDRIN ALDEHYDE
ENDRIN KETONE
GAMMA-BHC (LINDANE)
GAMMA-CHLORDANE
HEPTACHLOR
HEPTACHLOR EPOXIDE
HEXACHLOROBENZENE
METHOXYCHLOR
TOXAPHENE

EPA 8081A
EPA 3550B

4,4'-DDD
4,4'-DDE
4,4'-DDT
ALDRIN
ALPHA-BHC
ALPHA-CHLORDANE
BETA-BHC
DELTA-BHC
DIELDRIN
ENDOSULFAN I
ENDOSULFAN II
ENDOSULFAN SULFATE
ENDRIN
ENDRIN ALDEHYDE
ENDRIN KETONE
GAMMA-BHC (LINDANE)
GAMMA-CHLORDANE

EPA 8081A
EPA 3550B

HEPTACHLOR
HEPTACHLOR EPOXIDE
HEXACHLOROBENZENE
METHOXYCHLOR
TOXAPHENE

EPA 8082
EPA 3520C

PCB-1016 (AROCLOR-1016)
PCB-1221 (AROCLOR-1221)
PCB-1232 (AROCLOR-1232)
PCB-1242 (AROCLOR-1242)
PCB-1248 (AROCLOR-1248)
PCB-1254 (AROCLOR-1254)
PCB-1260 (AROCLOR-1260)

EPA 8082
EPA 3550B

PCB-1016 (AROCLOR-1016)
PCB-1221 (AROCLOR-1221)
PCB-1232 (AROCLOR-1232)
PCB-1242 (AROCLOR-1242)
PCB-1248 (AROCLOR-1248)
PCB-1254 (AROCLOR-1254)
PCB-1260 (AROCLOR-1260)

----------SEMI-VOLATILES----------

EPA 8270C
EPA 3550B

1,2,4-TRICHLOROBENZENE
1,2-DICHLOROBENZENE
1,2-DIPHENYLHYDRAZINE
1,3-DICHLOROBENZENE
1,4-DICHLOROBENZENE
1-CHLORONAPHTHALENE
2,4,5-TRICHLOROPHENOL
2,4,6-TRICHLOROPHENOL
2,4-DICHLOROPHENOL
2,4-DIMETHYLPHENOL
2,4-DINITROPHENOL
2,4-DINITROTOLUENE (2,4-DNT)

EPA 8270C
EPA 3550B

2,6-DINITROTOLUENE (2,6-DNT)
2-CHLORONAPHTHALENE
2-CHLOROPHENOL
2-METHYLNAPHTHALENE
2-METHYLPHENOL
2-NITROANILINE
2-NITROPHENOL
3,3-DICHLOROBENZIDINE
3-NITROANILINE
4,6-DINITRO-2-METHYLPHENOL
4-BROMOPHENYLPHENYL ETHER
4-CHLORO-3-METHYLPHENOL
4-CHLOROANILINE
4-CHLOROPHENYL PHENYL ETHER
4-METHYLPHENOL
4-NITROANILINE
4-NITROPHENOL
ACENAPHTHENE
ACENAPHTHYLENE
ANILINE
ANTHRACENE
BENZIDINE
BENZO(A)ANTHRACENE
BENZO(A)PYRENE
BENZO(B)FLUORANTHENE
BENZO(G,H,I)PERYLENE
BENZO(K)FLUORANTHENE
BENZOIC ACID
BENZYL ALCOHOL
BIS(2-CHLOROETHOXY)METHANE
BIS(2-CHLOROETHYL)ETHER
BIS(2-CHLOROISOPROPYL)ETHER
BIS(2-ETHYLHEXYL)PHTHALATE
BUTYL BENZYL PHTHALATE
CHRYSENE
DI-N-BUTYL PHTHALATE
DI-N-OCTYL PHTHALATE
DIBENZO(A,H)ANTHRACENE
DIBENZOFURAN
DIETHYL PHTHALATE
DIMETHYL PHTHALATE
FLUORANTHENE
FLUORENE
HEXACHLOROBENZENE
HEXACHLOROBUTADIENE

EPA 8270C
EPA 3550B

HEXACHLOROCYCLOPENTADIENE
HEXACHLOROETHANE
ISOPHORONE
N-NITROSODI-N-PROPYLAMINE
N-NITROSODIMETHYLAMINE
N-NITROSODIPHENYLAMINE
NAPHTHALENE
NITROBENZENE (NB)
PENTACHLOROPHENOL
PHENANTHRENE
PHENOL
PYRENE
PYRIDINE

EPA 8310
EPA 3550B

ACENAPHTHENE
ACENAPHTHYLENE
ANTHRACENE
BENZO(A)ANTHRACENE
BENZO(A)PYRENE
BENZO(B)FLUORANTHENE
BENZO(G,H,I)PERYLENE
BENZO(K)FLUORANTHENE
CHRYSENE
DIBENZO(A,H)ANTHRACENE
FLUORANTHENE
FLUORENE
INDENO(1,2,3-CD)PYRENE
NAPHTHALENE
PHENANTHRENE
PYRENE

Utah Department of Health
David N. Sundwall, MD
Executive Director

Epidemiology and Laboratory Services
Patrick F. Luedtke, MD, MPH.
Director of Public Health Laboratories

Bureau of Laboratory Improvement
David B Mendenhall, MPA, MT (ASCP)
Bureau Director

State of Utah
#
Governor
GARY HERBERT
Lieutenant Governor

NELAP Recognized

9/20/2006

EMAX Laboratories Incorporated
Kam Pang, Ph.D
1835 W. 205th St.
Torrance CA 90501

ID # CKY1
Account # 3106188889

Director,

In recognition of your NELAP accreditation and in compliance with the ELCP requirements, the laboratory listed is certified for environmental monitoring under the Clean Water Act and authorized to perform the following methods, for the analytes and matrix listed:

Non-Potable Water

Inorganics and Metals

110.2 [1971]	Color (Colorimetric-Platinum-Cobalt)
120.1 [1982]	Conductance (Specific Conductance, umhos at 25-C)
130.1 [1982]	Hardness, Total (mg/L as CaCO3) (Colorimetric, Automated EDTA)
130.2 [1971]	Hardness, Total (mg/L as CaCO3) (Titrimetric, EDTA)
150.1 [1982]	pH (Electometric)
160.1 [1971]	Residue, Filterable (Gravimetric, Dried at 180-C)
160.2 [1971]	Residue, Non-Filterable (Gravimetric, Dried at 103-105-C)
160.3 [1971]	Residue, Total (Gravimetric, Dried at 103-105-C)
160.4 [1971]	Residue, Volatile (Gravimetric, Ignition at 550-C)
160.5 [1974]	Settleable Matter (Volumetric, Imhoff Cone)
1664 A [1999]	Oil & Grease and Total Petroleum Hydrocarbons
180.1 [1993]	Turbidity
200.7 [1994]	Metals and Trace Elements in Water
200.7 [1994]	Aluminum
200.7 [1994]	Antimony
200.7 [1994]	Arsenic
200.7 [1994]	Barium
200.7 [1994]	Beryllium
200.7 [1994]	Boron
200.7 [1994]	Cadmium
200.7 [1994]	Calcium
200.7 [1994]	Chromium, Total
200.7 [1994]	Cobalt
200.7 [1994]	Copper
200.7 [1994]	Iron
200.7 [1994]	Lead

The expiration for the laboratory's certification is 8/31/2007. The Utah Environmental Laboratory Certification Program (ELCP) encourages clients and data users to verify the most current certification letter for the authorized method. For further assistance please call Lorna Ward 801-584-8469.

Inorganics and Metals

200.7 [1994]	Magnesium
200.7 [1994]	Manganese
200.7 [1994]	Molybdenum
200.7 [1994]	Nickel
200.7 [1994]	Potassium
200.7 [1994]	Selenium
200.7 [1994]	Silica
200.7 [1994]	Silver
200.7 [1994]	Sodium
200.7 [1994]	Thallium
200.7 [1994]	Tin
200.7 [1994]	Titanium
200.7 [1994]	Vanadium
200.7 [1994]	Zinc
200.8 [1994]	Metals And Trace Elements In Water and Wastes
200.8 [1994]	Aluminum
200.8 [1994]	Antimony
200.8 [1994]	Arsenic
200.8 [1994]	Barium
200.8 [1994]	Beryllium
200.8 [1994]	Cadmium
200.8 [1994]	Chromium
200.8 [1994]	Cobalt
200.8 [1994]	Lead
200.8 [1994]	Manganese
200.8 [1994]	Molybdenum
200.8 [1994]	Nickel
200.8 [1994]	Selenium
200.8 [1994]	Silver
200.8 [1994]	Thallium
200.8 [1994]	Vanadium
200.8 [1994]	Zinc
2130 B	Turbidity (Nephelometric)
2310 B	Acidity (Nephelometric)
2320 B	Alkalinity (Titration)
2340 B	Hardness (Calculation)
2340 C	Hardness (Titrimetric, EDTA)
2510 B	Conductivity (Laboratory)
2540 B	Total Solids Dried at 103-105-C
2540 C	Total Dissolved Solids Dried at 180-C
2540 D	Total Suspended Solids Dried at 103-105-C
2540 F	Settleable Solids
300.0 [1993]	Inorganic Anions In Water By Ion Chromatography
300.0 [1993]	Bromide
300.0 [1993]	Chloride
300.0 [1993]	Fluoride
300.0 [1993]	Nitrate
300.0 [1993]	Nitrite
300.0 [1993]	ortho-Phosphate
300.0 [1993]	Sulfate
305.1 [1974]	Acidity
310.1 [1978]	Alkalinity
330.3 [1978]	Chlorine, Total Residual
335.2 [1980]	Cyanide, Total

Inorganics and Metals

340.2 [1974]	Fluoride
350.2 [1974]	Nitrogen, Ammonia
351.3 [1978]	Nitrogen, Total Kjeldahl
353.3 [1974]	Nitrogen, Nitrate-Nitrite
365.2 [1971]	Phosphorous, Total
370.1	Silica, Dissolved
376.1 [1978]	Sulfide
376.2 [1978]	Sulfide
377.1 [1978]	Sulfite
405.1 [1974]	Biochemical Oxygen Demand
410.4 [1993]	Chemical Oxygen Demand
413.1 [1978]	Oil And Grease
415.1 [1974]	Organic Carbon, Total
418.1 [1978]	Petroleum Hydrocarbons
420.1 [1978]	Phenolics
425.1 [1971]	Methylene Blue Active Substances (MBAS)
4500 (F-) C	Fluoride (Ion-Selective Electrode)
4500 (H+) B	pH (Electrometric)
5210 B	Carboneous Biochemical Oxygen Demand (CBOD)
5220 D	Chemical Oxygen Demand (Colorimetric, Closed Reflux))
5310 B	Total Organic Carbon (Combustion-Infrared)
5520 B	Oil and Grease (Partition-Gravimetric)

Organics

624	Purgeables
624	Benzene
624	Bromodichloromethane
624	Bromoform
624	Bromomethane
624	Carbon Tetrachloride
624	Chlorobenzene
624	Chloroethane
624	2-Chloroethylvinyl Ether
624	Chloroform
624	Chloromethane
624	Dibromochloromethane
624	1,2-Dichlorobenzene
624	1,3-Dichlorobenzene
624	1,4-Dichlorobenzene
624	1,1-Dichloroethane
624	1,2-Dichloroethane
624	1,1-Dichloroethene
624	trans-1,2-Dichloroethene
624	1,2-Dichloropropane
624	cis-1,3-Dichloropropene
624	trans-1,3-Dichloropropene
624	Ethylbenzene
624	Methylene Chloride
624	1,1,2,2-Tetrachloroethane
624	Tetrachloroethylene
624	Toluene
624	1,1,1-Trichloroethane
624	1,1,2-Trichloroethane
624	Trichloroethene
624	Trichlorofluoromethane

Organics

624	Vinyl Chloride
625	Base/Neutrals and Acids
625	Acenaphthene
625	Acenaphthylene
625	Anthracene
625	Benzidine
625	Benzo(a)anthracene
625	Benzo(b)fluoranthene
625	Benzo(k)fluoranthene
625	Benzo(g,h,i)perylene
625	Benzo(a)pyrene
625	Benzyl Butyl Phthalate
625	bis(2-Chloroethyl)ether
625	bis(2-Chloroethoxy)methane
625	bis(2-Ethylhexyl)phthalate
625	bis(2-Chloroisopropyl)ether
625	4-Bromophenyl Phenyl Ether
625	2-Chloronaphthalene
625	4-Chlorophenyl Phenyl Ether
625	Chrysene
625	Dibenz(a,h)anthracene
625	Di-n-butylphthalate
625	1,2-Dichlorobenzene
625	1,3-Dichlorobenzene
625	1,4-Dichlorobenzene
625	3,3'-Dichlorobenzidine
625	Diethyl phthalate
625	Dimethyl phthalate
625	2,4-Dinitrotoluene
625	2,6-Dinitrotoluene
625	Di-n-octylphthalate
625	Fluoranthene
625	Fluorene
625	Hexachlorobenzene
625	Hexachlorobutadiene
625	Hexachlorocyclopentadiene
625	Hexachloroethane
625	Indeno(1,2,3-cd)pyrene
625	Isophorone
625	Naphthalene
625	Nitrobenzene
625	N-Nitrosodimethylamine
625	N-Nitrosodi-n-propylamine
625	N-Nitrosodiphenylamine
625	Phenanthrene
625	Pyrene
625	1,2,4-Trichlorobenzene
625	4-Chloro-3-methylphenol
625	2-Chlorophenol
625	2,4-Dichlorophenol
625	2,4-Dimethylphenol
625	2,4-Dinitrophenol
625	2-Methyl- 4,6-dinitrophenol
625	2-Nitrophenol

Organics	
625	4-Nitrophenol
625	Pentachlorophenol
625	Phenol
625	2,4,6-Trichlorophenol

The effective date of this certificate letter is: 9/1/2006.

The analytes by method which a laboratory is authorized to perform at any given time will be those indicated in the most recent certificate letter. The most recent certification letter supersedes all previous certification or authorization letters. It is the certified laboratory's responsibility to review this letter for discrepancies. The certified laboratory must document any discrepancies in this letter and send notice to this bureau within 15 days of receipt. This certificate letter will be recalled in the event your laboratory's certification is revoked.

Respectfully,

Patrick F. Luedtke, MD, MPH.
Director of Public Health Laboratories
Deputy Director of Epidemiology and Laboratory Services

State of Utah
#
Governor
GARY HERBERT
Lieutenant Governor

Utah Department of Health
David N. Sundwall, MD
Executive Director

Epidemiology and Laboratory Services
Patrick F. Luedtke, MD, MPH.
Director of Public Health Laboratories

Bureau of Laboratory Improvement
David B Mendenhall, MPA, MT (ASCP)
Bureau Director

NELAP Recognized

9/20/2006

EMAX Laboratories Incorporated
Kam Pang, Ph.D
1835 W. 205th St.
Torrance CA 90501

ID # CKY1
Account # 3106188889

Director,

On the basis of your most recent assessment, Proficiency Testing results and continuing compliance with the ELCP requirements, the laboratory listed is certified for environmental monitoring under the Resource Conservation and Recovery Act and authorized to perform the following methods, for the analytes and matrix listed:I

Characteristics

	Solid	Non-Potable Water	
1010	☐	☑	Ignitability
1311	☑	☑	Toxicity Characteristic Leaching Procedure Metals
1311	☑	☑	Toxicity Characteristic Leaching Procedure Semi-Volatiles
1311	☑	☑	Toxicity Characteristic Leaching Procedure Volatiles
1312	☑	☑	Synthetic Precipitation Leaching Procedure (TCLP Approval)

Inorganics

	Solid	Non-Potable Water	
9014	☑	☑	Cyanide
9034	☑	☑	Acid-Soluble and Acid-Insoluble Sulfides
9040 B	☐	☑	pH
9045	☑	☐	Soil and Waste pH
9056 [1994]	☑	☑	Fluoride

Metal Digestion

	Solid	Non-Potable Water	
3005 A	☐	☑	Acid Digestion Total Recoverable or Dissolved Metals
3010 A	☐	☑	Acid Digestion for Total Metals
3020 A	☐	☑	Acid Digestion for Total Metals
3050 B	☑	☐	Acid Digestion of Sediments, Sludges and Soils

Metals

	Solid	Non-Potable Water	
6010 B	☑	☑	Antimony
6010 B	☑	☑	Arsenic
6010 B	☑	☑	Barium
6010 B	☑	☑	Beryllium

The expiration for the laboratory's certification is 8/31/2007. The Utah Environmental Laboratory Certification Program (ELCP) encourages clients and data users to verify the most current certification letter for the authorized method. For further assistance please call Lorna Ward 801-584-8469.

Metals

	Solid	Non-Potable Water	
6010 B	☑	☑	Cadmium
6010 B	☑	☑	Chromium
6010 B	☑	☑	Cobalt
6010 B	☑	☑	Copper
6010 B	☑	☑	Lead
6010 B	☑	☑	Molybdenum
6010 B	☑	☑	Nickel
6010 B	☑	☑	Selenium
6010 B	☑	☑	Silver
6010 B	☑	☑	Thallium
6010 B	☑	☑	Vanadium
6010 B	☑	☑	Zinc
6020 [1994]	☑	☑	Antimony
6020 [1994]	☑	☑	Arsenic
6020 [1994]	☑	☑	Barium
6020 [1994]	☑	☑	Beryllium
6020 [1994]	☑	☑	Cadmium
6020 [1994]	☑	☑	Chromium
6020 [1994]	☑	☑	Cobalt
6020 [1994]	☑	☑	Copper
6020 [1994]	☑	☑	Lead
6020 [1994]	☑	☑	Molybdenum
6020 [1994]	☑	☑	Nickel
6020 [1994]	☑	☑	Selenium
6020 [1994]	☑	☑	Silver
6020 [1994]	☑	☑	Thallium
6020 [1994]	☑	☑	Vanadium
6020 [1994]	☑	☑	Zinc
7196 A	☑	☑	Chromium, Hexavalent
7199	☐	☑	Chromium, Hexavalent
7470 A	☑	☑	Mercury
7471 A	☑	☐	Mercury

Organic Cleanup

	Solid	Non-Potable Water	
3620 B	☑	☑	Florisil Cleanup
3640 A	☑	☑	Gel Permeation Cleanup
3660	☑	☑	Sulfur Cleanup

Organic Extraction

	Solid	Non-Potable Water	
3510 C	☐	☑	Separatory Funnel Liquid-Liquid Extractions
3520 C	☐	☑	Continuous Liquid-Liquid Extraction
3540 C	☑	☐	Soxhlet Extraction
3550 B	☑	☐	Ultrasonic Extraction
3580 A	☑	☐	Waste Dilution

Organic Instrumentation

	Solid	Non-Potable Water	
8011	☐	☑	1,2-Dibromoethane (EDB, Ethylene dibromide)

Organic Instrumentation

	Solid	Non-Potable Water	
8011	☐	☑	EDB and DBCP by Microextraction and Gas Chromatography
8015 B	☑	☑	Diesel Range Organics (DROs)
8015 B	☑	☑	Ethylene Glycol
8015 B	☑	☑	Gasoline Range Organics (GROs)
8015 B	☑	☑	Nonhalogenated Organics Using GC/FID
8021 B	☑	☑	Aromatic and Halogenated Volatiles
8021 B	☑	☑	Benzene
8021 B	☑	☑	Ethylbenzene
8021 B	☑	☑	meta-Xylene
8021 B	☑	☑	Methyl-t-Butyl Ether (MTBE)
8021 B	☑	☑	ortho-Xylene
8021 B	☑	☑	para-Xylene
8021 B	☑	☑	Toluene
8021 B	☑	☑	Xylenes, Total
8081 A	☑	☑	4,4'-DDD
8081 A	☑	☑	4,4'-DDE
8081 A	☑	☑	4,4'-DDT
8081 A	☑	☑	Aldrin
8081 A	☑	☑	alpha-BHC(alpha-hexachlorocyclohexane)
8081 A	☑	☑	alpha-Chlordane
8081 A	☑	☑	beta-BHC(beta-hexachlorocyclohexane)
8081 A	☑	☑	Chlorobenzilate
8081 A	☑	☑	Chloroneb
8081 A	☑	☑	Chlorothalonil
8081 A	☑	☑	delta-BHC(delta-hexachlorocyclohexane)
8081 A	☑	☑	Diallate
8081 A	☑	☑	Dieldrin
8081 A	☑	☑	Endosulfan I
8081 A	☑	☑	Endosulfan II
8081 A	☑	☑	Endosulfan sulfate
8081 A	☑	☑	Endrin
8081 A	☑	☑	Endrin Aldehyde
8081 A	☑	☑	Endrin Ketone
8081 A	☑	☑	gamma-BHC (Lindane, gamma-hexachlorocyclohexane)
8081 A	☑	☑	gamma-Chlordane
8081 A	☑	☑	Heptachlor
8081 A	☑	☑	Heptachlor Epoxide
8081 A	☑	☑	Hexachlorobenzene
8081 A	☑	☑	Methoxychlor
8081 A	☑	☑	Organochlorine Pesticides
8081 A	☑	☑	Toxaphene [Chlorinated camphene]
8082	☑	☑	2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl
8082	☑	☑	2,2',3,3',4,4',5-Heptachlorobiphenyl
8082	☑	☑	2,2',3,4',5,5',6-Heptachlorobiphenyl
8082	☑	☑	2,2',3,4,4',5',6-Heptachlorobiphenyl
8082	☑	☑	2,2',3,4,4',5'-Hexachlorobiphenyl
8082	☑	☑	2,2',3,4,4',5,5'-Heptachlorobiphenyl
8082	☑	☑	2,2',3,4,5'-Pentachlorobiphenyl
8082	☑	☑	2,2',3,4,5,5'-Hexachlorobiphenyl
8082	☑	☑	2,2',3,5'-Tetrachlorobiphenyl
8082	☑	☑	2,2',3,5,5',6-Hexachlorobiphenyl

Organic Instrumentation

	Solid	Non-Potable Water	
8082	☑	☑	2,2',4,4',5,5'-Hexachlorobiphenyl
8082	☑	☑	2,2',4,5,5'-Pentachlorobiphenyl
8082	☑	☑	2,2',5,5'-Tetrachlorobiphenyl
8082	☑	☑	2,2',5-Trichlorobiphenyl
8082	☑	☑	2,3',4,4'-Tetrachlorobiphenyl
8082	☑	☑	2,3,3',4',6-Pentachlorobiphenyl
8082	☑	☑	2,3-Dichlorobiphenyl
8082	☑	☑	2,4',5-Trichlorobiphenyl
8082	☑	☑	2-Chlorobiphenyl
8082	☑	☑	Aroclor-1016 [PCB-1016]
8082	☑	☑	Aroclor-1221 PCB-1221]
8082	☑	☑	Aroclor-1232 [PCB-1232]
8082	☑	☑	Aroclor-1242 [PCB-1242]
8082	☑	☑	Aroclor-1248 [PCB-1248]
8082	☑	☑	Aroclor-1254 [PCB-1254]
8082	☑	☑	Aroclor-1260 [PCB-1260]
8082	☑	☑	PCBs
8141 A	☑	☑	Atrazine
8141 A	☑	☑	Azinphos methyl (Guthion)
8141 A	☑	☑	Chlorfenvinphos
8141 A	☑	☑	Chlorpyrifos
8141 A	☑	☑	Chlorpyrifos Methyl
8141 A	☑	☑	Demeton-o
8141 A	☑	☑	Demeton-s
8141 A	☑	☑	Diazinon
8141 A	☑	☑	Dimethoate
8141 A	☑	☑	EPN
8141 A	☑	☑	Ethinon
8141 A	☑	☑	Famphur
8141 A	☑	☑	Malathion
8141 A	☑	☑	Mevinphos
8141 A	☑	☑	Naled
8141 A	☑	☑	Organophosphorus Compounds
8141 A	☑	☑	Parathion, ethyl
8141 A	☑	☑	Parathion, methyl
8141 A	☑	☑	Phorate
8141 A	☑	☑	Ronnel
8141 A	☑	☑	Sulfotepp
8141 A	☑	☑	Thionazin [Zinophos]
8151 A	☑	☑	2,4,5-T
8151 A	☑	☑	2,4,5-TP (Silvex)
8151 A	☑	☑	2,4-D
8151 A	☑	☑	2,4-DB
8151 A	☑	☑	3,5-Dichlorobenzoic Acid
8151 A	☑	☑	4-Nitrophenol
8151 A	☑	☑	Acifluorfen
8151 A	☑	☑	Bentazon
8151 A	☑	☑	Chloramben
8151 A	☑	☑	Chlorinated Herbicides
8151 A	☑	☑	Dalapon
8151 A	☑	☑	DCPA [di acid degradate]

Organic Instrumentation

	Solid	Non-Potable Water	
8151 A	☑	☑	Dicamba
8151 A	☑	☑	Dichlorprop(Dichloroprop)
8151 A	☑	☑	Dinoseb (DNBP, 2-sec-butyl-4,6-dinitrophenol)
8151 A	☑	☑	MCPA
8151 A	☑	☑	MCPP
8151 A	☑	☑	Pentachlorophenol
8151 A	☑	☑	Picloram
8260 B	☑	☑	1,1,1,2-Tetrachloroethane
8260 B	☑	☑	1,1,1-Trichloroethane
8260 B	☑	☑	1,1,2,2-Tetrachloroethane
8260 B	☑	☑	1,1,2-Trichloroethane
8260 B	☑	☑	1,1-Dichloroethane
8260 B	☑	☑	1,1-Dichloroethylene (-ethene)
8260 B	☑	☑	1,1-Dichloropropene
8260 B	☑	☑	1,2,3,4-Diepoxybutane
8260 B	☑	☑	1,2,3-Trichlorobenzene
8260 B	☑	☑	1,2,3-Trichloropropane
8260 B	☑	☑	1,2,4-Trichlorobenzene
8260 B	☑	☑	1,2,4-Trimethylbenzene
8260 B	☑	☑	1,2-Dibromoethane (EDB, Ethylene dibromide)
8260 B	☑	☑	1,2-Dichlorobenzene
8260 B	☑	☑	1,2-Dichloroethane
8260 B	☑	☑	1,2-Dichloropropane
8260 B	☑	☑	1,3,5-Trimethylbenzene
8260 B	☑	☑	1,3-Dichloro-2-propanol
8260 B	☑	☑	1,3-Dichlorobenzene
8260 B	☑	☑	1,3-Dichloropropane
8260 B	☑	☑	1,4-Dichlorobenzene
8260 B	☑	☑	1,4-Dioxane (1,3-Diethyleneoxide)
8260 B	☑	☑	2,2-Dichloropropane
8260 B	☑	☑	2-Chloroethyl Vinyl Ether
8260 B	☑	☑	2-Chlorotoluene
8260 B	☑	☑	2-Hexanone
8260 B	☑	☑	2-Picoline (2-Methylpyridine)
8260 B	☑	☑	3-Chloropropionitrile
8260 B	☑	☑	4-Chlorotoluene
8260 B	☑	☑	4-Methyl-2-pentanone (MIBK, Isopropylacetone, Hexone)
8260 B	☑	☑	Acetone
8260 B	☑	☑	Acetonitrile
8260 B	☑	☑	Acrolein (Propenal)
8260 B	☑	☑	Acrylonitrile
8260 B	☑	☑	Allyl Alcohol
8260 B	☑	☑	Allyl Chloride (3-Chloropropene)
8260 B	☑	☑	Benzene
8260 B	☑	☑	Bromoacetone
8260 B	☑	☑	Bromobenzene
8260 B	☑	☑	Bromochloromethane
8260 B	☑	☑	Bromodichloromethane
8260 B	☑	☑	Bromoform
8260 B	☑	☑	Carbon Disulfide
8260 B	☑	☑	Carbon Tetrachloride

Organic Instrumentation

	Solid	Non-Potable Water	
8260 B	☑	☑	Chlorobenzene
8260 B	☑	☑	Chlorodibromomethane [Dibromochloromethane]
8260 B	☑	☑	Chloroethane
8260 B	☑	☑	Chloroform
8260 B	☑	☑	Chloroprene
8260 B	☑	☑	cis-1,2-Dichloroethene (-ethylene)
8260 B	☑	☑	cis-1,3-dichloropropene
8260 B	☑	☑	cis-1,4-dichloro-2-butene
8260 B	☑	☑	Crotonaldehyde
8260 B	☑	☑	Dibromomethane
8260 B	☑	☑	Dichlorodifluoromethane
8260 B	☑	☑	Ethyl Methacrylate
8260 B	☑	☑	Ethylbenzene
8260 B	☑	☑	Hexachlorobutadiene
8260 B	☑	☑	Iodomethane (Methyl iodide)
8260 B	☑	☑	Isobutyl Alcohol (2-Methyl-1-propanol)
8260 B	☑	☑	Isopropylbenzene
8260 B	☑	☑	Malononitrile
8260 B	☑	☑	meta-Xylene
8260 B	☑	☑	Methacrylonitrile
8260 B	☑	☑	Methyl bromide [Bromomethane]
8260 B	☑	☑	Methyl chloride [Chloromethane]
8260 B	☑	☑	Methyl Ethyl Ketone (MEK, 2-Butanone)
8260 B	☑	☑	Methyl Methacrylate
8260 B	☑	☑	Methyl-t-Butyl Ether (MTBE)
8260 B	☑	☑	Methylene Chloride
8260 B	☑	☑	n-Butylbenzene
8260 B	☑	☑	n-Nitroso-di-n-Butylamine
8260 B	☑	☑	n-Propylamine
8260 B	☑	☑	n-Propylbenzene
8260 B	☑	☑	Naphthalene
8260 B	☑	☑	Nitrobenzene
8260 B	☑	☑	ortho-Xylene
8260 B	☑	☑	para-Xylene
8260 B	☑	☑	Pentachloroethane
8260 B	☑	☑	Pentafluorobenzene
8260 B	☑	☑	Propionitrile (Ethyl cyanide)
8260 B	☑	☑	Pyridine
8260 B	☑	☑	sec-Butylbenzene
8260 B	☑	☑	Styrene
8260 B	☑	☑	tert-Butyl Alcohol
8260 B	☑	☑	tert-Butylbenzene
8260 B	☑	☑	Tetrachloroethylene (Perchloroethylene -ethene)
8260 B	☑	☑	Toluene
8260 B	☑	☑	trans-1,2-Dichloroethylene (-ethene)
8260 B	☑	☑	trans-1,3-Dichloropropylene (-propene)
8260 B	☑	☑	trans-1,4-dichloro-2-butene
8260 B	☑	☑	Trichloroethene (Trichloroethylene)
8260 B	☑	☑	Trichlorofluoromethane
8260 B	☑	☑	Vinyl Acetate
8260 B	☑	☑	Vinyl Chloride

Organic Instrumentation

	Solid	Non-Potable Water	
8260 B	☑	☑	Volatile Organic Compounds
8260 B	☑	☑	Xylenes, Total
8270 C	☑	☑	1,2,4,5-Tetrachlorobenzene
8270 C	☑	☑	1,2,4-Trichlorobenzene
8270 C	☑	☑	1,2-Dichlorobenzene
8270 C	☑	☑	1,2-Diphenylhydrazine
8270 C	☑	☑	1,3,5-Trinitrobenzene (1,3,5-TNB)
8270 C	☑	☑	1,3-Dichlorobenzene
8270 C	☑	☑	1,4-Dichlorobenzene
8270 C	☑	☑	1,4-Naphthoquinone
8270 C	☑	☑	1-Naphthylamine
8270 C	☑	☑	2,3,4,6-Tetrachlorophenol
8270 C	☑	☑	2,4,5-Trichlorophenol
8270 C	☑	☑	2,4,6-Trichlorophenol
8270 C	☑	☑	2,4-Diaminotoluene
8270 C	☑	☑	2,4-Dichlorophenol
8270 C	☑	☑	2,4-Dimethylphenol
8270 C	☑	☑	2,4-Dinitrophenol
8270 C	☑	☑	2,4-Dinitrotoluene (2,4-DNT)
8270 C	☑	☑	2,6-Dichlorophenol
8270 C	☑	☑	2,6-Dinitrotoluene (2,6-DNT)
8270 C	☑	☑	2-Acetylaminofluorene
8270 C	☑	☑	2-Chloronaphthalene
8270 C	☑	☑	2-Chlorophenol
8270 C	☑	☑	2-Cyclohexyl-4,6-dinitrophenol
8270 C	☑	☑	2-Methyl-4,6-dinitrophenol (4,6-Dinitro-2-methylphenol)
8270 C	☑	☑	2-Methylnaphthalene
8270 C	☑	☑	2-Methylphenol (o-cresol, 2-Hydroxytoluene)
8270 C	☑	☑	2-Naphthylamine
8270 C	☑	☑	2-Nitroaniline
8270 C	☑	☑	2-Nitrophenol
8270 C	☑	☑	2-Picoline (2-Methylpyridine)
8270 C	☑	☑	3,3'-Dichlorobenzidine
8270 C	☑	☑	3-Methylcholanthrene
8270 C	☑	☑	3-Methylphenol (m-cresol, 3-Hydroxytoluene)
8270 C	☑	☑	3-Nitroaniline
8270 C	☑	☑	4-Aminobiphenyl
8270 C	☑	☑	4-Bromophenyl Phenyl Ether
8270 C	☑	☑	4-Chloro-3-methylphenol
8270 C	☑	☑	4-Chloroaniline
8270 C	☑	☑	4-Chlorophenyl Phenyl Ether
8270 C	☑	☑	4-Methylphenol (p-cresol, 4-Hydroxytoluene)
8270 C	☑	☑	4-Nitroaniline
8270 C	☑	☑	4-Nitrophenol
8270 C	☑	☑	5-Nitro-o-toluidine
8270 C	☑	☑	7,12-Dimethylbenz(a)anthracene
8270 C	☑	☑	Acenaphthene
8270 C	☑	☑	Acenaphthylene
8270 C	☑	☑	Acetophenone
8270 C	☑	☑	Alpha,alpha-dimethylphene-thylamine
8270 C	☑	☑	Aniline

Organic Instrumentation

	Solid	Non-Potable Water	
8270 C	☑	☑	Anthracene
8270 C	☑	☑	Benzidine
8270 C	☑	☑	Benzo(a)anthracene
8270 C	☑	☑	Benzo(a)pyrene
8270 C	☑	☑	Benzo(b)fluoranthene
8270 C	☑	☑	Benzo(g,h,i)perylene
8270 C	☑	☑	Benzo(k)fluoranthene
8270 C	☑	☑	Benzoic Acid
8270 C	☑	☑	Benzyl alcohol
8270 C	☑	☑	bis(2-chloroethoxy)methane
8270 C	☑	☑	bis(2-Chloroethyl)ether
8270 C	☑	☑	bis(2-chloroisopropyl)ether
8270 C	☑	☑	bis(2-Ethylhexyl) phthalate (DEHP)
8270 C	☑	☑	Butyl Benzyl Phthalate
8270 C	☑	☑	Carbazole
8270 C	☑	☑	Chrysene
8270 C	☑	☑	Di-n-butyl phthalate
8270 C	☑	☑	Di-n-octyl Phthalate
8270 C	☑	☑	Dibenzo(a,e)pyrene
8270 C	☑	☑	Dibenzo(a,h)anthracene
8270 C	☑	☑	Dibenzofuran
8270 C	☑	☑	Diethyl Phthalate
8270 C	☑	☑	Dimethoate
8270 C	☑	☑	Dimethyl Phthalate
8270 C	☑	☑	Dinoseb (DNBP, 2-sec-butyl-4,6-dinitrophenol)
8270 C	☑	☑	Diphenylamine
8270 C	☑	☑	Ethyl Methanesulfonate
8270 C	☑	☑	Famphur
8270 C	☑	☑	Fluoranthene
8270 C	☑	☑	Fluorene
8270 C	☑	☑	Hexachlorobenzene
8270 C	☑	☑	Hexachlorobutadiene
8270 C	☑	☑	Hexachlorocyclopentadiene
8270 C	☑	☑	Hexachloroethane
8270 C	☑	☑	Hexachlorophene
8270 C	☑	☑	Hexachloropropene
8270 C	☑	☑	Indeno(1,2,3-cd)pyrene
8270 C	☑	☑	Isodrin
8270 C	☑	☑	Isophorone
8270 C	☑	☑	Isosafrole
8270 C	☑	☑	Kepone
8270 C	☑	☑	Maleic Anhydride
8270 C	☑	☑	Methyl methanesulfonate
8270 C	☑	☑	n-Nitroso-di-n-Propylamine
8270 C	☑	☑	N-Nitrosodibutylamine
8270 C	☑	☑	N-Nitrosodiethylamine
8270 C	☑	☑	n-Nitrosodimethylamine
8270 C	☑	☑	n-Nitrosodiphenylamine
8270 C	☑	☑	N-Nitrosomethylethylamine
8270 C	☑	☑	N-Nitrosomorpholine
8270 C	☑	☑	N-Nitrosopiperidine

Organic Instrumentation

	Solid	Non-Potable Water	
8270 C	☑	☑	N-Nitrosopyrrolidine
8270 C	☑	☑	Naphthalene
8270 C	☑	☑	Nitrobenzene
8270 C	☑	☑	o,o,o-Triethyl phosphorothioate
8270 C	☑	☑	ortho-Toluidine
8270 C	☑	☑	p-Dimethylaminoazobenzene
8270 C	☑	☑	Parathion
8270 C	☑	☑	Parathion, methyl
8270 C	☑	☑	Pentachlorobenzene
8270 C	☑	☑	Pentachloronitrobenzene
8270 C	☑	☑	Pentachlorophenol
8270 C	☑	☑	Phenacetin
8270 C	☑	☑	Phenanthrene
8270 C	☑	☑	Phenol
8270 C	☑	☑	Phorate
8270 C	☑	☑	Pyrene
8270 C	☑	☑	Pyridine
8270 C	☑	☑	Safrole
8270 C	☑	☑	Semivolatile Organic Compounds
8270 C	☑	☑	Sulfotepp
8310	☑	☑	Acenaphthene
8310	☑	☑	Acenaphthylene
8310	☑	☑	Anthracene
8310	☑	☑	Benzo(a)anthracene
8310	☑	☑	Benzo(a)pyrene
8310	☑	☑	Benzo(b)fluoranthene
8310	☑	☑	Benzo(g,h,i)perylene
8310	☑	☑	Benzo(k)fluoranthene
8310	☑	☑	Chrysene
8310	☑	☑	Dibenzo(a,h)anthracene
8310	☑	☑	Fluoranthene
8310	☑	☑	Fluorene
8310	☑	☑	Indeno(1,2,3-c,d)pyrene
8310	☑	☑	Naphthalene
8310	☑	☑	Phenanthrene
8310	☑	☑	Polynuclear Aromatic Hydrocarbons
8310	☑	☑	Pyrene
8330	☑	☑	1,3,5-Trinitrobenzene (1,3,5-TNB)
8330	☑	☑	1,3-Dinitrobenzene (1,3-DNB)
8330	☑	☑	2,4,6-Trinitrotoluene (2,4,6-TNT)
8330	☑	☑	2,4-Dinitrotoluene (2,4-DNT)
8330	☑	☑	2,6-Dinitrotoluene (2,6-DNT)
8330	☑	☑	2-Amino-4,6-Dinitrotoluene (2-Am-DNT)
8330	☑	☑	2-Nitrotoluene (2-NT)
8330	☑	☑	3-Nitrotoluene (3-NT)
8330	☑	☑	4-Amino-2,6-Dinitrotoluene (4-Am-DNT)
8330	☑	☑	4-Nitrotoluene (4-NT)
8330	☑	☑	Hexahydro-1, 3, 5-tritro-1, 3, 5-triazine (RDX)
8330	☑	☑	Methyl-2,4,6-Trinitrophenylnitramine (TETRYL)
8330	☑	☑	Nirtoaromatics and Nitramines
8330	☑	☑	Nitrobenzene

Organic Instrumentation

	Solid	Non-Potable Water	
8330	☑	☑	Octahydro-1,3,5,7-Tetranitro-1,3,5,7-Tetrazocine (HMX)

Volatile Organic Preparation

	Solid	Non-Potable Water	
5030 B	☐	☑	Purge-and-Trap for Aqueous Samples
5035	☑	☐	Purge-and-Trap and Extraction for Volatile Organics

The effective date of this certificate letter is: 9/1/2006.

The analytes by method which a laboratory is authorized to perform at any given time will be those indicated in the most recent certificate letter. The most recent certification letter supersedes all previous certification or authorization letters. It is the certified laboratory's responsibility to review this letter for discrepancies. The certified laboratory must document any discrepancies in this letter and send notice to this bureau within 15 days of receipt. This certificate letter will be recalled in the event your laboratory's certification is revoked.

Respectfully,

Patrick F. Luedtke

Patrick F. Luedtke, MD, MPH.
Director of Public Health Laboratories
Deputy Director of Epidemiology and Laboratory Services

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING SERVICE CENTER
1100 23RD AVE
PORT HUENEME CA 93043-4370

IN REPLY REFER TO:

NFESC 413
November 16, 2006

Ms. Kenette Pimentel
Quality Assurance Manager
EMAX Laboratories, Inc.
1835 205th Street
Torrance, CA 90503

Dear Ms. Pimentel,

This correspondence addresses the status of EMAX Laboratories, Inc (EMAX) of Torrance, CA in the Navy Installation Restoration (IR) Quality Assurance (QA) Program as administered by the Naval Facilities Engineering Service Center (NFESC).

Your laboratory is accepted to perform sample analysis for the methods listed in Table 1. The period of acceptance expires January 19, 2007. This acceptance does not guarantee the delivery of any analytical samples. Acceptance is facility specific and can not be transferred to an affiliated or subcontract laboratory.

The Navy's review included a review of the laboratory's QA manual, selected standard operating procedures (SOPs) and SOP master list, list of major analytical instrumentation, performance test (PT) results and NELAC onsite audit documentation[1].

The Navy reserves the right to conduct additional laboratory assessments or to suspend or revoke acceptance status for any or all of the listed parameters if deemed necessary.

Table 1

300 series	Anions Chloride, Fluoride, Sulfate, nitrate, Nitrite, and Ortho-phosphate	Water
8021B	Aromatic Volatile Organics	Water
9010B/9012A	Cyanide	Water
9013	Cyanide	Solids
8330	Explosives	Water/solids
8151A	Herbicides	Water/solids
8081A	Organochlorine Pesticides	Water/Solids
8082	Polychlorinated Biphenyls	Water/Solids
8310	Polynuclear Aromatic Hydrocarbons	Water/Solids

[1] State of California Health and Human Services Agency, Department of Health Services conducted an on-site assessment under National Environmental Laboratory Accreditation Conference (NELAC) requirements on November 17-19, 2004.

NFESC 413
November 16, 2006

8270C	Semivolatile Organics	Water/Solids
SW-846	TAL Metals: Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Mercury, Nickel, Potassium, Selenium, Silver, Sodium, Thallium, Vanadium and Zinc	Water/Solids
Mod 8015	Total Petroleum Hydrocarbons-GRO	Water/Solids
Mod 8015	Total Petroleum Hydrocarbons-DRO	Water/Solids
8260B	Volatile Organics	Water/ Solids

Acceptance for use for parameters not identified on the table will be determined by Navy project personnel.

The laboratory should notify NFESC if there are parameters not presented on Table 1 that the laboratory expects to run on a routine basis in support of Navy installation restoration projects. In these circumstances the laboratory's capability to run the tests will be reviewed and the table will be modified accordingly.

Questions concerning the information provided should be directed to the NFESC IR QA Program coordinator, Ms. Patricia Moreno at (805) 982-1659, or via email at pati.moreno@navy.mil

Sincerely,

FOR Robert J. Kratzke
Supervisor, Consultation/Information
Management Branch

Soil Permit

Permit Number: S-57253

COPY

UNITED STATES DEPARTMENT OF AGRICULTURE

Animal and Plant Health Inspection Service

Plant Protection and Quarantine

Issued To: Emax Laboratories, Inc.
(Dr. Kam Pang)
1835 205th Street
Torrance, California 90501

TELEPHONE: (310) 618-8889

Under the authority of the Federal Plant Pest Act of May 23, 1957, permission is hereby granted to the facility/individual named above subject to the following conditions:

1. Valid for shipments of soil not heat treated at the port of entry, only if a compliance agreement (PPQ Form 519) has been completed and signed. Compliance Agreements and Soil permits are non-transferable. If you hold a Soil Permit and you leave your present employer or company, you must notify your local USDA office promptly.
2. To be shipped in sturdy, leakproof, containers and released without treatment at the port of entry.
3. To be used only for analysis, and only in the facility of the permittee at COMPANY located in CITY, STATE.
4. No use of soil for growing purposes is authorized, including the isolation or culture of organisms imported in soil.
5. All unconsumed soil, containers, and effluent is to be autoclaved, incinerated, or heat treated by the permittee at the conclusion of the project as approved and prescribed by PPQ.
6. This permit authorizes shipments from all foreign sources, including Guam, Hawaii, Puerto Rico, and the U.S. Virgin Islands through any U.S. port of entry staffed by Plant Protection and Quarantine.
7. The permittee must notify the office of the Los Angeles County Agricultural Commissioner upon arrival of shipment(s) at Area Code (526) 940-7803.

JUNE 30, 2007
Expiration Date

Deborah M. Knott
Approving Official : DEBORAH M. KNOTT

PPQ FORM 525B (8/94)

PART 3 - PPQ FIELD

APPENDIX B

SAFETY, HEALTH, AND EMERGENCY RESPONSE PLAN

FINAL

SAFETY, HEALTH, AND EMERGENCY RESPONSE PLAN
Long Term Monitoring
Colonie FUSRAP Site
Albany, New York

Baltimore HTRW
W912DR-05-D-0026
Delivery Order Number 0031

August 2010

Submitted to:

Department of the Army
New York District, Corps of Engineers
Colonie FUSRAP Site
26 Federal Plaza, Room 1811
New York, New York 10278

Submitted by:

Shaw Environmental, Inc.
13 British American Blvd
Latham, New York 12110

Issued to: _____ Date: _____

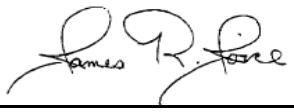
Copy #: _____ ☐ Controlled ☐ Uncontrolled

FINAL

SAFETY, HEALTH, AND EMERGENCY RESPONSE PLAN
Colonie FUSRAP Site
Albany, New York

Baltimore HTRW
W912DR-05-D-0026
Delivery Order Number 0031

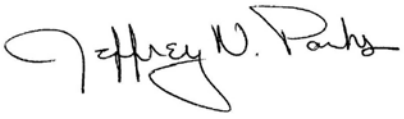
August 2010

Developed/
Implemented by:  Date: August 18, 2010

James Joice, CIH, CSP, CHMM
Shaw Environmental, Inc., Project CIH

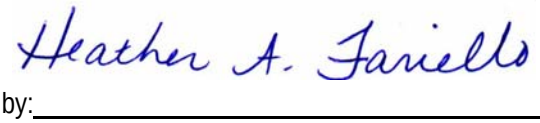
Revised/
Implemented by:  Date: August 18, 2010

Jennifer Flanagan,
Shaw Environmental, Inc., Project Scientist

Reviewed/
Concurred by:  Date: August 18, 2010

Jeffrey Parks, P.G.
Shaw Environmental, Inc. Program Manager

Reviewed/

Concurred/
Implemented by:  Date: August 18, 2010

Heather Fariello, CHMM
Shaw Environmental, Inc. Project Manager

Safety, Health, and Emergency Response Plan Disclaimer

The enclosed Safety, Health, and Emergency Response Plan (SHERP) has been designed for the methods presently contemplated by Shaw Environmental, Inc. (Shaw) for execution of the proposed work. Therefore, the SHERP may not be appropriate if the work is not performed by or using the methods presently contemplated by Shaw.

In addition, as the work is performed, conditions different from those anticipated may be encountered and the SHERP may have to be modified. Therefore, Shaw makes no representations of warranties as to the adequacy of the SHERP, except for warranties specifically stated in the SHERP itself.

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Acronyms and Abbreviations

°F	degrees Fahrenheit
ACGIH	American Conference of Governmental Industrial Hygienist
AHA	Activity Hazard Analysis
AIDS	acquired immunodeficiency syndrome
ANSI	American National Standards Institute
APR	air purifying respirator
C	Ceiling
Ca	carcinogenic
CFR	Code of Federal Regulation
CHP	Certified Health Physicist
CIH	Certified Industrial Hygienist
CISS	Colonie Interim Storage Site
CNS	central nervous system
CPDO	competent person drilling oversight
CPR	cardiopulmonary resuscitation
CRZ	Contamination Reduction Zone
CSP	Certified Safety Professional
CVS	cardiovascular system
DEET	N,N-Diethyl-m-toluamide
DOE	U.S. Department of Energy
EIC	Employee in Charge
EKG	electrocardiogram
EMS	Emergency Medical Service
FRA	Federal Railroad Administration
FUSRAP	Formerly Utilized Sites Remedial Action Program
GI	gastrointestinal
HBV	hepatitis B virus
HIV	human immunodeficiency virus
HWPs	Hazardous Work Permits
IDLH	immediately dangerous to life and health
JSA	Job Safety Analysis
MEC	Munitions and Explosives of Concern
mg/m^3	milligram(s) per cubic meter
MSDS	Material Safety Data Sheet
NIOSH	National Institute for Occupational Safety and Health
NL	National Lead
OSHA	Occupational Safety and Health Administration
PAH	polycyclic aromatic hydrocarbon
PEL	permissible exposure limit
PPE	personal protective equipment
ppm	part(s) per million
PVC	polyvinyl chloride
SAR	Supplied air respirator

Shaw	Shaw Environmental, Inc.
SHERP	Safety, Health, and Emergency Response Plan
SSHO	Site Safety and Health Officer
STEL	short-term exposure limit
TLV	threshold limit value
TWA	time-weighted average
USACE	U.S. Army Corps of Engineers

1.0 Introduction

This Safety, Health, and Emergency Response Plan (SHERP) describes the safety and health guidelines developed to protect on-site personnel, visitors, and the public from physical harm and exposure to hazardous materials during the project activities at the Colonie FUSRAP Site in Colonie, New York. This SHERP is prepared in accordance with the standards established by the United States Occupational Safety and Health Administration (OSHA) for regulated sites. Specifically, this SHERP complies with the appropriate standards contained in 29 Code of Federal Regulations (CFR) 1910.120; 29 CFR 1926.65; and the *Safety and Health Requirements Manual* (USACE, 2003). The safety and health measures presented are in effect for the duration of the project. This document is intended for field use by Shaw Environmental, Inc. (Shaw) personnel and subcontractors. All project personnel are required to abide by these measures and acknowledge such by signing the SHERP Acknowledgment Form (Appendix A, "SHERP Acknowledgment"). Where not specifically mentioned, all project personnel are required to comply with the applicable regulations contained in 29 CFR 1910, 29 CFR 1926, and the *Safety and Health Requirements Manual* while conducting this work. The procedures and guidelines contained herein are based upon the best available information at the time of the plan's preparation. Specific requirements may be revised if new information is received or site conditions change. Any revisions to this plan will be made with the knowledge and concurrence of Shaw and the U.S. Army Corps of Engineers (USACE), Baltimore Division, New York District. Additions or changes to this SHERP must be attached as a SHERP Amendment (Appendix B, "Safety, Health, and Emergency Response Plan Amendments"). This SHERP, used in conjunction with the SHERP Amendments will also serve as the projects:

Site-Specific Safety and Health Plan

Accident Prevention Plan

Emergency Response Plan

Emergency Action Plan

Fire Prevention Plan

1.1 Site Location and History

Remediation of the Colonie Interim Storage Site (CISS) in Colonie, NY is being performed by the US Army Corps of Engineers (USACE), New York District, under the Formerly Utilized Sites Remedial Action Program (FUSRAP). Past activities at the CISS have resulted in the presence of contaminants – mainly uranium, thorium, lead, and chlorinated solvents.

The site is located at 1130 Central Avenue in the Town of Colonie, Albany County, NY (See Figure 1, Site Location Map). The surrounding area consists of residential and commercial properties. The site was owned and operated by National Lead (NL) Industries from 1937 to 1984. The New York State Supreme Court shut down the NL plant in 1984. From 1984 to fall 1997, the Colonie Site was managed by the U.S. Department of Energy (DOE). During that time, all of the NL buildings were demolished, 53 vicinity properties were remediated and the investigation of the main site was begun. In 1997, the U.S. Army Corps of Engineers assumed control of the site. The Corps has since completed the remediation of three additional vicinity properties (VPs) and the main site.

The work covered under this Scope of Work involves the inspection, annual redevelopment, sampling of groundwater monitoring wells, picking up trash and mowing the lawn between the fence and Central Avenue (twice a month), mowing around the monitoring wells sampled (quarterly) as well as the preparation of detailed sampling reports that evaluate data trends.

1.2 Safety and Health Policy Statement

Shaw Environmental & Infrastructure, Inc. expects all of our employees, clients, and partners to uphold the highest environmental, health, and safety (EHS) standards to promote a positive and proactive safety attitude and to exhibit a heightened awareness of their surroundings both on and off the job. We must identify risks and hazards and implement appropriate controls in order to provide an injury-free work environment where people, equipment, and the environment are not placed at unreasonable threat of injury or damage. We will continually strive to be good citizens in our own community, as well as in every community in which we operate.

The EHS Program and the components of our Occupational Health & Safety Management System have been developed to guide us in our daily activities. We also commit ourselves to continual improvement in EHS management. Further, I ask that you include our EHS process in all aspects of your work, assist in the maintenance of our process, and communicate this policy to all persons working for or on behalf of Shaw with the intent that they are made aware of their individual EHS obligations.

Through compliance with this policy, we will all actively participate in this process and advocate this philosophy. Together, we can accomplish our goals and exceed the minimum requirements provided by applicable laws and regulations, thus resulting in all stakeholders being proud to be

a part of a team that truly values the importance of health, safety, and respect for the environment. Accordingly, we will maintain the position as a recognized leader in all of our business endeavors through a stewardship-based approach for our fellow employees, the environment, and the communities in which we live and work.

We are committed to the spirit and intent of this EHS policy statement and the laws, rules, and regulations to which we subscribe at its foundation.

George Bevan
President
Shaw Environmental & Infrastructure, Inc.

1.3 Project Workday Duration Policy Statement

This section describes the limitations of hours worked by site personnel and the general administrative qualifiers that guide the policy.

The following workday duration limitations for hours worked on the projects are in effect:

Personnel working on projects, including those who are operating hoisting equipment or mobile construction equipment, may work up to 12 hours at the site, which includes travel time to housing, but excludes non-compensated time. This workday duration is subject to reduction by the other requirements and factors described below. The 12-hour limit is primarily due to motor vehicle driving restrictions.

Personnel shall not operate motor vehicles after being in a duty status (regardless of their role or function) for more than 12 hours during any 24-hour period without at least eight consecutive hours of rest. A minimum of eight consecutive hours shall be provided for rest in each 24-hour period.

No employee may drive continuously for more than 10 hours in any single on-duty period. (Continuous period of more than 10 hours in any 24-hour period without at least eight consecutive hours of rest.)

1.3.1 General Administration

For each project effort, the Field Supervisor is responsible for adjusting the workday duration within the limits set above.

The following factors will be considered by the Field Supervisor for adjusting the workday duration:

Time of year (e.g., reduce workday duration because there is less daylight in winter).

Temperature/weather (e.g., reduce workday duration when the temperature is very cold, very hot, or very windy).

Type of work (e.g., reduce workday duration for personnel involved in physically demanding phases of work).

Individual personnel limitations (e.g., reduce workday duration for personnel with minor head colds or suffering from temporary effects of allergies).

For any questions regarding the implementation of this policy, please contact the Project Certified Industrial Hygienist (CIH) or Project Manager.

2.0 Organization, Qualifications, and Responsibilities

There will be numerous personnel required to complete this project. The necessary personnel will be off-site program team members, on-site Shaw project personnel, and various subcontractors. All project personnel share the responsibility for safely completing project activities.

2.1 On-Site Personnel

All on-site personnel are responsible for continuous adherence to safety and health procedures during the performance of assigned work. In no case may work be performed in a manner that conflicts with the inherent safety and environmental precautions outlined in this SHERP. After due warning personnel violating safety procedures will be dismissed from the site and possibly terminated from further work.

Any person who observes unsafe acts or conditions or other safety problems has "Stop Work Authority" and shall immediately report the deficiency to supervisory personnel. If there is any dispute with regard to safety and health, on-site staff will attempt to resolve the issue and if the issue cannot be resolved on-site, they will consult off-site technical staff and supervisors for assistance. The specific task or operation in question shall remain discontinued until the issue is resolved.

2.2 Program Manager

The Program Manager is the single focal point of contact with the USACE regarding the program. He has ultimate authority and responsibility for the establishment and maintenance of program administration control procedures. The Program Manager issues communications to the USACE on the program status. Specifically, the Program Manager is ultimately responsible for the development, implementation, and enforcement of the comprehensive Safety and Health Program.

2.3 Project Manager

The Project Manager is responsible for coordinating the development, implementation, and enforcement of this SHERP. The Project Manager is also responsible for ensuring that the necessary resources are available for this project to be completed safely and in compliance with this SHERP, USACE requirements, and OSHA regulations. The Project Manager reports to the Program Manager.

2.4 Project Certified Industrial Hygienist

The Project CIH is responsible for the following actions:

Develop, maintain, and oversee implementation of this SHERP.

Visit the project as needed to audit the effectiveness of this SHERP.

Remain available for project emergencies.

Develop modifications to this SHERP as needed.

Evaluate occupational exposure monitoring/air sampling data and adjust SHERP requirements as necessary.

Serve as a QC staff member.

Approve this SHERP by signature

The Project CIH reports to the Environmental Health and Safety Director, Federal Business Line, Shaw Environmental, Inc.

2.5 Site Safety and Health Officer

The Field Supervisor will serve as the Site Safety and Health Officer (SSHO) for the project. The SSHO assures operations are conducted in accordance with the SHERP, USACE requirement, and OSHA regulations. The SSHO reports to the Project CIH with functional issues. The SSHO has the authority to suspend operations at the project due to non-compliance. An alternate SSHO will be assigned when the primary SSHO is not available on-site. The SSHO has the overall responsibility to conduct exposure monitoring and/or air sampling and to select and/or adjust personal protective equipment (PPE) use. The SSHO shall have the authority and is responsible for the following actions:

Be present during operations to implement the SHERP.

Inspect site activities to identify safety and occupational health deficiencies and correct them.

Coordinate changes/modifications to the SHERP with the Project CIH, Project Manager, and contracting officer.

Conduct project-specific training.

Inspections completed by the SSHO will also be used to determine if operations are being conducted in accordance with the SHERP. Daily safety inspections shall be documented on the Daily Safety Inspection Report (Appendix C, Forms). Copies of the inspections will be provided to USACE, if requested.

Other SSHO responsibilities include the following:

General Safety and Health Program administration.

On-site contact for regulatory agencies on matters of safety and health.

Establish employee exposure monitoring notification programs.

Investigate significant accidents and illnesses and implement corrective action plans.

Implement all safety procedures and operations on site.

Observe work party members for symptoms of on-site exposure or stress.

Arrange for the availability of on-site emergency medical care and first aid, as necessary.

Determine evacuation routes, verify that an effective means of emergency communication is always available while workers are on site, establish and post local emergency telephone numbers, and arrange emergency transportation.

Establish work zones.

Present tailgate safety meetings and maintaining attendance logs and records.

Verifying that the respiratory protection program is implemented, when necessary.

Verifying that decontamination procedures meet established criteria, when necessary.

Monitoring employee work hours and limit those work hours that are excessive (Section 1.3).

At a minimum, the SSHO must have completed the 30-hour OSHA construction safety class or an equivalent course applicable to the work to be performed and given by qualified instructors. Such training shall have been within the last 3 years.

2.6 Field Supervisor

The Field Supervisor is the primary safety official and emergency response coordinator at the project (refer to Section 2.5 and Section 11.1.1). The Field Supervisor is responsible for the field implementation and enforcement of this SHERP. The Field Supervisor is also responsible for maintaining contact with the USACE representatives, the Project CIH, and the Project Manager. The Field Supervisor reports to the Project Manager.

2.7 Subcontractor Personnel

Both Shaw and subcontractors share the responsibility for the safety and health of their employees. Subcontractors are also responsible for complying with the standards established in this SHERP, the guidelines established in Shaw Environmental & Infrastructure, Inc. (Shaw E & I) Procedure No. HS011, "Health & Safety Rules for Contractors," EM 385-1-1,

Safety and Health Requirements Manual (USACE, 2003), and all other project safety requirements. Subcontractors shall be pre-qualified according to the requirements of Shaw E & I Procedure No. SOP-T-PR-301, "Qualification of Sources." The following are some of the requirements that apply to subcontractors:

All subcontractors under the direction of Shaw will report to the Field Supervisor.

An assigned safety representative for each subcontractor shall be present on any day that work is being performed. The name of the assigned safety representative shall be conveyed to the Field Supervisor.

Subcontractors shall submit all training and medical surveillance documents to Shaw prior to mobilization.

Planned operations for the day shall be verbally conveyed to the Field Supervisor at the beginning of each day.

All subcontractor employees working on site shall sign the Site Entry Log (Appendix C) at the beginning and end of each workday.

All subcontractor personnel shall attend a project safety orientation prior to beginning work on site.

All subcontractor personnel shall attend the morning tailgate safety meeting and prepare Job Safety Analyses. If scheduling precludes attendance at the Shaw meeting, then subcontractors shall hold and document their own safety meeting. Safety meeting documentation, using the Safety Meeting Log form (Appendix C), is to be submitted to the Field Supervisor.

All accidents, fires, injuries, illnesses, and spills shall be immediately reported to the Field Supervisor.

Vehicles, such as trucks and automobiles are to be inspected daily by the individual driving using the Vehicle Inspection form (Appendix C). Inspection documentation is to be submitted to the Field Supervisor.

Subcontractors are required to frequently inspect work sites for safety deficiencies and correct all deficiencies. Documentation of these inspections, as well as the corrective actions implemented, is to be submitted to the Field Supervisor. The Daily Safety Inspection Report (Appendix C) or equivalent shall be used.

2.8 Visitors and Other On-Site Personnel

Visitors and other on-site personnel shall check in with the Field Supervisor in order to verify that all appropriate entry requirements are met. All visitors will be briefed by the Field Supervisor on the hazards to be expected on the site(s) and the safety and health controls required (i.e., hardhat, foot protection, etc.). The Field Supervisor will verify that all visitors entering the site are properly protected and are wearing or provided with the appropriate PPE. A stock of common PPE (i.e., hard hats, eye protection, hearing protection, reflective vests, etc.)

shall be maintained at the project for use by visitors. Visitors are responsible for providing their own respiratory protection, if required, as Shaw cannot provide respiratory protection to visitors. The Field Supervisor will provide an escort for all visitors while on site.

3.0 Accident Prevention Plan

This section addresses general safety areas specified in Appendix A of the EM 385-1-1, *Safety and Health Requirements Manual* (USACE, 2003), as components of the Accident Prevention Plan.

3.1 Project Safety Goal

Safety is Shaw's highest priority. Shaw Environmental, Inc. and project personnel have targeted a goal of zero injuries, illnesses, and environmental incidents for the duration of this project. All activities shall be conducted in a manner that supports this goal.

3.2 Indoctrination of New Employees

Both Shaw and subcontractor personnel are required to attend a safety-orientation meeting prior to working on-site. These orientation meetings are documented and kept on file. Refer to Section 9.4 for an outline of the information that is conveyed to all personnel.

3.3 Fire Prevention and Protection

This section details fire prevention and protection procedures/resources at the Colonie FUSRAP Site.

3.3.1 Workplace Fire Hazards

The primary fire hazards at the project consist of fueling operations, storage of fuels at the project site.

3.3.2 Potential Ignition Sources

The significant ignition sources at the project include smoking materials, vehicle/equipment exhaust, catalytic converters, and engine block surfaces. Personnel shall also be alert for other ignition sources such as, static electricity, lightning, and electrical equipment.

3.3.3 Fire Control Systems, Equipment, and Procedures

Depending on the nature and extent of any fire, the following fire control systems and equipment are available:

The Fuller Road Fire Department (Colonie, NY) is the available fire fighting service.

Project vehicles and drill rigs shall be equipped with fire extinguishers.

A fire extinguisher shall be available when performing work at locations where grass or weeds exists.

The AHA for fueling operations shall be followed by project personnel.

Flammable and oxidizing materials shall be stored in marked (No Smoking, Matches, or Open Flame) areas with fire extinguishers available.

Smoking shall only be permitted only in designated areas. Personnel shall never discard cigarette butts into the environment while working at the Colonie FUSRAP Site.

Project personnel are only permitted to extinguish small fires in their incipient stages.

Fighting fires is prohibited by project personnel and shall only be performed by the local fire department (Section 11.5).

3.3.4 Fire Control Equipment Maintenance Responsibilities

The SSHO is responsible for the monthly inspections and annual service of all fire extinguishers provided at the site. Vehicle and heavy equipment operators are responsible for the inspection and service of vehicle/equipment-equipped fire extinguishers.

3.4 Housekeeping

Housekeeping shall be a priority at the project site. The following provisions are specified to maintain a high standard of housekeeping:

The importance of housekeeping and the expectations that good housekeeping shall be maintained will be regular topics of the morning safety meetings.

Work areas shall be cleaned up on a daily basis.

Subcontractors are required to maintain good housekeeping practices.

Trash will be bagged and removed from the site. All trash will be disposed of properly.

Housekeeping is an operational/safety item, which is regularly considered during routine inspections.

Nails shall be bent-over or removed from scrap lumber immediately.

3.5 Mechanical Equipment Inspections

Before any machinery or mechanized equipment is placed in use, it shall be inspected and tested in accordance with the manufacturer's recommendations and requirements of the *Safety and Health Requirements Manual* (USACE, 2003) and shall be certified in writing by a competent person to meet the manufacturer's recommendations and requirements of the manual. Subsequent re-inspections will be conducted at least annually thereafter. These inspections shall be documented on the Daily Equipment Inspection form (Appendix C). All safety deficiencies noted during the inspection shall be corrected prior to the equipment being placed in service at the project. If at any time the machinery or mechanized equipment is removed and subsequently returned to the project (other than equipment removed for routine off-site operations as part of the project), it shall be re-inspected and re-certified prior to use. All equipment shall be inspected by each operator prior to use on the project and shall then be inspected on a daily basis. Daily inspections shall be documented on the Daily Equipment Inspection form (Appendix C). Deficiencies in the equipment shall be noted on the form. All inspection documentation shall be submitted to the Field Supervisor prior to using the equipment if safety deficiencies are observed and at the end of the day if no safety deficiencies are observed.

The Field Supervisor shall immediately evaluate the inspection forms and determine if the equipment is in need of immediate repairs and if it should be "red tagged" and taken out of service. If the equipment is taken out of service, then the equipment shall not be used until the Field Supervisor is satisfied that the necessary repairs have been affected. For minor deficiencies that do not compromise the safe operation of the equipment, repairs shall be made at the discretion of the equipment owner. All inspection records are to be kept on file in the Shaw field office.

3.6 First Aid and Medical Facilities

The following addresses first aid and medical facilities:

Effective emergency communication devices must always be available while personnel are present at the site.

Employees working alone in a remote location or away from other workers shall be provided an effective means of emergency communications. This means of communication could include a cellular phone, two-way radios, hard-line telephones or other acceptable means. The selected communication must be readily available (easily within the immediate reach) of the employee and must be tested prior to the start of work to verify that it effectively operates in the area/environment.

There shall be a first aid kit available in all project vehicles.

Emergency telephone numbers shall be available in all project vehicles (Table 1).

The following has been selected as the CORE Health Networks medical clinic:

Access Health Systems

776A Watervliet-Shaker Rd.
Latham, New York 12110
(518) 782-2200 or (518) 786-1875

Shaw Environmental, Inc. employees shall utilize this clinic for injuries that do not require assistance or transport by Emergency Medical Services.

The route map to Access Health Systems shall be available in all project vehicles (Section 11.3); however, the facility to care for serious medical emergencies shall be determined by the Emergency Medical Technician responding to the incident. The nearest hospital for medical emergencies is the Albany Medical Center located on New Scotland Avenue in Albany, New York (518) 262-3131. At a minimum, two on-site employees shall be certified in first aid and cardiopulmonary resuscitation (CPR) during intrusive activities. First aid and CPR training/certification must be made by a reputable provider, such as, the American Red Cross or American Heart Association.

3.7 Sanitation

The following provisions will be made to address sanitation:

Safe drinking water (one-serving size individual bottles of water) shall be provided to workers. .

Portable washing facilities are provided as necessary in Contamination Reduction Zones (CRZ). Portable washing facilities shall consist of, at a minimum, soap, water, and paper towels.

3.8 Illumination

There shall be adequate lighting to perform all activities in a safe manner. Work shall be conducted during daylight hours.

3.9 Engineering and Administrative Controls

The use of engineering and administrative controls shall be the preferred method of reducing or eliminating hazards. Only in cases where the use or application of engineering and administrative controls is deemed as not feasible, then PPE may be used.

3.10 Signs, Labels, and Tags

Hazard warning signs shall be used to define specific hazards of a nature such that failure to designate them may lead to accidental injury to workers or the public, or both, or to property

damage. All new and replacement signs shall be in accordance with the requirements contained in 29 CFR 1910.145.

All containers of hazardous materials shall be labeled as to contents and associated hazards. Hazard warning labels, whether on containers or equipment, shall not be removed by employees without the permission of the Project CIH.

Tags shall be used as a means to prevent accidental injury or illness to employees who are exposed to hazardous or potentially hazardous conditions, equipment, or operations, which are out of the ordinary, unexpected, or not readily apparent. Tags shall be used until such time as the identified hazard is eliminated or the hazardous operation is completed. Tags need not be used where signs, guarding, or other positive means of protection are being used. All equipment that is in need of repair for safety related reasons shall be tagged as "Out of Service" until the equipment has been satisfactorily repaired.

3.11 Safety Promotions

The following methods for promoting accident prevention will be enacted:

Accident prevention will be a regular topic discussed at safety meetings.

All personnel will be encouraged to sign a Zero Accident Pledge.

A Safety Incentive Award Program shall be implemented to reward safe employee behavior.

3.12 Accident Reporting

All accidents, regardless of their severity, shall be reported to the Field Supervisor, SSHO, Project CIH, and USACE. Other provisions for accident reporting and investigation are addressed later in this SHERP.

3.13 Scope of Work

The following is the general anticipated scope of work for field activities at the Colonie FUSRAP Site:

Redevelop wells.

Perform groundwater sampling.

Cutting grass (around the sampled wells and along Central Avenue).

Trash removal along Central Avenue..

3.14 Activity Hazard Analysis

Activity Hazard Analyses (Appendix D) identify potential safety, health, and environmental hazards associated with specific tasks and provide protective measures for personnel, the community, and the environment.

Activity Hazard Analyses are developed for all major tasks performed during this project and included with SHERP Addenda. The AHA shall be reviewed and modified by the Field Supervisor and SSHO (with input from field employees and subcontractors). An AHA shall also be prepared when new tasks are added, the job situation changes, or when it becomes necessary to alter safety requirements. Work will not proceed on a particular task/phase until the AHA has been reviewed with the work crews. Any changes to this SHERP will be included as a SHERP Amendment (Appendix B, "Safety, Health, and Emergency Response Plan Amendments"). Any addenda or amendment to the SHERP must have written approval from the Project CIH, Project Manager, and USACE.

The names of the competent/qualified person(s) required for a particular activity as specified by OSHA and will be identified and included in the AHA. Proof of their competency/qualification must be submitted to the SSHO for acceptance prior to the start of that work activity.

3.15 Job Safety Analysis

Job Safety Analyses are an effective management technique for identifying hazardous conditions and unsafe acts in the workplace. A JSA is intended to analyze the individual steps or activities, which together create a job or specific work duty, and to detect any actual or potential hazards that may be present. Each crew must complete a JSA for each task that will be accomplished for that day, as required by Shaw Procedure No. HS045, "Job Safety Analysis". The JSA shall be revised, as necessary, when unforeseen circumstances arise or work site conditions change. Any revisions shall be immediately communicated with the affected site workers. If the need to complete an unplanned task becomes necessary at any point throughout the day, a new JSA shall be prepared to cover that task. The JSAs shall be completed using the JSA Checklist Form and JSA Worksheet Form, both of which can be found in Appendix C.

3.16 Hazard Assessment Resolution Process

Hazard Assessment Resolution Process (HARP) shall be exercised prior to starting each task. HARP is a brief, paperless, general risk assessment of which the objective is to anticipate, identify and eliminate or control potential real-time workplace hazards, which could lead to an accident. HARP requires workers to take time (less than two minutes) before starting a job to become aware of the immediate work environment so as to detect conditions unanticipated by our work planning. This involves a three-step process:

Assess the hazard(s) and risk(s) to identify what could go wrong and what is the worst thing that could happen

Analyze the situation to determine how to reduce the risks. Evaluate each identified risk and implement the appropriate safeguards to control the hazards

Act to ensure safe operations:

Take the necessary steps to complete the job safely.
Follow written standards and procedures (APP, AHAs, JSAs, etc.).
Do not proceed until it is safe.

Risk reduction is a critical component of HARP. The following risks will be avoided:

Hurrying

Thinking the job is routine or simple

Believing nothing bad can happen

Not talking about precautions with co-workers

Not raising a "gut feel."

The appropriate hazard resolution and corrective actions must take place before proceeding with the task:

Communicate hazards and precautions to take with co-workers and supervisor

Eliminate or control the hazards. The implementation of administrative controls is sometimes effective, that is, marking the hazard with warning tape, signs, or tags

If the risk is unacceptable or if a hazard cannot be satisfactorily controlled, then stop work and contact the SSHO or HSM.

3.17 Safety Observation Program

Safety observations are behavior-based and provide a systematic feedback process between line personnel and supervision to proactively identify opportunities for safety improvement in work areas.

Employees engaged in work activities are often the most knowledgeable about the hazards of their work and can provide valuable feedback on unsafe conditions and unsafe practices, which may require corrective action.

The Safety Observation Program is a tool for employees to provide information on actual or potential safety hazards that they observe in their workplace, which if left unreported may result in an accident and or injury. This program also provides a mechanism for recommending corrective actions.

The Shaw Safety Observation Program:

Identifies practices that could cause accidents, injuries, or damage.

Identifies specific needs for coaching and training.

Checks the adequacy of the EHSP, AHAs, JSAs, and compliance with general site rules and other procedures.

Monitors the effectiveness of training.

The SSHO must develop a schedule for conducting safety observations. A general guideline for the number of observations in a week is one observation per 100 work hours on the project. The schedule for observation(s) shall be communicated to site personnel.

The volunteer conducting the safety observation shall record their findings on the Safety Observation Reporting Card, as required by Shaw Procedure No. HS026, "Safety Observation Procedure" (2010). Tasks or items that require follow-up because of serious risk potential must be addressed immediately by the SSHO. Items with lesser risk should be discussed in the next tailgate safety meeting. The action items and corrective actions, including dates and responsible person(s) shall be documented on the Safety and Occupational Health Deficiency Tracking Log (Appendix C), maintained, and available for inspection.

3.18 Safety and Health Bulletin Board

A safety and health bulletin board is not feasible since there are no available facilities for this field effort; however, the following shall be maintained by the SSHO and be made available at the project site:

Map denoting the route to the nearest emergency care facility.

Emergency telephone numbers.

Copy of the SHERP, which will be accessible on the site by all workers.

The OSHA Form 300A.

Copy of Safety and Occupational Health Deficiency Tracking Log, which shall be accessible by all workers upon request.

Date of last lost workday injury.

OSHA Safety and Health Poster.

4.0 Project Hazards and Hazard Control Measures

There are potential chemical, physical, and environmental hazards present at the project sites. The hazards, if not properly controlled, could cause harm to project personnel, visitors, and the public. The anticipated hazards at the project sites and the recommended control measures are presented in this section. Additional information on specific hazards and control measures are outlined in the AHAs (Appendix D).

4.1 Chemical Hazards

Previous field investigations performed at the Colonie FUSRAP Site indicate the presence of inorganic and organic chemicals in soil and groundwater. This section provides an overview of the chemical contaminants detected in various media at the Colonie FUSRAP Site and an assessment of the chemical hazards associated with each contaminant of concern.

There is potential for exposure to personnel through all routes (i.e., dermal contact, inhalation of dust and vapors, ingestion, and injection). Controls have been specified in this SHERP to reduce the risk of these potential exposures. The use of PPE and proper decontamination procedures is required when performing work with contaminated media. A brief description of the exposure limits used is provided below:

Threshold Limit Value-Time Weighted Average (TLV-TWA) – Airborne concentrations of substances, generally expressed as an 8-hour time-weighted average and represent conditions under which it is believed that nearly all workers may be repeatedly exposed day after day for a 40-hour workweek without adverse health effects. Threshold limit values are guidelines for occupational exposures established by the ACGIH (2010).

Threshold Limit Value-Short Term Exposure Limit (TLV-STEL) – The 15-minute time-weighted average airborne concentrations of substances that should not be exceeded at any time during a workday, even if the 8-hour TWA is within the TLV-TWA. Threshold limit values are guidelines for occupational exposures established by the ACGIH (2010).

Immediately Dangerous to Life or Health (IDLH) – The National Institute of Occupational Safety and Health defines IDLH as, air concentrations, which represent the maximum concentration from which, in the event of respirator failure, one could escape within 30 minutes without a respirator and without experiencing any escape-impairing or irreversible health effects.

Recommended Exposure Limit – The time-weighted average concentration exposure for up to a 10-hour workday during a 40-hour workweek, recommended by the National Institute of Occupational Safety and Health (NIOSH).

Permissible Exposure Limit (PEL) – The 8-hour time-weighted average, short-term exposure limit (STEL), or ceiling (C) concentration above which workers cannot be exposed. Permissible exposure limits are enforceable by OSHA.

4.1.1 Inorganic Chemicals

Various inorganic chemicals have been identified as being present as contaminants in soils and waters at the Colonie FUSRAP Site. Certain chemical contaminants in the soils and waters are classified as particularly toxic or carcinogenic substances. The OSHA defines "particularly hazardous substances" as consisting of select carcinogens, reproductive toxins, and substances that have a high degree of acute toxicity. These contaminants include the following:

Arsenic. Arsenic compounds target the liver, kidneys, skin, lungs, and lymphatic system (lung and lymphatic cancer). Symptoms of exposure include dermatitis, ulceration of the nasal septum, gastrointestinal disturbances, respiratory irritation, hyper pigmentation of the skin, and degeneration of the peripheral central nervous system. Arsenic is considered a confirmed human carcinogen (ACGIH, 2010). (Permissible exposure limit [PEL]-time-weighted average [TWA]: 0.01 milligrams per cubic meter [mg/m^3] for inorganic arsenic; immediately dangerous to life and health (IDLH): National Institute for Occupational Safety and Health (NIOSH) Potential Occupational Carcinogen 5 mg/m^3; TLV-TWA: 0.01 mg/m^3.) TLV Basis: lung cancer (ACGIH, 2010).

Copper. Copper compounds target the eyes, skin, respiratory system, liver, kidneys (increased risk with Wilson's disease). Symptoms of exposure include irritation eyes, nose, and pharynx; nasal septum perforation; metallic taste; dermatitis. (PEL: 1.0 mg/m^3; IDLH: 100 mg/m^3; TLV-TWA: 1.0 mg/m^3.) TLV Basis: irritation; GI (ACGIH, 2010).

Lead. Lead targets the eyes, gastrointestinal tract, central nervous system, kidneys, blood, and gingival tissue. Symptoms of exposure include lassitude (weakness, exhaustion), insomnia; facial pallor; anorexia, weight loss, malnutrition; constipation, abdominal pain, colic; anemia; gingival lead line; tremor; paralysis wrist, ankles; encephalopathy; kidney disease; irritation eyes; hypotension. Lead is a confirmed animal carcinogen with unknown relevance to humans (ACGIH, 2010). (PEL: 0.050 mg/m^3; IDLH: 100 mg/m^3; TLV-TWA: 0.05 mg/m^3.) TLV Basis: CNS impairment; PNS impairment; hematological effects (ACGIH, 2010).

4.1.2 Organic Compounds

Groundwater remedial investigation activities have identified several hazardous organic compounds (volatile and semi-volatile) present as contaminants in the soil and water at the Colonie FUSRAP Site. All of these organic chemicals are considered toxic and some are identified as being carcinogenic. Information about the organic chemical contaminants present is summarized as follows.

Benzene. Benzene targets the eyes, skin, respiratory system, blood, central nervous system, bone marrow. Symptoms of exposure include Irritation eyes, skin, nose, respiratory system; dizziness; headache, nausea, staggered gait; anorexia, lassitude (weakness, exhaustion); dermatitis; bone marrow depression; [potential occupational carcinogen]. Benzene is a confirmed human carcinogen (ACGIH, 2010). (PEL-TWA: 1 part per million [ppm], STEL: 5 ppm; IDLH: Ca [500 ppm]; TLV-TWA: 0.5 ppm, 2.5 ppm TLV-STEL with a skin notation.) TLV Basis: Leukemia (ACGIH, 2010).

1,2-Dichloroethene. 1,2-dichloroethene targets the eyes, respiratory system, and central nervous system. Symptoms of exposure include irritation eyes, respiratory system; central nervous system depression (PEL-TWA: 200 ppm; IDLH: 1,000 ppm; TLV-TWA: 200 ppm.) TLV Basis: CNS impairment; eye irritation (ACGIH, 2010).

Polycyclic Aromatic Hydrocarbons. Polycyclic aromatic hydrocarbons target the respiratory system, skin, bladder, and kidneys [lung, kidney, and skin cancer]. Symptoms of exposure include dermatitis and bronchitis; (potential occupational carcinogen) (NIOSH, 2005). Exposure limits have not been established for many specific polycyclic aromatic hydrocarbons in this large group of compounds. Coal tar pitch volatiles are a confirmed human carcinogen (ACGIH, 2010). (PEL-TWA: 0.2 mg/m^3 – diphenyl; IDLH: Ca [80 mg/m^3]; TLV-TWA: 0.2 mg/m^3.) TLV Basis: cancer (ACGIH, 2010).

Tetrachloroethene. Tetrachloroethene, also commonly called perchloroethene, targets the liver, kidneys, respiratory system, eyes, skin, and CNS. Symptoms of exposure include irritation to the eyes, nose, throat, and respiratory system; nausea; flushed face and neck; vertigo; dizziness; headache; in-coordination; drowsiness; redness to the skin; and liver damage; (potential occupational carcinogen) (NIOSH, 2005). Tetrachloroethene is a confirmed animal carcinogen with unknown relevance to humans (ACGIH, 2010). (PEL-TWA: 100 ppm, PEL-C: 200 ppm, PEL-5-minute maximum peak in any 3 hours: 300 ppm, IDLH: Ca [150 ppm]; TLV-TWA: 25 ppm, TLV-STEL: 100 ppm) TLV Basis: CNS impairment (ACGIH, 2010).

Trichloroethene. Trichloroethene targets the eyes, skin, respiratory system, heart, liver, kidneys, and central nervous system. Symptoms of exposure include irritation eyes, skin; headache, visual disturbance, lassitude (weakness, exhaustion), dizziness, tremor, drowsiness, nausea, vomiting; dermatitis; cardiac arrhythmias, paresthesia; liver injury; [potential occupational carcinogen] (NIOSH, 2005). Trichloroethene is a suspected human carcinogen (ACGIH, 2010). (PEL-TWA: 100 ppm, PEL-C: 200 ppm, PEL- 5-minute maximum peak in any 2 hours: 300 ppm; IDLH: Ca 1,000 ppm; TLV-TWA: 10 ppm, TLV-STEL: 25 ppm.) TLV Basis: CNS impairment; cognitive decrements; renal toxicity (ACGIH, 2010).

Vinyl chloride. Vinyl chloride targets the liver, central nervous system, blood, respiratory system, and lymphatic system. Symptoms of exposure include lassitude (weakness, exhaustion); abdominal pain, gastrointestinal bleeding; enlarged liver; pallor or cyanosis of extremities; liquid: frostbite; [potential occupational carcinogen]. Vinyl chloride is considered a confirmed human carcinogen (ACGIH, 2010). (PEL-TWA: 1 ppm, PEL-C: 5 ppm; IDLH: [Ca]; TLV-TWA: 1 ppm) TLV Basis: lung cancer; liver damage (ACGIH, 2010).

4.1.3 Munitions and Explosives of Concern

There is very little potential for Munitions and Explosives of Concern (MEC) to be encountered during project activities.

4.1.4 Radiological Hazards

The Colonie FUSRAP Site radiological contaminants are uranium (primarily U-238 as depleted uranium) and thorium-232 and respective decay products found in groundwater and well sediments. The rules that govern worker exposure to radioactive materials found in 10 CFR 20

will be followed throughout this project. This will include application of as low as reasonably achievable (ALARA) principles.

At the anticipated concentrations of these contaminants, external exposure is not significant and personnel will not require external dosimetry. Pathways for internal exposure are inhalation, ingestion and absorption through skin (following contamination of skin or clothing). However, the potential for internal exposure from radionuclides is below the threshold requiring personnel monitoring.

Worker training, engineering and administrative controls, positive contamination control practices, and PPE are utilized to prevent intake of radioactive particles into the body. The policies and objectives for controlling remediation worker exposure to radioactive material (and subsequent dose) are implemented through HWPs. Radiation exposure to the general public from groundwater sampling is not credible.

4.1.5 Operational Chemicals/Hazard Communication Program

Hazardous chemicals will be brought on-site for use in activities supporting the planned work. These chemicals are used as fuels, lubricants, preservatives, etc. The use of operational chemicals is regulated by OSHA under the Hazard Communication Standard (29 CFR 1910.1200). A written hazard communication program has been established as Shaw E & I Procedure HS060, "Hazard Communication Program," which includes the following elements:

Container Labeling—Project personnel will ensure that all containers are labeled according to their contents. This requirement will apply to containers from manufacturers and those produced on site by operations. The labels on all incoming and outgoing containers will be checked for identity, hazard warning, and the name and address of the responsible party.

Material Data Safety Sheets—MSDSs will be provided on site for each hazardous chemical used or known to be present at the site.

Employee Information and Training—Employees will receive annual chemical hazard safety training, supplemented by informal daily safety meetings. Project specific chemical hazards will be communicated to employees through an initial site orientation meeting and daily safety meetings.

The written hazard communication program will be available at the project site for personnel review and provides requirements for the safe use of operational chemicals. Proper ventilation and personal protective equipment (PPE) shall be used when working with operational chemicals. Air monitoring may be performed as needed to assess and control exposures resulting from the use of operational chemicals. Both an inventory list of the operational chemicals (Hazardous Chemical Inventory List) used and a Material Safety Data Sheets (MSDS)

for operational chemicals shall be made available at the project site (Appendix E). A copy of the MSDSs shall be provided to the Fuller Road Fire Department (Colonie, NY) upon request.

4.2 Physical Hazards

There will be numerous physical hazards associated with site operations that require consideration. Some of these physical hazards are as follows:

Noise
Slips, trips, and falls
Groundwater Sampling/Wells
Use of small tools
Use of mechanized equipment
Operation of motor vehicles
Material handling
Hazardous energies (i.e., electrical, mechanical, and pressure)
Vehicular Traffic
Portable Generator Use
Active Railroad Tracks

4.2.1 Noise and Hearing Conservation

There will be many sources of noise at each project site. Noise may be generated from the use of heavy equipment and tools, or may be from base operations. Hearing loss, resulting from occupational exposure to noise, can be prevented. Shaw Environmental & Infrastructure, Inc. Procedure No. HS402, "Hearing Conservation Program," shall be implemented at each project site whenever there is employee noise exposures equal to or exceeds an eight-hour TWA of 85 dBA (decibels, A-scale). As part of the criteria for a hearing conservation program, audiometric testing of personnel must be conducted annually. Personnel shall wear hearing protection when working with or around heavy equipment, power tools, as noise monitoring indicates, or in areas posted as such.

4.2.2 Slips, Trips, and Falls

The following details procedures to prevent slips, trips, and falls:

Personnel shall keep working areas clean and orderly. Tools, equipment, and materials shall be used and stored in a fashion to minimize tripping hazards.

Small objects, tools, and debris shall not be left lying around in any place, particularly in areas where personnel walk.

Spills shall be cleaned up immediately.

Personnel are prohibited from walking or working on surfaces or equipment that are not intended as walking or working surfaces.

Personnel shall take extra precautions, such as establishing firm handholds, wearing suitable footwear, and walking slowly when walking on surfaces during wet, snowy, or icy weather.

Personnel shall not jump from elevated places or equipment.

Personnel using hand and mechanical tools shall position themselves properly and consider the events if a tool slips or suddenly moves.

Electrical extension cords and electrical wiring shall be kept clear of walking and working areas and/or covered, buried, or otherwise secured.

Running is prohibited on job sites unless under emergency conditions.

Employees exposed to fall hazards shall be protected by standard guardrail, catch platforms, temporary floors, safety nets, personal fall protection devices, or the equivalent. No employee may be exposed to a fall of over 6 feet without being adequately protected.

Shaw Environmental & Infrastructure, Inc. Procedure No. HS301, "Fall Protection," shall be followed when there is a fall hazard of six feet or greater.

4.2.3 Groundwater Sampling/Wells

Contamination avoidance will be practiced at all times. The sampling team will review the sampling work plan, AHA, JSA, emergency procedures, and the location of emergency equipment with everyone before the task begins.

The hazards of sampling include lacerations from broken containers, strains, and sprains from carrying sampling coolers or heavy tools, skin contact from spilled contaminated soils or splashing liquids or contact from sampling preservatives.
Shaw personnel will observe the following procedures and practices for well installation, well development, well abandonment, well gauging, well bailing and groundwater sampling:
Wear appropriate PPE to avoid skin, eye, and inhalation contact with contaminated groundwater and/or soil.

Stand upwind when conducting tasks and minimize possible inhalation exposure, especially when first opening monitoring wells.

Conduct air monitoring in breathing zone to determine level of respiratory protection.

Use engineering controls such as portable air movers to draw away or blow away chemical vapors.

Perform personal decontamination after sampling.

4.2.4 Use of Small Tools

Hand and power tools shall be used, inspected, and maintained in accordance with the manufacturer's instructions and recommendations and will be used only for the purpose for which designed. A copy of the manufacturer's instructions and recommendations shall be maintained at the project site. The following requirements shall be adhered to:

Tools designed to accommodate guards will be equipped with such guards when in use.

Tools shall be inspected to ascertain safe operating conditions and are to be kept clean and free of accumulated dirt.

Electric power tools and extension cords shall be used with ground fault circuit interrupter.

Portable power cords will be designated as hard usage or extra hard usage and shall not be used if damaged, patched, oil-soaked, worn, or frayed.

Hand tools, such as hammers and chisels, shall be inspected and dressed if necessary to remove mushroomed heads, which may separate and become projectile hazards.

4.2.5 Use of Cutting Tools

Proper cutting tools, such as scissors, snips, side cutters, etc., are to be used when possible in lieu of box cutters or knives. Furthermore, if box cutters are determined to be the appropriate tool for the job, the only type that should be used is the design that has a self-retracting blade capability. Employees must utilize appropriate PPE (leather gloves) to allow for further protection. There are many cutting tool manufacturers that offer a variety of safety knives, which are available for all types of cutting. The Field Supervisor shall evaluate each cutting task in order to determine that the safest and most appropriate cutting tool is used. The Field Supervisor shall also provide training in the proper use of the selected cutting tool. The following evaluation shall be made for each cutting task:

Determine that hand knives are actually the most practical tool for the task. Where possible, use the safest cutting tool for the job (e.g., scissors, snips, or wire strippers).

If a knife happens to be the correct tool, keep the knife sharp and clean. A dull blade can cause accidents because more force is needed to cut an object. However, a knife or any other unprotected blade tool must be the last resort when choosing a cutting tool.

Maintain a supply of either replacement knives and/or blades and make them readily available.

Cut away from yourself, ending the knife stroke away from your body. Hold the item you are cutting firmly, and do not cut downwards and towards your body. Cut into the air or onto hard surface.

Confirm that appropriate PPE (e.g., gloves) specific to the task is available to employees and used when the possibility of injury exists.

Personal knives (e.g., pocketknives) shall not be considered as a tool for any type of work-related cutting. Employees are required to ask for a cutting tool from their supervisor, thereby resulting in an additional review of using the right cutting tool for the job.

The Field Supervisor is to inspect material cutting activities to verify that leather gloves are being used to protect hands.

4.2.6 Use of Mechanized Equipment

A drill rig or other types of specialized equipment may be used to accomplish the work at the project. Additionally, a high weed mower or brush cutter will be used for mowing activities. The use of mechanized equipment can be dangerous. Extra care shall be exercised in its use and while working in the vicinity of this equipment.

4.2.6.1 Drill Rig Use

All drilling operations are to comply with Shaw E & I Procedure No. HS316, "Drill Rig Operations." All members of the drilling crew(s) shall receive site-specific training prior to beginning work. The Field Supervisor must have successfully completed Shaw's in-house training pertinent to competent person drilling oversight (CPDO Training). The Field Supervisor is required not only to have successfully completed CPDO Training, but to have an appropriate educational background, coupled with field experience and the authority to make changes to correct deficiencies, or to stop the job if need be. The driller is responsible for the safe operation of the drill rig, as well as the crew's adherence to the requirements of this SHERP. The driller is to verify that all safety equipment is in proper condition and is properly used. The members of the crew shall follow all instructions provided by the manufacturer of the drill rig, wear the required PPE, and be aware of all hazards and control procedures. The drill crews shall participate in the daily tailgate safety meeting and be aware of all emergency procedures.

All drilling activities must comply with Shaw E & I Procedure No. HS308, "Underground/Overhead Utility Contact Prevention."

4.2.7 Operation of Motor Vehicles

All company owned, leased, or rented vehicle operations shall comply with the requirements of Shaw E & I Procedure No. HS800, "Motor Vehicle Operation: General Requirements" and Shaw E & I Procedure No. HS810, "Commercial Motor Vehicle Operation and Maintenance." Shaw Environmental & Infrastructure, Inc., vehicles shall be inspected on a daily basis. Additionally, all Shaw vehicles shall be inspected prior to any trip, which is 50 miles or greater. Vehicle inspections shall be documented on the Vehicle Inspection form (Appendix C).

Subcontractors operating motor vehicles at projects shall comply with all federal, state, and local traffic regulations. Subcontractors shall only use vehicles that are in good condition and safe to operate. Subcontractors shall inspect their vehicles on a daily basis and submit the inspection

documentation to the Field Supervisor. Vehicle inspections shall be documented on the Vehicle Inspection form (Appendix C).

All personnel must observe the maximum-posted speed limits on the base roadways and parking lots. All personnel shall drive defensively and wear seat belts while vehicles are in motion. All Shaw employees are required to attend a defensive driving training course.

Operators of vehicles may only use cellular telephones with hands-free devices while the vehicle is in motion. Prior to using a hand-held cellular telephone, drivers shall find a safe place to bring their vehicle to a stop. This requirement does not preclude passenger(s) from using cellular telephones while the vehicle is in motion. The use of headphones and earphones for music or radio is prohibited while operating a motor vehicle.

Since backing accidents at these types of projects are frequent, the following guidelines shall be observed:

Backing of vehicles shall be avoided when possible.

Extra care shall be taken to back vehicles when unavoidable.

Back-up slowly and back-up the shortest distance necessary to accomplish the maneuver.

When parking vehicles, vehicles shall be backed into the space whenever possible.

Before entering a vehicle, which has been parked, the driver should first physically perform a 360° walk around the vehicle to observe all areas and especially the area behind the vehicle.

Spotters shall be used to back vehicles whenever possible or necessary.

4.2.8 Material Handling

Various materials and equipment may be handled manually during project operations. Care should be taken when lifting and handling heavy or bulky items to avoid back injuries. The following fundamentals address the proper lifting techniques that are essential in preventing back injuries:

Size, shape, and weight of the object to be lifted shall first be considered. No individual employee is permitted to lift any object that weighs over 60-pounds. Multiple employees or the use of mechanical lifting devices is required for objects over the 60-pound limit.

Anticipated path to be taken by the lifter should be inspected for the presence of slip, trip, and fall hazards.

Feet shall be placed far enough apart for good balance and stability (typically shoulder width).

Worker shall get as close to the load as possible. Legs shall be bent at the knees.

Back shall be kept as straight as possible and abdominal muscles should be tightened.

Twisting motions should be avoided when performing manual lifts.

To lift the object, the legs are straightened from their bending position.

Take small turning steps without twisting the knees or the back if it is necessary to turn with the load.

A worker shall never carry a load that cannot be seen over or around.

When placing an object down, the stance and position are identical to that for lifting. The legs are bent at the knees and the object lowered.

When two or more workers are required to handle the same object, coordination is essential for sharing the weight between the individuals carrying the load and to make a uniform lift. When carrying the object, each worker, if possible, shall face the direction in which the object is being carried. In handling bulky or heavy items, the following guidelines shall be followed to avoid injury to the hands and fingers:

A firm grip on the object is essential; leather gloves shall be used as necessary.

Hands and the object shall be free of oil, grease, and water, which might prevent a firm grip. Fingers shall be kept away from any points that could cause them to be pinched or crushed, especially when setting the object down.

Item shall be inspected for metal slivers, sharp or jagged edges, burrs, and rough or slippery surfaces prior to being lifted.

4.2.9 Hazardous Energies (Electrical, Mechanical, and Pressurized Systems)

All portable electrical equipment and extension cords shall be protected with a ground fault circuit interrupter (GFCI) as part of the circuit. Applicable OSHA standards for electrical power, 29 CFR 1926 Subpart K and Section 11 of the *Safety and Health Requirements Manual* (USACE, 2003) apply.

Only qualified electricians may work on electrical circuits. Qualified personnel shall be trained with the proper use of the special precautionary techniques, PPE, including arc-flash, insulating and shielding materials, and insulated tools and test equipment.

Live parts to which an employee might be exposed shall be put into an electrically safe work condition (de-energized) before an employee works on or near them, unless it can be demonstrated that de-energizing introduces additional or increased hazards or is infeasible due to equipment design or operational limitations. This rule applies to all electrical work, including changing a light bulb.

Where work is performed in locations containing un-insulated energized overhead lines that are not guarded or isolated, precautions shall be taken to prevent employees from contacting such lines directly with any unguarded parts of their body or indirectly through conductive materials, tools, or equipment. Refer to Table 2, "Minimum Clearance from Energized Overhead Electric Lines" when working near overhead power lines. Where the work to be performed is such that contact with un-insulated energized overhead lines is possible, the lines shall be de-energized and visibly grounded at the point of work, or suitably guarded.

Only hard or extra-hard usage extension cords shall be used. Extension cords, power tools, and lighting equipment shall be inspected before each use, protected from damage, and kept out of wet areas.

The handling of compressed gas cylinders shall comply with the requirements established in Shaw E & I Procedure No. HS304.

Lockout/tagout procedures are to be implemented during servicing or maintenance of machines and equipment to preclude the unexpected release of stored energy or inadvertent energization. These procedures are contained in Shaw E & I Procedure No. HS315, "Control of Hazardous Energy Sources," and comply with the requirements established in 29 CFR 1926.417.

Subcontractors may implement their own lockout/tagout procedure if the Field Supervisor has approved its use and verifies that it is no less protective than the Shaw E & I Procedure.

4.2.10 Vehicular Traffic

Observe the following procedures and practices regarding vehicular traffic

- Wear Class 2 high-visibility safety vest when working near road.
- Stay off road when mowing or removing litter.
- Use cones, flags, barricades, and caution tape to define work area.
- Engage police detail for high-traffic situations.
- Always use a spotter in tight or congested areas.
- Review Shaw Procedure HS800, Motor Vehicle Operation.

4.2.11 Portable Generator Use

Refer to the generator manufacturer's instructions for safe operation. Never use a generator in enclosed or partially enclosed spaces due to the quick build-up of high levels of carbon monoxide. The concentration of carbon monoxide shall be monitored when using generators in areas of poor ventilation. The concentration of carbon monoxide in the work area shall not be allowed to exceed 25 ppm.

Keep the generator dry and do not use in rain or wet conditions. To protect from moisture, operate it on a dry surface under an open, canopy-like structure. Dry your hands, if wet, before touching the generator. Use a heavy duty, outdoor-rated extension cord that is rated (in watts or amps) at least equal to the sum of the connected appliance loads. Check that the entire cord is free of cuts or tears and that the plug has all three prongs, especially a grounding pin. Ground generators by using a hand-inserted ground-rod, if recommended by the manufacturer.

Before refueling the generator, turn it off and let it cool down. Gasoline spilled on hot engine parts could ignite. A 20-B:C fire extinguisher shall be readily available in locations where a generator is being used.

Use hearing protection when working near a generator.

4.2.12 Active Railroad Tracks

Work near railroad tracks poses a danger to personnel from being struck by locomotives, cars, or other track-based equipment. Personnel operating near tracks also present a hazard to the passing train if their work equipment strikes it or if the operation compromises track integrity.

The Federal Railroad Administration (FRA) has established regulations to protect to personnel working near railroad tracks. Compliance with FRA regulations is required when people are working or equipment is positioned within four (4) feet of the track, which is referred to as "fouling" the track. CSX has broadened the FRA definition of fouling the track to people or equipment within 15 feet of the track.

Personnel working within the foul area of railroad track will employ the following critical safety practices:

Advise the CSX Point of Contact (POC) of planned work in the foul zone.

Do not begin operations in the foul zone until the Employee in Charge (EIC) arrives at the site.

Expect train movement at any time, in any direction, on any track.

Do not foul track unless the task requires it.

Verify appropriate track protection is in place, such as watchman/lookout or working limits.

Cross a minimum of 25 feet in front of or behind standing equipment.

Participate in the job briefing/JSA.

Know the location of the designated place of safety or rally point.

Complete the required FRA on-track safety training for contractor roadway workers on an annual basis.

FRA Training Rules Card for each individual in the foul zone must be readily available; workers must know where a copy of the railroad operating rules is located.

4.3 General Work Rules

While all the procedures outlined in this SHERP are required, the following list presents general work rules that must be strictly enforced by the Field Supervisor and Subcontractor Supervisors:

Personnel are not allowed on site without the prior knowledge and consent of the Field Supervisor.

Loose jewelry, clothing, or long hair is not permitted on or near equipment with moving parts.

Personnel shall not enter a restricted area unless authorized.

All work zones, as established on the site, shall be observed. All required PPE shall be worn prior to entering these zones.

Legible and understandable labels shall be affixed prominently to the containers of waste materials.

An emergency eyewash capable of delivering at least 0.4 gallons per minute for at least 15 minutes shall be located immediately adjacent to employees who handle hazardous or corrosive materials, such as sample preservatives.

If on-site activities continue later than dusk, adequate lighting shall be provided.

Field activities shall be suspended during severe weather such as thunderstorms, lightning, and tornado warnings.

Damaged PPE shall be immediately repaired or replaced, as appropriate.

Personnel shall thoroughly wash their hands and face before eating, smoking, or drinking.

Unauthorized removal of materials from the project is prohibited.

Possession of controlled substances and prohibited items, such as alcohol, illicit drugs, firearms, and weapons while working on site is strictly prohibited.

Operations involving the potential for fire hazards shall be conducted in a manner as to minimize the risk of fire.

Overhead and underground utility hazards shall be identified and/or located prior to conducting operations.

4.4 Buddy System

The “buddy system” will be used at all times while working on-site – this requires that personnel maintain visual, voice, cellular telephone, or radio communication.

4.5 Environmental Hazards

In addition to chemical and physical hazards, there are environmental hazards that may be present. For the purposes of this SHERP, the environmental hazards are comprised of extreme ambient temperatures, insects, spiders, rodents, poisonous plants, and sunburn.

4.5.1 Heat Stress

Heat stress is of concern for worker safety during the summer months or when working in areas containing steam lines or other heat generating equipment. Heat stress is caused by a number of interacting factors, including environmental conditions, clothing, PPE, workload, and individual characteristics. Heat stress can cause physical discomfort, loss of efficiency, or personal illness/injury.

Individuals vary in their susceptibility to heat stress. Factors that may predispose individuals to heat stress include the following:

Lack of physical fitness and/or obesity

Insufficient acclimation

Age

Dehydration

Alcohol and/or drug use

Infection

Sunburn

Diarrhea

Chronic disease

Medical conditions and/or the use of some medications, such as beta-blockers for high blood pressure

The amount and type of PPE worn, directly influences reduced work tolerance and the increased risk of heat stress. Personal protective equipment adds weight, bulk, reduces the body's capability for physiological thermoregulation (such as, evaporation, convection, and radiation), and increases energy expenditure.

4.5.1.1 Signs and Symptoms of Heat Stress

If the body's physiological processes fail to maintain a normal body temperature because of excessive heat, a number of physical reactions can occur – ranging from mild to fatal.

These physical reactions to excessive heat include the following:

Heat rash is caused by continuous exposure to heat and humidity and aggravated by chafing clothes. Heat rash decreases the body's ability to tolerate heat in addition to being a nuisance.

Heat cramps are caused by profuse perspiration with inadequate electrolytic fluid replacement. Heat cramps cause painful muscle spasms and pain in the extremities and abdomen.

Heat exhaustion is caused by increased stress on various organs to meet increased demand to cool the body. Heat exhaustion causes shallow breathing; pale, cool, moist skin; profuse sweating; and dizziness.

Heat stroke is the most severe form of heat stress. Heat stroke symptoms include hot, dry skin; no perspiration; nausea; dizziness; confusion; strong, rapid pulse; coma; and sometimes death. Heat stroke is a serious medical emergency. The affected person shall be cooled down rapidly and medical attention must be given immediately (Section 4.5.1.4 for heat stroke first aid treatment).

The American Conference of Governmental Industrial Hygienist (2010) states that excessive heat stress may be marked by one or more of the following symptoms, and an individual's exposure to heat stress should be discontinued when any of the following occur:

Sustained (several minutes) heart rate is in excess of 180 beats per minute minus the individual's age in years (180 minus age), for individuals with assessed normal cardiac performance

Body core temperature is greater than 101.3 degrees Fahrenheit (°F) for medically selected and acclimatized personnel; or greater than 100.4°F in unselected, unacclimatized workers

Recovery heart rate at one (1) minute after a peak work effort is greater than 110 beats per minute

There are symptoms of sudden and severe fatigue, nausea, dizziness, or lightheadedness

An individual may be at greater risk of heat stress if:

Profuse sweating is sustained over several hours
Weight loss over a shift is greater than 1.5 percent of body weight
24-hour urinary sodium excretion is less than 50 millimoles (ACGIH, 2010)

4.5.1.2 Heat Stress Prevention

The following practices will help prevent heat stress:

Acclimatize workers to hot working conditions.

Provide plenty of liquids to replace the body fluids lost by perspiration. Fluid intake should be forced because, under conditions of heat stress, the normal thirst mechanism is not adequate to bring about a voluntary replacement of lost fluids.

Provide personal cooling devices.

Conduct strenuous field operations in the early morning and provide shade when possible.

Train personnel to recognize the signs and symptoms of heat stress, its prevention, and treatment.

Rotate personnel to various job duties and establish adequate work/rest cycles.

Provide shade or shelter during rest periods.

4.5.1.3 Heat Stress Treatment

Workers expressing the symptoms of heat stress shall notify the Field Supervisor immediately. At the onset of heat related illness, activities must be halted and treatment initiated. Early detection and treatment of heat stress helps to prevent further serious illness or injury. Individuals that have experienced heat related illness could become more sensitive and predisposed to additional future heat stress related problems.

Heat exhaustion can be alleviated by having the affected person rest in a cool, shaded location and have them drink cool water. To cool down the affected person's body:

Remove impermeable PPE

Remove worker from direct sunshine

Apply copious amounts of cool, not cold, water on them

Have them drink cool water, not cold, if conscious

4.5.1.4 Heat Stroke Treatment

Heat stroke is a true medical emergency. In a heat stroke situation, the body must be cooled immediately to prevent severe injury or death – medical attention must be immediately obtained. The following shall be performed if heat stroke is suspected:

Transportation of the victim to a medical facility must not be delayed – seek immediate medical attention.

Apply cold packs, if available; place under the arms, around the neck, or any other place where they can cool large surface blood vessels.

If transportation to a medical facility is delayed, reduce body temperature by immersing victim in a cool water bath (however, be careful not to over-chill the victim once body temperature is reduced below 102°F). If this is not possible, continuously douse victim with cool water and fan for evaporative cooling.

4.5.1.5 Acclimatization

Physiologically adjusting or acclimatizing personnel to hot conditions is extremely important. Supervisors shall provide the necessary time for adequate worker acclimatization, due to each individual's physical condition and his or her ability to work in hot and humid environments.

4.5.1.6 Physiological Monitoring

Adequate work/rest periods shall be implemented as necessary to prevent heat stress on personnel. However, since individuals vary in their susceptibility to heat stress, Shaw will also utilize physiological monitoring to aid in measuring each individual's response to heat stress. The initiation of physiological monitoring will be required when employees are working in environments exceeding 90°F ambient air temperatures. Physiological monitoring is also required when ambient temperatures exceed 70°F and impermeable garments are worn. Ambient air temperatures shall be recorded on the Ambient Air Temperature Log (Appendix C) when ambient temperatures exceed 70°F. The two physiological parameters that each individual will monitor are as follows:

Heart Rate—Each individual will count his/her radial (wrist) pulse as early as possible during each rest period. If the heart rate of any individual exceeds 75 percent of their calculated maximum heart rate (maximum heart rate equals 200 minus age) at the beginning of the rest period, then the work cycle will be decreased by one-third. The rest period will remain the same. An individual is not permitted to return to work until his/her sustained heart rate is below 75 percent of their calculated maximum heart rate.

Body Temperature—Each individual will measure his/her body temperature with an intra-aural (ear) thermometer, as directed by the thermometer manufacturer's instructions, as early as possible in the first rest period. If the temperature exceeds 99.6°F at the beginning of the rest period, then the work cycle shall be decreased by one-third. The rest period will remain the same.

An individual is not permitted to return to work if his/her temperature exceeds 100.4°F. Physiological monitoring data will be recorded on the Employee Physiological Monitoring Record for Heat Stress (Appendix C).

4.5.1.7 Training

Personnel (including subcontractor employees) who may be exposed to hot working environments shall be trained on the following:

Employees:

- Sources of heat stress, influence of protective clothing, and importance of acclimatization
- How the body handles heat

Heat-related illnesses and their recognition (signs and symptoms)

Preventive/corrective measures

Individual factors, such as age, weight, gender, level of acclimatization, etc. that may predispose some workers to heat stress

Medical conditions and use of prescription drugs, such as beta blockers, that may modify a worker's ability to adapt physiologically to heat stress

Physiological monitoring, record keeping of oral temperature/pulse, and establishment of work-rest regimes

First aid procedures

Supervisors:

Physiological monitoring, record keeping of oral temperature/pulse, and establishment of work-rest regimes

First aid procedures

4.5.2 Cold Stress

Observe Shaw Procedure HS401. In addition, observe the following procedures and practices regarding cold stress:

- Wear suitably layered clothing, including hardhat liner, boots, and gloves as appropriate for the actual conditions present.
- Take breaks in heated shelters or vehicles when working in extremely cold temperatures.
- Upon entering the shelter, remove the outer layer of clothing and loosen other layers to promote evaporation of perspiration.
- Drink warm liquids to reduce the susceptibility to cold stress.
- Be aware of cold stress symptoms, including shivering, numbness in the extremities, and sluggishness.
- Follow cold stress procedures in Shaw Procedure HS401.

4.5.3 Ticks and Tick-Borne Diseases

Working in tall grass, especially in or at the edge of wooded areas, increases the potential for ticks to bite workers. Ticks can be particularly numerous in the spring and fall. Ticks are vectors of many different diseases including Rocky Mountain spotted fever, Q fever, ehrlichiosis, tularemia, Colorado tick fever, Lyme, and Lyme like disease. Ticks attach to the skin and intravenously feed on blood, creating an opportunity for disease transmission.

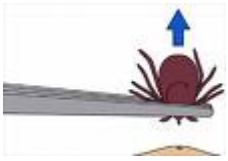
The symptoms of tick-borne diseases are high fever, head and joint aches, nausea, and vomiting. Additionally, persons infected with Rocky Mountain spotted fever may develop a red, spotty rash. Symptoms of tularemia may also include occasional cough, chest pain, swollen lymph glands, and severe pneumonia. Lyme disease usually (60 to 80 percent of the cases) presents a distinctive bull's eye rash at the site of the bite in addition to flu-like symptoms and swollen lymph nodes. If tick-borne diseases are not properly treated with the appropriate antibiotic(s), then arthritis, heart disease, brain/nerve disorders, liver damage, and kidney damage are possible.

Wearing long-sleeved, light-colored shirts, light-colored trousers tucked into the socks, and the use of insect repellent containing N,N-Diethyl-m-toluamide (DEET) help prevent tick bites.

Periodically during the workday, employees should inspect themselves for the presence of ticks. If a tick is discovered, the following procedure should be used to remove it:

Do not try to detach a tick with your bare fingers; bacteria from a crushed tick may be able to penetrate even unbroken skin. Fine-tipped tweezers should be used.

Grip the tick as close to your skin as possible and gently pull it straight away from you until it releases its hold.



Do not twist the tick as you pull and do not squeeze its body. That may actually inject bacteria into your skin.

Thoroughly wash your hands and the bite area with soap and water, and then apply an antiseptic to the bite area.

Save the tick in a small container noting the date and the location on the body of the bite.

Notify the SSHO, Project CIH, and Project Manager of any tick bites as soon as possible.

It may be determined that personnel sustaining a tick bite will need to consult a physician. Consult http://www.osha.gov for more information concerning ticks and tick-borne illnesses.

4.5.4 Chiggers

Chiggers may be a problem while working at project locations. Chiggers, also known as "red-bugs" or "harvest mites," are the immature stages of a tiny red mite. They inhabit areas of tall grass, associated with low, wet spots, ponds and stream banks, wild berry patches, and forest underbrush. The larvae attach themselves to the clothing of people or to the fur of passing animals. Before settling down to feed, chiggers move to a constriction, such as sock tops,

waistbands, or armpits. Feeding chiggers inject a salivary fluid, which dissolves the host's cells, and then they suck up the liquefied tissue. Within a few hours, small, reddish, intensely itching welts appear. These bites may continue to itch for several days up to two weeks after the chigger is dislodged. Following are suggestions that should provide some protection from chiggers:

Stay out of areas where chiggers are likely to be present including wood lots, pastures, roadside ditches, or other areas with tall grasses and weeds. Chiggers are especially common in moist low-lying areas.

Wear loose-fitting clothing (if possible) when working outdoors. Vehicles should be frequently vacuumed to reduce the number of chiggers that may have been deposited.

Apply a repellent containing DEET to shoes, socks, and trousers before entering chigger infested areas. Caution: some individuals may be sensitive to DEET – always read and follow label directions.

Immediately after possible exposure to chiggers, take a bath, thoroughly scrubbing the body with hot soapy water. This will kill or dislodge many of the chiggers. The clothes that were worn when the bite(s) occurred should be placed in a plastic bag for temporary storage until they can be laundered.

When bites begin to itch, one course of treatment is to apply rubbing alcohol, followed by one of the nonprescription local anesthetics. A baking soda paste, calamine lotion, or product such as "After-Bite" or "Chigarid" also will help reduce discomfort. Avoid scratching bites since this only increases irritation and may lead to a secondary infection of the bite.

4.5.5 Poisonous Plants

Three or five leaves radiating from a stem is the rule of thumb for identifying poison ivy, poison oak, and poison sumac. Poison ivy is in the form of a vine (and sometimes low-lying) while oak and sumac are bush-like. All of these plants can produce a delayed allergic reaction. The plant tissues have an oleoresin, which is active in live, dead, and dried plants. The oleoresin may be carried through smoke, dust, contaminated articles, and the hair of animals. Additionally, when operating a chain saw to clear brush in the winter or early spring, saw dust may be contaminated with enough oleoresin to cause a severe rash. Symptoms usually occur 24 to 48 hours after exposure resulting in rashes that itch and blister. Should exposure to any of these plants occur, wash the affected area with a mild soap and water within one-half hour, but do not scrub the area. The best preventative measure for poisonous plants is recognition and avoidance. The use of disposable gloves and Tyvek® coveralls can help prevent skin contact with these plants.

4.5.6 Flying Insects

Flying insects such as mosquitoes, wasps, hornets, and bees may be encountered while working at the Colonie FUSRAP Site. Personnel who are allergic to bee stings should notify their supervisor and the SSHO. Mosquito bites can be effectively prevented by the use of insect

repellants containing DEET. Insect repellant containing DEET shall be available to personnel while working on site. Additionally, special insecticide preparations, such as Repel Permanone, shall be available for treating worker's clothing. Commercially prepared ointments for treatment of insect bites and bee stings shall be available on site. All personnel shall immediately report any bee stings to their supervisor and the SSHO.

4.5.7 West Nile Virus/West Nile Encephalitis

The following sections discuss West Nile Virus/West Nile Encephalitis.

4.5.7.1 Background Information on West Nile Virus and West Nile Encephalitis

West Nile Virus/West Nile Encephalitis is rapidly becoming a significant health issue in the United States. West Nile Virus was first identified in the New York area in 1999, and is closely related to the St. Louis Encephalitis Virus, which is routinely found in the United States. Both of these viruses belong to the genus *Flavivirus* and causes diseases that are similar to one another. "Encephalitis" means an inflammation of the brain and it can be caused by viral and bacterial infections. West Nile Encephalitis can be a serious or even fatal illness.

4.5.7.2 Transmission of the Disease

West Nile Encephalitis is a viral infection of the brain transmitted through the bite of a mosquito, which has previously fed on birds and/or horses that were infected with West Nile Virus. Dead birds in an area may mean that West Nile Virus is circulating between the birds and the mosquitoes in that area. West Nile Virus is not transmitted from one person to another. Human illness from West Nile Virus is relatively rare, even in areas where the virus has been reported.

4.5.7.3 Symptoms of Exposure

Most people who become infected with West Nile Virus will have either no symptoms or only mild ones, with higher susceptibility in those over 50 years old. Symptoms of West Nile Encephalitis include high fever, headache, confusion, muscle aches and weakness, seizures, or paralysis. At its most serious, the infection can result in coma, permanent neurological damage, and death. Symptoms usually occur 5 to 15 days following the bite of an infected mosquito. Because West Nile Encephalitis is a viral infection, antibiotics are not effective and there is no specific treatment available other than general support therapy.

4.5.7.4 Protective Measures

There is currently no vaccine to protect humans against West Nile Virus, although some drug companies are working on producing one. Individuals at project sites can reduce their risk from being infected with West Nile Virus by taking the following actions to protect against mosquito bites:

Review the hazards of West Nile Virus periodically in morning safety meetings.

Increase protective measures when working at dawn, dusk, and in the early evening.

Reduce the area of exposed skin when working outdoors. Long-sleeved shirts with sleeves rolled down are recommended. Understand that mosquitoes may bite through thin clothing, so personnel should evaluate the actual Level D clothing worn, for example, heavy long sleeve work shirts and heavy dungarees/jeans may be indicated. Activity at projects where disposable coverall-use (i.e., Tyvek®) is specified further reduces the risk of mosquito bites.

For activities where only Level D PPE is specified, consider using disposable coveralls when working in wooded, highly vegetated, or swampy areas.

Use an insect repellent containing approximately 30 percent DEET. In concentrations greater than 35 percent DEET provides no additional protection. Use the repellent according to the manufacturer's directions provided on the container. Frequent re-application or saturation is unnecessary for effectiveness. Avoid prolonged and excessive use of DEET.

When additional protection against mosquitoes is necessary, commercially prepared "clothing and gear" insect repellants containing 0.5 percent permethrin may be used. These repellants, such as Repel Permanone™ are available in the sporting goods departments at major retailers. Clothing and gear insect repellants are not for use on skin. Use the repellent according to the manufacturer's recommendations provided on the container.

After returning from outdoor field activities, wash treated skin with soap and water.

Personnel should report flu-like symptoms to the SSHO.

4.5.8 Spiders

Personnel shall be alert to the potential for spider bites. Spiders sometimes establish residence in dark places, stored clothing, and PPE. It is advisable for personnel to inspect clothing and PPE for spiders prior to donning. If a spider bite is sustained, personnel shall report it to the SSHO.

4.5.9 Sunburn

Personnel working in direct sunlight, are encouraged to wear wide-brim hats (where hard hats are not a requirement) and apply sunscreen to all unprotected skin surfaces. The benefits of preventing sunburn and skin cancer are self-evident. Sunscreen will be provided for use by project personnel while working on site.

5.0 Personal Protective Equipment

When engineering and administrative controls are not feasible or adequate to protect personnel from the hazards associated with project activities, PPE use will be required.

5.1 Respiratory Protection

Respiratory protection equipment shall be NIOSH-approved and respirator use will conform to American National Standards Institute Z88.2 and OSHA 29 CFR 1910.134 requirements. Shaw Environmental & Infrastructure, Inc. Procedure No. HS601, "Respiratory Protection Program," details the medical qualification and training requirements, as well as the selection, use, inspection, cleaning, maintenance, storage, and fit testing of respiratory protection equipment. This procedure complies with the requirements contained within 29 CFR 1910.134 and will be maintained in the project office along with other pertinent Shaw Safety and Health Procedures.

All personnel (including visitors) using respiratory protection, shall possess a written opinion by the medical examiner of the person's ability to use the necessary respiratory protective equipment and shall have successfully passed a respirator fit test in accordance with Shaw E & I Procedure No. HS601 within the last 12 months. Fit testing and any training related to respiratory protection for site personnel will be documented on the Training Acknowledgment Form (Appendix C).

5.2 Levels of Protection

The following is a description of the PPE that will be required during project activities.

5.2.1 Level B Personal Protective Equipment

Level B PPE shall be worn by personnel if air monitoring action levels are exceeded, or as directed by the SSHO.

Supplied air respirator (SAR): airline respirators with 5-minute egress bottles or self-contained breathing apparatus.

Work clothing as prescribed by weather.

Safety-toed work boots meeting ANSI Z41 specifications.

Hard hat meeting ANSI Z89.1 specifications.

Tyvek® coveralls with hoods, elastic wrists, and ankles (as necessary).

Chemical resistant (polyvinyl chloride [PVC]/latex) boot covers.

Nitrile disposable surgical gloves (double pair when sampling).Hearing protection (if necessary or required).

5.2.2 Level D – Modified Protection

Additional PPE may be required for specific tasks. Level D – modified protection generally consists of the following PPE:

Safety glasses with side shields meeting ANSI Z87.1 specifications.

Safety-toed work boots meeting ANSI Z41 specifications.

Chemical splash goggles when handling acidic preservatives.

Nitrile disposable surgical gloves (double pair when sampling).

Hearing protection (if necessary or required).

Hard hat meeting ANSI Z89.1 specifications.

High visibility vests – Class 2 (when working near vehicular traffic).

- Tyvek® coveralls with hoods, elastic wrists, and ankles (as necessary).

5.2.3 Level D Protection

Level D protection is the minimum level of protection that will be used for all other activities at the project. Level D PPE shall, at a minimum, consist of:

Safety-toed work boots meeting ANSI Z41 specifications.

Safety glasses with side shields meeting ANSI Z87.1 specifications.

Hard hat meeting ANSI Z89.1 specifications.

Hearing protection (if necessary or required).

High visibility vests – Class 2 (when working near vehicular traffic).

Work gloves, such as leather, cotton, or other material that provides cut/abrasion resistance (as necessary).

5.3 Respiratory Protection

Respiratory protection equipment shall be NIOSH-approved and respirator use will conform to American National Standards Institute Z88.2 and OSHA 29 CFR 1910.134 requirements. Shaw Environmental & Infrastructure, Inc. Procedure No. HS601, “Respiratory Protection Program,” details the medical qualification and training requirements, as well as the selection, use,

inspection, cleaning, maintenance, storage, and fit testing of respiratory protection equipment. This procedure complies with the requirements contained within 29 CFR 1910.134.

All personnel (including visitors) using respiratory protection, shall possess a written opinion by the medical examiner of the person's ability to use the necessary respiratory protective equipment and shall have successfully passed a respirator fit test (Section 5.2.2) in accordance with Shaw E&I Procedure No. HS601 within the last 12 months. Fit testing and any training related to respiratory protection for site personnel will be documented on the Training Acknowledgment Form (Appendix C).

5.3.1 Breathing Air Quality

Supplied breathing air will meet the requirements of the specification for Grade D breathing air as described in the ANSI/CGA Specification G-7.1-1997. A certificate of analysis from the vendors of breathing air in order to show that the air meets this standard is required. Breathing air will be preferentially obtained in cylinders; however, site-generated breathing air may be used if the air is properly compressed, filtered, monitored, and used as required by 29 CFR 1910.134(i) and ANSI/CGA Specification G-7.1-1997.

5.3.2 Respirator Inspection and Cleaning

Respirators shall be checked periodically by a qualified individual and inspected before each use by the wearer. All respirators and associated equipment will be decontaminated and hygienically cleaned after each use.

5.3.3 Respirator Fit Testing

Annual respirator fit tests are required of all personnel wearing respirators. The test will use isoamyl acetate or irritant smoke. The fit test must be for the style and size of the respirator to be used. Quantitative fit-testing is required for use of respirators in chemical environments where the respirator effective use limit exceeds 10 (exposure of 1 ppm inside the respirator for 10 ppm outside the respirator). Therefore, quantitative fit-testing is dependent on the PEL/TLV of the chemical substance involved. Quantitative fit-testing is required for potential exposure to airborne particulate levels that exceed 10 times the established PEL/TLV.

5.3.4 Facial Hair

No personnel who have facial hair, which interferes with the respirator's sealing surface, will be permitted to wear a respirator and will not be permitted to work in areas requiring respirator use.

5.3.5 Corrective Lenses

Normal eyeglasses cannot be worn under full-face respirators because the temple bars interfere with the respirator's sealing surfaces. For workers requiring corrective lenses, special spectacles designed for use with respirators will be provided.

5.3.6 Medical Certification

Only workers who have been certified by a physician as being physically capable of respirator usage will be issued a respirator. Personnel unable to pass a respiratory fit test or without medical clearance for respirator use will not be permitted to enter or work in areas on site that require respiratory protection. Employees will receive a written physicians opinion that they are fit for general hazardous waste operations as per 29 CFR 1910.120(f)(7).

5.4 Activity-Specific Levels of Protection

The required level of personal protection is specific to the activity being conducted and are outlined in Table 3, "Task Protection Levels". Levels of PPE are subject to change or to modification. Upgrading of PPE may occur when air monitoring action levels are exceeded or when specified by the SSHO. Levels of PPE shall not be downgraded without prior approval from the SSHO or Project CIH (Section 8.2). Levels of PPE shall not be downgraded without prior approval from the Project CIH.

5.5 Donning/Doffing Personal Protective Equipment

All persons entering an Exclusion Zone shall be wearing the required PPE in accordance with the requirements of this SHERP. When leaving the Exclusion Zone, PPE will be removed in accordance with the procedures listed in Section 7.1, in order to minimize the spread of contamination.

6.0 Site Control and Work Zones

The purpose of site control is to minimize chemical exposures to workers, protect the public from hazards due to site activities, and prevent vandalism. The work areas that pose chemical and physical hazards to personnel may be regarded as regulated or restricted. To prevent both exposures to unprotected personnel and migration of contamination due to tracking by personnel or equipment, work areas known to contain chemical contamination will be clearly identified.

Shaw Environmental, Inc. will designate work zones at the project as suggested in *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities* (NIOSH et al., 1985). Regulated work areas are divided into the following three zones:

Exclusion Zone
CRZ
Support Zone

6.1 Exclusion Zone

The Exclusion Zone is, in general, the area where chemical, physical, or other hazards occur/exist during project work. All employees are required to follow the established procedures when working in these areas. Fencing, banner tape, signs, or other appropriate means will identify the location of the Exclusion Zone. An Exclusion Zone Entry Log (Appendix C) shall be kept daily, which records the time of entry and exit from the Exclusion Zone for each person. Unauthorized personnel shall not be allowed in the Exclusion Zone.

6.2 Contamination Reduction Zone

Personnel and equipment decontamination will be performed in the CRZ. All personnel and equipment entering or leaving the Exclusion Zone will pass through the CRZ in order to prevent cross contamination and for the purpose of accountability. Personal protective equipment will be removed in the CRZ, cleaned, and properly stored or disposed of. All water generated from equipment and personal decontamination will be contained on site and disposed of in an appropriate manner.

6.3 Support Zone

The Support Zone, or clean zone, will be the area outside the Exclusion Zone and CRZ and within the geographic perimeters of the site. The Support Zone is used for staging of materials, parking of vehicles, sanitation facilities, and receipt of deliveries. Eating, drinking, and smoking will only be allowed in this area.

6.4 Emergency Entry and Exits

During an emergency, personnel will evacuate upwind at a safe distance, within sight of the emergency. Additional emergency procedures can be found in Section 11.0.

6.5 Site Entry Requirements

In order to allow an individual into regulated areas of the site (i.e., Exclusion Zone and CRZ) he/she must meet the following requirements:

Documentation of completing training requirements as described in Section 9.0 (including review of this SHERP and signing off as such)

Documentation of completing medical surveillance requirements as described in Section 10.0

Respiratory fit testing, as necessary (Section 5.1)

Attend the site-specific safety orientation training session (Section 9.4)

Review the specific AHA(s)

Obtain authorization from SSHO

Don the appropriate PPE

Sign the site entry log

6.6 Colonie FUSRAP Site Security

All equipment shall be locked or removed from site when project personnel are not present.

6.7 Posting Site

Due to the nature and duration of these activities, there are no site posting requirements.

7.0 Decontamination

Adequate washing facilities shall be available for employee use. Each washing facility shall be maintained in a sanitary condition and provided with water, soap, and individual means of drying (disposable towels).

7.1 Personnel Decontamination

Personnel decontamination consists of discarding disposable PPE, cleaning reusable PPE, and washing the hands and face. All personnel shall wash hand and face prior to eating, drinking, or using tobacco products.

7.1.1 Decontamination Procedures for Level D-Modified Personal Protective Equipment

In general, the personnel decontamination procedure for activities conducted in Level D – modified consists of personnel discarding disposable PPE, washing reusable PPE, then washing hands and face.

7.1.2 Decontamination Procedures for Level B Personal Protective Equipment

The general decontamination sequence for activities conducted at Level B is as follows:

Remove SAR

Stage mask, harness, and bottle for cleaning

Remove outer nitrile surgical gloves and discard and boot covers and discard

Remove hard hat

Remove coveralls, if worn

Move to respirator wash area, and wash mask and related hose line

Remove inner nitrile surgical gloves and discard

Wash hands and face

Disposable gloves and coveralls will be removed by turning inside out. Ground cloths, gloves, coveralls, and boot covers will be placed into plastic trash bags and stored at the CRZ for disposal. Respirators shall be cleaned with potable water in the field after each use and shall be washed at the end of the day using a soap and water wash followed by disinfecting and rinsing. Respirators shall be inspected before each use for damage, missing parts, and proper function. Other reusable protective equipment worn by personnel performing field activities will be rinsed with potable water after each use and will be cleaned at the end of each day in the manner

described by the manufacturer. Reusable PPE items will be air-dried and properly stored. Respirators masks shall be thoroughly dried and placed in plastic bags for storage.

7.2 Suspected Contamination

Any employee suspected of experiencing skin or clothing contact with fuel is to remove affected clothing (as modesty permits and exposure warrants), thoroughly wash the affected area(s), and don clean clothes. Following this, he/she shall report to the Field Supervisor.

7.3 Procedures for Equipment Decontamination

Equipment contacting jet fuel shall be washed or scrubbed/wiped with detergent and water. All wash waters will be collected for treatment or disposal, as required. Equipment decontamination will be conducted prior to removing equipment from the work area. The Field Supervisor (or designee) will inspect all equipment leaving the site for adequacy of decontamination (visually clean unless otherwise specified).

7.4 Decontamination Equipment and Supplies

Decontamination equipment and supplies may consist of, but are not limited to, the following:

Potable water
Washtubs
Non-phosphate detergent, such as Alconox
Brushes, hand sprayers
Paper towels
Plastic sheeting
5-gallon buckets with lids
Garbage bags
55-gallon drums or similar container for collection of decontamination fluids
Labels or paint sticks for marking contents of containers

7.5 Procedures for Emergency Decontamination

In the event of an accident and if immediate medical treatment is required to save a life, decontamination should be delayed until the victim is stabilized. Proceed with decontamination if it can be performed without interfering with essential life-saving techniques or first aid. If a worker has been exposed to corrosive materials such as sample preservative, decontamination must be performed immediately. If an emergency due to a heat related illness develops, protective clothing should be removed from the victim as soon as possible to reduce further stress.

If decontamination can be done:

Wash, rinse, and/or remove protective clothing and equipment.

Note: In the event that corrosive materials, such as sample preservative gets in the eyes, first aid personnel should begin to administer a 15-minute eye irrigation with water while EMS personnel are responding to the incident. Similarly, if a corrosive material is on an injured employee's skin, first aid personnel should flush the material off of the skin in conjunction with other first aid procedures being administered. Emergency Medical Service personnel should always be summoned as quickly as possible so as not to delay professional medical treatment.

If decontamination cannot be done:

Alert medical personnel to potential contamination and instruct them about specific decontamination procedures, if necessary.

Provide site personnel familiar with the incident at the medical facility.

8.0 Environmental and Personnel Monitoring Program

The SSHO or designated sampling personnel will conduct environmental, personal, and ambient air monitoring, as necessary, to measure the concentrations of flammable/combustible vapors, various airborne site contaminants, radiation, and meteorological conditions. Air monitoring data is primarily used to verify that administrative controls, engineering controls, and PPE are effectively preventing harmful exposures to project personnel. Meteorological data shall be obtained as necessary for determining if physiological monitoring should be activated. The results of monitoring shall be conveyed to project personnel.

8.1 Types of Monitoring

The following monitoring will be performed as necessary:

Real-time air monitoring
Time-integrated air sampling (based on real-time air monitoring)
Ambient air temperature

Refer to Table 4, Direct Reading Air Monitoring Requirements.

8.1.1 Real-Time Air Monitoring

Real-time air monitoring will be conducted during well redevelopment, groundwater sampling, prior to and during hot work activities, and during spills. The Field Supervisor, or designee, shall use the following real-time instrumentation as specified during the project:

Combustible gas indicator for flammable/combustible atmospheres for during spills.

Photoionization detector for organic vapor monitoring.

8.1.1.1 Combustible Gas Indicator/Oxygen Meter/Carbon Monoxide Meter

An MSA Model FiveStar, or equivalent, shall be used to determine the concentration of flammable/combustible gases during any fuel spill clean-up activities.

8.1.1.2 Photoionization Detector

A Photovac model 2020 (or equivalent) equipped with a 10.6 eV lamp, or equivalent, shall be used to determine the concentration of VOCs in the breathing zone of personnel during well redevelopment, groundwater sampling activity. This monitoring will be performed as follows:

At any time at any work location when personnel observe odors

A minimum of twice per hour at each well redevelopment location until activity at that location has been completed

A minimum of once per sampling event at each sampling location (water). Air monitoring shall be performed in the breathing zone of personnel.

8.1.2 Real-time Air Monitoring Action Levels

The following action levels are established for the collected air monitoring data:

Combustible Gas: > 10% of the lower explosive limit (LEL), instantaneous reading.

Volatile organic chemicals in the breathing zone greater than 5.0 parts per million sustained for 15-seconds.

Unexpected instrument readings at or above action levels generally warrant the following:

All personnel will stop work in the area, exit the work area, and assemble upwind.

Additional monitoring shall be performed to substantiate previous readings. Confirmed volatile organic chemicals greater than 5.0 parts per million require upgrade to Level B, if engineering controls are not implemented.

If previous readings are substantiated, engineering controls, increase ventilation, shall be implemented to maintain air quality within specified levels or personnel shall upgrade to the appropriate level of protection. If engineering controls, such as increased ventilation, cannot maintain atmospheres to within acceptable qualities, then the Project CIH shall be contacted prior to continuing work activities. In no case are personnel permitted to work in atmospheres where combustible gas concentrations are greater than 10% of the LEL.

8.1.3 Time-Integrated Air Sampling

Time-integrated air sampling may be performed during activities when real-time instrumentation indicates that exposures to personnel are suspected to be approaching established limits (PEL/TLV) for target compounds. Air samples will be collected and analyzed following OSHA or NIOSH methods. An American Industrial Hygiene Association accredited laboratory shall be used to analyze all personal air samples.

8.2 Calibration, Handling, and Maintenance

All air monitoring equipment will be maintained and calibrated by the SSHO or designated sampling personnel according to the manufacturer's recommendations. Care shall be given by the operator to the handling of instruments so that the accuracy and fitness for use are maintained. Calibration checks on real-time monitoring instruments shall be performed using standards, which are National Institute of Standards and Testing traceable. Calibration for all instruments will be performed and documented before and after use each day. Only properly functioning instrumentation shall be used. All instruments are to be maintained as per the manufactures recommendations.

8.3 Quality Assurance/Quality Control

The major concerns of quality assurance/quality control are calibration of equipment and document control. Air monitoring instruments shall be properly maintained and calibrated before and after use. The calibration and field maintenance of air monitoring instruments shall be performed by the SSHO against known standards and manufacturer specifications. Instruments shall be calibrated to plus or minus 5 percent against known standards. If instruments cannot be calibrated within this tolerance or if operation becomes erratic, then the instruments shall not be used and sent out for maintenance.

8.4 Record Keeping

The SSHO or his/her designee will be responsible for maintaining all monitoring records. The following air monitoring data and calibration records (Appendix C) shall be maintained, controlled, and retrievable at all times by the SSHO:

Air Monitoring Data Record
Air Sampling Data Record
Employee Notification of Industrial Hygiene Monitoring Results

These records shall be maintained by the SSHO and stored in the permanent project files. The Employee Notification of Industrial Hygiene Monitoring Results records will be forwarded to Shaw or subcontractor Human Resources Department (or equivalent safety records personnel) for inclusion in personnel files when appropriate.

9.0 Training Requirements

This section describes general training, hazardous waste operations training, safety meetings, site-specific training, hazard communication, First Aid and CPR, and other additional training, certification, and licenses needed to work on the site.

9.1 General Training

The SSHO is responsible for informing all site personnel and all visitors of the contents of this SHERP and ensuring that each person signs off on this SHERP. Documentation of certification of training requirements will be reviewed by the SSHO, placed in the project files, and submitted to the USACE (as required).

9.2 Hazardous Waste Operations Training

All site personnel working in regulated areas at this project will meet the minimum training requirements as specified in 29 CFR 1926.65 and 29 CFR 1910.120. The following criteria are used to determine the level of training required:

Personnel engaged in hazardous substance removal or other activities, which expose or potentially expose them to hazardous substances and health hazards shall receive a minimum of 40 hours of instruction off site and three days of supervised field experience.

Personnel who perform limited activities at the site and are not potentially exposed to contaminant levels above the PEL shall receive a minimum of 24 hours of instruction off site, and one day of supervised field experience.

9.2.1 40-Hour Training

The following is a general list of topics covered in the 40-hour course:

General site safety

Chemical, physical, and environmental hazards

Key management positions responsible for site safety and health

Safety, health, and other hazards (including noise)

PPE

Work practices by which employees can minimize risks from hazards

Safe use of engineering controls and equipment on site

Medical surveillance requirements including recognition of signs and symptoms of exposure

Hazard communication (Worker Right-to-Know)

Engineering controls and safe work practices

Components of the site Safety and Health Program

Decontamination practices for personnel and equipment

Confined space entry procedures

Emergency response procedures

9.2.2 24-Hour Training

The same topics presented in the 40-hour course are reviewed in the 24-hour course but with less time and detail spent on each topic.

9.2.3 Supervisory Training

Field supervisory personnel including the SSHO will receive eight additional hours of specialized training. The following topics are discussed:

Overall safety and health program
PPE program
Spill containment program
Health hazard monitoring procedures and techniques

9.2.4 Refresher Training

Personnel covered by Sections 9.2.1 and 9.2.2 are required to complete 8 hours of refresher training annually on the following topics:

Safe work practices
Chemical hazard awareness
Hearing conservation
Hazard communication
Respirator refresher
Confined space entry refresher

9.2.5 Supervised Field Experience

Personnel covered by Section 9.2.1 will receive a minimum of 3 days actual field experience under the direct supervision of a trained, experienced supervisor. A minimum of 1 day is required for personnel who fall under the requirements of Section 9.2.2.

9.2.6 Visitor Training

Site access by personnel making deliveries or performing repairs to utilities, public or government officials, visitors, or local residents will be limited to support areas only. These persons will not be required to comply with the medical and training requirements as previously defined. Support Zone access will be limited to designated work, delivery, or observation areas to minimize any potential exposure to site contaminants. Site observation areas will be located upwind from the Exclusion Zone. Weather conditions or other site activities may restrict access to these areas. Authorization for limited site access will be determined on a case-by-case basis by the SSHO in consultation with the Project CIH, Project Manager, and the USACE. These personnel will be escorted on-site and will be strictly prohibited from entering the Exclusion Zone or CRZ.

9.3 Safety Meetings

Employees shall be provided continuing safety and health training to enable them to perform their work in a safe manner.

9.3.1 Morning Safety Meetings

The Field Supervisor and/or SSHO (or designee) shall conduct a safety meeting at the beginning of each shift. The topics discussed at this daily "tailgate" safety meeting shall include safety and health considerations for the day's activities, pertinent aspects of JSAs, necessary PPE, problems encountered, and new operations. Attendance records and meeting notes shall be documented on the Safety Meeting/Training Log form (Appendix C) and are maintained with the project files and submitted to the USACE, if requested. At the conclusion of each shift, a debriefing for site employees will be held, if necessary.

9.4 Site-Specific Training

All personnel, including subcontractors, working at the Colonie FUSRAP Site and falling within the scope and application of 29 CFR 1926.65 and 29 CFR 1910.120 shall attend a site-specific orientation covering the following topics:

Purpose and review of this SHERP including emergency response procedures as outlined in Section 11.0

The pertinent provisions for safety and health contained in *Safety and Health Requirements Manual* (USACE, 2003a)

Review of applicable AHAs

Names of personnel responsible for site safety

The provisions for medical care and facilities and the names of CPR and first aid trained personnel assigned to the project

Morning safety and preparatory meeting procedures

Safety and health hazards on site and the means to control/eliminate those hazards

Responsibilities for accident prevention and maintaining safe and healthful work environments

Stop Work authority

Procedures for reporting and correcting unsafe conditions or practices

Responsibilities for reporting all accidents and illnesses

PPE (use and care)

Location of safety equipment (i.e., fire extinguishers, first aid kits, eyewash stations, etc.)

Standard operating procedures, safety rules, and safe work practices for the project

Work zones and site control measures

Hazard Communication Program (includes discussion of MSDSs on site)

Hot work procedures

Lockout/tagout procedures

Fall protection

Fire prevention

Housekeeping

The content of the training will be derived from information contained within this SHERP. The USACE will be notified at least five days prior to the site-specific training sessions.

9.5 Hazard Communication

All personnel performing field activities will receive basic hazard communication training, which involves a review of the Shaw written hazard communication program, MSDSs, container labeling, and chemical health hazards. Personnel shall be trained on the hazards of chemicals on-site by reviewing Section 4.1 and the MSDSs. Material Safety Data Sheets for additional materials brought on-site will be reviewed with personnel prior to the use.

9.6 First Aid and Cardiopulmonary Resuscitation

There shall be at least two persons trained and certified in both American Red Cross First Aid techniques and CPR on-site whenever there are two or more employees working at the project. These employees will meet both the training and vaccination requirement of Shaw

Procedure HS512, "Handling of Blood or Other Potentially Infectious Materials" (Current Revision).

9.7 Additional Training, Certification, and Licenses

In addition to the training, certification, and licensing previously detailed, the following shall also be required:

The Project CIH shall maintain certification as specified by the American Board of Industrial Hygiene. The American Board of Industrial Hygiene requires re-certification every 5 years.

All personnel operating motor vehicles shall hold a valid operator's license from the state in which they reside. License renewal is subject to individual state laws.

The certification and recertification requirements for first aid (three years) and CPR (one year) are applicable. First aid and CPR training/certification must be made by a reputable provider, such as the American Red Cross or American Heart Association.

Personnel wearing respiratory protection shall receive training in the use, care, and maintenance of that equipment on an annual basis. Fit testing for that equipment shall be performed on an annual basis as specified in 29 CFR 1910.134.

Personnel may only use portable fire extinguishers to extinguish small fires, if the employee has been trained and the employee is confident that the small fire can be safely extinguished.

10.0 Medical Surveillance

Shaw Environmental, Inc. will utilize the services of an Occupational Medicine physician for the medical surveillance requirements of this project. Dr. Nassetta (below) reviews all Shaw medical examinations and is available for medical consultation on an "as-needed" basis.

Dr. Nassetta, MD, MPH,
Consulting Medical Director,
CORE (877) 347-7429
Subcontractors shall also utilize the services of an Occupational Medicine physician of their choice to meet the medical surveillance requirements of this project.

10.1 Medical Examination

As required by Shaw E & I Procedure No. HS100, "Medical Policies and Procedures," all personnel on site with the potential for exposure to contamination will have successfully completed a pre-placement or periodic/updated physical examination.

10.1.1 Pre-Placement Examination

On-site personnel with the potential for exposure to contamination shall undergo a pre-placement examination that complies with 29 CFR 1926.65, 29 CFR 1910.120, and *Safety and Health Requirements Manual* (USACE, 2003a) requirements for hazardous waste site operations and hazardous, toxic, and radioactive waste activities. Specifically, the following on-site personnel shall be required to participate in this medical surveillance program:

All employees who are or may be exposed to hazardous substances or health hazards at or above the established PEL, above the published exposure levels for these substances, without regard to the use of respirators, for 30 days or more than a year.

All employees who wear a respirator for 30 days or more a year or as required by 29 CFR 1910.134.

All employees who are injured, become ill, or develop signs or symptoms due to possible overexposure involving hazardous substances or health hazards from an emergency response or hazardous waste operation.

Members of HAZMAT teams.

Pre-placement medical examinations consist of the following:

Medical and occupational history questionnaire, which includes information on past GI, hematological, renal, cardiovascular, reproductive, immunological, and neurological problems.

Physical examination.

Chest X-ray (no more frequently than every 4 years).

Blood pressure.

Complete blood count and differential to include hemoglobin and hematocrit determinations, red cell indices, and smear of peripheral morphology.

Blood urea nitrogen and serum creatinine.

Sequential Multiple Analyzer Computer Profile (SMAC 24).

Pulmonary function test.

Audiogram.

Electrocardiogram for employees over 35 years old or when other complications indicate the necessity.

Stress test (as directed by the occupational physician based on electrocardiogram/pulmonary function testing).

Visual acuity.

Urinalysis, as necessary, for metals.

The medical surveillance provided to the employee includes a written opinion by the medical examiner of the employee's ability to use the necessary respiratory protective equipment. Any employee found to have a medical condition, which could directly or indirectly be aggravated by exposure to any chemical substance present at the Colonie FUSRAP Site, or by the use of respiratory equipment will not be employed for the project. A copy of the medical examination shall be provided at the employee's request.

The employee will be informed of any medical conditions that would result in work restriction or that would prevent them from working at hazardous waste sites.

10.1.2 Annual Exam

Site personnel may be required to receive an annual, updated exam meeting the requirements of 29 CFR 1926.65 and 29 CFR 1910.120. The results of these exams are compared to previous results and the baseline physical to determine if any medical effects due to exposure have occurred. Appropriate actions shall be taken as recommended by the physician should the results indicate an exposure; otherwise, employees are cleared for continued work.

In general, an annual exam is required when the employee meets at least one of the following criteria:

All employees who are or may be exposed to hazardous substances or health hazards at or above the established PEL, above the published exposure levels for these substances, without regard to the use of respirators, for 30 days or more than a year

All employees who wear a respirator for 30 days or more than a year or as required by 29 CFR 1910.134

All employees who are injured, become ill or develop signs or symptoms due to possible overexposure involving hazardous substances or health hazards from an emergency response or hazardous waste operation

Members of HAZMAT teams

When an annual examination is required, the frequency shall be at least once every 12 months unless the attending physician believes a longer interval (not greater than biennially) is appropriate.

10.1.3 Exit Exam

Shaw Environmental, Inc. offers exit physical exams (optional) for all employees involved in the medical surveillance program who are leaving the company for any reason.

10.1.4 Other Exams

Periodically, the need arises to conduct medical examinations at times other than those previously discussed. These include reassignment in accordance with 29 CFR 1910.120 (f)(3)(i)(C) and 29 CFR 1926.65 (f)(3)(i)(C), if an employee develops signs or symptoms of illnesses relating to work place exposure, if the physician determines examinations needing to be conducted more often than once a year, and whenever an employee sustains a lost time injury or develops a lost time illness.

10.1.5 Hearing Conservation Program

Personnel, including subcontractors, shall participate in a continuing, effective hearing conservation program, as described in 29 CFR 1910.95 (c), whenever employee noise exposures equal or exceed an 8-hour time-weighted average sound level of 85 decibels measured on the A scale (slow response) or, equivalently, a dose of 50 percent.

10.2 Subcontractor Requirements

Subcontractors shall certify that their employees have successfully completed a physical examination by a qualified physician on the Training Acknowledgment Form (Appendix C), when applicable. The physical examinations shall meet the requirements of 29 CFR 1926.65 and

29 CFR 1926.103. The subcontractor requirements for physical examination are the same as for Shaw employees (Section 10.1).

10.3 Medical Records

Medical and personal exposure monitoring records will be maintained according to the requirements of 29 CFR 1926.65 and 29 CFR 1910.120 and will be kept for a minimum of 30 years. The confidentiality of employee medical records shall be maintained. The written medical opinion from the occupational physician is kept in project files.

10.4 Medical Restrictions

When a medical care provider identifies a need to restrict work activity, the employee's home office will communicate the restriction to the employee SSHO and Project CIH. The terms of the restriction will be discussed with the employee and the SSHO. Every attempt will be made to keep the employee working, while not violating the terms of the medical restriction.

10.5 Drug and Alcohol Testing

Shaw Environmental, Inc. is firmly committed to providing employees a safe and healthful workplace, and to providing clients and the public safe and efficient services. Employee involvement with the use, possession, or sale of alcohol, illegal drugs, or any substance represented as a controlled substance creates an impediment toward meeting these commitments and is prohibited.

At no time while on duty may employees use or be under the influence of alcohol, narcotics, intoxicants, or similar mind-altering substances. Employees found under the influence of or consuming such substances will be immediately removed from the job site, as specified in the *Safety and Health Requirements Manual* (Section 01.C.02) (USACE, 2003a).

All employees of Shaw and its subcontractors are subject to drug and alcohol testing as described in Shaw E & I Procedure No. HS101, "Drug and Alcohol Testing."

11.0 Emergency Response Plan and Contingency Procedures

An emergency is defined as a sudden, generally unexpected occurrence demanding immediate action. Emergencies at project sites include accidents, injuries requiring medical care, fires, explosions, spills and significant releases of hazardous substances to the environment, and extreme weather events. Upon mobilization to the project, the Field Supervisor shall verify a means for effective emergency communications (cellular phone) prior to commencing site activities.

In the event that an emergency arises, the appropriate immediate response must be taken by the first person to recognize the situation. The field crew shall immediately notify the Field Supervisor of the incident, and the appropriate emergency service organization shall be contacted. A list of emergency contacts is provided in Table 1, "Emergency Telephone Numbers." A copy of the emergency telephone numbers and directions to the nearest selected urgent care facility shall be available in each project vehicle.

The Project CIH, Project Manager, SSHO, and the USACE shall be notified of any accident, injury, or illness.

In the case of injury or illness, a trained person will render the proper emergency first aid care. First aid equipment shall be available at the area of fieldwork. Personnel will be notified as to the locations of first aid equipment during the initial safety briefing session.

If the injury or illness is from exposure to a hazardous substance, the MSDS shall be provided to the medical personnel. Material Safety Data Sheets are provided for operational chemicals. The MSDS details first aid procedures to follow in the event an exposure occurs.

Unless the emergency event is extreme and obvious, the decision to cease all field activities and evacuate the site shall be made by the Field Supervisor. Field personnel will report to the Shaw office in Latham, NY.

11.1 Personnel Roles/Lines of Authority

The responsibilities of specific project individuals and the coordination of emergency service personnel are defined in the following subsections.

11.1.1 Field Supervisor

At all times during scheduled work activities, a Field Supervisor, or designee, will be present on site. This individual will be responsible for implementing these procedures and determining

appropriate response actions. Specific responsibilities for the Field Supervisor include the following:

Evaluating and assessing emergency incidents or situations

Coordinating response activities on site

Informing field personnel of the potential hazards associated with the site

Summoning emergency response personnel

Notifying the Project Manager and Project CIH of an emergency situation

Verifying that all emergency equipment is routinely inspected and functional

Informing the appropriate emergency response agencies of the provisions made herein

Evaluating the safety of site personnel in the event of an emergency and providing evacuation coordination if necessary

The Field Supervisor will direct all emergency response activities conducted or managed by Shaw and is ultimately responsible for field implementation and enforcement of the SHERP.

11.2 List of Emergency Contacts and Notification

The Field Supervisor will be notified immediately in the event of an emergency. The Field Supervisor will immediately evaluate the incident and, if necessary, notify emergency response personnel. If not previously notified, the USACE will be advised of the situation. Telephone numbers for emergency contact personnel are listed in Table 1 of this SHERP. The list will be maintained with current contacts and telephone numbers, and provided in all project vehicles.

The information provided to the emergency contact should include the nature of the incident and the exact location. Specifically, the information should include the following:

Name and telephone number of the individual reporting the incident

Location and type of incident

Nature of the incident

Number and nature of medical injuries

Potential for additional risks or dangers

Potential off-site risks or dangers

Movement or direction of spill/vapor/smoke

Response actions currently in progress

Estimate of quantity of any released materials

Status of incident

Other pertinent information.

When reporting fuel spills (Fuller Road Fire Department [Colonie, NY] - 911), the following information is to be provided:

Name and telephone number of person making notification

Exact location, cause and time of spill or emergency

Type and description of emergency

Estimate of amount and type of material spilled

Extent of actual or potential environmental damage

Injuries or property damage, if any

Possible hazards to off-post human health and environment

Immediate response actions taken.

11.3 Medical Emergency Response

Minor injuries will be treated on site by qualified first aid/CPR providers. Injuries and illnesses that do not require immediate medical care shall be treated at the selected medical care facilities. The EMS shall be summoned in the event of moderate to severe physical injury, which requires immediate emergency care. In all cases, the Field Supervisor shall accompany the injured worker to the appropriate medical care facility. Figure 2, "Hospital Location Map," indicates the location of Albany Medical Center. Figure 3, "Medical Facility Route Map," contains a map from the Colonie FUSRAP Site to Access Health Systems.

The route to the selected urgent care facility and the hospital shall be available in all project vehicles.

11.4 Personal Exposure or Injury

The following procedures will be implemented in the event of a personal injury (other than first aid only).

11.4.1 Serious Injuries Requiring Transport by Ambulance

The Field Supervisor will provide any necessary support to emergency responders.

Upon the realization that an individual(s) needs medical care with transport by ambulance, the following procedure will be used when applicable:

Administer first aid and contact the Field Supervisor to arrange for dispatch of the EMS.

Notify the Project CIH.

Provide an individual to meet the EMS at the project site entrance, to minimize time in locating the injured worker(s).

Wait for emergency care, document the event, and maintain communication with the Field Supervisor.

In the event of a chemical exposure, the following procedures shall be followed after summoning the EMS:

Skin Contact:

Flush with water
Remove clothing, flush skin
Obtain prompt medical attention, as necessary

Inhalation:

Remove the person from the area
Administer first aid/CPR, as needed
Obtain immediate medical attention.

Ingestion:

Contact the Poison Control Center for immediate treatment, then obtain immediate medical attention

Inducing vomiting may cause further injury to the victim; follow instructions from the MSDS and/or Poison Control Center

Eye Contact:

Flush eyes immediately with water for a minimum of 15 minutes
Obtain immediate medical attention

11.5 Fire Control

In the event of a fire or explosion at the site, the following actions shall be implemented:

Evacuate all personnel to a safe location upwind or crosswind of the incident. Contact the Field Supervisor.

Concurrently with the above, contact the Fuller Road Fire Department (Colonie, NY).

If personnel are present who have had training in the use of fire extinguishers, use available fire extinguishers to extinguish small fires, if the fire can be safely extinguished.

Alert EMS about the possibility of fire victims, as appropriate.

Document the incident in the field logbook and follow the procedures for incident reporting in Section 13.4.

11.6 Spill Prevention and Control

This spill prevention and control section sets forth the procedures for the coordination of and response to potential spills/discharges of hazardous materials or wastes.

11.6.1 Preemptive Measures

The following measures shall be taken to minimize the possibility of spills/discharges:

Site controls are to be maintained so that only authorized personnel have access to work areas.

Site personnel will be advised of appropriate spill/discharge control measures.

Appropriate secondary containment structures will be used for storage of hazardous materials and wastes on site.

Storage containment shall be examined daily.

11.6.2 Spill Response

If a hazardous material or waste release is observed at the site, the Field Supervisor will be immediately notified. If fuel was spilled, the Fuller Road Fire Department (Colonie, NY) shall then be notified by the Field Supervisor. An assessment will be made of the magnitude and potential impact of the release. If it is safe to do so, trained site personnel will attempt to locate the source of the release, prevent further release, and contain the spilled and/or affected materials as follows:

The spill or release area will be approached from upwind.

Hazards will be identified based on available information from witnesses or material identification documents. The potential hazards will be evaluated to determine the proper personal protection levels, methods, and equipment necessary for response.

Eliminate possible ignition sources for flammable material spills (e.g., turn power off, no smoking).

As necessary, the release area will be evacuated, isolated, and secured.

Eliminate routes to water by closing/blocking storm drains.

Work zones, including a decontamination station, shall be set up.

If possible, spill containment will initially be made without entering the immediate hazard area.

Entry to the release area will be made by personnel with the PPE, training, methods, and equipment necessary to perform the work. Hazardous spill containment and collection will be performed as follows:

- Contain the spill with absorbent socks, booms, granules, or construction of temporary dikes.
- Control the spill at the source by closing valves, plugging leaks, up righting containers, over packing containers, or transferring contents of a leaking container.
- Collect the spilled material with shovels, pumps, or heavy equipment as necessary.

The decontamination procedures established in Section 7.0 shall be used after the response is complete. Refer to Section 7.5 for information on procedures for emergency decontamination.

If site personnel cannot safely respond to an environmental release, evacuation of the area may be warranted. Upon their arrival at the site, the Field Supervisor will brief emergency responders of the status and any potential hazards.

11.7 Site Evacuation Procedures

Voice, radio, or cellular telephone communication may be used to alert site workers and provide special instructions on site evacuation. Personnel shall evacuate to a designated safe, upwind location and perform a "head count." The Field Supervisor is to remain in frequent contact for proper execution of the evacuation procedures.

Situations requiring evacuation may include unusually severe weather conditions or fires. In the event of project evacuation, other than weather related, the Fuller Road Fire Department (Colonie, NY) will be notified immediately.

11.8 Adverse Weather Conditions/Natural Disasters

Personnel should be aware of the possibility for the occurrence of severe weather such as winter storms/blizzards, lightning, thunderstorms, or high winds. Local weather broadcasts will be monitored by the Field Supervisor when the likelihood for severe weather exists. Generally, voice or cellular telephone communication will be utilized to alert crews to threatening weather. A severe weather shelter shall be identified and the location communicated with the crew(s) upon project mobilization.

Observe the following procedures and practices regarding inclement weather:

- Stop outdoor work during electrical storms, hailstorms, and other extreme weather conditions such as extreme heat or cold.
- Take cover indoors or in vehicle.

- Listen to local forecasts for warning about specific weather hazards such as tornadoes, thunderstorms, and flash floods.

11.9 Lightning Safety

Outdoor activities will be suspended when the potential for lightning occurs. The following measures, offered by the National Lightning Safety Institute of Louisville, Colorado shall be taken to minimize the possibility of injury to personnel by lightning:

The Field Supervisor is responsible to monitor weather conditions.

Upon seeing lightning or hearing thunder, outdoor activities shall be suspended and personnel shall be evacuated to safe areas (i.e., inside vehicles or buildings). When clouds with dark bases and wind speeds pick up, anticipate thunderstorms. Those who have been struck by lightning did not seek cover in a timely fashion.

The Field Supervisor will continue to monitor weather conditions.

Outdoor activities may resume 30-minutes after the last bolt of lightning was observed and the last clap of thunder was heard.

People who have been struck by lightning do not carry an electrical charge and are safe to handle. Apply first aid immediately, if you are qualified to do so. Get emergency help promptly.

SAFE AREAS INCLUDE:

Fully enclosed metal-topped vehicles with windows up
Substantial and permanent buildings

UNSAFE AREAS INCLUDE:

Small structures including huts and rain shelters

Nearby metallic objects like fences, gates, instrumentation and electrical equipment, wires, and power poles

The following shall be avoided when lightning is in the area:

Trees
Water
Open fields
Using hard-wired telephones and headsets

If hopelessly isolated from shelter during close-in lightning, adopt a low crouching position with feet together (up on toes, if possible) and hands on ears. If hair stands on end or rises on back of neck, a lightning strike is imminent.

Remember the warning phrase from the National Lightning Safety Institute: "If you can see it (lightning), flee it; if you can hear it (thunder), clear it."

11.10 Emergency Equipment

At a minimum, the following emergency equipment shall be maintained at the project site(s):

Fire extinguishers
First aid kits
Blood-borne pathogen control supplies or kit
Emergency eyewash
Spill control
Communication devices

This equipment is to be inspected by the Field Supervisor on a weekly basis to verify that they are in good condition, ready to use, and easily accessible. Note: a seal may be maintained on first aid kits to indicate if the kit has been accessed within the preceding week. The weekly inspection of the first aid kit will only be necessary if the seal has been broken.

11.11 Critique and Follow-up of Emergency Procedures

The USACE shall be verbally notified immediately and receive a written notification within 24 hours of all accidents or incidents including releases, fires, or explosions. The report shall include the following items:

Name, organization, telephone number, and location of the contractor

Name and title of the person(s) reporting

Date and time of accident/incident

Location of accident/incident

Brief summary of accident/incident including pertinent details, such as, type of operation ongoing at time of accident

Cause of accident/incident, if known

Casualties

Details of any contamination

Estimated property damage, if applicable

Nature of damage, effect on contract schedule

Action taken by Shaw to maximize safety and security

Other damage or injuries sustained (public or private)

The Field Supervisor will investigate the cause of the incident to prevent its re-occurrence. The investigation should begin as soon as practical after the incident is under control but not later than the first workday after the incident. Investigations will follow the procedures described below:

Interview witnesses and participants as soon as possible or practical

Determine the chronological sequence of events (opinions as to cause should not be solicited at this time)

Note any movement, sounds, noises, or other sensory perceptions experienced by the participants or witnesses

Obtain weather data

Ascertain the location and position of all switches, controls, etc.

Verify the condition of all safeguards

Determine if a revision to emergency procedures is warranted

After the facts have been collected, causal factors should be identified and controlled/eliminated.

11.12 Hospital Information

The local hospital:

Albany Medical Center
43New Scotland Ave
Albany, New York 12208

Telephone: (518) 262-3131

The route to the clinic from the Colonie FUSRAP Site is as follows:

- Start going southeast on Central Avenue/NY-5 toward Osborne Rd/CR154
  - Turn right onto N Lake Avenue
  - Turn left onto Madison Avenue/US-20
  - Turn right onto New Scotland Avenue

The distance to the Albany Medical Center is approximately 3.46 miles from the Colonie FUSRAP Site. The location of Albany Medical Center is depicted on Figure 2. Travel time to the Albany Medical Center is approximately 10 minutes from the Colonie FUSRAP Site.

11.13 Medical Services Clinic Information

The CORE Health Networks clinic for the project is:

Access Health Systems
776A Watervliet-Shaker Rd.
Latham, NY 12110
(518) 782-2200 or (518) 786-1875

The route to the clinic from the Colonie FUSRAP Site is as follows:

- Turn left into NY-5/Central Ave. toward Cramond St.
- Merge onto I-87 North toward Saratoga Springs.
- Take the Route 155 exit, Exit 5, toward Latham.
- Turn right onto Watervliet-Shaker Road/NY-155
- Enter next roundabout and take second exit to Watervliet-Shaker Road.
- End at 776A Watervliet-Shaker Road, Latham, NY on the left.

The distance to the clinic is approximately 5.62 miles from the Colonie FUSRAP Site. The route to the clinic is depicted on Figure 3. Travel time to the clinic is approximately 10 minutes from the Colonie FUSRAP Site.

12.0 Blood-Borne Pathogen Exposure Control Plan

Blood-borne pathogens are microorganisms (i.e., bacteria, virus) sometimes present in blood and certain body fluids, which are capable of causing human disease or death. These pathogens can also be present on objects and surfaces that have had contact with infected blood or certain body fluids. Blood-borne pathogens are also capable of causing human disease or death to unprotected people who are exposed to infected blood or body fluids. Diseases caused by blood-borne pathogens include, but are not limited to, hepatitis A, hepatitis B, hepatitis C, malaria, acquired immunodeficiency syndrome (AIDS), and other sexually transmitted diseases. The most significant of these and of greatest concern are hepatitis B and AIDS.

Hepatitis B is a serious disease caused by the hepatitis B virus (HBV), which attacks the liver. The virus can cause lifelong infection, cirrhosis (scarring) of the liver, liver cancer, liver failure, and death. Exposure symptoms include fever, fatigue, nausea, vomiting, muscle aches, loss of appetite, and jaundice (yellowing of the eyes or skin). Hepatitis diagnosis is difficult because some symptoms are similar to the flu and may remain mild for an extended period. The HBV can remain infectious for up to 10 days, even in dried blood. Hepatitis B vaccine is available for all age groups to prevent HBV infection.

Human immunodeficiency virus (HIV) is the virus that causes AIDS. People with HIV have what is called HIV infection. Some of these people will develop AIDS because of their HIV infection. Humans may be infected with HIV for many years without experiencing any symptoms. Upon development of AIDS, symptoms may include weight loss, skin lesions, dry cough, fever, fatigue, diarrhea, swelling of the lymph glands, and death. Presently, no cure exists for HIV or AIDS, and no vaccination is currently available.

A hazard exists for blood and other bodily fluids to be infected with dangerous, infectious pathogens. Employees could become infected if they are exposed to these blood-borne pathogens.

The purpose of this Blood-borne Pathogen Exposure Control Plan is to provide the information, procedures, and requirements necessary to prevent employee exposure to blood-borne pathogens.

12.1 Regulatory, Requirement, and Policy Compliance

This Blood-borne Pathogen Exposure Control Plan has been prepared in compliance with:

29 CFR 1910.1030, Blood-borne Pathogens
EM 385-1-1, Safety and Health Requirements Manual (USACE, 2003), Section A.03.06
Shaw E & I Procedure No. HS512

12.2 Exposure Determination

OSHA requires employers to perform an exposure determination, identifying employees who may incur occupational exposure to blood or other potentially infectious materials. The exposure determination is made without regard to the use of PPE. For exposure determination purposes, employees are considered to be exposed, even if they wear PPE.

In general, it is anticipated that project activities will not present a high risk of employee exposure to blood or other body fluids. An exception to this would be under circumstances when personnel administer first aid care or CPR to injured workers and when personnel clean-up areas and equipment that may have been exposed to blood because of the incident. In these cases, there is reasonable potential for employee skin, eye, mucous membrane, or potential contact with blood or other bodily fluids.

The OSHA requires a listing of job classifications with identification of tasks performed in which some employees may have potential for occupational exposure. This requirement is for employees to clearly understand the tasks that they may perform have a potential for occupational exposure to infectious materials. The job classifications and associated tasks with an exposure potential are as follows:

Field Supervisor—Administer first aid or CPR; decontaminate or disinfect surfaces and articles that have contacted infectious materials, and prepare biohazard waste for temporary storage and subsequent disposal.

Subcontractor Supervisors—Administer first aid or CPR; decontaminate or disinfect surfaces and articles that have contacted infectious materials, and prepare biohazard waste for temporary storage and subsequent disposal.

Laborer—Administer first aid or CPR; decontaminate or disinfect surfaces and articles that have contacted infectious materials, and prepare biohazard waste for temporary storage and subsequent disposal.

These employees have potential for exposure to blood-borne pathogens when administering first aid or CPR and when performing post-accident clean-up operations due to the following:

Contact or absorption of blood or blood-contaminated objects through open or broken skin (i.e., cuts, scratches, and rashes)

Blood splashes to their eyes, nose, or mouth, or other mucous membranes

Punctures through the skin with a contaminated sharp object (such as, scissors)

Workers can reduce their risk of contacting blood-borne pathogens by implementing the recommended work practices (outlined in this plan) before, during, and after responding to emergency medical incidents primarily involving personal injuries.

12.3 Schedule of Implementation

The procedures in this Blood-borne Pathogen Exposure Control Plan are to be implemented immediately.

Implementation includes:

Verifying personnel who are available to voluntarily provide first aid care and CPR hold a valid training certificate from a reputable training provider (American Red Cross or American Heart Association).

The Field Supervisor is responsible for verifying that an appropriate number of personnel have been trained in and hold valid certification to perform first aid and CPR.

Verifying that personnel voluntarily providing first aid care, CPR, post-accident clean-up operations, and biohazard waste handling have received the specialized training meeting the requirements of 29 CFR 1910.1030; EM 385-1-1, *Safety and Health Requirements Manual* (USACE, 2003), Section A.03.06; and Shaw E & I Procedure No. HS512. This training is required for applicable personnel prior to the commencement of work and at least annually thereafter. This training shall cover the following elements:

Copy of 29 CFR 1910.1030 and this procedure including an explanation of the contents

General explanation of the epidemiology and symptoms of blood-borne diseases

Explanation of the modes of transmission of blood-borne pathogens

Explanation of the appropriate methods for recognizing tasks and other activities that may involve exposure to blood and other potentially infectious materials

Explanation of the use and limitations of practices that will prevent or reduce exposure including appropriate engineering controls, work practices, and PPE

Information of the types, proper use, location, removal, handling, decontamination, and/or disposal of PPE

Explanation of the basis for selection of PPE

Information on the hepatitis B vaccine, including information on its efficacy, safety, and the benefits of being vaccinated

Information on the appropriate actions to take and persons to contact in an emergency

Explanation of the procedure to follow if an exposure incident occurs including the method of reporting the incident and the medical follow-up that will be made available

Information on the medical counseling that is provided for exposed individuals

Explanation of required signs and labels

The Field Supervisor is responsible for verifying that this blood-borne pathogen training has occurred.

Verifying that engineering controls are readily available at the project for use in an emergency. Engineering controls for this project include the following:

Red-bags for temporary storage of contaminated PPE and cleaning materials

Appropriately labeled, 30-gallon hard-plastic container for the temporary storage of red-bagged waste

Whisk-broom and dust pan for cleaning up contaminated broken glass

Gallon container of Clorox® household bleach

Large utility sponge

Rolls of paper towels

Container of liquid disinfectant hand soap

"Biohazard" warning labels

Individually packaged disinfectant towelettes

CPR barriers

The Field Supervisor is responsible for verifying that this inventory of engineering controls is readily available at the project site for emergency use.

Personal protective equipment is necessary to prevent employee exposures to infectious materials. The necessary PPE, which shall be maintained separately for use in an emergency include the following:

P-100 Particulate filtering face-piece respirator (3-M 8293 or equivalent)
Face-shields with ratcheting head-suspension
Safety glasses with clear lens
Disposable nitrile examination gloves
PVC Monkey Grip work gloves
Poly-coated or Saran-coated disposable Tyvek® coveralls with attached hood

Vinyl or latex disposable boot covers
Fluid-resistant surgical hoods

The Field Supervisor is responsible for verifying that the above inventory of PPE is readily available at the project site for emergency use.

12.4 Work Practice Controls

Work practice controls reduce the likelihood of exposure by altering the manner in which a task is performed. The work practice controls outlined in this section are applicable to the administration of first aid and the subsequent clean-up operations.

Work practice controls shall be instituted whenever there is potential for employee contact with blood and bodily fluid. Situational examples where these controls are to be implemented include, but are not limited to:

The voluntary administration of first aid care, such as application of bandages to minor or major cuts and abrasions of another person. This care may allow for contact with sores, wounds, broken skin, blood, or other bodily fluids.

The voluntary administration of first aid care, such as providing CPR.

Clean-up activities involving handling soiled articles (e.g., gauze, bandages, compresses, etc.) and the decontamination or disinfecting of surfaces and articles that have contacted potentially infectious materials, such as blood or other bodily fluids.

Prepare biohazard waste for temporary storage and subsequent disposal.

Based upon professional judgment, an employee may choose to temporarily forego the use of PPE if the employee determines that the use of the PPE will further jeopardize his well-being or that of the injured worker. This limited application must be carefully evaluated and considered by the employee. If this situation does occur, Shaw will investigate and document the circumstances in an effort to provide alternative means to avoid further occurrence.

The following are specific work practice controls that shall be implemented in the above noted situations or whenever an employee determines that the implementation of these work practices is prudent or necessary:

The appropriate PPE shall be donned prior to engaging in any activities that have the potential for employee contact with potentially infectious materials, such as blood or other bodily fluids.

Hands and face will be washed as soon as possible after engaging in any activities that have the potential for employee contact with potentially infectious materials, such as blood or other bodily fluids. If wash facilities are not readily available, individually packaged disinfectant towelettes may be used in the interim.

Eating, drinking, or smoking is not allowed in any work area where a potential exists for occupational exposure to blood-borne pathogens.

Open wounds or cuts shall be promptly bandaged.

Work surfaces and areas shall be cleaned and disinfected immediately after being contacted by potentially infectious materials. A 10 percent bleach solution (one part bleach added to nine parts water) shall be applied and allowed to have a contact time of 15 minutes. Non-disposable articles, equipment, or materials contaminated with potentially infectious materials shall be similarly cleaned/disinfected prior to reuse.

All bins, pails, cans, and similar receptacles intended for reuse, which have become contaminated with blood or other potentially infectious materials shall be cleaned and disinfected immediately after use.

Broken glassware, which may be contaminated, shall not be picked up directly by hand. Broken glass shall be picked-up using mechanical means, such as by using a whiskbroom and dustpan.

All PPE shall be immediately removed upon leaving the potentially contaminated work area, or as soon as possible if visibly contaminated. The contaminated PPE shall be placed in a labeled "red-bag" and then placed in the 30-gallon container for temporary storage and subsequent disposal.

Any clothing that has contacted blood or other potentially infectious fluids shall be removed as soon as possible.

Any clothing that has contacted blood or infectious fluids shall be placed in a labeled "red-bag" and then placed in the 30-gallon container for temporary storage and subsequent disposal.

12.4.1 Universal Precautions

Universal precautions is a method of infection control, which operates on the assumption that all human blood and bodily fluids are to be treated as if they are known to be infectious for HIV, HBV, or other blood-borne pathogens. Universal precautions shall be observed to prevent contact with blood or other potentially infectious materials. Universal precautions consist of the following practices:

All workers shall routinely use appropriate barrier precautions to prevent skin and mucous-membrane exposure when contact with blood or other bodily fluids is anticipated. Gloves should be worn for touching blood and bodily fluids, mucous membranes, or non-intact skin and for handling items or surfaces contaminated with blood or body fluids. Masks and protective eyewear or face shields shall be worn during procedures that are likely to generate droplets of blood or other body fluids to prevent exposure of mucous membranes of the mouth, nose, and eyes. Protective suits shall be worn during procedures that are likely to generate splashes of blood or other bodily fluids.

Hands and other skin surfaces shall be washed immediately and thoroughly if contaminated with blood or other bodily fluids. Hands shall be washed immediately after gloves are removed, using a disinfectant soap.

Cardiopulmonary resuscitation barriers or other ventilation devices should be available for use in areas in which the need for resuscitation is foreseeable.

Workers who have exudative lesions or weeping dermatitis shall be excluded from handling potentially infectious materials until the condition resolves.

Pregnant workers should be especially familiar with and strictly adhere to precautions to minimize the risk of transmission.

12.4.2 Personal Protective Equipment

The proper use of PPE is an effective work practice control. The following requirements for PPE are mandatory whenever there is potential for employee contact with blood and bodily fluid:

Inspect PPE prior to use to verify it is in good working order and without defects.

Blood or other potentially infectious materials.

Disposable (single use) gloves, such as surgical or examination gloves shall be replaced when visibly soiled, torn, punctured, or when their ability to function as a barrier is compromised. Gloves should be changed as soon as possible after contact with blood or bodily fluids. After use, remove gloves from top to bottom inside out, not allowing unprotected skin to contact the exterior of the gloves. Hands and other skin surfaces shall be washed with disinfectant soap immediately after care has been rendered or clean up has been completed. Gloves reduce the incidence of blood contamination of hands, but they cannot prevent penetrating injuries caused by sharp objects. Do not reuse gloves once removed. A CPR barrier shall be used when administering CPR.

Protection for the eyes, face, hands, body, feet, and against inhalation hazards shall be provided as appropriate for each job.

Gloves shall be worn when employees have the potential for direct skin contact with or when handling items or surfaces soiled with blood, other potentially infectious materials, mucous membranes, and non-intact skin.

Polyvinyl chloride work gloves may be disinfected for immediate reuse if the integrity of the glove is not compromised; however, gloves must be discarded if they are cracked, peeling, discolored, torn, punctured, or exhibit other signs of deterioration. All gloves shall be discarded at the conclusion of the activity or at the end of the shift – whichever comes first.

Masks and eye protection or chin-length face shields shall be worn whenever splashes, spray, splatter, droplets, or aerosols of blood or other potentially infectious materials may be generated and there is a potential for eye, nose, or mouth contamination.

Fluid-resistant clothing (e.g., coated Tyvek® suits) shall be worn if there is a potential for splashing or spraying of blood or potentially infectious materials. Coated Tyvek® coveralls shall also be worn during clean-up activities involving decontamination or disinfecting of surfaces and articles that have contacted potentially infectious materials, and when preparing biohazard waste for temporary storage and subsequent disposal.

Fluid-resistant clothing (e.g., coated Tyvek® suits) shall be worn if there is a potential for clothing becoming soaked with blood or other potentially infectious materials.

Surgical caps or hoods shall be worn if there is a potential for splashing or splattering of blood or potentially infectious materials on the head.

Fluid-proof coverings shall be worn if there is a potential for shoes or boots to contact blood or other potentially infectious materials.

Disposable nitrile or vinyl gloves shall be worn for touching blood and bodily fluids requiring universal precautions, mucous membranes, or non-intact skin and for handling items or surfaces soiled with blood or bodily fluids to which universal precautions apply.

12.4.3 Waste Handling

All wastes generated because of administering emergency first aid care and the subsequent clean-up activities shall be placed in red-bags, labeled as a biohazard, and kept separately from other trash. Wastes used in medical emergency treatment (i.e., gloves, towels, and gauze) shall also be bagged and stored in an identical manner. Red-bagged, biohazard waste shall be placed in the 30-gallon collection container, labeled, and secured for temporary storage and disposal. Additional containers shall be obtained as needed and containers shall not be overfilled.

12.5 Biohazard Waste Disposal

The Shaw Transportation and Disposal Coordinator shall be contacted to arrange for proper disposal of biohazard wastes. The waste shall remain secured on site in labeled container(s) until disposal arrangements have been made at an approved disposal facility. Disposal of the infectious waste container(s) shall be in accordance with applicable local, state, and federal regulations.

12.6 Medical Requirements

Employees receive medical evaluations in accordance with Shaw E & I Procedure No. HS100. The medical requirements of this exposure control plan include provisions for vaccinations to all exposed employees as well as for post-exposure procedures and evaluations. All employees with potential for occupational exposure to blood-borne pathogens shall receive the hepatitis B vaccination and tetanus vaccination prior to workplace exposure, unless they read and sign the Hepatitis B and Tetanus Vaccination Declination form (Appendix C).

12.6.1 Hepatitis B Vaccination

All potentially exposed employees will have made available to them, at no cost, a hepatitis B vaccination. Recombivax or Accelerated Recombivax vaccines shall be utilized. If the employee has previously received the hepatitis B vaccination and/or antibody testing reveals that the employee is immune, a new vaccination is not required. Employees may be subjected to occupational exposure immediately after receiving the first shot in the hepatitis B vaccination series. Antibody testing shall be performed 30-days after completing the hepatitis B vaccination series. Employees unable to develop immunity shall be precluded from further occupational exposure. If a physician recommends a booster dose(s), the doses shall be provided according to standard recommendations for medical practice. The employee will also receive training as to the vaccine's efficacy, safety, benefits, and consequences prior to administration. The vaccination series may also be initiated within 24-hours of an incident with exposure potential.

12.6.2 Tetanus Vaccination

All employees subject to this policy shall maintain current status documentation of their tetanus vaccination (current status for tetanus vaccination is within five (5) years). All potentially exposed employees shall be offered a tetanus vaccination at no cost.

12.6.3 Post-Exposure Procedures and Evaluation

All exposure incidents shall be reported as required by Shaw E & I Procedure No. HS020, "Accident Prevention Program: Reporting, Investigation and Review." The occupational medicine physician shall be advised in addition to standard notification procedures.

Following a report of an exposure incident, each involved employee shall be offered a confidential medical evaluation and follow-up, which includes at least the following elements:

Documentation of the route(s) of exposure.

Hepatitis B virus and HIV antibody status of the source patient(s) (if known), and how the exposure occurred.

The medical confidentiality rights of the source patient shall be preserved at all times.

If the source patient can be determined and permission is obtained, collection of and testing of the source patient's blood to determine the presence of HIV or HBV infection shall be conducted under the direction of the attending physician.

Collection of blood from the exposed employee as soon as possible after the exposure incident for the determination of HIV and/or HBV status. Actual core antibody and surface antigen testing of the blood or serum sample may be done at that time or later if the employee so requests. If the test is deferred, arrangements shall be made through the attending physician to properly archive the specimen.

Follow-up of the exposed employee including antibody and antigen testing, counseling, illness reporting, and safe and effective post-exposure prophylaxis, according to standard recommendations for medical practice as defined by the occupational medicine physician.

Where applicable laws require employee consent, documented consent shall be obtained prior to testing. If an employee refuses the blood test, documentation of the refusal will be made. Documentation of the test results shall be made available to the exposed employee(s). All test results shall be kept confidential.

12.6.4 Physician Information

The following information shall be provided to the evaluating physician:

Copy of 29 CFR 1910.1030 and its appendices

Description of the affected employee's duties as they relate to the employee's occupational exposure

12.6.5 Physician Opinion

For each potentially exposed employee evaluation, the employee shall receive a copy of the evaluating physician's written opinion within 15 working days of the completion of the evaluation. The written opinion shall be limited to the following information:

The physician's recommended limitations upon the employee's ability to receive the hepatitis B vaccination.

A statement that the employee has been informed of the results of the medical evaluation and that the employee has been told about any medical conditions resulting from exposure to blood or other potentially infectious materials, which require further evaluation or treatment.

Specific findings or diagnoses, which are related to the employee's ability to receive the HBV vaccination. Any other findings and diagnoses shall remain confidential.

12.6.6 Hazard Communication

There are regulatory requirements for labels, signs, and training. The provisions and exceptions for these are contained in the subsections below.

12.6.7 Warning Labels

Containers used for disposal of blood-contaminated supplies and waste will be labeled in accordance with the word "biohazard." The following symbol shall be an integral part of the label:

12.6.8 Warning Signs

There will be no designated areas for medical treatment on project sites, because first aid is provided on an emergency basis only; therefore, warning signs are not applicable. In cases of potential exposure, observers and nonessential personnel should be verbally warned to keep a safe distance from injured personnel.

12.6.9 Employee Training Program

All employees who are first aid/CPR trained and may provide assistance shall be trained in the requirements for voluntary providers as described in Shaw E & I Procedure No. HS512, this SHERP and the general provisions of this procedure.

12.7 Recordkeeping

There are federal record-keeping requirements for training, medical, and incident reporting documentation. The provisions for keeping these records are contained in the subsections below.

12.7.1 Training Records

All employees covered under this exposure plan shall be trained as required. A record of the training shall be appropriately generated. The training record will contain the date of the training session(s), the contents or a summary of the training session(s), the names of persons conducting the training, and the names of all persons attending the training sessions.

The training records will be maintained by the Shaw Training Department for at least five (5) years from the training date.

12.7.2 Medical Records

Medical records necessary for Shaw employees will include documentation of HBV vaccination status, medical follow-up, post-exposure testing, and a medical professional's written evaluation.

The employee medical records will be forwarded to and maintained by CORE Health Networks, 12091 Bricksome Avenue, Suite B, Baton Rouge, Louisiana 70816 for inclusion in the employee's medical file. Confidentiality of all medical records shall be maintained.

Shaw Environmental & Infrastructure, Inc. maintains employee medical records for the duration of the employee's employment plus 30 years thereafter. If, for whatever reason, Shaw no longer does business and no successor exists, Shaw will notify the director of NIOSH in writing three (3) months prior to the disposal of records. If so directed, the records shall be transferred to the director of NIOSH.

Subcontractors should handle their medical records in a similar fashion.

12.7.3 Incident Recording

An incident that occurs because of rendering emergency medical care will be recorded on the OSHA 300 log as OSHA defines work-related injuries and illnesses. All injuries involving the release of blood or bodily fluids must be immediately reported to the Project CIH for proper reporting and follow-up.

12.8 Plan Review and Update

This Blood-borne Pathogen Exposure Control Plan shall be reviewed and updated on an annual basis.

13.0 Logs, Reports, and Record Keeping

Proper record keeping and data management are essential in the implementation of this SHERP. The forms associated with the record keeping and data management requirements shall be completed in an accurate, timely fashion and appropriately filed. The proper completion of forms is the responsibility of the SSHO. Completed forms will be kept and maintained by Shaw for a 5-year period. Subcontractors will also be responsible for keeping a copy of the forms pertaining to their activities.

Copies of all pertinent site safety and health forms and logs are provided in Appendix C.

13.1 Employee Training and Medical Certification Records

Before personnel are allowed to work in regulated areas on site, the SSHO shall verify that the following training documentation is current and available in the project file:

OSHA 40-hour HAZWOPER training certificate (all personnel)

OSHA 8-hour HAZWOPER Refresher training certificate (all personnel who attended the OSHA 40-hour HAZWOPER training over 12 months in the past)

OSHA 8-hour HAZWOPER Supervisor training certificate (all supervisory personnel such as the Field Supervisor)

Three days of HAZWOPER supervised field experience

A completed Training Acknowledgement Form

Portable fire extinguisher training (two workers per crew)

First aid/CPR training (at least two workers on site)

Site Safety Orientation documentation indicating that employees have received the following training:

- Review of SHERP (SHERP Acknowledgment Form)
- Radiation Safety Training
- Site-specific Hazard Communication training (Hazard Communication and Right-To-Know Standards Employee Training Record)

The SSHO shall also verify that the following medical surveillance documentation is current and available in the project Health and Safety file:

The OSHA HAZWOPER medical surveillance certification for personnel working with HTRW as required by 29 CFR 1910.120 (f)

Annual audiogram evidence for workers who may be exposed to noise greater than 85 decibels

Positive physician's medical determination regarding the employee's ability to use respiratory protection for personnel required to wear respiratory protection

All personnel (including visitors) using respiratory protection, shall have successfully passed a respirator fit test in accordance with Shaw E & I Procedure No. HS601 within the last 12 months. A document providing proof of a fit test for the specific respirator used shall be available in the project file.

13.2 Daily Safety Log

The SSHO will maintain and complete a daily log for each day's work. The daily log will document each day's safety and health activities in sufficient detail for future reference as needed.

The following items will be developed as applicable and maintained on site by the SSHO as part of the daily safety log:

Daily safety meeting logs
Exclusion Zone sign-in logs
Noise survey data
Personnel training and medical certificates
Hot Work Permits
Air monitoring/sampling data forms
Project safety inspections (daily and monthly)
Contractor safety inspections
Hazard Communication Program audits
Warnings given related to safety infractions
AHAs
JSAs
Accident investigation reports
First aid log

All personnel will be required to log in and out of the Exclusion Zone. The Exclusion Zone sign-in log, maintained as part of the daily safety log, provides a project record of the following information for each shift's activities:

Worker's name
Work area
Duties performed
Level of protection

Time in/time out

13.3 Safety Inspections/Audits

Shaw Environmental, Inc.'s accident prevention program is centered on the following key procedures:

Investigating, reporting, and reviewing of all near misses, incidents, and accidents

Managing reviews of all incident/accident reports, corrective action, and project safety concerns

Reviewing of project, operations, and construction activities by safety and health professionals and supervisory personnel

Safety reviews and inspections are conducted by all tiers of the management structure and are documented. A list of all corrective action items shall be maintained showing the corrective action, responsible person, and the date the action is to be completed. Follow-up inspections are conducted by safety and health personnel to verify that corrective actions or measures have been implemented.

The SSHO will inspect the site daily and identify areas of safety concerns or ideas for safety improvement. The Subcontractor Supervisor will also inspect site conditions and activities daily to identify changing conditions or potential hazards. Daily safety inspections shall be documented on the Daily Safety Inspection Report (Appendix C). Identified safety and occupational health deficiencies and suggested corrective measures will be brought to the attention of the Field Supervisor, Project Manager, and Project CIH.

Safety and occupational health deficiencies shall be tracked on the Safety and Occupational Health Deficiency Tracking Log (Appendix C), which provides the following information:

Date deficiency identified
Description of deficiency
Name of person responsible for correcting deficiency
Projected resolution date
Date actually resolved

The SSHO will immediately notify the Project CIH of any OSHA or other regulatory agency inspections. (The inspection will not be delayed due to the Government Designated Authority being unavailable.) The SSHO shall provide the Project CIH a copy of any citations or reports issued by the inspector and any corrective action responses to the citation(s) or report(s).

13.4 Accident Investigation and Reporting

Project personnel are required to report all near misses, injuries, illnesses, and accidents to their immediate supervisor. The Field Supervisor/SSHO shall immediately arrange appropriate medical care or other emergency response services as necessary. Once immediate medical care for the injured personnel or other critical emergency procedures has been accomplished, the Field Supervisor/SSHO shall follow the Incident Notification, Reporting, and Management Procedure (Appendix F). The appropriate form(s) to be completed are in Appendix C and include the following:

Supervisor's Employee Injury/Illness Report Form
Vehicle Accident Report
Equipment, Property Damage and General Liability Loss Report
Incident Investigation Report
Injured Employee Statement
Employee Witness Statement
Accident Review Board
USACE Accident Investigation Report ENG Form 3394

All incidents shall be immediately reported to the Project Manager and Project CIH. All lost time injuries and property damage accidents (excluding on-the-road accidents) in which the property damage exceeds $2,000 will be reported to the USACE within 24 hours of the accident/incident. An accident with the consequences of a fatal injury, three or more persons admitted to a hospital, a permanent totally disabling injury, a permanent partial disabling injury, or property damage greater than $100,000 will be reported immediately to the USACE. Except for rescue and emergency measures, the accident scene shall not be disturbed until it has been released by the investigating official.

The SSHO shall immediately investigate all near misses, injuries, illnesses, and accidents. Corrective actions will be determined and implemented to prevent the recurrence of the accident, and responsibility for implementation of corrective actions will be assigned. The final report and required forms will be submitted within five days of the incident to the Project CIH and the USACE.

U.S. Army Corps of Engineers Accident Investigation Report, ENG Form 3394, Sep 89 shall be submitted within two working days to:

Jim Moore
26 Federal Plaza, Room 2108
New York, NY 10278-0090
Phone: 719-790-8331
Cell: 917-751-1272

In the event that an accident results in an employee being sent to a doctor, the Return-to-Work Examination Form (Appendix C) shall be completed by the attending physician, on the date of treatment stating that either:

Employee may return to full duty work
Employee may return to limited duty (with type of limitations)
Employee is unable to return to work

A copy of this release shall accompany the accident report. In addition to the requirement for maintaining a log of OSHA recordable injuries/illnesses, a separate log will be maintained for all first aid treatments not otherwise recordable/reportable.

14.0 References

American Conference of Governmental Industrial Hygienists (ACGIH), 2010, *Threshold Limit Values and Biological Exposure Indices, Cincinnati, Ohio.*

Code of Federal Regulations (CFR), Title 29, Part 1910, *Safety and Health Regulations for General Industry*, U.S. Government Printing Office, Washington, D.C., <http://www.access.gpo.gov/nara/cfr/index.html>.

Code of Federal Regulations (CFR), Title 29, Part 1926, *Safety and Health Regulations for Construction*, U.S. Government Printing Office, Washington, D.C., <http://www.access.gpo.gov/nara/cfr/index.html>.

National Fire Protection Agency (NFPA) 70E, 2009, *Standard for Electrical Safety in the Workplace*, National Fire Protection Association 1, Batterymarch Park, Quincy, Massachusetts.

National Institute for Occupational Safety and Health (NIOSH), 2005, *Pocket Guide to Chemical Hazards*, Publication No.2005-149, Cincinnati, Ohio, September.

National Institute for Occupational Safety and Health, Occupational Safety and Health Administration, U.S. Coast Guard, and U.S. Environmental Protection Agency (NIOSH et al.), 1985, *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities*, NIOSH Publication No. 85-115, Cincinnati, Ohio, October.

Shaw Environmental & Infrastructure, Inc. (Shaw), 2010, *Health and Safety Policies and Procedures Manual*, March <http://shawnet3.shawgrp.com/sites/handspps/default.aspx>.

U.S. Army Corps of Engineers (USACE), 2003, *Safety and Health Requirements Manual*, EM 385-1-1, Washington, D.C., November 3.

Tables

Table 1
Emergency Telephone Numbers

Colonie FUSRAP Site
1130 Central Ave, Albany NY 12205

Contact	Phone Number
Emergency Medical Service (Ambulance)	911 or (518) 489-4421
Fuller Road Fire Department, Colonie, NY	911 or (518) 489-4421
Colonie Police Department	911 or (518) 783-2744
Albany Medical Center (Hospital) 43 New Scotland Ave Albany, New York 12208	(518) 262-3125 or (518) 262-3131
Access Health Systems 776A Watervliet-Shaker Rd. Latham, NY 12110	(518) 782-2200 or (518) 786-1875
Poison Control Center	(800) 222-1222
Heather Fariello (Shaw PM)	(518) 482-0237 (518) 466-6383 (Cell)
James Joice (Shaw Project CIH)	(419) 424-4960 (419) 306-3637 (Cell)
Warren Houseman (Shaw Health and Safety Manager)	(412) 585-3917 (412) 580-6793 (Cell)
James Moore (USACE Project Manager)	(732) 435-0079 (NJ) (917) 790-8331 (NY) (917) 751-1272 (Cell)
Phyllis Della-Camera (USACE Design Center Manager)	(410) 962-6643
Paula Higgins (USACE NY District Safety Office)	(917) 502-4733
Hans Honerlah (USACE Baltimore Health Physicist)	(410) 962-9184 (410) 207 4822 (Cell)

Table 2
Minimum Clearance from Energized Overhead Electric Lines

Nominal System Voltage	Minimum Required Distance
0 to 50 kilovolts	3 meters (10 feet)
51 to 200 kilovolts	4.5 meters (15 feet)
201 to 300 kilovolts	6 meters (20 feet)
301 to 500 kilovolts	7.5 meters (25 feet)
501 to 750 kilovolts	10.5 meters (35 feet)
751 to 1,000 kilovolts	13.5 meters (45 feet)

Table 3
Task Protection Levels

Task	Initial PPE Level	Upgrade PPE Level	Skin Protection	Respiratory Protection	Other PPE
Mobilization / Site Setup	Level D	Modified Level D	Generally none: some activities may require Tyvek® coveralls to prevent insect bites / contact with poisonous plants	None	Hearing protection >85 dBA, leatherwork gloves.
Well redevelopment	Level D-modified	Level B	Tyvek® coveralls, vinyl or nitrile surgical gloves, outer gloves as needed, boot covers	Initial - None Upgrade - Level B: Full-face supplied air respirator.	High visibility vests when working near road or vehicular traffic.
Groundwater sampling	Level D-modified	Level B	Tyvek® coveralls, vinyl or nitrile surgical gloves, outer gloves as needed, boot covers	Initial - None Upgrade - Level B: Full-face supplied air respirator.	High visibility vests when working near road or vehicular traffic.
Mowing and litter removal	Level D	Modified Level D	Generally none: some activities may require Tyvek® coveralls to prevent insect bites / contact with poisonous plants	None	Hearing protection >85 dBA, leatherwork gloves, high visibility vests when working near road or vehicular traffic.
Equipment decontamination	Level D-modified	None	Tyvek® coveralls, vinyl or nitrile surgical gloves, outer gloves as needed, boot covers	None	Hearing protection >85 dBA, face-shield and shin/metatarsal protection if pressure washing.
Demobilization	Level D	Modified Level D	Generally none: some activities may require Tyvek® coveralls to prevent insect bites / contact with poisonous plants	None	Hearing protection >85 dBA, leatherwork gloves.

Table 4
Direct Reading Air Monitoring Requirements

Monitoring Device / Contaminant	Monitoring Location / Personnel	Monitoring Frequency	Action Level	Action
Combustible Gas Indicator (LEL)	In the Breathing Zone, Exclusion Zone, and work area.	Prior to hot work permitting and during any fuel spill clean-up activities.	<10% Lower Explosive Limit (LEL)	Continue Work
			>10% LEL	Stop work: Evacuate area and apply engineering controls.
PID (volatile organics)	In the Breathing Zone of personnel during well redevelopment, groundwater sampling activity.	At any time at any work location when personnel observe odors. A minimum of twice per hour at each well redevelopment location until activity at that location has been completed. A minimum of once per sampling event at each sampling location (water). During any fuel spill clean-up activities	> 5 ppm above background sustained for 15 seconds	Stop work: Evacuate area, assemble upwind, evaluate hazard, provide engineering controls and/or upgrade PPE.
			> 50 ppm above background	Stop work: Evacuate area, assemble upwind, evaluate hazard, apply engineering controls, and contact Project CIH.

Figures

Figure 1 Site Location Map

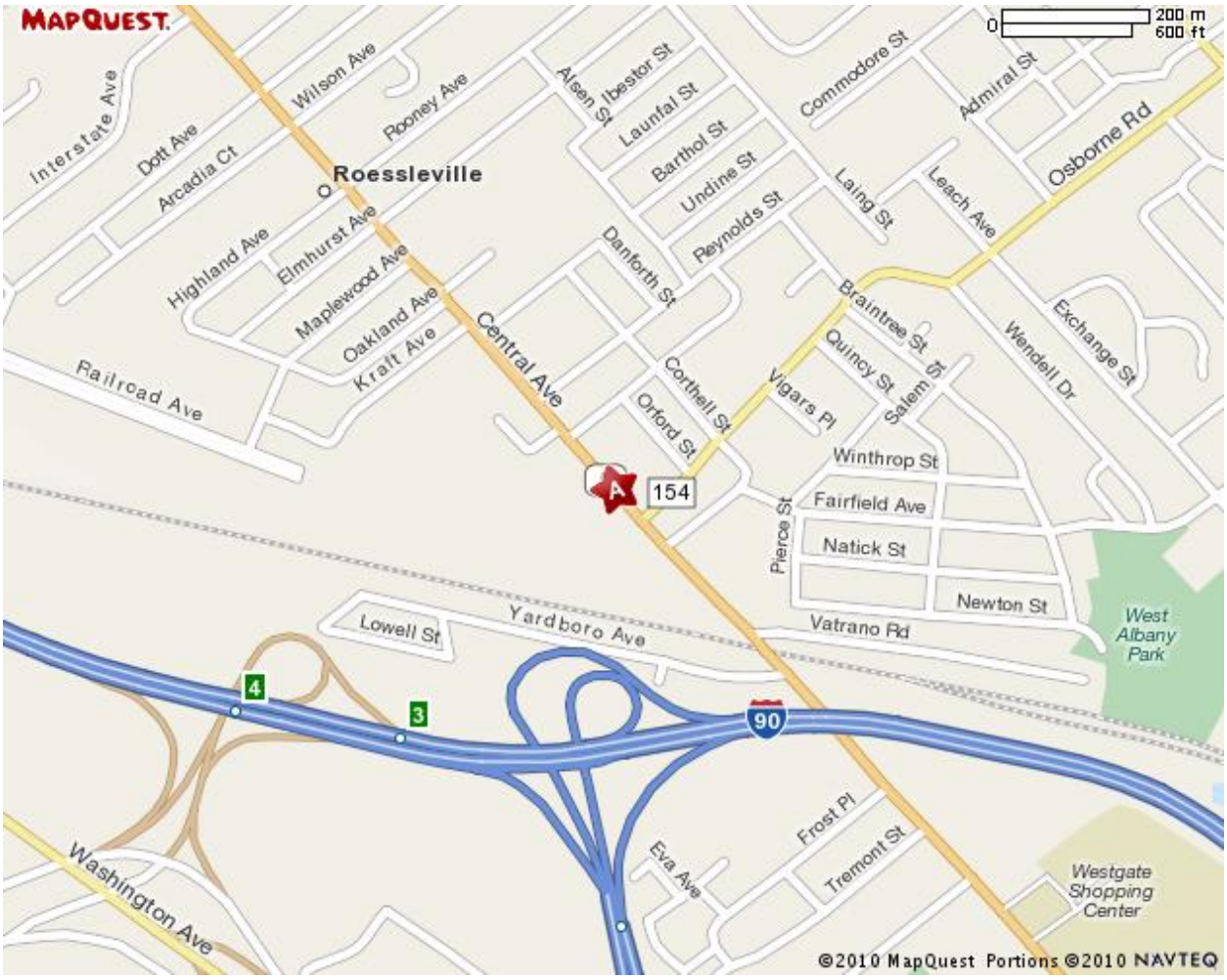
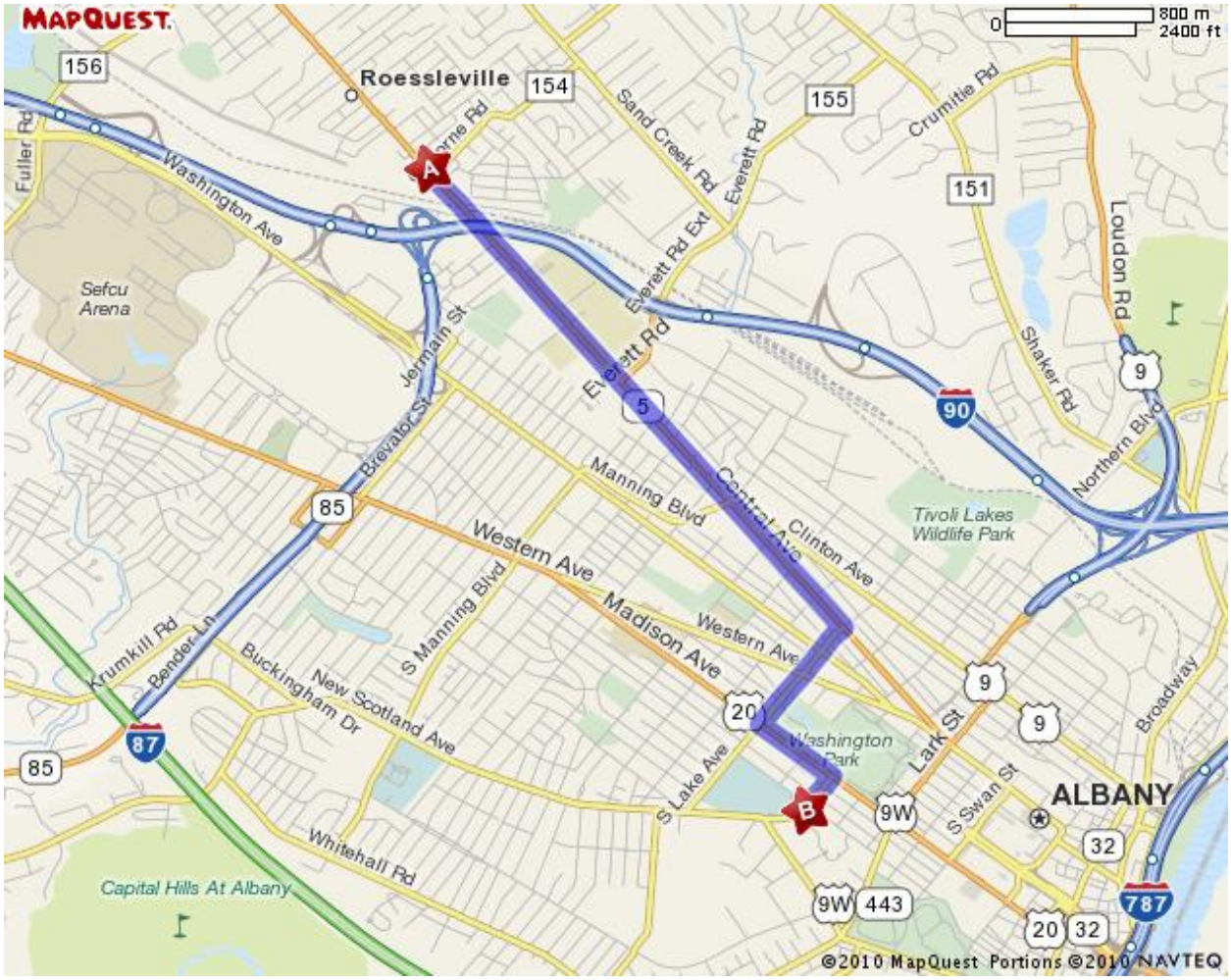


Figure 2 Map and Route to Hospital

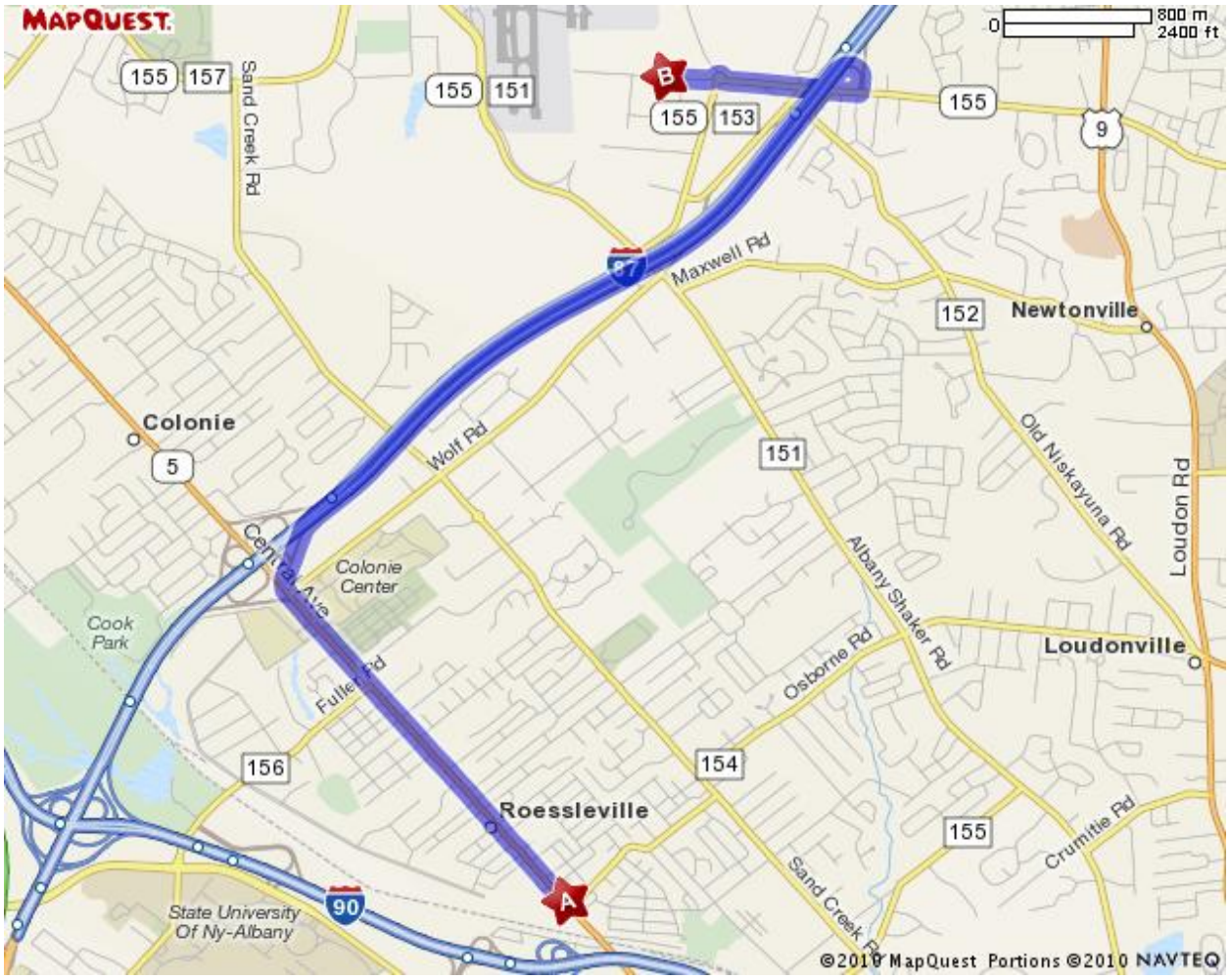


Route to Hospital

1. Start going southeast on Central Avenue/NY-5 toward Osborne Road/CR154 2.4mi.
2. Turn right onto N Lake Avenue 0.5mi.
3. Turn left onto Madison Avenue/US-20 0.3mi.
4. Turn right onto New Scotland Avenue 0.2mi.

43 NEW SCOTLAND AVENUE is on the RIGHT

Figure 3 Map and Route to Access Health Medical Facility



Route to Medical Facility

1.	Turn left into NY-5/Central Ave. toward Cramond Street	1.6mi.
2.	Merge onto I-87 North toward Saratoga Springs	3.0mi.
3.	Take the Route 155 exit, EXIT 5, toward Latham	0.2mi.
4.	Turn right onto Watervliet-Shaker Road/NY-155	0.5mi.
5.	Enter next roundabout and take second exit to Watervliet-shaker Road	0.2mi.

End at 776A Watervliet-Shaker Road, Latham, NY on the Left.

Appendix A
Safety, Health and Emergency Response Plan Acknowledgment

Safety, Health, and Emergency Response Plan Acknowledgment Form

I have read, understand, and agree to follow the Safety, Health, and Emergency Response Plan for the Colonie FUSRAP Site project. I understand that there will be additional safety and health requirements, which may be presented in task-specific Activity Hazard Analyses. I agree to abide by the requirements of the Activity Hazard Analyses for the work that I will perform.

Printed Name	Signature	Representing	Date

Appendix B
Safety, Health and Emergency Response Plan Amendments

(Reserved for Future Changes)

Appendix C
Forms

Site Forms Index

ATTACHMENT 7

ACCIDENT REVIEW BOARD

DATE:	LOCATON:
BOARD MEMBERS:	
ACCIDENT DATE:	EMPLOYEE(S) INVOLVED IN INCIDENT:
INVESTIGATION COMPLETE:	ACCIDENT CLASSIFICATION:

THE FOLLOWING INFORMATION MUST BE PROVIDED BY THE REVIEW BOARD FOR THIS INCIDENT (PRINT):

SUPERVISOR: _____ **PROJECT/LOCATION MGR:** _____

POTENTIAL CAUSE OF ACCIDENT:

ACTION BY BOARD*:

*ALL ACTIONS BY THE ACCIDEDNT REVIEW BOARD ARE SUBJECT TO FINAL REVIEW BY THE HUMAN RESOURCES AND LEGAL DEPARTMENTS.

ACCEPTED:

(Employee Signature)	(Supervisor Signature)
APPROVED:	REJECTED FOR:
(Project/Location Manager)	
APPROVED:	REJECTED FOR:
(Business LIne Health and Safety Manager or Designee)	
APPROVED:	REJECTED FOR:
(Business Line Vice President)	

Page _____

Activity Hazard Analysis (AHA)

AHA Number _____

Activity: _____ Analyzed by/date: _____ Reviewed by/date: _____

PRINCIPLE STEPS	POTENTIAL HAZARDS	RECOMMENDED CONTROLS

EQUIPMENT TO BE USED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS

AIR MONITORING DATA RECORD

Location: _____ **Project No.:** _____ **Date:** _____

Instrument: Mfg/Model/Serial No.: _____ **Calibrated by:** _____

COMBUSTIBLE GAS/OXYGEN/CARBON MONOXIDE METER CALIBRATION

Time	Battery Charged (Y/N)	Zero Checked (Y/N)				Calibration Standard	Calibration Standard				Actual Meter Reading				Ambient Air Re-Zero Check			
		H_2S (0%)	LEL (0%)	O_2 (20.8%)	CO (0 ppm)		% H_2S	% LEL	% O_2	ppm CO	% H_2S	% LEL	% O_2	ppm CO	H_2S (0%)	LEL (0%)	O_2 (20.8%)	CO (0 ppm)

PHOTOIONIZATION DETECTER/FLAME IONIZATION DETECTER CALIBRATION

Time	Battery Charged (Y/N)	Calibration Standard	Calibration Standard Concentration (ppm)	Expected Meter Reading (ppm)	Actual Meter Reading (ppm)	Comments

REAL TIME AIR MONITORING RESULTS

Date	Instrument Operator	Time	Monitoring Results		Action Level Exceeded (Y or N)	Location/Activity	Corrective Actions
			Compound	Concentration			

Comments: _____

Calibration Q.C.: Calibrations are to be within 5% for validity.
Abbreviations: CO = carbon monoxide, %LEL = percent of the lower explosive limit, O_2 = oxygen

AIR SAMPLING DATA RECORD

SAMPLING INFORMATION

Date of Sampling		Project Name	
Type of Sample Personal/Area		Project Number	
Employee Sampled		Operation/Task Monitored	
Employee Number			
Employee Social Security Number		Location of Air Sampling	
Employee Job Title		Person Performing Sampling/Employee #	

SAMPLING & PUMP CALIBRATION DATA

PROJECT SPECIFIC SAMPLE IDENTIFICATION NUMBER:

Air Pump Manufacturer/ Model/Number:								Ambient Air Temperature:		
Pre-sampling Calibration Flow Rate (mL/min)				Post-sampling Calibration Flow Rate (mL/min)				Final Sample Flow Rate (mL/min)		
1st flow rate	2nd flow rate	3rd flow rate	Pre-average flow rate	1st flow rate	2nd flow rate	3rd flow rate	Post-average flow rate	Pre-average flow rate	Post-average flow rate	Final average flow rate

Pump start time:	Pump stop time:	Total pump run-time (minutes):	Final average flow rate (mL/min):	Total sample volume (liters):

Analytes sampled for:	Analyte #1: _____ NIOSH Method # _____	Analyte #2: _____ NIOSH Method # _____	Analyte #3: _____ NIOSH Method # _____
Date Sample Shipped to Laboratory:	Remarks:		

HAZARD CONTROL MEASURES (check all that apply):

Respirator	☐ None	☐ Half-face APR	☐ Full-face APR	☐ PAPR	☐ Supplied-air (specify):	
Coveralls	☐ None	☐ Cotton	☐ Nomex	☐ Tyvek®	☐ Poly-coated Tyvek®	☐ Saranex
Gloves	☐ None	☐ Cotton	☐ Leather	☐ Sample	☐ Nitrile	☐ Other:
Boots	☐ Work	☐ Tyvek®	☐ Latex	☐ PVC	☐ Neoprene	☐ Other:
Engineering	☐ None	☐ Negative Air	☐ Ventilation		☐ Other:	

LABORATORY INFORMATION:

Laboratory Used (Name/Address/Telephone/Contact):

ANALYTICAL RESULTS:

Analyte #1	Analyte #2	Analyte #3

AIR SAMPLING DATA RECORD

SAMPLING INFORMATION

Date of Sampling		Project Name	
Type of Sample Personal/Area		Project Number	
Employee Sampled		Operation/Task Monitored	
Employee Number			
Employee Social Security Number		Location of Air Sampling	
Employee Job Title		Person Performing Sampling/Employee #	

SAMPLING & PUMP CALIBRATION DATA

PROJECT SPECIFIC SAMPLE IDENTIFICATION NUMBER:

Air Pump Manufacturer/ Model/Number:								Ambient Air Temperature:		
Pre-sampling Calibration Flow Rate (mL/min)				Post-sampling Calibration Flow Rate (mL/min)				Final Sample Flow Rate (mL/min)		
1st flow rate	2nd flow rate	3rd flow rate	Pre-average flow rate	1st flow rate	2nd flow rate	3rd flow rate	Post-average flow rate	Pre-average flow rate	Post-average flow rate	Final average flow rate

Pump start time:	Pump stop time:	Total pump run-time (minutes):	Final average flow rate (mL/min):	Total sample volume (liters):

Analytes sampled for:	Analyte #1: _____ NIOSH Method # _____	Analyte #2: _____ NIOSH Method # _____	Analyte #3: _____ NIOSH Method # _____
Date Sample Shipped to Laboratory:	Remarks:		

HAZARD CONTROL MEASURES (check all that apply):

Respirator	☐ None	☐ Half-face APR	☐ Full-face APR	☐ PAPR	☐ Supplied-air (specify):	
Coveralls	☐ None	☐ Cotton	☐ Nomex	☐ Tyvek®	☐ Poly-coated Tyvek®	☐ Saranex
Gloves	☐ None	☐ Cotton	☐ Leather	☐ Sample	☐ Nitrile	☐ Other:
Boots	☐ Work	☐ Tyvek®	☐ Latex	☐ PVC	☐ Neoprene	☐ Other:
Engineering	☐ None	☐ Negative Air	☐ Ventilation		☐ Other:	

LABORATORY INFORMATION:

Laboratory Used (Name/Address/Telephone/Contact):

ANALYTICAL RESULTS:

Analyte #1	Analyte #2	Analyte #3

VOLUNTARY
ALLERGY/SENSITIVITY QUESTIONNAIRE

This information is requested so that you may be assigned work duties which minimize your exposure to elements which may cause you to have a threatening medical reaction and will be used only in case of an emergency. Submitting this form is strictly **VOLUNTARY**. However, your cooperation is appreciated so that we can maintain a safe working environment.

Name: _____

Employee Number: _____ **Date:** _____

Are you allergic or sensitive to:	Yes	No	Don't know
Bee stings			
Insect bites			
Animal or reptile bites			
Pollens			
Plant material			
Dust			
Smoke, smog or ozone			

Are you allergic or sensitive to:	Yes	No	Don't know
Any cloths or fibers			
Latex			
Powders			
Medications			
Metals			
Foods (i.e., peanuts, etc.)			
Chemical/ petroleum products			

Have you ever had an asthmatic attack?			
Have you ever experienced exercise induced asthma?			

Do you have an allergy or medical condition for which you wear a medic alert bracelet or necklace?			

If you answered "yes" to any of the above, please list specific allergy information:

_____

_____

_____

_____

Are there any special instructions that should be provided to a physician in case of an emergency?

_____

_____

_____

Project Location: _____
Client: _____
Project Number: _____

AMBIENT AIR TEMPERATURE LOG

Thermometer Location: _____ Date: _____

Time (hours)	Temp. (°F)	Time (hours)	Temp. (°F)
0000 (Midnight)	_____	1200 (Noon)	_____
0100	_____	1300	_____
0200	_____	1400	_____
0300	_____	1500	_____
0400	_____	1600	_____
0500	_____	1700	_____
0600	_____	1800	_____
0700	_____	1900	_____
0800	_____	2000	_____
0900	_____	2100	_____
1000	_____	2200	_____
1100	_____	2300	_____

Comments: _____

_____

_____

ATTACHMENT 9B
MEDICAL FORMS
AUTHORIZATION FOR RELEASE OF PROTECTED MEDICAL INFORMATION

Printed Name: _____ Date of Birth: _____

Address:_____

Social Security #:_____ Home Telephone:_____

Authority to Release Protected Health Information

I hereby authorize the release of medical information, identified in this authorization form, and provide such information to:

HEALTH RESOURCES
600 West Cummings Park, Suite 3400
Woburn, Massachusetts 01801
Phone: (800) 350-4511
Fax: (800) 853-2641

AND

The Shaw Group Inc.
4171 Essen Lane
Baton Rouge, Louisiana 70809
Phone: 225-932-2500
Fax: 225-932-2636

The Information To Be Released includes the following:

Complete health record	Discharge summary	Progress notes
History and physical exam	Consultation reports	X-ray films / images
Laboratory test results	X-ray & Image reports	Itemized bill
Diagnosis & treatment codes	Complete billing record	

Other, (specify)_____

Purpose of the Requested Disclosure of Protected Health Information

I am authorizing the release of my Protected Health Information.

Drug and/or Alcohol Abuse, and/or Psychiatric, and/or HIV/AIDS Records Release

I understand if my medical or billing record contains information in reference to, psychiatric care, sexually transmitted disease, hepatitis B or C testing, previous drug and/or alcohol abuse and/or other sensitive information, I agree to its release. ***Check One:*** ☐ **Yes** ☐ **No**

I understand if my medical or billing record contains information in reference to HIV/AIDS (Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome) testing and/or treatment I agree to its release. ***Check One:*** ☐ **Yes** ☐ **No**

Right to Revoke Authorization

Except to the extent that action has already been taken in reliance on this authorization, the authorization may be revoked at any time by submitting a written notice to ***The Corporate Claims Dept.*** **at** ***The Shaw Group Inc., 4171 Essen Lane, Baton Rouge, Louisiana 70809***. Unless revoked, this authorization will expire at which time completion of treatment for the injury or illness has been accomplished.

Re-disclosure

I understand the information disclosed by this authorization may be subject to re-disclosure by the recipient and no longer be protected by the Health Insurance Portability and Accountability Act of 1996.

Signature of Patient or Personal Representative Who May Request Disclosure

I understand that I do not have to sign this authorization. However, if health care services are being provided to me for the purpose of providing information to a third-party (e.g. fitness-for-work test), I understand that services may be denied if I do not authorize the release of information related to such health care services to the third-party. I can inspect or copy the protected health information to be used or disclosed. **I hereby release and discharge _*The Shaw Group Inc*** **of any liability and the undersigned will hold** ***The Shaw Group Inc*** **harmless for complying with this Authorization.**

Signature: _____ **Date:** _____

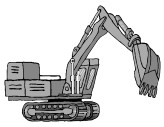
Description of relationship if not patient: _____

Equipment No: _____ **Date:** _____

Equipment Type: _____ **Location:** _____

Equipment Hrs: _____ **Supervisor:** _____

Shaw™
Shaw Environmental & Infrastructure, Inc.



DAILY EQUIPMENT INSPECTION

List Quantities And Kinds of Fluids Added In Space At Bottom Of Sheet

ITEM		OK	Add	N/A	Comments
1	Check Engine Oil Level And Engine Compartment For Trash, Debris, etc.	☐	☐	☐	☐
2	Check Hydraulic Oil Level, Cap And Vent.	☐	☐	☐	☐
3	Check Radiator Coolant Level And Radiator Fins For Dirt, Leaves, etc.	☐	☐	☐	☐
4	Check Transmission Oil Level (Dozers) or Swing Case (Excavators).	☐	☐	☐	☐
5	Check Oil Level in Frame Joint Bearing, Consult Manual. (Volvo A-40 only)	☐	☐	☐	☐
6	Check For Oil or Coolant Leaks.	☐	☐	☐	☐
7	Check Wheels / Tires / Tracks For Damage, Cuts And Proper Inflation PSI._____	☐	☐	☐	☐
8	Check Ground Engaging Implements, Cutting Edges, Teeth, Blade, etc.	☐	☐	☐	☐
9	Inspect Visible Hydraulic Hoses / Lines For Scuffs, Wear, Leaks, etc.	☐	☐	☐	☐
10	Inspect ROPS, FOPS, For Any Obvious Signs Of Loose Mounts, etc.	☐	☐	☐	☐
11	Check All Guages, Lights, Controls, Backup Alarms, Horn, etc.	☐	☐	☐	☐
12	Inspect Operators Compartment For Debris And Fire Extinguisher Charge. Check Floor For Build-up Of Dirt Around Pedals. Inspect Seat Belts, Lap Bar, Etc. Clean The Windows And Note Any Cracks.	☐	☐	☐	☐
13	Do a Walk Around Inspection Looking For Obvious Signs Of Future Problem Areas. Check Grab Handles and Step Treads, etc.	☐	☐	☐	☐
14	Check Operation Of All Systems, Boom, Bucket, Dump Bed, Grapple, Shears. Look for Leaks, Damage, Warning Signs, Excess Slack, Obvious Wear, etc.	☐	☐	☐	☐
15	Check Under The Machine For Any Loose Or Hanging Objects, Leaks, Or Anything Out Of The Ordinary.	☐	☐	☐	☐
16	Check Fuel Level And Cap Condition, Fill Tank Prior To Beginning Daily Operation.	☐	☐	☐	☐
17	**Lube All Moving Parts**, Such As Blade, Bucket, Stick, Connecting Links Equalizer bar, Cylinder Pins And Any Point That Is Subject To Grease Being Pushed Or Worn Out Due To Daily Use. Consult Manual For Grease Points.	☐	☐	☐	☐
18	Check Breathing Air Sustem (If Used). Make Sure Bottle Is Full And Mask / Hose Assembly Is Clean And In Good Working Condition Before Each Use.	☐	☐	☐	☐
19	**Verify The Presence Of The Operations / Maintenance Manual.**	☐	☐	☐	☐

Report All Damage To Supervisor Immediately

COMMENTS:

USE LINE NUMBER, BE SPECIFIC, NOTIFY REGIONAL MAINTENANCE COORDINATOR IF IMMEDIATE ATTENTION IS NEEDED.

EMPLOYEE NAME: **EMPLOYEE NUMBER:**

THESE SHEETS ARE TO BE RETAINED ON THE PROJECT FOR REVIEW BY ESG PERSONNEL.

Project Location: _____
Client: _____
Project Number: _____

DAILY SAFETY INSPECTION REPORT

Inspector name: _____ Date: _____

Supervisor: _____ SSHO: _____

General Project Activities Description: _____

_____

_____

Safety conditions and/or deficiencies:	Corrective actions to be completed:

Note: The status of corrective actions is to be tracked through closure on the Safety and Occupational Health Deficiency Tracking Log.

Signature: _____ Signature: _____
(Supervisor) (Safety Representative)

Drill Rig Inspection Checklist

Project Name/Number: _____
Make/Model Number: _____
Equipment Number: _____
Hours/Mileage: _____

Rig clean and free of soils, oils, and other debris.		Tracks in good condition.	
All hydraulic fittings and hoses free of damage, tightened, and not leaking.		Tires fully inflated and in good condition.	
Rig controls clearly labeled and in working condition.		Back-up alarm working.	
Rig Kill Switch in working order.		First Aid Kit accessible and stocked.	
All of the Rig's connections tightened and leak-free.		Fire Extinguisher accessible and fully charged.	
Parking brake functions properly.		Eye Wash full and accessible.	
Steering controls in working order and clear of obstacles.		Hearing protection available and is being used.	
Copy of the manual for all drilling equipment available.		All overhead and underground hazards identified.	

√ = OK
N/A = Not Applicable
X = Defective

These items are to be checked each shift before operating this piece of equipment.
Report all items requiring repair to supervisor.

Notes:	
Operator/Inspector:	Date:

EMERGENCY EYEWASH STATION/FIRE EXTINGUISHER INSPECTION CHECKLIST

Location: _____ Project Number: _____

Client: _____ Date: _____

Inspected by: _____

EMERGENCY EYEWASH STATIONS

Inspection Points	Unit #1	Unit #2
Is unit in assigned location?		
Is unit full of water?		
Is unit location well marked?		
Is access to unit unobstructed?		
Is unit in sanitary condition?		
Has water been changed with disinfectant added within the last six months?		
Has inspection tag on unit been signed and dated?		

PORTABLE FIRE EXTINGUISHERS

Inspection Points	Unit #	Unit #	Unit #	Unit #	Unit #
Fire extinguisher is in assigned location?					
Access to fire extinguisher is not obstructed?					
Fire extinguisher is fully charged?					
Lock-pin in place?					
Service tag attached and serviced within past year?					
Has inspection tag on unit been signed and dated?					

√ = OK N/A = Not Applicable X = Defective Comments: _____

EMPLOYEE NOTIFICATION OF INDUSTRIAL HYGIENE MONITORING RESULTS

Employee Name _____ SS# _____

Project Name _____ Project No. _____

Project Manager _____

Substance Monitored _____ Date Monitored _____ Sample Number _____

Results _____ mg/m^3 _____ ppm Other _____

Exposure Standard _____ mg/m^3 _____ ppm Other _____

Protective Equipment Used _____

For instance where exposures were found to be in excess of an exposure limit, the following corrective action steps (engineer administrative, job techniques, etc.) are being taken to reduce potential future exposures:

H&S Representative: _____ _____ _____

Name Printed Signature Date

Employee monitored: _____ _____ _____

Name Printed Signature Date

Employee Physiological Monitoring Record For Heat Stress

Employee Name _____ Date _____ Employee SS# _____

PPE used during performance of work: _____ Shift Start Time _____ Location _____

Shift Stop Time _____ Job Number _____

Site Safety & Health Officer _____ Supervisor _____

Temperatures

A. Initial Reading
- 1. Ambient Air Temp. °F _____
- 2. Baseline Body Temp. °F _____
- 3. Time Temp. Taken _____

B. After First Work Period
- 1. Ambient Air Temp. °F _____
- 2. Body Temp. °F _____
- 3. Length of work period _____

C. After Second Work Period
- 1. Ambient Air Temp. °F _____
- 2. Body Temp. °F _____
- 3. Length of work period _____

D. After Third Work Period
- 1. Ambient Air Temp. °F _____
- 2. Body Temp. °F _____
- 3. Length of work period _____

E. After Fourth Work Period
- 1. Ambient Air Temp. °F _____
- 2. Body Temp. °F _____
- 3. Length of work period _____

Heart Rate

A. Initial Reading
- 1. Baseline Heart Rate _____ Beats per minute

B. After First Work Period
- 1. Heart Rate _____ Beats per minute

C. After Second Work Period
- 1. Heart Rate _____ Beats per minute

D. After Third Work Period
- 1. Heart Rate _____ Beats per minute

E. After Fourth Work Period
- 1. Heart Rate _____ Beats per minute

- Baseline Body Temperature and Heart Rate to be taken at project site location at beginning of shift before engaging in physical activity.
- Heart Rate – Each individual will count his/her radial (wrist) pulse as early as possible during each rest period. If the heart rate of any individual exceeds 75 percent of their calculated maximum heart rate (MHR = 200 – age) at the beginning of the rest period, then the work cycle will be decreased by one-third. The rest period will remain the same. An individual is not permitted to return to work until his/her sustained heart rate is below 75 percent of their calculated MHR.
- Temperature – Each individual will measure his/her temperature with a thermometer for one minute as early as possible in the first rest period. If the temperature exceeds 99.6°F at the beginning of the rest period, then the work cycle will be decreased by one-third. The rest period will remain the same.
  An individual is not permitted to return to work if her/her temperature exceeds 100.4 °F. Note: due to the lack of accuracy in measuring body temperatures, heart rate is probably a better measurement of heat stress and should be weighted accordingly.
- This completed form should be retained in project file.

EMPLOYEE REQUEST FOR MATERIAL SAFETY DATA SHEET (MSDS)

Project Name: _____ Project Number: _____

Employee Name: (Please Print) _____

Employee Number: _____

Job Title/Location: _____

Department/Work Area: _____

I am requesting a copy of the MSDS(s) for the following chemical(s):

(Chemical name, Common name, Trade name)

1. _____

2. _____

3. _____

_____ _____

Signature Date

I have received a copy of the above MSDS(s) I requested.

_____ _____

Signature Date

cc: Local Health and Safety Representative

EMPLOYEE TRAINING RECORD
(LADDER TRAINING)*

NAME _____ LOCATION _____

CLIENT: _____ PROJECT NUMBER: _____

EMPLOYEE NUMBER _____ SUPERVISOR _____

1. I have reviewed, understand, and agree to abide by the ladder procedures described in HS302.

2. I acknowledge that it is my responsibility to inspect ladders prior to their use and after any event that could result in ladder damage.

SIGNATURE _____ DATE _____

1. I have observed a demonstration of the ladder usage skills for the above associate and feel that they understand how to correctly use a ladder, are familiar with safety rules and regulatory requirements, and have demonstrated satisfactory ladder skills.

INSTRUCTOR SIGNATURE _____

DATE _____

*** Place original completed form in the project H&S file and forward a copy to the employee's home H&S Office.**

ATTACHMENT 6b
Employee Witness Statement
MUST BE COMPLETED WITHIN 24 HOURS OF THE INCIDENT

This form should be completed by every employee working in the crew of the injured employee and by every other employee with knowledge of events or circumstances incolved in the incident. This information is being solicited from you so that the company can accurately assess the reported incident to avoid similar occurrences in the future. Describe only the facts for which you have personal knowledge. If you have no knowledge of the incident, write "no knowledge".

Company: _____

exact Location of Incident/Accident: _____

Name of Injured Employee: _____

Date of Incident/Accident _____

Date of this Statement _____

Time your shift begins: _____

Witness Information: _____

Name: _____

Home Phone No.: _____

Home Address: _____

County: _____ State/Zip: _____

Witness Supervisor's Name: _____

If not employed by Shaw E&I, enter the name of your company: _____

Company Phone Number: _____

Did you see the Incident/Accident? _____

How Far From You (approx., in fee) Did the Incident/Accident Occur? _____

Stating Only Factual Information, Describe in Detail What happened and Include any Applicable Events Leading to the Incident/Accident.

_____

_____

_____

_____

_____

_____

_____

_____

_____

I certify that, tot he best of my knowledge, all of the above information is complete, accurate and factual. I acknowledge that the intentional falsification or altering of facts or making misleading statemnts may be grounds for disciplinary action.

_____ _____
(Witness Signature/Date) (Print Name)

ATTACHMENT 6b
Employee Witness Statement
MUST BE COMPLETED WITHIN 24 HOURS OF THE INCIDENT

This form should be completed by every employee working in the crew of the injured employee and by every other employee with knowledge of events or circumstances incolved in the incident. This information is being solicited from you so that the company can accurately assess the reported incident to avoid similar occurrences in the future. Describe only the facts for which you have personal knowledge. If you have no knowledge of the incident, write "no knowledge".

Company: _____

exact Location of Incident/Accident: _____

Name of Injured Employee: _____

Date of Incident/Accident _____

Date of this Statement _____

Time your shift begins: _____

Witness Information: _____

Name: _____

Home Phone No.: _____

Home Address: _____

County: _____ State/Zip: _____

Witness Supervisor's Name: _____

If not employed by Shaw E&I, enter the name of your company: _____

Company Phone Number: _____

Did you see the Incident/Accident? _____

How Far From You (approx., in fee) Did the Incident/Accident Occur? _____

Stating Only Factual Information, Describe in Detail What happened and Include any Applicable Events Leading to the Incident/Accident.

_____

_____

_____

_____

_____

_____

_____

_____

_____

I certify that, tot he best of my knowledge, all of the above information is complete, accurate and factual. I acknowledge that the intentional falsification or altering of facts or making misleading statemnts may be grounds for disciplinary action.

_____ _____
(Witness Signature/Date) (Print Name)

ATTATCHMENT 4

EQUIPMENT, PROPERTY DAMAGE AND GENERAL LIABILITY LOSS REPORT

This report is to be completed for all losses or damage to company property in excess of 1,000.00 and all third party damage, regardless of value, resulting form company activities.

PROJECT/LOCATION: _____ PROJECT # _____ DATE: _____
ADDRESS: _____
HOW DID DAMAGE OR LOSS OCCUR: _____

_____

_____

DESCRIPTION AND VALUE ($) OF DAMAGED/LOST/STOLEN PROPERTY: _____

_____

LOCATION OF DAMAGED/LOST/STOLEN PROPERTY (Before Loss) _____

_____

DATE AND TIME OF DAMAGE, LOSS, OR THEFT: DATE: _____ TIME: _____ ☐ AM ☐ PM

OWNER OF DAMAGED/LSOT/STOLEN PROPERTY:
Name: _____ Phone # _____
Address: _____ City/State _____
Employer and Address: _____

INJURED PARTIES (Also complete a Supervisor's Employee Injury Report if a Company Employee):
Name: _____ Phone # _____
Address: _____ City/State _____
Employer and Address: _____
Description of Injury: _____

Witnesses:
1. Name: _____ Home Phone # _____
Home Address: _____ City/State _____
Employer and Address: _____
2. Name: _____ Home Phone # _____
Home Address: _____ City/State _____
Employer and Address: _____

WERE PICTURES TAKEN? ☐ YES ☐ NO
WERE POLICE NOTIFIED? ☐ YES ☐ NO DEPT. _____ REPORT NO. _____

COMPLETED BY: _____
(Print) (Signature) (Date)

SUPERVISOR: _____
(Print) (Signature) (Date)

REPORT MUST BE FAXED TO:
CORPORATE CLAIMS DEPARTMENT (FAX: 225-932-2636)
WITHIN 24 HOURS, OR NOT LATER THAN NEXT BUSINESS DAY

EXCLUSION ZONE ENTRY LOG

Date: ______________________________ Client: ______________________________

Location: ______________________________ Job No.: ______________________________

Name	Time In	Time Out	Time In	Time Out	Time In	Time Out	Level of Protection

FIRST AID KIT INSPECTION LOG
(Inventory Kit)

Location: _____ Project Name: _____

Project Number: _____ Client: _____ Date: _____

Inspected by: _____ SSHO Approval Signature: _____

Contents	Fixed Location Kit		Vehicular Kit*			
				Actual Quantity		
	Minimum Required Quantity	Actual Quantity	Required Quantity	Vehicle 1 ID	Vehicle 2 ID	Vehicle 3 ID
Telfa Bandage Compress, 4"x4"	4		2			
Adhesive Bandages, 1"x3-3/8"	25		25			
Ammonia Inhalants	2		1			
Triangular Bandage 40" x 40" x 56"	1		-			
Eye Covering with Means of Attachment	1		-			
Eye Flush, 1oz.	2		2			
Absorbent Compress 24 sq. in.	1		1			
Antiseptic Wipes 1" x 1"	10		5			
Antiseptic Swabs 0.14 fl. oz.	10		5			
Antiseptic Towelettes 24 sq. in.	10		-			
Sterile Pad 3" x 3"	4		2			
Burn Treatment 0.14 fl. Oz.	6		1			
Roller Bandage 4" x 6 yd.	1		-			
Roller Bandage 2" x 6 yd.	2		-			
Kwik-Kold Ice Pak	2		-			
Adhesive Tape, 1" x 5 yd.	2		1			
Scissors and Forceps Kit	1		-			
Tick Removal Kit	1		-			
Emergency Blanket	1		-			
Disposable Gloves	4 pair		2 pair			
Flashlight	1		-			
Cotton-tip Applicators	10		-			
Disposable mouth-to-mouth Resuscitators	2		1			
Multi-Trauma Dressings 8"x10"	2		-			
2" Bandage Compress 2" x 36"	4		-			
3" Bandage Compress 3" x 60"	2		-			
4" Bandage Compress 4" x 72"	1		-			
Supervisor's Employee Injury Report	1		1			
Inventory Kit	1		-			

* Readily available "vehicle-size" first aid kits may be purchased at the local department store to fulfill vehicle kit stocking requirements. The kit contents do not need to be inspected as long as the shrink-wrap sanitary covering is intact.

HAZARD COMMUNICATION AND RIGHT-TO-KNOW STANDARDS
EMPLOYEE TRAINING RECORD

Project Name: _____ Project Number: _____

		INITIAL:
1.	I have been informed about the Hazard Communication Program, Material Safety Data Sheets (MSDS), their use and location, and the procedures to obtain copies.	
2.	I have been informed that some of my work may involve exposure to toxic substances, the hazards of which will be reviewed with me in tailgate safety meetings or site-specific training.	
3.	I have been informed about the right of employees to have access to relevant exposure and medical records, and the procedures for requesting access.	
4.	I understand that the company must act upon a request in a reasonable amount of time so as to avoid interruption of normal work operations.	
5.	I have been provided access to the applicable regulations governing hazard communication, and access to employee exposure and medical records.	

PRINT NAME: _____

SIGNATURE: _____

EMPLOYEE NUMBER: _____

DATE: _____

HAZARD COMMUNICATION AND RIGHT-TO-KNOW STANDARDS
EMPLOYEE TRAINING RECORD

Project Name: _____ Project Number: _____

		INITIAL:
1.	I have been informed about the Hazard Communication Program, Material Safety Data Sheets (MSDS), their use and location, and the procedures to obtain copies.	
2.	I have been informed that some of my work may involve exposure to toxic substances, the hazards of which will be reviewed with me in tailgate safety meetings or site-specific training.	
3.	I have been informed about the right of employees to have access to relevant exposure and medical records, and the procedures for requesting access.	
4.	I understand that the company must act upon a request in a reasonable amount of time so as to avoid interruption of normal work operations.	
5.	I have been provided access to the applicable regulations governing hazard communication, and access to employee exposure and medical records.	

PRINT NAME: _____

SIGNATURE: _____

EMPLOYEE NUMBER: _____

DATE: _____

HEPATITIS B AND TETANUS VACCINATION DECLINATION

Due to the potential for you to have occupational exposure to potentially infectious materials in your work, the company will provide, and encourages you to accept, vaccinations for Hepatitis B and Tetanus. Information to assist you in this decision is provided below.

Tetanus

- Bacterial disease causing muscle spasms, seizures, and "lockjaw"
- Single injection vaccination has few side effects
- Minimal loss in protection if the vaccination is given at the time of an exposure/injury rather than in advance

Hepatitis B

- Viral infection of the liver
- About 9,500 occupational cases occur annually, mostly in health care workers, with about 200 deaths
- Three-injection vaccination has few side effects
- Vaccination is 90 percent effective for at least 7 years when given prior to exposure
- Vaccination is 70 to 88 percent effective when given within 1 week of exposure
- Can survive in the environment for 24 to 48 hours after drying
- Risk of infection from one cut or puncture wound from a contaminated object:
  - Hepatitis B virus 6 to 30 percent
  - Human Immunodeficiency Virus (AIDS) 0.5 percent

If you wish to talk to a company doctor before making your decision, please ask the Health and Safety Manager to make arrangements for you. *If you choose to decline vaccination at this time, you must print and sign your name, and date the bottom of this form.*

I understand that due to my occupational exposure to blood or other potentially infectious materials I may be at risk of acquiring Hepatitis B Virus (HBV) infection.

I have been given the opportunity to receive the Hepatitis B vaccine, at no charge to myself. However, I decline Hepatitis B vaccination at this time. I understand that by declining this vaccine, I continue to be at risk of acquiring Hepatitis B, a serious disease.

If in the future I continue to have occupational exposure to blood or other potentially infectious materials and I want to be vaccinated with the Hepatitis B vaccine, I can receive this vaccination series at no charge to me.

Name (print) _____

Signature _____ Date _____

HOT WORK PERMIT

Project Name _____ Project # _____

Good for This Date Only ____/____/____ Time From _____ To _____

Hot Work Area _____

Specific Work to be Done _____

Personal Protective Equipment Required: _____

_____

Emergency Equipment Required: _____

_____

CHECKLIST	INITIAL	
	YES	DOES NOT APPLY
Area personnel have been informed of work to be performed.		
All tanks, lines, valves are disconnected, blinded, or blocked out.		
Electrical service has been locked out and tagged.		
Equipment and all attached piping has been cleaned and purged with: (check blank) Water _____ Steam _____ Inert gas _____ Air		
All grounding/bonding wire in place.		
Surrounding equipment and operations are safe for hot work.		
No open vessels, lines or combustible items within 35 feet of hot work area.		
Fully charged and appropriate fire extinguisher easily accessible.		
Fire watch has been provided.		
No flammable gases greater than 10% LEL in hot work area.		
Compressed gas cylinders kept upright and secured.		
Air monitoring required.		

AIR MONITORING (If Required)						
STATE EXACT LOCATION OF TEST	TIME	% LOWER EXPLOSION LIMIT	% OXYGEN	OTHER TEST _____	OTHER TEST _____	INITIAL

Special Instructions: _____

_____

Completed by: _____ _____ _____

Printed Name Signature Date

ATTACHMENT 5

INCIDENT INVESTIGATION REPORT

Must Be Completed Within 72 Hours & Relevant Support Documentation Must Be Attached/Submitted

Investigation Date: _____ **Date of Incident:** _____

Employee Name: _____

Supervisor Name: _____

Project No./Name: 842115 Ft. Benning

Location of Incident: _____

Incident Classification:

Injury: ☐ First Aid ☐ OSHA Recordable ☐ Lost Workday ☐ Restricted Workday

Vehicle: ☐ Chargeable ☐ Non-Chargeable

DOT ☐ DOT Vehicle ☐ DOT Reportable

Near Miss: ☐

General Liability ☐

Description (Provide facts, describe how incident occurred, provide diagram [on back] or photos)

Analysis (What unsafe acts or condiditons contributed to the incident?)

Corrective Action(s) (List corrective action items, responsible person, scheduled completion date)

Witness Names (Complete Attachment 6 - Employee Witness Statement)

	Print Name	Signature	Date
Investigated By			
Supervisor:			

ATTACHMENT 6a
Injured Employee Statement
MUST BE COMPLETED WITHIN 23 HOURS OF THE INCIDENT

This form should be completed by the injured employee involved in the incident. Describe only the facts for which you have personal knowledge. If you have no knowledge of a particular question, write "no knowledge".

Company: Shaw Infrastructure, Inc.

Exact Location of Incident/Accident: _____

Name of Injured Employee: _____

Date of Incident/Accident: _____ Time: _____ ☐ a.m. ☐ p.m.

Date of this Statement: _____ Time: _____ ☐ a.m. ☐ p.m.

Time your shift begins: Beginning Time: _____ ☐ a.m. ☐ p.m. Ends: _____ ☐ a.m. ☐ .m.

Name(s) of Known Witnesses:

Name: _____

Name: _____

Name: _____

Name: _____

Your Immediate Supervisor's Name: _____

If not employed by Shaw E&I, enter the name of your company and phone number: _____

Have You had a prior injury similar to this injury? _____

Was it while you were at work? _____

What date did the prior injury occur? _____

Stating Only Factual information, Describe in Detail What Happened and Include Any Applicable Events Leading to the Incident/Accident.

_____

_____

_____

_____

_____

_____

_____

_____

_____

I certify that, tot he best of my knowledge, all of the above information is complete, accurate and factual. I acknowledge that the intentional falsification or altering of facts or making misleading statemnts may be grounds for disciplinary action.

_____ _____

(Signature/Date) (Print Name)

JOB SAFETY ANALYSIS CHECKLIST FORM

DATE:
JOB#:
PERMIT#:
ISSUED BY:
SUPERVISOR:

Job Analyzed: _____ **Project Name:** _____

Consider the following and check the items which apply to the job, then review with the work crew.

PERMITS
- _____ Excavation
- _____ Cold Work
- _____ Hot Work
- _____ Confined Space Entry Permit
- _____ All Conditions Met
- _____ Signed-off When Complete
- _____ Other: _____

PPE
- _____ Chemical Protective Gloves
- _____ Leather Gloves
- _____ Special Purpose Gloves (e.g. Whizards)
- _____ Chemical Protective Coveralls
- _____ Acid Suit
- _____ Chemical protective Boots
- _____ Chemical Splash Goggles
- _____ Face Shield
- _____ Respirator
- _____ Fresh Air Ventilation
- _____ Hearing Protection
- _____ Safety Harness
- _____ Burning Goggles/Welder's Helmet
- _____ Other: _____

TOOLS
- _____ Current Inspection
- _____ Proper Tools for the Job
- _____ Good Tool Condition
- _____ Qualifications, e.g. explosive actuated tool
- _____ Other: _____

EMERGENCY EQUIPMENT
- _____ Fire Extinguishers
- _____ Safety Shower/Eyewash
- _____ Evacuation Route Mapped
- _____ Other: _____

ACCESS
- _____ Scaffold (properly inspected ____)
- _____ Scaffold Training
- _____ Ladder (HS 302 followed)
- _____ Man-lift
- _____ Personnel Basket (inspected/approved)
- _____ Operator Training
- _____ Special Provisions
- _____ Other: _____

WELDING
- _____ Flash-burns
- _____ Combustibles
- _____ Spark Containment
- _____ Shields
- _____ Grounding
- _____ Water Hose
- _____ Fire Extinguisher
- _____ Fire Blanket
- _____ Fire Watch
- _____ Sewer Covers
- _____ Other: _____

OVERHEAD WORK
- _____ Barricades
- _____ Signs
- _____ Hole Cover
- _____ Handrail
- _____ Other: _____

ELECTRICAL
- _____ Locked & Tagged out
- _____ Try Start/Stop Switch
- _____ GFCI Test
- _____ Assured Grounding
- _____ Extension Cord Inspection
- _____ Other: _____

LIFTING
- _____ Forklift
- _____ Boom Truck
- _____ Load Chart
- _____ Angle
- _____ Crane
- _____ Chain-fall
- _____ Proper Rigging Practices
- _____ Manual Lifting
- _____ Condition of Equipment
- _____ Operator Certification

DRILLING / DIRECT PUSH
- _____ Underground Utilities
- _____ Overhead Hazards
- _____ Rig Inspected
- _____ Air Monitoring
- _____ Emergency Procedures
- _____ Other: _____

HAZARDS (ENVIRONMENTAL)
- _____ Cold Stress
- _____ Heat Stress
- _____ Heavy Objects
- _____ Hot/Cold Surfaces or Materials
- _____ Inadequate Lighting
- _____ Irritating Plants
- _____ Noise
- _____ Heavy Weather
- _____ Insects/Animals
- _____ Other: _____

HAZARDS (CHEMICALS)
- _____ Chemical Burn Skin/Eyes
- _____ Flammable
- _____ Ingestion
- _____ Inhalation
- _____ Skin Contact

HAZARDS (BODY)
- _____ Fall Potential
- _____ Pinch Points
- _____ Slip-Trip Potential
- _____ Other: _____

OTHER WORK IN AREA
- _____ Others Working Overhead
- _____ Type Work Others Doing
- _____ PPE Due to Other Work
- _____ Other: _____

CONFINED SPACE ENTRY
- _____ Permit Required
- _____ Permit Completed
- _____ Personnel Trained
- _____ Rescue Services Available

EXCAVATION
- _____ Permit Completed
- _____ Competent Person Supervising
- _____ Underground Utilities
- _____ Overhead Hazards
- _____ Soils Tested
- _____ Heavy Equipment Inspected
- _____ Perimeter Protection
- _____ Daily Inspections
- _____ Protective Systems
- _____ Air Monitoring

SUPERVISOR/FOREMAN RECOMMENDATIONS:

JOB SAFETY ANALYSIS WORKSHEET FORM

DATE:
JOB#:
PERMIT#:
ISSUED BY:
SUPERVISOR:

Location of Job (Unit/Location on Project):		**Job Task Analyzed**
Required PPE:	**Safety Access/ Location**	Supervisor of Work:
	Safe Haven:	JSA Prepared By:
	Wind Direction:	Are other crews in area?
Pre-Job Preparation 1. Fill out JSA 2. Review JSA (EVERYONE) 3. Sign JSA (EVERYONE)	Evacuation Route: Assembly Point::	New: / Revised:

Job Task (What you are doing)	**Audit the Job:** Audit Time:

Potential Hazards	**Supervisor's Comments:**

Recommended Action or Procedure	**Supervisor's Initials:**

Crew Name Signatures:		

Project Location: ______________________
Client: ______________________________
Project Number: ______________________

Shaw®

LOCKOUT LOG

AUTHORIZED EMPLOYEE	DATE	EQUIPMENT NAME	EQUIPMENT NUMBER	REASON FOR LOCKOUT

LOCKOUT/TAGOUT FOR COMPRESSED AIR AND GASES

Project Name: _____ Project Number: _____

Job: _____

Device: _____

Location: _____

Authorized Person: _____

Site Supervisors: _____

PREPARATION FOR SHUTDOWN

1. Determine types and shutoff location.
2. Determine if there is more than one energy source.
3. Determine magnitude of compressed air, gas, steam, water, or fluids.
4. Notify affected employees in the area that equipment will be locked out for maintenance.
5. Shutoff main supply to machine.

LOCKOUT/TAGOUT

6. Lock and tag main supply in the OFF position.
7. Bleed line and verify that no air or gases remain in the equipment.
8. Repair equipment.

RETURN TO SERVICE

9. Be sure all connections are made and any unused tools and equipment are removed.
10. Remove lock if necessary to verify proper operations.
11. Remove tag.
12. Notify employees in the area that the equipment is available.

Signature:

Authorized Person: _____

Site Supervisor: _____

LOCKOUT/TAGOUT FOR ELECTRICAL EQUIPMENT

Project Name: _____ Project Number: _____

Job: _____

Device: _____

Location: _____

Authorized Person: _____

Site Supervisors: _____

PREPARATION FOR SHUTDOWN

1. Determine power type and shutoff location.
2. Determine if there is more than one energy source.
3. Determine magnitude of power (voltage).
4. Notify affected employees in the area that equipment will be locked out for maintenance.
5. Shutoff power sources to machine.

LOCKOUT/TAGOUT

6. Lock and tag main switches in the OFF position, remove fuses.
7. Verify that no power is available to the equipment using a voltmeter, if necessary.
8. Drain devices such as capacitor banks.
9. Verify that these devices have no stored energy by use of the voltmeter.
10. Repair equipment.

RETURN TO SERVICE

11. Be sure all connections are made and any unused tools and equipment are removed.
12. Remove lock if necessary to verify machine is repaired. The maintenance employee, while verifying the machine is repaired cannot leave the immediate area.
13. Remove tag from machine.
14. Notify employees in the area that the equipment is available.

Signature:

Authorized Person: _____

Site Supervisor: _____

LOCKOUT/TAGOUT FOR HYDRAULIC EQUIPMENT

Project Name: _____ Project Number: _____

Job: _____

Device: _____

Location: _____

Authorized Person: _____

Site Supervisors: _____

PREPARATION FOR SHUTDOWN

1. Determine power type and shutoff location.
2. Determine if there is more than one energy source.
3. Determine magnitude of energy (pressure).
4. Notify affected employees in the area that equipment will be locked out for maintenance.
5. Shutoff main hydraulic to equipment.

LOCKOUT/TAGOUT

6. Lock and tag main supply in the OFF position.
7. Drain fluids from shutoff valves to equipment.
8. Verify that the hydraulic fluid is disconnected.
9. Block ram or items controlled by the hydraulic system using the appropriate blocking.
10. Repair equipment.

RETURN TO SERVICE

11. Be sure all connections are made and any unused tools and equipment are removed.
12. Remove lock if necessary to verify machine is repaired. Maintenance employee cannot leave the immediate area, while verifying the machine is repaired.
13. Remove tag from machine.
14. Notify employees in the area that the equipment is available.

Signature:

Authorized Person: _____

Site Supervisor: _____

LOCKOUT/TAGOUT FOR STEAM, WATER, AND FLUID LINES

Project Name: _____ Project Number: _____

Job: _____

Device: _____

Location: _____

Authorized Person: _____

Site Supervisors: _____

PREPARATION FOR SHUTDOWN

1. Determine types and shutoff location.
2. Determine if there is more than one energy source.
3. Determine magnitude of compressed air or gas.
4. Notify affected employees in the area that equipment will be locked out for maintenance.
5. Disconnect/shutoff main steam, water, or fluid lines to equipment.

LOCKOUT/TAGOUT

6. Lock and tag main supply (i.e. chaining through valve handle with lock) in the OFF position with a bleeder open on the load side.
7. Drain fluids from shutoff valves to equipment.
8. Repair equipment.

RETURN TO SERVICE

9. Be sure all connections are made and any unused tools and equipment are removed.
10. Remove lock if necessary to verify machine is repaired. The maintenance employee cannot leave the immediate area, while verifying the machine is repaired.
11. Remove tag from machine.
12. Notify employees in the area that the equipment is available.

Signature:

Authorized Person: _____

Site Supervisor: _____

LOCKOUT/TAGOUT FOR STEAM, WATER, AND FLUID LINES

Project Name: _____ Project Number: _____

Job: _____

Device: _____

Location: _____

Authorized Person: _____

Site Supervisors: _____

PREPARATION FOR SHUTDOWN

1. Determine types and shutoff location.
2. Determine if there is more than one energy source.
3. Determine magnitude of compressed air or gas.
4. Notify affected employees in the area that equipment will be locked out for maintenance.
5. Disconnect/shutoff main steam, water, or fluid lines to equipment.

LOCKOUT/TAGOUT

6. Lock and tag main supply (i.e. chaining through valve handle with lock) in the OFF position with a bleeder open on the load side.
7. Drain fluids from shutoff valves to equipment.
8. Repair equipment.

RETURN TO SERVICE

9. Be sure all connections are made and any unused tools and equipment are removed.
10. Remove lock if necessary to verify machine is repaired. The maintenance employee cannot leave the immediate area, while verifying the machine is repaired.
11. Remove tag from machine.
12. Notify employees in the area that the equipment is available.

Signature:

Authorized Person: _____

Site Supervisor: _____

LOCKOUT/TAGOUT PROCEDURE FOR SPECIFIC EQUIPMENT

Project Name: _____ Project Number: _____

Equipment:		
Cat. No. and Location:		
Serial Number (if available):		
Electrical:	Voltage:	Location:
Describe:		
Air (Type):		Location:
Describe:		
Gases (Type):		Location:
Describe:		
Steam (Type):		Location:
Describe:		
Water:		Location:
Describe:		
Fluids:		Location:
Describe:		
Hydraulic:		Location:
Describe:		
Stored Energy – Capacitors, Springs, Etc.:		
Describe:		

LOG DATA AND RETURN TO SITE-SUPERVISOR

LOCKOUT/TAGOUT PROCEDURE FOR SPECIFIC EQUIPMENT

Project Name: _____ Project Number: _____

Equipment:		
Cat. No. and Location:		
Serial Number (if available):		
Electrical:	Voltage:	Location:
Describe:		
Air (Type):		Location:
Describe:		
Gases (Type):		Location:
Describe:		
Steam (Type):		Location:
Describe:		
Water:		Location:
Describe:		
Fluids:		Location:
Describe:		
Hydraulic:		Location:
Describe:		
Stored Energy – Capacitors, Springs, Etc.:		
Describe:		

LOG DATA AND RETURN TO SITE-SUPERVISOR

PROJECT SAFETY INSPECTION REPORT

DATE _____

BUSINESS LINE: _____

PROJECT NAME/NUMBER: _____

PROGRAM MANAGER: _____ PROJECT MANAGER: _____

GENERAL PROJECT DESCRIPTION: _____

SITE ACTIVITIES AT TIME OF INSPECTION: _____

_____

_____

INTERVIEWED EMPLOYEE: _____

SAFETY ISSUE: _____

CORRECTIVE ACTION: _____

_____

ASSIGNED TO: _____ FOLLOW-UP DATE: _____

CORRECTION VERIFIED BY: _____ DATE: _____

INTERVIEWED EMPLOYEE: _____

SAFETY ISSUE: _____

CORRECTIVE ACTION: _____

_____

ASSIGNED TO: _____ FOLLOW-UP DATE: _____

CORRECTION VERIFIED BY: _____ DATE: _____

INSPECTION COMPLETED BY: _____ DATE: _____

HEALTH AND SAFETY REVIEW BY: _____ DATE: _____

PROJECT SAFETY INSPECTION REPORT

PROJECT_____ DATE _____

	YES	NO	N/A
FIRST AID			
1. Are first aid kit locations identified and accessible?			
2. Are emergency eye wash/safety showers available and inspected monthly?			
3. Are first aid kits inspected weekly?			
4. Is a qualified first aid/CPR provider on-site?			
PERSONAL PROTECTIVE EQUIPMENT			
1. Have levels of personnel protection been established?			
2. Are respirators decontaminated, inspected, and stored according to standard procedures?			
3. Have employees been fit-tested?			
4. Is defective personal protective equipment tagged and taken out of service?			
5. Does compressed breathing air meet CGA Grade "D" minimum?			
6. Are there sufficient sizes and quantities of protective equipment?			
7. At a minimum, are employees utilizing safety glasses, hard hats, and steel toe boots?			
FIRE PREVENTION			
1. Are employees smoking only in designated outdoor areas?			
2. Are fire lanes established and maintained?			
3. Are flammable liquid dispensing systems bonded?			
4. Are approved safety cans available for storage of flammable liquids?			
5. Has the local fire department been contacted?			
6. Are fire extinguishers available and inspected monthly?			
7. Are flammables and combustibles properly stored?			
8. Are flammable storage cabinets available and used when needed?			
AIR MONITORING			
1. Is required air monitoring being conducted?			
2. Are air monitoring instruments calibrated daily?			
3. Are air monitoring logs up to date?			
4. Are instrument user manuals available?			
5. Are instruments being maintained?			
6. Are employees notified of personal sampling results within 5 days of receipt?			
WELDING AND CUTTING			
1. Are fire extinguishers present at welding and cutting operations?			
2. Are confined spaces evaluated prior to and during cutting and welding operations?			
3. Have Hot Work Permits been completed?			
4. Are proper helmets, goggles, aprons, and gloves available for welding and cutting operations?			
5. Are welding machines properly grounded?			
6. Are oxygen and fuel gas cylinders stored a minimum of 20 feet apart?			
7. Are only trained personnel permitted to operate welding and cutting equipment?			
8. Are gas cylinders transported in a secured vertical position with caps in place?			
HAND AND POWER TOOLS			
1. Are defective hand and power tools tagged and taken out of service?			
2. Is eye protection available and used when operating power tools?			
3. Are guards and safety devices in place on power tools?			
4. Are power tools inspected before each use?			
5. Are nonsparking tools available when necessary?			

PROJECT SAFETY INSPECTION REPORT

PROJECT_____ DATE _____

	YES	NO	N/A
HAND AND POWER TOOLS (continued)			
6. Is the correct tool being used for the job?			
MOTOR VEHICLES			
1. Are vehicles regularly inspected?			
2. Are personnel licensed for the vehicles they operate?			
3. Are unsafe vehicles tagged and reported to supervision?			
4. Is vehicle's safety equipment operating properly?			
5. Are loads secure?			
6. Are vehicle occupants using safety belts?			
7. Are current insurance cards and blank accident report forms located in vehicles?			
EMERGENCY PLANS			
1. Are emergency telephone numbers posted?			
2. Have emergency escape routes been designated?			
3. Are employees familiar with the emergency signal?			
4. Has the emergency route to the hospital been established and posted?			
5. Is a vehicle on site that can transport injured employees to the hospital?			
MATERIALS HANDLING			
1. Are materials stacked and stored to prevent sliding or collapsing?			
2. Are tripping hazards identified?			
3. Are semi-trailers chocked?			
4. Are fixed jacks used under semi-trailers?			
5. Are riders prohibited on materials handling equipment?			
6. Are approved manlifts provided for the lifting of personnel?			
7. Are personnel in manlifts wearing approved fall protection devices?			
FIRE PROTECTION			
1. Has a fire alarm system been established?			
2. Do employees know the location and use of all fire extinguishers?			
3. Are fire extinguisher locations posted?			
4. Are combustible materials segregated from open flames?			
5. Have fire extinguishers been professionally inspected during the last year?			
6. Are fire extinguishers visually inspected monthly?			
ELECTRICAL			
1. Is electrical equipment and wiring properly guarded and maintained in good condition?			
2. Are extension cords kept out of wet areas?			
3. Is damaged electrical equipment tagged and taken out of service?			
4. Have underground electrical lines been identified by proper authorities?			
5. Has a lockout/tagout system been established?			
6. Are GFCIs being used on all temporary electrical systems and as needed?			
7. Are extension cords being inspected daily (i.e., group pin in place, no unapproved splices)?			
8. Are warning signs exhibited on high voltage equipment (250V or greater)?			
9. Is adequate distance maintained from overhead electrical lines?			
10. Are switches, circuit breakers, and switchboards installed in wet locations enclosed in weatherproof enclosures?			

PROJECT SAFETY INSPECTION REPORT

PROJECT_____ DATE _____

	YES	NO	N/A
CRANES AND RIGGING			
1. Are cranes inspected daily prior to use?			
2. Are crane swing areas barricaded or demarked?			
3. Is all rigging equipment tagged with an identification number and rated capacity?			
4. Is rigging equipment inspection documented?			
5. Are slings, chains, and rigging inspected before each use?			
6. Are damaged slings, chains, and rigging tagged and taken out of service?			
7. Are slings padded or protected from sharp corners?			
8. Do employees keep clear of suspended loads?			
9. Are rated load capacities and special hazard warnings posted on crane?			
10. Are the records of annual crane inspection available?			
11. Has accessible areas within the swing radius of the rear of the crane been barricaded?			
12. Do crane operators have required training/certification?			
COMPRESSED GAS CYLINDERS			
1. Are breathing air cylinders charged only to prescribed pressures?			
2. Are like cylinders segregated and stored in well-ventilated areas?			
3. Is smoking prohibited in cylinder storage areas?			
4. Are cylinders stored secure and upright?			
5. Are cylinders protected from snow, rain, etc.?			
6. Are cylinder caps in place before cylinders are moved?			
7. Are fuel gas and oxygen cylinders stored a minimum of 20 feet apart?			
8. Are propane cylinders stored and used only outside of buildings?			
SCAFFOLDING			
1. Is scaffolding placed on a flat, firm surface?			
2. Are scaffold planks free of mud, ice, grease, etc.?			
3. Is scaffolding inspected before each use?			
4. Are defective scaffold parts taken out of service?			
5. Have employees completed scaffold user training?			
6. On scaffolds where platforms are overlapped, is planking overlapped a minimum of 12 inches?			
7. Does scaffold planking extend over end supports between 6 to 18 inches (dependent upon platform length)?			
8. Are employees restricted from working on scaffolds during storms and high winds?			
9. Are all pins in place and wheels locked?			
10. Is required perimeter guarding (top rail, mid rail, and toe board) present?			
11. Has a competent person been designated to oversee scaffold construction?			
12. Are employees prohibited from moving mobile scaffold horizontally while employees are on them?			
13. Are all scaffold components manufactured by the same company?			
WALKING AND WORKING SURFACES			
1. Are ladders regularly inspected?			
2. Are accessways, stairways, ramps, and ladders clean of ice, mud, snow, or debris?			
3. Are ladders being used in a safe manner?			
4. Are ladders kept out of passageways, doors, or driveways?			
5. Are broken or damaged ladders tagged and taken out of service?			
6. Are metal ladders prohibited in electrical service?			

PROJECT SAFETY INSPECTION REPORT

PROJECT_____ DATE _____

	YES	NO	N/A
WALKING AND WORKING SURFACES (continued)			
7. Are stairways and floor openings guarded?			
8. Are safety feet installed on straight and extension ladders?			
9. Is general housekeeping being maintained?			
10. Are ladders tied off?			
11. Are handrails and side rails installed along the unprotected sides of stairways having 4 or more risers or rising more than 30 inches?			
SITE SAFETY PLAN			
1. Is a site safety plan available on site or accessible to all employees?			
2. Does the safety plan accurately reflect site conditions and tasks?			
3. Have potential hazards been described to employees on site?			
4. Is there a designated safety official on site?			
5. Have all employees signed the safety plan acknowledgment form?			
SITE POSTERS			
1. Are the following posters displayed in a prominent and accessible area?			
A. Minimum Wage			
B. OSHA Job Protection			
C. Equal Employment Opportunity			
2. Are all required state-specific posters displayed?			
SITE CONTROL			
1. Are work zones clearly marked?			
2. Are support trailers located to minimize exposure from a potential release?			
3. Are support trailers accessible for approach by emergency vehicles?			
4. Is the site properly secured during and after work hours?			
5. Is an exclusion zone sign-in/sign-out log maintained?			
6. Are only employees with current training and physicals permitted in exclusion zone?			
HEAVY EQUIPMENT			
1. Is heavy equipment inspected as prescribed by the manufacturer?			
2. Is defective heavy equipment tagged and taken out of service?			
3. Are project roads and structures inspected for load capacities and proper clearances?			
4. Is heavy equipment shut down for fueling and maintenance?			
5. Are backup alarms installed and working on mobile equipment?			
6. Have qualified equipment operators been designated?			
7. Are riders prohibited on heavy equipment?			
8. Are guards and safety appliances in place and used?			
9. Are operators using the "three point" system when mounting/dismounting equipment?			
EXCAVATION			
1. Has a "competent person" been designated to oversee excavation activities?			
2. Prior to opening excavations, are utilities located and marked?			
3. Has a professional engineer evaluated all excavations greater than 20 feet deep?			
4. Is there rescue equipment on site and accessible to the excavation area?			
5. Is excavated material placed a minimum of 24 inches from the excavation?			
6. Are the sides of excavations sloped or shored to prevent cave ins?			

PROJECT SAFETY INSPECTION REPORT

PROJECT_____ DATE _____

	YES	NO	N/A
EXCAVATION (continued)			
7. Have excavations greater than 4 feet deep been monitored for hazardous atmospheres (i.e., LEL/O_2 deficiency)?			
8. Are ladders or ramps used in excavations over 4 feet deep?			
9. Are means of egress available so as to require no more than 25 feet of lateral travel?			
10. Are barriers, i.e., guardrails or fences, placed around excavations near pedestrian or vehicle thoroughfares?			
11. Is excavation inspected daily by competent persons and documented?			
CONFINED SPACES			
1. Have employees been trained in the hazards of confined spaces?			
2. Are confined space permits posted at entrance to confined space?			
3. Is a copy of the confined space entry procedure available?			
4. Has a rescue plan been established?			
5. Is an entry supervisor present at each permit-required entry?			
6. Are required extraction/fall protection devices being used?			
DECONTAMINATION			
1. Are decontamination stations set up on site?			
2. Is decontamination water properly contained and disposed of?			
3. Are all pieces of equipment inspected for proper decontamination before leaving the site?			
4. Are shin/metatarsal guards being used during power washing activities?			
HAZARD COMMUNICATION			
1. Is there a copy of the HAZCOM procedure on site?			
2. Are their MSDSs for required materials/chemicals present on site?			
3. Are all containers properly labeled, as to content, hazard?			
4. Have employees been trained in accordance with the HAZCOM procedure?			
5. Do employees (including subcontractors) know and understand the effects of exposure from the chemicals on site?			
6. Have all personnel signed the HAZCOM acknowledgment form?			
7. Is there an updated list of chemicals maintained on site?			
TRAINING			
1. Are tailgate safety meetings being conducted daily?			
2. Are current training/medical records maintained on site?			
DOCUMENTATION			
1. Is an OSHA 300 Log maintained on site and posted during the months of February, March, and April?			
2. Are accident report forms available?			
3. Is a copy of health and safety policy and procedures available on site?			

PROJECT SAFETY INSPECTION REPORT

PROJECT _____ DATE _____

ALL NEGATIVE RESPONSES	CORRECTIVE ACTION	ASSIGNED TO	DATE ASSIGNED	DATE COMPLETED	VERIFIED BY

DESCRIBE POSITIVE SAFETY OBSERVATIONS

ATTACHMENT 9C
MEDICAL FORMS

RETURN-TO-WORK EXAMINATION FORM

Exam Date: _____ / _____ / _____ **Employee Name:** _____

Birth Date: _____ / _____ / _____ **Social Security #:** _____ - _____ - _____

Job Title: _____ **Sex:** ❑ Male ❑ Female

Examining Provider: **Please complete this form and fax to Health Resources at (800) 853-2641. Please contact Health Resources at (800) 350-4511 to report status of employee post-treatment.**

DIAGNOSIS: _____

TREATMENT PLAN: _____

MEDICATIONS: _____

PHYSICAL THERAPY: _____

OTHER: _____

- ❑ May return to full duty work effective ___/___/
- ❑ May return to limited duty from ___/___/___ to ___/___/
- ❑ Unable to return to work from ___/___/___ to ___/___/

WORK LIMITATIONS:

- ❑ Restricted lifting/pushing/pulling: maximum weight in lbs: _____ (company limits all lifting to ≤ 60 lbs).
- ❑ Work only with right/left hand.
- ❑ Restricted repetitive motion right/left hand.
- ❑ Sitting job only.
- ❑ Restricted operation of moving equipment.
- ❑ Other: _____

FOLLOW-UP PLAN:

- ❑ Release from care.
- ❑ Schedule for follow-up appointment on ___/___/___.
  Time _____ AM/PM
- ❑ Referral to _____
  Appointment date ___/___/___ Time _____ AM/PM

Comments: _____

Examiner's Name (*print)*	Examiner's Signature	Date

SAFETY MEETING / TRAINING LOG

- ☐ Tailgate (daily)
- ☐ Activity Hazard Analysis (prior to new task or operation)
- ☐ Job Safety Analysis (prior to new task or operation)
- ☐ Site Safety Orientation (new personnel)
- ☐ Supervisor's (monthly)
- ☐ Supervisor's (weekly)
- ☐ UXO Awareness
- ☐ Asbestos Awareness
- ☐ Health and Safety Plan Addendum: _____
- ☐ Other: _____

Date/Time: _____ Client: _____

Location: _____ Job No.: _____

Meeting/training conducted by: _____

Work Activities: _____

Safety / Training Topics Presented

Chemical Hazards: _____

Physical Hazards: _____

Specific Safety Topic(s): _____

_____

Specific Training Covered: _____

_____

Attendees

Name Printed and Employee Number:	Signature:

SAFETY MEETING / TRAINING LOG
(Continued)

Date: ______________________________ Job No.:______________________

Attendees

Name Printed and Employee Number: Signature:

Safety, Health, and Emergency Response Plan Acknowledgment Form

I have read, understand, and agree to follow the Safety, Health, and Emergency Response Plan for the Colonie FUSRAP Site project. I understand that there will be additional safety and health requirements, which may be presented in task-specific Activity Hazard Analyses. I agree to abide by the requirements of the Activity Hazard Analyses for the work that I will perform.

Printed Name	Signature	Representing	Date

Safety, Health, and Emergency Response Plan Amendment Form

Amendment Number _____
Date Effective _____

Date: _____ Client: _____

Location: _____ Job No.: _____

Type of amendment:

☐ Change of text in SHERP ☐ Addition of form

☐ Addition of Activity Hazard Analysis ☐ Deletion of form

☐ Other:

Details of amendment (attach appropriate document/documentation):

Approved by: _____ Date: _____
Project Manager

Approved by: _____ Date: _____
Project Health and Safety Manager

Shaw®

SITE ENTRY LOG

Date: ______________________________ Client: ______________________________

Location: ______________________________ Job No.: ______________________________

Name	Representing	Time In	Time Out

Attatchment 2

REPORT ALL WORKER'S COMPENSATION INJURIES TO SHAW CLAIMS DEPARTMENT

FAX REPORT WITHIN 25 HOURS OF INCIDENT TO 225-932-2636

Phone all injuries/illnesses to Shaw Notification

Hotline/Helpdesk

1-866-299-3445

Supervisor's Employee Injury/Illness Report Form

Employee Information

Employee's Social Security Number:		Claim Number:	
Employee's Name		Home Phone Number:	
Home Address:			Business Line Code:
Male or Female:	Date of Birth:	Hire Date:	
Dependents:	Dependents Under 18:	Marital Status:	
Occupation:		Department Name:	
State Hired:		Hourly Wage:	
Days Worked Per Week:	Hours Per Week:	Hours Worked Per Day:	
Employment Status:	Employee Report No.:		Employee ID No.: N/A
Salaried continued:	Paid for Date of Injury:		Education No. Of Yrs.:
Ever Injured on the Job:	Supervisor Name & Phone No.:		

Employer Information

Empoyer Name: The Shaw Group Inc.		
Work Location:		
Contact Name: John Mollere	Telephone Number:	(800) 747-3322 Ext.2572
Employer SIC:	Employer Location Code:	
Employer FED ID:	Employer Code: N/A	
Nature of Business:		
Policy Number:		

Accident Information

Date and Time of Injury:		
Did the Accident Occur at the Work Location?	Yes	No
Accident Address:		
Nature of Incident:		
Give A Full Description of the Accident: (Be as Factually Complete As Possible)		

Are Other WC Claims Involved? No	Date and Time Reported to Employer:
Person Reported To:	

Witness Information

Were there any witnesses?

If yes, List Names and How to Contact Them:

Injury Information

Which Part of the Body was Injured? (e.g. Head, Neck,Arm, Leg)

What was the Nature of the Injury? (e.g. Fracture, Sprain, Laceration)

Part of body Location: (e.g. Left, Righjt Upper, Lower)

Injury Description:

Source of Injury:	Is Employee Hospitalized?
Lost Time: Yes No	If Yes, What Was First Full Day Out?
Date Last Day Worked:	Date Disability Began: N/A
Date Returned To Work:	Estimated Return Date: N/A

Medical Information

ER Treated & Released:	Hospitalized: Phy./Clinic:
Hospital - Name, Address, Phone Number	Was Employee Transported Via Ambulance? Yes No
N/A	

Clinic - Name, Address, Phone Number:

Additional Comments and Information

Reported Prepared By

Name:	Title:
Signature:	Phone:

Project: _____

Project Number: _____

TRAINING ACKNOWLEDGMENT FORM

By signing this certificate, you are acknowledging that you have completed the following formal training courses that meet OSHA's requirements:

Training	Date Completed
24-Hour HAZWOPER	_____
40-Hour HAZWOPER	_____
8-Hour Refresher	_____
8-Hour Supervisor	_____

Site-specific Training: I have been provided and have completed the site-specific training. The Site Safety and Health Officer conducted the training.

_____
Employee/Visitor Initials

Respiratory Protection: I have been trained in accordance with the criteria in Shaw Environmental, Inc.'s/my Employer's Respiratory Protection Program. I have been trained in the proper work procedures and use and limitations of the respirator(s) I will potentially wear. I have been trained in and will abide by the facial hair policy.

_____
Employee/Visitor Initials

Respirator Fit-test Training: I have been trained in the proper selection, fit, use, care, cleaning, and maintenance, and storage of the respirator(s) that I will potentially wear. I have been fit-tested in accordance with the criteria in Shaw Environmental, Inc.'s/my Employer's Respiratory Protection Program and have received a satisfactory fit. I have been assigned my individual respirator. I have been taught how to properly perform positive and negative pressure fit-check upon donning negative pressure respirators each time.

_____
Employee/Visitor Initials

Medical Examination: I have had a medical examination within the last twelve months, which was paid for by my employer. The examination included: health history, pulmonary function tests and may have included an evaluation of a chest x-ray. A physician made a determination regarding my physical capacity to perform work tasks on the project while wearing protective equipment including a respirator. I was personally provided a copy and informed of the results of that examination. The Site Safety and Health Officer evaluated the medical certification provided by the physician and signed the appropriate blank below. The physician determined that there:

Were no limitations to performing the required work tasks:

_____
Employee/Visitor Initials

Were identified physical limitations to performing the required work tasks:

_____
Employee/Visitor Initials

[Employee's] [Visitor's] Signature _____

Date _____

Printed Name _____

Site Safety and Health Officer Signature _____

Date _____

(For Safety Staff only)	REPORT NO.	EROC CODE	**UNITED STATES ARMY CORPS OF ENGINEERS** **ACCIDENT INVESTIGATION REPORT** *(For Use of this Form See Attached Instructions and USACE Suppl to AR 385-40)*	REQUIREMENT CONTROL SYMBOL: CEEC-S-8(R2)

1. ACCIDENT CLASSIFICATION

PERSONNEL CLASSIFICATION	INJURY/ILLNESS/FATAL	PROPERTY DAMAGE	MOTOR VEHICLE INVOLVED	DIVING
GOVERNMENT ☐ CIVILIAN ☐ MILITARY	☐	☐ FIRE INVOLVED ☐ OTHER	☐	☐
☐ CONTRACTOR	☐	☐ FIRE INVOLVED ☐ OTHER	☐	☐
☐ PUBLIC	☐ FATAL ☐ OTHER		☐	

2. PERSONAL DATA

a. NAME (Last, First, MI)	b. AGE	c. SEX ☐ MALE ☐ FEMALE	d. SOCIAL SECURITY NUMBER	e. GRADE

f. JOB SERIES/TITLE	g. DUTY STATUS	h. EMPLOYMENT STATUS AT TIME OF ACCIDENT
	☐ ON DUTY ☐ TDY ☐ OFF DUTY	☐ ARMY ACTIVE ☐ ARMY RESERVE ☐ VOLUNTEER ☐ PERMANENT ☐ FOREIGN NATIONAL ☐ SEASONAL ☐ TEMPORARY ☐ STUDENT ☐ OTHER (Specify)

3. GENERAL INFORMATION

a. DATE OF ACCIDENT *(month/day/year)*	b. TIME OF ACCIDENT *(military time)* hrs	c. EXACT LOCATION OF ACCIDENT	d. CONTRACTOR'S NAME (1) PRIME:

e. CONTRACT NUMBER	f. TYPE OF CONTRACT	g. HAZARDOUS/TOXIC WASTE	(2) SUBCONTRACTOR
☐ CIVIL WORKS ☐ MILITARY ☐ OTHER (SPECIFY)	☐ CONSTRUCTION ☐ SERVICE ☐ A/E ☐ DREDGE ☐ OTHER (SPECIFY)	☐ SUPERFUND ☐ DERP ☐ IRP ☐ OTHER (SPECIFY)	

4. CONSTRUCTION ACTIVITIES ***(Fill in line and corresponding code number in box from list - see instructions)***

a. CONSTRUCTION ACTIVITY	(CODE) #	b. TYPE OF CONSTRUCTION EQUIPMENT	(CODE) #

5. INJURY/ILLNESS INFORMATION ***(Include name on line and corresponding code number in box for items e, f & g - see instructions)***

a. SEVERITY OF ILLNESS/INJURY	(CODE) #	b. ESTIMATED DAYS LOST	c. ESTIMATED DAYS HOSPITALIZED	d. ESTIMATED DAYS REST. DUTY

e. BODY PART AFFECTED	(CODE) #	g. TYPE AND SOURCE OF INJURY/ILLNESS
PRIMARY		(CODE) #
SECONDARY	(CODE) #	TYPE
f. NATURE OF ILLNESS/INJURY	(CODE) #	(CODE) # SOURCE

6. PUBLIC FATALITY ***(Fill in line and correspondence code number in box - see instructions)***

a. ACTIVITY AT TIME OF ACCIDENT	(CODE) #	b. PERSONAL FLOATATION DEVICE USED? ☐ YES ☐ NO ☐ N/A

7. MOTOR VEHICLE ACCIDENT

a. TYPE OF VEHICLE	b. TYPE OF COLLISION	c. SEAT BELTS	USED	NOT USED	NOT AVAILABLE
☐ PICKUP/VAN ☐ AUTOMOBILE ☐ TRUCK ☐ OTHER (Specify)	☐ SIDE SWIPE ☐ HEAD ON ☐ REAR END ☐ BROADSIDE ☐ ROLL OVER ☐ BACKING ☐ OTHER (Specify)	(1) FRONT SEAT (2) REAR SEAT			

8. PROPERTY/MATERIAL INVOLVED

a. NAME OF ITEM	b. OWNERSHIP	c. $ AMOUNT OF DAMAGE
(1)		
(2)		
(3)		

9. VESSEL/FLOATING PLANT ACCIDENT ***(Fill in line and correspondence code number in box from list - see instructions)***

a. TYPE OF VESSEL/FLOATING PLANT	(CODE) #	b. TYPE OF COLLISION/MISHAP	(CODE) #

10. ACCIDENT DESCRIPTION (Use Additional paper, if necessary)

11. CASUAL FACTORS ***(Read Instructions Before Completing)***

a. (Explain YES answers in item 13	YES	NO
DESIGN: Was design of facility, workplace or equipment a factor?	☐	☐
INSPECTION/MAINTENANCE: Were inspection & maintenance procedures a factor?	☐	☐
PERSON'S PHYSICAL CONDITION: In your opinion, was the physical condition of the person a factor?	☐	☐
OPERATING PROCEDURES: Were operating procedures a factor?	☐	☐
JOB PRACTICES: Were any job safety/health practices not followed when the accident occurred?	☐	☐
HUIMAN FACTORS: Did any human factors such as size or strength of person, etc., contribute to accident?	☐	☐
ENVIRONMENTAL FACTORS: Did heat, cold, dust, sun, glare, etc. contribute to the accident?	☐	☐

a. (CONTINUED)	YES	NO
CHEMICAL AND PHYSICAL AGENT FACTORS: Did exposure to chemical agents, such as dust, fumes, mists, vapors, or physical agents such as noice, radiation, etc. contribute to accident?	☐	☐
OFFICE FACTORS: Did office setting such as, lifting office furniture, carrying, stooping, etc. contribute to the accident?	☐	☐
SUPPORT FACTORS: Were inappropriate tools/resources provided to properly perform the activity/task?	☐	☐
PERSONAL PROTECTIVE EQPT: Did the improper selection, use or maintenance of personal protective eqpt contribute to the accident?	☐	☐
DRUGS/ALCOHOL: In your opinion, was deugs or alcohol factor to the accident?	☐	☐

b. WAS A WRITTEN JOB/ACTIVITY HAZARD ANALYSIS COMPLETED FOR TASK BEING PERFORMED AT TIME OF ACCIDENT?

☐ YES (If yes, attach a copy) ☐ NO

12. TRAINING

a. WAS PERSON TRAINED TO PERFORM ACTIVITY/TASK?	b. TYPE OF TRAINING	c. DATE OF MOST RECENT FORMAL TRAINING
☐ YES ☐ NO	☐ CLASSROOM ☐ ON JOB	Month/Day/Year

13. FULLY EXPLAIN WHAT ALLOWED OR CAUSED THE ACCIDENT: INCLUDE DIRECT AND INDIRECT CAUSES (See instruction for definition of direct and indirect causes.) (Use additional paper, if necessary)

a. DIRECT CAUSE

b. INDIRECT CAUSE(S)

14. ACTION(S) TAKEN, ANTICIPATED OR RECOMMENDED TO ELIMINATE CAUSE(S)

DESCRIBE FULLY:

15. DATES FOR ACTIONS IDENTIFIED IN BLOCK 14

a. BEGINNING (Month/Day/Year)	b. ANTICIPATED COMPLETION (Month/Day/Year)		
c. SIGNATURE AND TITLE OF SUPERVISOR CORPS CONTRACTOR	d. DATE (Month/Day/Year)	e. ORGANIZATION IDENTIFIER (Div,Br,Sect)	f. OFFICE SYMBOL

16. MANAGEMENT REVIEW (1st)

a. ☐ CONCUR b. ☐ NON CONCUR c. COMMENTS

SIGNATURE	TITLE	DATE

17. MANAGEMENT REVIEW (2nd - Chief Operations, Construction, Engineering, etc.)

a. ☐ CONCUR b. ☐ NON CONCUR c. COMMENTS

SIGNATURE	TITLE	DATE

18. SAFETY AND OCCUPATIONAL HEALTH OFFICE REVIEW

a. ☐ CONCUR b. ☐ NON CONCUR c. ADDITIONAL ACTIONS/COMMENTS

SIGNATURE	TITLE	DATE

19. COMMAND APPROVAL

COMMENTS

COMMANDER SIGNATURE	DATE

* U.S. GOVERNMENT PRINTING OFFICE: 1993-0-791-757

10. ACCIDENT DESCRIPTION (Continuation)

13a. DIRECT CAUSE (Continuation)

13b. INDIRECT CAUSES (Continuation)

14. ACTION(S) TAKEN, ANTICIPATED, OR RECOMMENDED TO ELIMINATE CAUSE(S) (Continuation)

U.S. ARMY CORPS OF ENGINEERS
Safety Inspection Checklist for Construction Equipment
(Including Cranes, Derricks, and Hoisting Equipment)

Project Name:	Project Number:	Client:
Project	Contractor	Contract No.
Type and Make of Equipment	Model	Serial No.

Before any machinery or mechanized equipment is placed in use it shall be inspected and tested by a competent mechanic and certified to be in good operating condition. Records of tests and inspections shall be maintained as part of the active contract File at Project or Resident Office. Checklist set forth herein requires the application of EM 385-1-1, US Army Corps of Engineers Safety and Health Requirements Manual, September 1996. The appropriate EM paragraph to be applied is listed at the end of each testing requirement.

CHECKLIST	Yes	No	N/A
1. Are adequate and serviceable fire extinguishers provided? (09.E.01 through 09.E.03)			
2. Are all wire rope cables in good condition? (15.B.01 and 15.B.02)			
3. Are wire rope, sockets, splices, thimbles, and clips and adequate and properly applied? (15.B.03 through 15.B.08)			
4. Are hooks, safety nooks, shackles, rings, etc., in good condition?			
5. Are necessary platforms, foot-walks, etc., provided? (22.A.01 and 22.A.02)			
6. Are access steps, platforms, etc., provided with non-slip surfaces? (21.A.13)			
7. Is operator protected against the elements, falling or flying objects, swinging loads, and similar hazards? (16.B.10, 16.B.11, and 21.A.11)			
8. Are all glasses in operator's compartment safety glass and in good repair? (16.B.10 and 18.A.07)			
9. Is suitable access provided at lubrication points? (16.B.13)			
10. Do all modifications, extensions, replacement parts, and/or repairs to equipment maintain the same factor of safety as original designed equipment? (16.A.18)			
11. Are drums for load lines equipped with at least one positive holding device, applied directly to the motor shaft or some part of the train gear?			
12. Is there sufficient cable to allow three full wraps of cable on drums at all working positions? (16.C.10)			
13. Are adequate headlights, taillights, and turn signals provided and are they in proper operating condition (16.A.07 and 18.A.02 through 18.A.04)			
14. Are all approved brakes on wheeled equipment and in good operating condition? (16.A.07, 18.A.02, and 18.A.05)			
15. Do windshields have wipers in proper operating condition? (16.A.07, 18.A.02, and 18.A.06)			

CHECKLIST	Yes	No	N/A
16. Are rear view mirrors provided? (18.A.02 and 18.A.06)			
17. Are operating levers equipped with latch and other devices to prevent accidental starting? (18.A.10)			
18. Is engine equipped with power-operated starting device in operative condition? (18.A.06)			
19. Do all pressure vessels have valid inspection certificates? (20.A.03)			
20. Are reverse signal alarms on equipment? (16.B.01)			
21. Are belts, gears, shafts, electrical contacts, etc., adequately guarded? (16.B.03)			
22. Are all hot pipes and surfaces suitably guarded? (16.B.03)			
23. Are fuel tanks located so that spills or overflows will not come in contact with engine or exhaust? (16.B.04)			
24. Are exhausts and discharges so directed as not to endanger workmen or obstruct view of operator? (16.B.05)			
25. Are guards in place on equipment with drop type skip pans? (16.B.03)			
26. Are adequate seats provided for all riders? (16.A.07 and 18.C.01)			
27. Are tires in serviceable condition? Are testing/inspections documented? (18.A.02)			
28. Are steering linkage and tie rod in good operating condition? Are testing/inspections documented? (18.A.02)			
29. Are dump bodies provided with holding device or other suitable device for locking body in raised position? (18.A.10)			
30. Are tailgate dumping devices so arranged that operator will be in the clear while dumping loads? (18.A.10)			
31. Are trip handles provided on tailgates to facilitate handling? (18.A.10)			
32. Is the air hose free from leaks or defects? (20.B.03)			
33. Are safety lashings for quick make-up type connections provided? (20.A.16)			
34. Is an acceptable spark arrestor installed and working?			
35. Do heating devices comply with references?			
36. Does welding equipment comply with code requirements? (10.A.10 and 10.E.01)			
37. Is equipment adequately grounded? (10.E.04 and 10.E.07)			
38. Do electrical components comply with code? (10.E.01)			
39. Are required pressure, temperature, or relief gages and valves installed and operable? (20.A.10 through 20.A.13 and 20.B.02)			
40. Are approved seat belts and rollover protection provided? (16.B.08, 16.B.12, and 18.B.02)			
41. Is recommended preventive maintenance being followed? (16.A.08 and 18.A.02)			
42. Do helicopter cranes meet construction requirements (16.J.01)			
43. Does hydraulic equipment meet special safety conditions (11.H.08, 11.H.09, and 13.A.09)			
44. Is concrete equipment fitted with adequate safety devices? (27.A.04)			

CHECKLIST	Yes	No	N/A
45. Are elevating and rotating work platforms in conformance with ANSI A92.2? (22.K.01)			
46. Do conveyors, cableways, and related equipment conform to ANSI 320.01?			
47. Are pile drivers equipped with all appropriate safety devices? (16.L)			
48. Do material hoists conform to ANSI A10.5? (16.K.01)			
49. Do passenger elevators conform to ANSI A10.4? Do temporary hoists conform to ANSI A10.22: (21.H)			
50. Do hand and power tools comply with applicable ANSI standards (13.A through 13.G)			
51. Is high voltage sign posted?			
52. Is equipment fitted with positive stops for rotation when near power lines? (11.E and 16.D.06)			
53. Is there any visible evidence of damage to boom? (16.C.12 and Appendix H)			
54. Is the boom position indicator operating and visible to operator? (16.D.01 and 16.D.04)			
55. Have all operators had a current physical examination? (1.C and 16.C.04)			
56. Is breaking equipment capable of effectively braking, lowering, and safely holding a load of at least the full rated load as required?			

Remarks:

Certification: I hereby certify that this item of equipment is in good operating condition and that it meets all above requirements except as noted in the remarks.

_____ _____

Signature of Competent Mechanic Date

_____ _____

Signature of Superintendent/Quality Control Engineer Date

ATTACHMENT 3a
Vehicle Accident Report
Page 1 of 2

This report is to be initiated by the employee involved in the accident or his/her direct supervisor. Please answer all questions completely. This report must be forwarded to the appropriate health and safety reprresentative within 24 HOURS of the accident. Attach police report

ACCIDENT DESCRIPTION

ACCIDENT DATE: _____ TIME: _____ a.m. ☐ p.m. ☐

LOCATION OF ACCIDENT (CITY, STATE): _____

ACCIDENT DESCRIPTION: _____

WITNESS: _____ PHONE NUMBER: _____

ADDRESS: _____ CITY: _____ STATE & ZIP: _____

POLICE OFFICER'S NAME AND BADGE #: _____ DEPARTMENT: _____

COMPANY VEHICLE

DRIVER: _____ D.L. # _____ STATE: _____

ADDRESS: _____ CITY: _____ STATE & ZIP: _____

WORK PHONE NO.: _____ S.S. # _____ PROJECT # _____

VEHICLE NO.: _____ YR: _____ MAKE: _____ MODEL: _____ LIC. PLATE # _____

STATE: _____ VEHICLE OWNER: ☐ COMPANY ☐ LEASE/RENTED ☐ PRIVATE VEHICLE

VEHICLE TYPE: ☐ COMMERCIAL MOTOR VEHICLE ☐ NON-COMMERCIAL

IF NOT COMPANY-OWNED: OWNER _____ PHONE NO. _____

ADDRESS: _____ CITY: _____ STATE & ZIP: _____

VEHICLE DAMAGE: _____

NO. OF VEHICLES TOWED FROM SCENE: _____ NUMBER OF INJURIES: _____ NUMBER OF FATALITIES: _____

WERE HAZARDOUS MATERIALS RELEASED? YES ☐ NO ☐ IF YES, DESCRIBE MATERIALS

_____

OTHER VEHICLE

DRIVER: _____ D.L. # _____ STATE: _____

ADDRESS: _____ CITY: _____ STATE & ZIP: _____

WORK PHONE NO.: _____ S.S. # _____

OWNERS NAME (☐ CHECK IF SAME AS DRIVER) _____

ADDRESS: _____ CITY: _____ STATE & ZIP: _____

INSURANCE COMPANY: _____ POLICY # _____

AGENT'S NAME: _____ PHONE NO. _____

ADDRESS: _____ CITY: _____ STATE & ZIP: _____

VEHICLE YR: _____ MAKE: _____ MODEL: _____ LIC. PLATE # _____ LIC. PLATE # _____

VEHICLE I.D. NO. _____

VEHICLE DAMAGE: _____

PASSENGERS: YES ☐ NO ☐ INJURIES: YES ☐ NO ☐ (If Yes, list names and telphone numbers)

_____

ATTACHMENT 3b
VEHICLE ACCIDENT REPORT

WHEATHER: ☐ Clear ☐ Cloudy ☐ Fog ☐ Rain ☐ Sleet ☐ Snow OTHER: _____

PAVEMENT: ☐ Asphalt ☐ STEEL ☐ Concrete ☐ Wood ☐ Gravel/Dirt ☐ Brick/Stone OTHER: _____

CONDITION: ☐ Dry ☐ Wet ☐ Icy ☐ Pot Holes Other _____

TRAFFIC CONTROL: ☐ Traffic Light ☐ Stop Sign ☐ Railroad ☐ No Intersection ☐ No Control

ROADWAY: Number of Lanes Each Direction: _____ ☐ Divided Highway ☐ Divided Hwy ☐ Undivided Hwy

Draw and name roadways showing each vehicle, direction of travel, and point of impact. Indicate travel before the accident with a solid line, and post-accident movement with abroken line.

(You can copy and paste symbols and draw accordingly)

SYMBOLS:

Your Vehicle: (1)

Other Vehicle(s): (2) (3)

Pedestrian:

Stop Sign:

Yield:

Railroad: ‡

ADDITONAL INFORMATION: _____

Employee: _____ (Print) _____ (Signature) _____ (Date)

Supervisor: _____ (Print) _____ (Signature) _____ (Date)

Safety Rep.: _____ (Print) _____ (Signature) _____ (Date)

ATTACH POLICE REPORT TO VEHICLE ACCIDENT REPORT

REPORT MUST BE FAXED TO:

CORPORATE CLAIMS DEPARTMENT (FAX: 225-932-2636)

WITHIN 24 HOURS, OR NOT LATER THAN NEXT BUSINESS DAY

REPORT ALL CHARGEABLE VEHICLE ACCIDENTS TO SHAW NOTIFICTAION HOTLINE/HELPDESK
(PHONE: 1-866-299-3445)

Equipment Services Group

VEHICLE INSPECTION

UNIT NO: _____ **DATE:** _____
MILEAGE: _____ **CURRENT PROJECT NO:** _____
VEHICLE TYPE: _____ **LICENSE NUMBER:** _____
INSPECTED BY: _____ **FUEL FRONT:** _____
EMPLOYEE NUMBER: _____ **FUEL REAR:** _____

For Authorized Repairs On Donlen Vehicles, Call 1-800-323-1483

RETAIN THIS INSPECTION DOCUMENT IN PROJECT FILES

PRE-TRIP **Yes / No** **DAILY (USACE Project)** **Yes / No**

N / A = NOT APPLICABLE **C** = COMMENTS **O** = OKAY **N** = NEEDS ATTENTION

_____	Exterior / Interior Clean	_____	Engine Oil, Oil Pressure
_____	Lights: Head-Tail-Turn-Stop-Emergency-Backup	_____	Transmission Oil & Drive Line
_____	Operating Controls / Gauges	_____	Radiator / Cooling System
_____	Battery / Starter / Horn	_____	Exhaust / Muffler
_____	Air Conditioner / Heater / Defroster	_____	Front Axle / Steering / Suspension System
_____	Back-up Alarm (Trucks)	_____	Donlen Coupon Book
_____	Windshield, Other Glass, Wipers / Washers	_____	First Aid Kit
_____	Mirrors: Inside-Outside (Convex - trucks)	_____	Fire Extinguisher (mounted/accessible/charged)
_____	Insurance Card & Accident Report Kit	_____	Emergency Flares or Reflective Markers
_____	Emergency Phone Number List	_____	Tires / Wheels / Rims
_____	Map to Urgent Care Facility & Hospital	_____	Spare Tire, Jack, Lug Wrench
_____	Current Registration, Plates	_____	Frame / Bumpers
_____	Service Brakes, Emergency/Parking Brakes	_____	Seat Belts (One for Each Passenger)
_____	Trailer Aux Brake Controller/Electrical Connection	_____	Visible Damage to Body
_____	Coupling Devices/Safety Chain Anchor Point	_____	Driver Safety Notification Sticker
_____	Wheel Chocks (When Equipped With Trailer)	_____	Other, Please Enter Comments Below

Was Unit Serviced? Y / N **DATE** **MILES**

COMMENTS: _____

I am authorized to operate this vehicle. _____ Initials

I am licensed to operate this vehicle. _____ Initials

INSPECTORS SIGNATURE: **DATE:**

REPORT ALL DEFICIENCIES TO YOUR SUPERVISOR

Zero Accident Pledge

Shaw® Shaw Environmental, Inc.

We, the undersigned personnel of the Colonie FUSRAP Site Project, are committed to a goal of **ZERO ACCIDENTS** for the duration of the project:

Appendix D
Activity Hazard Analyses

Activity Hazard Analysis (AHA)

AHA Number 1.0

Activity: Field Mobilization Analyzed by/date: James R. Joice / 04-28-08 Reviewed by/date: _____

PRINCIPLE STEPS	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
Arrival of new personnel at site.	Untrained personnel.	- All personnel working on site shall attend the site safety orientation. - Collect personnel training certifications, such as confined space entry, forklift operator, etc. for availability on site.
	Medical qualifications.	- All personnel who will wear respirators shall submit current physician's certificate stating that employee is participating in an appropriate medical surveillance program meeting 29 Code of Federal Regulation (CFR) 1910.134.
	Allergies.	- Complete the Optional Allergy/Sensitivity Questionnaire, if desired.
	Unfamiliarity with: site, general (chemical, physical, environmental) site hazards, project safety rules and hazard control procedures, chain of command, and emergency procedures.	- Attend the site orientation training. - After personnel are trained in the contents of the Safety, Health, and Emergency Response Plan (SHERP), they shall sign the SHERP Acknowledgment Form. - Personnel who may enter utilidors shall attend Asbestos Awareness training.
Travel at project site.	See AHA Number 2.0, Vehicle Operations.	- Review all pertinent AHAs with personnel (as applicable).
Unload equipment/prepare site.	Heavy lifting/strains, sprains.	- No individual shall lift any object that weighs over 60 pounds. - Use proper lifting techniques. - For lifting objects over the 60-pound limit, multiple employees or the use of mechanical lifting devices is required.

Activity Hazard Analysis (AHA)

AHA Number 1.0

Activity: Field Mobilization Analyzed by/date: James R. Joice / 04-28-08 Reviewed by/date: _____

PRINCIPLE STEPS	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
Unload equipment/prepare site (continued).	Slips, trips, falls.	- Keep work areas clear and maintain housekeeping. - Do not jump from equipment or elevated surfaces.
	Hand injuries.	- Inspect items for sharp edges prior to handling them. - Wear leather gloves when handling sharp materials. - Be aware of and avoid pinch point hazards.
	Electrical.	- Use ground-fault circuit interrupters (GFCI) on all power tools and extension cords. - Extension cords, power tools, and lighting equipment shall be inspected before each use, protected from damage, and kept out of wet areas. - Keep extension cords off of roads. The extension cords amp rating will exceed the sum of amp ratings of equipment hooked up to them.
	Fire.	- Shut off engines before refueling. - A 40-B:C fire extinguisher shall be available at refueling areas. - Smoking shall not be permitted near fueling areas. - Smoking is permitted only in designated areas.

Activity Hazard Analysis (AHA)

AHA Number 1.0

Activity: Field Mobilization Analyzed by/date: James R. Joice / 04-28-08 Reviewed by/date: _____

PRINCIPLE STEPS	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
Working Outside.	Heat, cold, and severe weather.	- The SSHO will monitor weather conditions each day in order to plan and prepare for hazardous conditions. - The SSHO will identify a suitable storm shelter at each work location. - Work activities will be suspended prior to weather conditions becoming hazardous so that workers have ample time to seek shelter. - Upon seeing lightning or hearing thunder, outdoor activities shall be suspended and personnel shall be evacuated to safe areas (inside vehicles, buildings, or tornado shelters as appropriate). - Follow the procedures in Section 11 of the SHERP.

EQUIPMENT TO BE USED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
See specific AHAs Level D Personal Protective Equipment Heavy equipment Leather gloves Extension cords, power tools, GFCI Fire extinguisher AM/FM radio	Check Known Allergies Questionnaire, training, and medical certifications against personnel roster Site inspections (daily) Drill rig (U.S. Army Corps of Engineers form prior to use) Drill rig (daily) Extension cords, power tools, GFCI (before each use) Housekeeping (daily) Fire extinguisher (weekly) Housekeeping (daily) Monitor approaching storms	Site safety orientation Applicable AHAs Lifting/back safety Lockout/tagout procedures Fire extinguisher use Emergency procedures

Activity Hazard Analysis (AHA)

AHA Number 2.0

Activity: Vehicle Operations Analyzed by/date: James R. Joice / 04-28-08 Reviewed by/date:_____

PRINCIPAL STEPS	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
Travel to, from, or at project site.	Operation of motor vehicles and trucks - general.	- All company owned, leased, or rented vehicle operations shall comply with the requirements of Shaw Environmental, Inc. (Shaw) Procedure HS800, "Motor Vehicle Operation: General Requirements." All company owned, leased, or rented commercial vehicle operations shall comply with the requirements of Shaw Procedure HS810, "Commercial Motor Vehicle Operation and Maintenance." - Subcontractors operating motor vehicles at the base shall comply with all local traffic regulations. Subcontractors shall only use vehicles, which are in good condition and safe to operate. Make sure windshields are clean outside and inside (especially). - Inspect all vehicles on a daily basis. The vehicle inspection form is provided in the SHERP. Inspection documentation shall be submitted to the Site Safety and Health Officer. - Shaw personnel shall attend a defensive driving course. - Drive defensively, take adequate rest breaks, and wear seat belts while vehicles are in motion.

Activity Hazard Analysis (AHA)

AHA Number 2.0

Activity: Vehicle Operations Analyzed by/date: James R. Joice / 04-28-08 Reviewed by/date:_____

PRINCIPAL STEPS	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
Travel to, from, or at project site (continued).	Operation of motor vehicles and trucks – backing.	- Back into parking spaces upon arrival, whenever possible. - Walk around the vehicle before backing to identify any new conditions or obstructions. - Use a spotter when backing up whenever possible. - Understand all hand signals. - Sound vehicle horn prior to backing. - Check the rear-view and side mirrors prior to backing. (Note: All vehicles, other than automobiles, should have small convex mirrors attached to the side mirrors.) - Back slowly in areas of obstructed vision. - Anticipate others who may be backing out into their pathway and adjust accordingly.

Activity Hazard Analysis (AHA)

AHA Number 2.0

Activity: Vehicle Operations Analyzed by/date: James R. Joice / 04-28-08 Reviewed by/date:_____

PRINCIPAL STEPS	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
Travel to, from, or at project site (continued).	Operation of motor vehicles and trucks – speeding.	- Obey all posted speed limits. - Radar detectors are prohibited in all Shaw owned, leased, or rented vehicles. - Reduce travel speed during hazardous conditions (e.g., rain, fog, and snow). Personnel need to maintain 2 seconds between vehicles under normal conditions; 3 seconds behind motorcycles; 7 seconds when pulling a trailer behind a semi-truck; and 6 seconds when behind a semi-truck, no trailer; add additional seconds for rain, fog, etc.
	Operation of motor vehicles and trucks – spacing/distance.	- Determine whether their vehicle has anti-lock brakes. If it does, read the operators manual to determine how to use them properly. Test the brakes on a wet roadway so that they will know how to perform under emergency conditions. - Always leave an “out” for emergencies during travel. - Leave enough distance when stopping between your vehicle and the car in front of you. You must be able to see the rear tires of the vehicle in front, when stopped. - When at a red light, and it turns green, use the “delayed start” technique, by counting to three before you take your foot off the brake. - DO NOT TAILGATE.

Activity Hazard Analysis (AHA)

AHA Number 2.0

Activity: Vehicle Operations Analyzed by/date: James R. Joice / 04-28-08 Reviewed by/date:_____

PRINCIPAL STEPS	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
Travel to, from, or at project site (continued).	Operation of motor vehicles and trucks – skids.	- If the vehicle has begun to skid out of control, turn the steering wheel in the direction of the skid and readjust the wheel, as necessary. Place front-wheel drive vehicles in neutral to help control a skid. Check vehicle's manual for additional information. - Drive at slow speeds during hazardous travel conditions. - Use 4-wheel drive, if available, when driving vehicles off road, on steep inclines, muddy conditions, etc. - Do not take vehicles "off road" if they cannot be operated safely.
	Operation of motor vehicles and trucks – blind spots.	- Become familiar with any blind spots associated with your vehicle. - Adjust vehicle mirrors properly. - Use directional signals when turning. - Always look over your shoulder to verify that the lane is clear when changing lanes. - Use extra caution when approaching other drivers' blind spots.
	Operation of motor vehicles and trucks – cellular phones.	- Do not use handheld cellular phones while driving. - Pull over to the side of the road when making or receiving a call.

Activity Hazard Analysis (AHA)

AHA Number 2.0

Activity: Vehicle Operations Analyzed by/date: James R. Joice / 04-28-08 Reviewed by/date:_____

PRINCIPAL STEPS	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
Travel to, from, or at project site (continued).	Operation of motor vehicles and trucks – equipment failure.	- Perform the required inspections of your vehicle. - Do not use any vehicle with mechanical defects that may endanger the safety of the driver, passengers, or the public. - Verify that safety equipment is in the vehicle. Safety equipment should include a spare tire, jack, first aid kit, fire extinguisher, and flashlight. Flares and/or reflective triangles should be available in larger trucks. - Personnel shall ensure that the proper documentation is in the vehicle. Documentation should include an operations manual for the vehicle, insurance card, vehicle registration, and accident report forms.
	Operation of motor vehicles and trucks – influenced by drug and alcohol.	- Never drive under the influence of drugs or alcohol.
	Operation of motor vehicles and trucks – crossing railroad tracks.	- Stop, look, and listen before crossing. Be aware that multiple tracks may have more than one train using them, and the trains may be traveling in opposite directions.

Activity Hazard Analysis (AHA)

AHA Number 2.0

Activity: Vehicle Operations Analyzed by/date: James R. Joice / 04-28-08 Reviewed by/date:_____

PRINCIPAL STEPS	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
Travel to, from, or at project site (continued).	Operation of motor vehicles and trucks – driver attitude.	- Do not operate any vehicle when abnormally tired or under the influence of drugs or alcohol. - Keep an even temper when driving. Do not let the actions of others affect your attitude. - No employee is authorized to operate a company vehicle (including rentals) after having been on duty for a period of 12 hours. - No employee may drive for more than 12 hours in a single on-duty period.
	Operation of motor vehicles and trucks – vehicle loading.	- Do not overload the vehicle. - Secure all equipment within the body of the vehicle. - Do not block side view mirrors with the load. - Do not transport U.S. Department of Transportation manifested hazardous materials without a commercial driver's license with appropriate endorsements. All hazardous material shipments must have prior approval from the Project Manager and Project CIH. - Dispatch all equipment and personnel with proper forms and identification.

EQUIPMENT TO BE USED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
Seatbelt, spare tire and jack, first aid kit, fire extinguisher, flashlight, operations manual for the vehicle, insurance card, vehicle registration, and accident report forms	Vehicle inspections (daily) Vehicle inspections (prior to trips greater than 50 miles for Shaw provided vehicles)	Site orientation Licensed vehicle operators

Activity Hazard Analysis (AHA)

AHA Number 3.0

Activity: Monitoring Well Development and Sampling Analyzed by/date: James R. Joice / 4-28-08 Reviewed by/date: _____

PRINCIPLE STEPS	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
Develop monitoring wells and perform sampling.	Unfamiliarity with: site, general site hazards, project safety rules, chain of command, and emergency procedures. Active railroad tracks. Contaminated water (chemical and radiological) or hazardous chemicals (acidic preservatives). Use of pumps, sampling equipment, and hand tools.	- All personnel shall attend the site orientation training. - Complete Job Safety Analyses for each task on a daily basis. - Workers shall have FRA safety training and follow procedures in SHERP. - Monitor breathing zone of workers with PID. Notify the Site Safety and Health Officer (SSHO) if odors are detected. - Avoid physical contact with contaminated media or hazardous chemicals. - Personal protective equipment use is required when contact is possible or probable (see SHERP). - A portable eye wash station shall be readily available in the area where acids are being used. Personnel who sustain skin contact shall immediately wash the affected area with soap and water (eyes should be irrigated for 15 minutes with potable water) and report the incident to the SSHO. - Use acids in areas with adequate ventilation. - Properly label all containers. - Inspect hand tools and equipment daily and before each use. - Remove damaged tools from service. - Work in a manner and pace to reduce strains and overexertion.

Activity Hazard Analysis (AHA)

AHA Number 3.0

Activity: Monitoring Well Development and Sampling Analyzed by/date: James R. Joice / 4-28-08 Reviewed by/date: _____

PRINCIPLE STEPS	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
Develop monitoring wells and perform sampling (continued).	Slips, trips, and falls.	- Keep work areas clear and maintain housekeeping. - Do not jump from elevated surfaces. - Use caution when walking on rocky, slippery, or uneven terrain.
	Fire.	- Smoke only in designated areas. - Do not park vehicles in tall dry grass with the engine running. - Fire extinguishers shall be available at work locations. - Do not start gas powered equipment in fueling area (at least 10 feet away). - Store gasoline in safety cans with flash arrestors and spring-loaded vents.
	Use of portable generators.	- Refer to the generator manufacturer's instructions for safe operation. Check operator's manual for generator grounding requirements, if any. - Never use a generator in enclosed or partially enclosed spaces due to the quick build-up of high levels of carbon monoxide (CO). - Use proper lifting procedures when moving portable generators. - Use a heavy duty, outdoor-rated extension cord that is rated (in watts or amps) at least equal to the sum of the connected appliance loads (S, ST, SO, STO, SJ, SJO, SJT, SJOT). - Check that the entire cord is free of cuts or tears and that the plug has all three prongs, especially a grounding pin. - Before refueling the generator, turn it off and let it cool down. Gasoline spilled on hot engine parts could ignite.

Activity Hazard Analysis (AHA)

AHA Number 3.0

Activity: Monitoring Well Development and Sampling Analyzed by/date: James R. Joice / 4-28-08 Reviewed by/date: _____

PRINCIPLE STEPS	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
Develop monitoring wells and perform sampling (continued).	Noise.	- Complete a Site Layout Plan prior to mobilizing the drilling rig. The plan shall identify all overhead hazards.
	Overhead power lines.	- Before drilling equipment is moved, the travel route shall be surveyed for overhead and terrain hazards. The mast must be lowered before transporting equipment.
	Tip over of drill rig.	- The drill rig shall be positioned in a level fashion with stands and outriggers set.
	Unsafe drill rig.	- All components of the rig that has a direct bearing on the safety of the operation shall be inspected at the beginning of each shift and when possible, observed during operation. - All guards for moving machinery shall be in place. - Do not use rig if it is not in a safe operating condition. - A copy of the drill rig manual shall be available at the job site.
	Moving/operating parts and equipment.	- Be aware of pinch-point hazards and work in a manner to prevent injuries. - Keep hands out of areas that may present a pinching hazard and personnel shall not position themselves between equipment. - Drill crewmembers shall not wear loose clothing or jewelry. - The operator shall verbally alert employees and visually ensure employees are clear from dangerous parts of equipment prior to starting or engaging equipment. - Be aware of and avoid hot surfaces from heat generated from engine and rope friction.

Activity Hazard Analysis (AHA)

AHA Number 3.0

Activity: Monitoring Well Development and Sampling Analyzed by/date: James R. Joice / 4-28-08 Reviewed by/date: _____

PRINCIPLE STEPS	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
Develop monitoring wells and perform sampling (continued).	Hand injuries.	- Inspect items to be handled for sharp edges prior to being handled. - Wear leather gloves when handling sharp materials. - Be aware of and avoid pinch point hazards.
	Insect/animal bites/West Nile Virus.	- No individual shall lift any object that weighs over 60 pounds, including coolers. - Use proper lifting techniques. - Multiple employees or the use of mechanical lifting devices are required for lifting objects over the 60-pound limit. - Review injury potential with workers. - Observe well at a distance to determine if wasps are active at well. Return to wells with active wasps early in the morning when wasp activity is low. - Consider the use of a professional exterminator, if large wasp population is observed. - Use protective insect repellents containing DEET to prevent insect bites. - Check limbs/body for insects/ insect bites before showering. - Consider applying Permethrin (Repel Permanone or equivalent) preparations to clothing to repel ticks, chiggers, mosquitoes, and/or spiders. - Notify SSHO of flu-like symptoms. - Blousing pant legs into socks may help prevent tick bites.

Activity Hazard Analysis (AHA)

AHA Number 3.0

Activity: Monitoring Well Development and Sampling Analyzed by/date: James R. Joice / 4-28-08 Reviewed by/date: _____

PRINCIPLE STEPS	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
Develop monitoring wells and perform sampling (continued).	Contact dermatitis and poison ivy.	- Identify workers who are known to contract poison ivy. - Learn to identify poisonous plants. - Check around work areas to identify if poison ivy is present. - Wear long-sleeve shirts/trousers or Tyvek® coveralls to avoid skin contact with plants or other skin irritants. - Avoid unnecessary clearing of plant/vegetation areas. - Cover vegetation with plastic (visqueen) where sampling position raises exposure potential. - Apply protective cream/lotion to exposed skin to prevent poison ivy or similar reactions.
	Heat/cold.	- Follow procedures outlined in the SHERP.
	Noise.	- Personnel working in vicinity of drilling rig, air compressor, and generator shall wear hearing protection while equipment is in operation to reduce exposures to below the Occupational Safety and Health Administration limits.
	Severe weather.	- The SSHO will monitor weather conditions each day in order to plan and prepare for hazardous conditions. - The SSHO will identify a suitable tornado shelter at each work location. - Work activities will be suspended prior to weather conditions becoming hazardous so that workers have ample time to seek shelter. - Upon seeing lightning or hearing thunder, outdoor activities shall be suspended and personnel shall be evacuated to safe areas (inside vehicles, buildings, or tornado shelters as appropriate).

Activity Hazard Analysis (AHA)

AHA Number 3.0

Activity: Monitoring Well Development and Sampling Analyzed by/date: James R. Joice / 4-28-08 Reviewed by/date: _____

EQUIPMENT TO BE USED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
Hearing protection Level D Modified Photoionization detector Hand sprayer Chemical splash goggles Eyewash station Heavy duty extension cords (S, ST, SO, STO, SJ, SJO, SJT, SJOT) Drinking water Leather gloves Insect repellant (DEET) Repel Permanone AM/FM radio	Hand tools (before each use) Eyewash station (daily) Site inspections (daily) Extension cords (before each use) Survey areas for poisonous plants, insects, and animals Check body for ticks Verify tornado shelter available Monitor approaching storms Drill rig (initial U.S. Army Corps of Engineers before use) Daily Drill Rig Inspection Checklist Site layout plan completed	Site orientation HAZWOPER Hearing conservation Hazard Communication Biological hazard identification and control Emergency procedures Tornado shelter locations Lightning safety procedures Drilling operations

Activity Hazard Analysis (AHA)

AHA Number 4.0

Activity: Fueling Operations Analyzed by/date: James R. Joice / 04-28-08 Reviewed by/date: _____

PRINCIPAL STEPS	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
Fueling operations.	Exposures to fuels.	- Periodically review the Material Safety Data Sheets (MSDS) for the fuels that are being used at the project. - Perform the handling and use of fuels in well-ventilated areas. - Avoid skin and eye contact with fuels. - Wear safety glasses and disposable nitrile gloves while handling fuels. - A small eyewash bottle shall be readily available when fueling equipment. - If you get fuel in their eyes, then the eyes shall be irrigated with the entire contents of the eye wash bottle and then the employee shall seek medical assistance. - If you sustain skin contact with fuels, then the affected area shall be immediately washed with soap and water.
	Fire extinguisher requirements.	- If you sustain fuel contact with clothing, then clothing shall be removed and changed immediately. - A 2-A:10-B:C fire extinguisher shall be readily available when fueling equipment at any location on site. - A 40-B:C fire extinguisher shall be readily available when fueling equipment at a bulk tank on site. - Personnel who intend to extinguish small fires shall be trained in the use of fire extinguishers. - Equipment and property are of secondary concern in a fire situation - never try to extinguish a fire if there is any doubt that it can be extinguished safely.

Activity Hazard Analysis (AHA)

AHA Number 4.0

Activity: Fueling Operations Analyzed by/date: James R. Joice / 04-28-08 Reviewed by/date: _____

PRINCIPAL STEPS	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
Fueling operations (continued).	Fire: elimination of ignition sources – hot surfaces.	- Shut down all vehicles and equipment prior to fueling. - Allow small equipment, such as generators, mowers, pressure washers, etc. to cool prior to refueling. - Allow heavy equipment with the fuel cap near the engine or near other hot surfaces to cool prior to refueling.
	Fire: elimination of ignition sources – arcs/sparks/open flames.	- Do not smoke within 50 feet of fueling operations. - Visually survey the immediate area for open flames and other ignition sources prior to commencing fueling operations. - Do not use cell phones or two-way radios during fueling operations.
	Fire: elimination of ignition sources – static electricity.	- Do not fill portable fuel cans that are in the bed of a pickup truck or in the trunk of an automobile. - Filling fuel containers on plastic pickup truck bed-liners can cause static electric discharges, which may ignite the fuel. - Remove the fuel can(s) from the truck bed or automobile trunk and place on the ground before adding fuel. - Maintain electrical continuity between the portable fuel can and the tank being filled. - Use a bonding cable to maintain continuity between the metal fuel container and the equipment fuel tank.

Activity Hazard Analysis (AHA)

AHA Number 4.0

Activity: Fueling Operations Analyzed by/date: James R. Joice / 04-28-08 Reviewed by/date: _____

PRINCIPAL STEPS	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
Fueling operations (continued).	Fire: elimination of ignition sources – static electricity (continued).	- Avoid "free-fall" of fuel into tanks. - Do not re-enter vehicles while fueling is underway due to the static electric charge generated between clothing and vehicle seats. - If you absolutely have to get in your vehicle while the gas is pumping, make sure you touch metal away from fueling point, before you pull the nozzle out. This way the static from your body will be discharged before you remove the nozzle.
	Storage and transportation: saddle tanks in pick-up trucks.	- Do not transport gasoline in portable saddle tanks – only diesel fuel shall be transported in saddle tanks. - All portable saddle tanks mounted in pick-up trucks shall be manufactured to meet U.S. Department of Transportation (DOT) specifications. - Securely mount all portable saddle tanks to the pick-up truck, as recommended by the manufacturer. - Properly mark all saddle tanks (see 49 Code of Federal Regulation 172.101) with the proper shipping name and labeled for "No Smoking." - No more than 110 gallons of diesel fuel may be transported in a saddle tank unless all the DOT Hazardous Material Regulations are complied with, such as proper packaging, completing shipping papers, placarding, and the appropriate HM 126 Training (as well as having been provided emergency response information and training.) - Securely close caps on saddle tanks. - Inspect saddle tanks daily to check for leaks. - Notify drivers that they are transporting hazardous materials.

Activity Hazard Analysis (AHA)

AHA Number 4.0

Activity: Fueling Operations Analyzed by/date: James R. Joice / 04-28-08 Reviewed by/date: _____

PRINCIPAL STEPS	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
Fueling operations (continued).	Storage and transportation: five-gallon cans in pick-up trucks.	- Store and transport gasoline in properly marked/labeled five-gallon safety cans (equipped with self-venting cap and flash arrestor). - Secure gasoline cans to prevent movement during transportation. - No more than six, five gallon containers of gasoline may be transported in vehicles (back of pick-up trucks or trailers) at the same time unless all the DOT Hazardous Material Regulations are complied with, such as proper packaging, completing shipping papers, placarding (as required), and the appropriate HM 126 Training (as well as having been provided emergency response information and training). - The total quantity of hazardous materials may never exceed 400 pounds total. - Hazardous materials must be secured prior to transporting. - Drivers must be notified that they are transporting hazardous materials.
	Storage of fuel on site.	- Portable gasoline cans must be stored within the flammable materials storage cabinet. Bulk storage tanks on site are prohibited without permission from the Project HSM.
	Spills.	- Report all spills to the Shaw Project Manager for clean up.

EQUIPMENT TO BE USED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
Safety glasses and disposable nitrile gloves Eye wash bottle Fire extinguishers Bonding cable Saddle tanks Five-gallon safety cans (equipped with self-venting cap and flash arrestor)	Verify eye wash bottle is readily available Fire extinguisher (before fueling equipment) Survey area for ignition sources (prior to commencing fueling operations) Verify MSDSs for fuels are available in vehicles transporting fuels Saddle tanks (daily)	Review MSDS for fuels Portable fire extinguisher use Bonding techniques Materials of Trade Hazard communication

Activity Hazard Analysis (AHA)

AHA Number 5.0

Activity: Equipment Decontamination Analyzed by/date: James R. Joice / 4-28-08 Reviewed by/date: _____

PRINCIPAL STEPS	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
Equipment decontamination.	Slips, trips, falls.	- Be cautious when walking/working on slippery surfaces. - Maintain good house keeping in the decontamination area. - Maintain hoses and extension cords in an orderly fashion
	Heavy lifting.	- No individual shall lift any object that weighs over 60 pounds. - Use proper lifting techniques. - For lifting objects over the 60-pound limit, multiple employees or the use of mechanical lifting devices is required.
	Hazardous materials/contaminated equipment.	- Avoid physical contact with contaminated equipment or hazardous chemicals. - Personal protective equipment use is required when contact is possible/probable, which may include face shields, aprons, gloves, boots, etc. - Personnel who sustain skin contact shall immediately wash the affected area with soap and water (eyes should be irrigated for 15 minutes with potable water) and report the incident to the Site Safety and Health Officer (SSHO).
	Small tool use.	- Inspect tools daily and before each use. - Remove damaged tools from service.

PRINCIPAL STEPS	POTENTIAL HAZARDS	RECOMMENDED CONTROLS

Activity Hazard Analysis (AHA)

AHA Number 5.0

Activity: Equipment Decontamination Analyzed by/date: James R. Joice / 4-28-08 Reviewed by/date: _____

Equipment decontamination.	Use of pressure or steam washer.	- Inspect the pressure/steam washer before each use. Use the manufacturer's instruction manual to guide the inspection process. - All personnel associated with the use of steam/pressure washers shall wear Level D-Modified personal protective equipment (PPE). Rain gear shall be worn by personnel in addition to Nitrile gloves. - Avoid physical contact with contaminated media or hazardous chemicals. Personnel who sustain skin contact shall immediately wash the affected area with soap and report the incident to the SSHO. - Wash hands and face at the conclusion of decontamination activities and before breaks. - Personnel shall be trained in the use of the washing equipment. - All personnel working in the equipment decontamination area shall be trained in the emergency shut-off procedures for the equipment being used. - Use the minimum amount of steam/pressure that will complete the job. - Do not use pressure washers exceeding 3,000 pounds per square inch without the approval of the Project HSM.

PRINCIPAL STEPS	POTENTIAL HAZARDS	RECOMMENDED CONTROLS

Activity Hazard Analysis (AHA)

AHA Number 5.0

Activity: Equipment Decontamination Analyzed by/date: James R. Joice / 4-28-08 Reviewed by/date: _____

Equipment decontamination (continued).	Pressure/steam washing (continued).	- Only direct the spray from equipment at surfaces to be cleaned and never at body parts or other personnel. - Personnel in the immediate area shall use face shields and metatarsal/shin guards. - Be aware that the spray from a pressure washer can easily cut into skin like a knife. - Keep a firm grip on the wand and do not point it at anything that is not being washed. - Maintain good footing while operating pressure washer. - Never wire or fixed the trigger on the wand in the open position. - Take adequate breaks to avoid fatigue.
	Hot surfaces.	- Avoid touching hot surfaces. - Shut off engines and allow to cool prior to refueling. - Wear 100% cotton clothing under synthetic PPE.
	Heat stress/cold stress	- Take breaks as necessary. - Hot or cool beverages shall be provided to personnel during breaks. - Additional precautionary measures for heat stress, detailed in the SHERP, are applicable.

Activity Hazard Analysis (AHA)

AHA Number 5.0

Activity: Equipment Decontamination Analyzed by/date: James R. Joice / 4-28-08 Reviewed by/date: _____

PRINCIPAL STEPS	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
Equipment decontamination.	Use of methanol.	- Keep methanol in storage cabinets when not in use. Maintain on-site quantities of methanol to less than four gallons. - Only use methanol away from hot surfaces, in areas where smoking is prohibited, and in areas where all ignition sources have been removed. - Use methanol outdoors or in areas with adequate ventilation. - Personnel using methanol shall wear safety glasses, Silver Shield gloves, and 100% cotton clothing under Saranex coated Tyvek® coveralls. - A fire extinguisher and charged water hose shall be available in the immediate area where methanol is being used. - Avoid physical contact with methanol. - Personnel who sustain skin contact shall immediately wash the affected area with soap and water (eyes should be irrigated for 15 minutes with potable water) and report the incident to the Site Safety and Health Officer. - An eye wash station shall be readily available in the area where methanol is being used. - Properly label all containers.

Activity Hazard Analysis (AHA)

AHA Number 5.0

Activity: Equipment Decontamination Analyzed by/date: James R. Joice / 4-28-08 Reviewed by/date: _____

EQUIPMENT TO BE USED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
Level D-Modified PPE (See SHERP) Eye wash station Pressure/steam washer Rain Gear, nitrile gloves Metatarsal/shin guards, face shield, etc. Fire extinguisher AM/FM radio	Site inspection (daily) Eye wash station (daily) Tools (before each use) Equipment cleanliness (post-decontamination) Pressure/steam washer (daily per manufacturer) Identify surfaces that get hot Verify tornado shelter available Monitor approaching storms	HAZWOPER Pressure/steam washer operation Heat stress/cold stress procedures Emergency procedures Tornado shelter locations Lightning Safety Procedures

Appendix E
Hazardous Chemical Inventory List & Material Safety Data Sheets (MSDS)

Project Location: Colonie NY
Client: USACE
Project Number: 131658

Hazardous Chemical Inventory List

Available on Site	Chemical	Exact Name from Container Label
X	Gasoline	Unleaded Gasoline

MATERIAL SAFETY DATA SHEET

Section 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

CHS Inc.
P.O. Box 64089
Mail station 525
St. Paul, MN 55164-0089

Transportation Emergency (CHEMTREC): 1-800-424-9300
Technical Information: 1-651-355-8443
MSDS Information: 1-651-355-8438

PRODUCT NAME: Regular, Midgrade & Premium Unleaded Gasoline
COMMON NAME: Unleaded Gasoline, Premium Unleaded Gasoline
CHEMICAL NAME: Light Petroleum Distillate

MSDS: 0147- M6A0 - Rev. G (01/03/07)
CHEMICAL FORMULA: Mixture
CHEMICAL FAMILY: Mixed Petroleum Hydrocarbon

Section 2 - COMPOSITION AND INFORMATION ON INGREDIENTS

INGREDIENTS	PERCENTAGES (by weight)	PEL (OSHA)	TLV (ACGIH)	CAS #
Product				
Gasoline (Mixture)	100	300 ppm TWA 500 ppm STEL	300 ppm TWA 500 ppm STEL	8006-61-9
Ingredients				
Toluene	< 20	200 ppm TWA	50 ppm TWA	108-88-3
Xylene Isomers	< 20	100 ppm TWA 150 ppm STEL	100 ppm TWA 150 ppm STEL	1330-20-7
Benzene	< 5	1 ppm TWA 5 ppm STEL	0.5 ppm TWA 2.5 ppm STEL	71-43-2
1,2,4-Trimethylbenzene	< 5	25 ppm TWA	25 ppm TWA	95-63-6
Ethyl Benzene	< 5	100 ppm TWA 125 ppm STEL	100 ppm TWA 125 ppm STEL	100-41-4
n-Hexane	< 4	500 ppm TWA	50 ppm TWA Skin	110-54-3
Naphthalene	< 0.5	10 ppm TWA	10 ppm TWA	91-20-3

(TWA) - Time Weighted Average is the employee's average airborne exposure in any 8-hour work shift of a 40-hour work week which shall not be exceeded.
(STEL) - Short Term Exposure Limit is the employee's 15-minute time weighted average exposure which shall not be exceeded at any time during a work day unless another time limit is specified.

Section 3 - HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

Reddish golden brown liquid with gasoline odor - HIGHLY FLAMMABLE LIQUID.
DANGER! Contains Benzene. Cancer Hazard. Can cause kidney, liver and blood disorders.

OSHA HAZARD CLASS

Based on OSHA definitions, the following ingredients in this product are hazardous. The OSHA physical and health hazard categories are shown below. **Note: CHS has not conducted specific toxicity tests on this product. Our hazard evaluation is based on information from similar products, the ingredients, technical literature, and/or professional experience**

Gasoline - Flammable, toxic, irritant, target organ (CNS)
Toluene - Flammable, toxic, irritant, target organ (CNS)
Xylene - Flammable, toxic, irritant
Benzene - Flammable, irritant, carcinogen, target organ (kidney, liver, blood)
1,2,4-Trimethylbenzene - Flammable, toxic, irritant, target organ (CNS, blood)
Ethylbenzene - Flammable, toxic, irritant

POTENTIAL HEALTH EFFECTS

ROUTES OF ENTRY: Inhalation, Dermal, Ingestion.

ACUTE EFFECTS OF OVER EXPOSURE:

Eyes - Slight to moderate eye irritation.

Skin - Moderately irritating; causes redness, drying of skin.

Inhalation - Irritating to mucous membranes and respiratory tract. Causes dizziness, irritation of eyes, nose and throat, signs of intoxications. Can act as a simple asphyxiant.

Ingestion - Burning of the throat and stomach, loss of consciousness, convulsions, cyanosis, congestion and capillary hemorrhaging of the lungs and internal organs. Possible pneumonia (if vomited), loss of consciousness, and death.

CHRONIC EFFECTS OF OVER EXPOSURE: Suspect carcinogen from long term exposure studies on laboratory animals. Recent studies with laboratory animals have shown that gasoline vapors caused kidney damage and kidney cancer in rats and liver cancer in mice.

Mouse skin painting studies have shown that petroleum middle distillates (boiling range of 100-700°F) can cause skin cancer when repeatedly applied and never washed from the animal's skin. The relative significance of this to the skin and the resulting skin effects (irritation, cell damage, etc.) may play a role in the tumorigenic response. Studies have shown that washing the animal's skin with soap and water between treatments greatly reduces the carcinogenic effect of some petroleum oils.

A few studies have indicated that workers exposed many years to high concentrations of benzene have a slightly higher incidence of leukemia. Benzene can also be toxic to the blood and blood-forming tissues. For additional information on employee monitoring, information and training, medical surveillance, methods of compliance, etc., refer to the OSHA benzene standard, CFR 1910.1028.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: May aggravate pre-existing dermatitis, respiratory illness, or other conditions which have the same symptoms or effects as stated above.

CARCINOGENICITY:

Unleaded Gasoline -	**NTP:** No	**IARC:** No	**OSHA:** No
Benzene -	**NTP:** Yes	**IARC:** Yes	**OSHA:** Yes

Section 4 - FIRST AID MEASURES

EMERGENCY AND FIRST AID PROCEDURES:

Eye Contact - If material comes in contact with the eyes, immediately wash the eyes with large amounts of water, occasionally lifting the lower and upper lids until medical attention can be obtained.

Skin Contact - Remove contaminated clothing. Wash affected areas with soap and water. If irritation or redness develops, seek medical attention.

Inhalation - Move person away from source of exposure and into fresh air. If symptoms persist, seek immediate medical attention. Apply artificial respiration or cardiopulmonary resuscitation if not breathing. Get medical attention.

Ingestion - Never give anything by mouth to an unconscious person. Do **not** induce vomiting. Aspiration of material into the lungs due to vomiting can cause chemical pneumonitis which can be fatal. If spontaneous vomiting occurs, keep head below hips to prevent aspiration of liquid into lungs and monitor for breathing difficulty. Seek medical attention immediately. Keep victim warm and quiet.

Section 5 - FIRE - FIGHTING MEASURES

FLASH POINT: -40°F (TCC) **AUTO IGNITION TEMP:** 495-850°F

FLAMMABLE LIMITS IN AIR	**LOWER**	**UPPER**
% BY VOLUME	1.4	7.6

EXTINGUISHING MEDIA: Dry Chemical, Foam, Carbon Dioxide (CO_2), Water (fog pattern).

SPECIAL FIRE FIGHTING PROCEDURES: Water may be ineffective on flames, but should be used to keep fire-exposed containers cool. Large fires, such as tank fires, should be fought with caution. If possible, pump the contents from the tank and keep adjoining structures cool and protect personnel. Avoid spreading burning liquid with water used for cooling purposes. Do not flush down public sewers. The use of a self-contained breathing apparatus and protective clothing is recommended for fire fighters. Avoid inhalation of vapors.

UNUSUAL FIRE AND EXPLOSION HAZARDS: Highly volatile material. Flowing gasoline can be ignited by self-generated static electricity; containers should be bonded and grounded. Vapors may travel along the ground to a source of ignition (pilot light, heater, electric motor) some distance away. Containers, drums (even empty) can explode when heat (welding, cutting, etc.) is applied.

HAZARD RATINGS:				
	NFPA 704:	Health- 1	Fire- 3	Reactivity- 0
	HMIS:	Health- 2	Fire- 4	Reactivity- 0

Section 6 - ACCIDENTAL RELEASE MEASURES

STEPS TO TAKE IF MATERIAL IS RELEASED OR SPILLED: Notify emergency response personnel as appropriate. If facility or operation has an "Oil or Hazardous Substance Contingency Plan", "Spill Prevention Control & Countermeasures (SPCC) Plan" or equivalent, activate its procedures. REMOVE ALL SOURCES OF IGNITION. Keep unnecessary people away; isolate hazard area and deny entry. Contain spill if possible. Small spills can be removed with inert absorbent. Dike area of large spill to prevent run-off to sewers, streams, etc. Ventilate area. Avoid breathing vapors. Use appropriate personal protective equipment during clean up. Contact fire authorities and notify appropriate Federal, State, and Local agencies.

Section 7 - HANDLING AND STORAGE

HANDLING AND STORING: Transport, handle and store in accordance with OSHA Regulation 29 CFR 1910.106, and applicable D.O.T. Regulations. Store in tightly closed containers in a dry cool place, away from sources of heat or ignition. Ground and bond all transfer and storage equipment and equip with self-closing valves, pressure vacuum bungs and flame arrestors. **Caution:** Misuse of empty containers can be hazardous. Empty containers can be hazardous if used to store toxic, flammable, or reactive materials. Cutting, welding or other of empty containers might cause fire, explosion or toxic fumes from residues. Do not pressurize or expose to open flame, heat, sparks or other sources of ignition. Do not siphon gasoline by mouth.

> **WARNING:** Danger! Contains Benzene. Cancer Hazard. Can cause kidney, liver and blood disorders. **Other:** Do not siphon gasoline by mouth. May cause irritation to eyes, skin and respiratory system. Avoid liquid, mist and vapor contact. Harmful or fatal if swallowed. Aspiration hazard, can enter lungs and cause damage. May cause irritation or be harmful if inhaled or absorbed through the skin. Flammable Liquid. Vapors may explode.

Section 8 - EXPOSURE CONTROL - PERSONAL PROTECTION

ENGINEERING CONTROLS: Provide adequate ventilation to keep vapors below permissible concentrations.

RESPIRATORY EQUIPMENT: Use appropriate NIOSH-approved respiratory protection where atmospheric concentrations may exceed acceptable exposure limits. Self-contained breathing apparatus or supplied air respiratory protection required for entry into tanks, vessels, or other confined spaced containing gasoline.

EYE PROTECTION: Chemical type goggles or face shield where contact with liquid or mist may occur.

PROTECTIVE CLOTHING: Wear impervious clothing and gloves when contact with skin may occur.**OTHER (SAFETY SHOWERS, EYE WASH STATIONS, ETC.):** Emergency eye wash station and safety shower where operations and exposure warrant. Loading, unloading, tank gauging, etc., remain upwind.

Section 9 - PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE: Reddish golden brown liquid

ODOR: Gasoline odor (odor threshold approximately 10 ppm).

BOILING POINT: 760 mmHg @ 80°F

SPECIFIC GRAVITY (water=1): .72

VAPOR PRESSURE: 400 mmHg @ 68°F

VAPOR DENSITY (air=1): 4

SOLUBLE IN WATER: Negligible

EVAPORATION RATE (ether=1): Slower

pH: N/D

Section 10 - STABILITY AND REACTIVITY

STABILITY

STABLE **X** (At room temperature and pressure. See handling and storage section)
UNSTABLE _____

INCOMPATIBILITY -

CONDITIONS TO AVOID: Heat, sparks, flame, build-up of static electricity, and other sources of ignition should be avoided.

MATERIALS TO AVOID: Strong oxidizing agents, halogens, strong acids, and alkalies.

HAZARDOUS DECOMPOSITION PRODUCTS: Carbon monoxide, carbon dioxide, and hydrocarbons.

HAZARDOUS POLYMERIZATION: Has not been reported to occur under normal temperatures and pressures.

Section 11 - TOXICOLOGY INFORMATION

Note: CHS has not conducted specific toxicity tests on this product.

Section 12 - ECOLOGICAL INFORMATION

Note: CHS has not conducted specific ecological tests on this product.

Section 13 - DISPOSAL CONSIDERATION

WASTE DISPOSAL PROCEDURES: Recycle as much of the recoverable product as possible. Do not flush to drain or storm sewer or otherwise release to the environment. Dispose of non-recyclable material as a RCRA hazardous waste, complying with federal, state and local regulations. Note: Re-evaluation of this product may be required by the user at the time of disposal, since the product uses, transformations, mixtures and processes may change classification to non-hazardous or hazardous for reasons other than, or in addition to ignitable.

Section 14 - TRANSPORTATION

DOT PROPER SHIPPING NAME: Gasoline*

DOT HAZARD CLASS: Flammable Liquid*

DOT IDENTIFICATION NUMBER: UN 1203

DOT EMER. RESPONSE GUIDE NO.: 128

*EFFECTIVE 10/1/93 DOT's HM-181 changes how materials are classified. Proper Shipping Name-**Gasoline**; Hazard Class-**3**; UN/NA Identification #- **UN 1203**; **Packing Group II**; Placard-**FLAMMABLE**

Section 15 - REGULATORY INFORMATION

This product contains the following toxic chemicals subject to the reporting requirements of SARA Section 313 of the Emergency Planning and Community Right-To-Know Act of 1986 and of 40 CFR 372:

CAS Number	Chemical Name	Percent by Weight
108-88-3	Toluene	Up to 18.1%
1330-20-7	Xylene	Up to 15.3%
71-43-2	Benzene	Up to 5.3%
95-63-6	1,2,4 Trimethylbenzene	Up to 4.8%
100-41-4	Ethylbenzene	Up to 2.6%
110-54-3	n-Hexane	Up to 4%
91-20-3	Naphthalene	Up to 1%

SARA SECTION 311-312 HAZARD CATEGORIES (40 CFR 370.2):

FIRE: Yes **SUDDEN RELEASE OF PRESSURE:** No **REACTIVE:** No **ACUTE:** Yes **CHRONIC:** Yes

Section 16 - OTHER INFORMATION

Updated By: Hue Lam Date: January 03, 2007

Title: EHS Compliance Specialist Supersedes: December 24, 2003

Reason for Issue: Periodic review and update

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Appendix F
Incident Notification, Reporting and Management Procedure

Incident Notification, Reporting, and Management Procedure

Directions, Notes, and Reminders

- Follow this procedure step-by-step for all incidents.
- This procedure has limited application to subcontractors. Assist subcontractors with medical emergencies (as applicable) and then immediately notify the Program H & S Manager for guidance.
- Periodically review this procedure in order to be familiar with the steps - prior to an incident occurring.
- For injuries and vehicle accidents, secure the scene to prevent additional injury/incident, administer on-site first aid, and arrange for emergency assistance prior to making any other notifications.
- The Project Manager is responsible for making all other notifications to:
    - CORE Health Services (must be notified while employee is en route to medical care facility): 877-EHS-SHAW (877-347-7429)
    - Help Desk / Hot Line: 866-299-3445
    - Project Manager: Heather Fariello: 518-396-9834 (cell)
    - Marcia Musgrave: 419-425-6160 (for proper notification of field labor management and for coordination of post accident drug and alcohol testing).
- The Project Manager is responsible for notifying the Program H & S Manager by telephone prior to making any other notifications (other than calling 911 and CORE Health Services).
- The Project Manager shall accompany all injured personnel to the CORE Health Services clinic or to the hospital emergency room.
- The Project Manager shall notify the Program Manager in person or by telephone no later than two hours after the incident.
- All incident reports shall be completed by typing (when feasible and applicable).
- All incident reports shall be submitted (email or fax) to the Program H & S Manager for review and distribution.
- Complete all the blanks on the INCIDENT NOTIFICATION AND COMMUNICATION CONTACT LIST (page 6) and post near all site telephones.

Incident Notification, Reporting, and Management Procedure – AFP4

Action	Who / When	Under what circumstances	How	Notes
1. Notify Project Manager for all incidents (no matter how minor)	Injured person, first person recognizing incident, driver/passenger, or employee causing damage *Immediately*	All incidents no matter how minor (including minor cuts, scratches, minor strains/sprains, and insect bites)	In person or by telephone	Project Manager to make note of very minor incidents (such as band-aid over scratch) in field logbook
2. For ***life-threatening injuries / illnesses*** - make scene safe, contact local emergency personnel For ***non life-threatening injuries / illnesses*** - make scene safe, transport injured person to doctor at an occupational medical facility For ***vehicle accidents*** – make scene safe, notify police, aid injured parties For ***equipment / property damage*** - make scene safe, prevent further damage or injuries	Project Manager *Immediately (concurrently with next step if injury or illness)* *Project Manager* *Immediately (concurrently with next step if injury or illness)* Driver/passenger *Immediately* Employee causing damage *Immediately*	In case of serious injury or illness requiring off-site medical care	Via ambulance Via vehicle	Project Manager must immediately go to emergency care facility. Follow HS101 post accident alcohol and drug testing procedure. Project Manager must transport and stay with injured person until released from care. Make medical personnel aware of Shaw's "restricted work will be provided" and "no prescriptions if possible" policies. CORE Health Services clinics are the preferred urgent care facilities when possible, unless injury is severe and victim is transported by ambulance.
3. Notify CORE Health Services (for injuries / illnesses to Shaw employees only)	Project Manager *Immediately, prior to transporting the injured employee, unless injuries are life threatening*	• Serious injury requiring off-site medical care • If employee states that he/she has been exposed to any chemical or biological substance • If illness is work related	CORE Health Services 877-EHS-SHAW (877-347-7429)	Not required for temporary agency and subcontractor labor Provide name of injured employee, name and phone # of treating medical facility, description of the incident CORE Health Services will help with medical facility coordination and follow-up care
4. Notify Program H & S Manager Notify Alternate H&S Manager if Program H & S Manager cannot be contacted.	Project Manager *Immediately (concurrently with providing transportation to occupational medical facility or EMS transport to hospital)*	All incidents except on-site first aid cases	See Incident Notification and Communication Contact List (attached)	Program H & S Manager will notify H&S Manager Federal ER&C, as appropriate

Incident Notification, Reporting, and Management Procedure – AFP4

Action	Who / *When*	Under what circumstances	How	Notes
5. Notify Shaw Notification Hotline / Help Desk	Project Manager *As soon as practical, but not longer than one hour after occurrence.* *Prior to sending an individual for medical treatment*	• Illness and/or injury (doctors cases and above) • Any utility damage • Property damage (damage > $2,500.00) • Vehicle accidents (All) • Criminal activity (i.e. bomb threat, theft) • Natural disaster (all) • Explosion and/or fires (damage > $2,500.00 or result in injury) • Environmental spills/releases (incidents that requires regulatory notification or have an offsite impact) • Regulatory agency visit • Fatalities	Shaw Notification Hotline / Help Desk Phone Number: 866-299-3445	Request name of Hotline / Help Desk operator for future reference and note date/time of notification
6. Complete forms: I*njuries and illnesses*: • Authorization for Release of Protected Medical Information • Authorization for Treatment of Occupational Injury/Illness • Return-To-Work Examination Form ***and*** fax to CORE Health Services ***and*** email or fax to Program H & S Manager	Injured employee and medical facility personnel (Project Manager is responsible for verifying forms are completed) *Prior to leaving medical facility*	• Serious injury requiring off-site medical care • If employee states that he/she has been exposed to any chemical or biological substance	Fax to CORE Health Services: 225-292-8986 Email or fax to Program H & S Manager	Project Manager must take these forms with him/her to occupational medical facility or hospital (Contained in HS 020) Contact Program H & S Manager for blank electronic forms or obtain forms: http://shawnet3.shawgrp.com/sites/eihs/federal/Lists/Announcements/DispForm.aspx?ID=8
7. Call Program Manager and notify of incident	Project Manager *As soon as reasonably possible*	If Hot Line / Help Desk notification is required (see # 5 above)	See Incident Notification and Communication Contact List	Project Manager will verbally report incident to upper level of Operations/Business Line Management *As soon as reasonably possible*
8. Notify Marcia Musgrave	Project Manager	All incidents involving personnel (injuries, illnesses, vehicle accidents)	419-425-6160	For proper notification of field labor management and for coordination of post accident drug and alcohol testing.

Incident Notification, Reporting, and Management Procedure – AFP4

Action	Who / When	Under what circumstances	How	Notes
9. Call back Program H & S Manager to report on status of *injured / ill employee*	Project Manager *Prior to employee leaving medical facility*	All injuries and illnesses requiring off-site medical care	See Incident Notification and Communication Contact List (attached)	
10. Complete forms (typed electronically): *OSHA Recordable Cases* • Supervisor's Employee Injury/Illness Report Form • Injured Employee Statement • Witness Statement Form(s) *First Aid Cases (Doctor's)* • Supervisor's Employee Injury/Illness Report • Injured Employee Statement • Witness Statement Form(s) Email or Fax completed forms to Program H & S Manager and CORE Health Services	• Project Manager • Witnesses *As soon as possible – no later than 24 hours*	All injuries, illnesses, and first aide cases	Email or fax to Program H & S Manager See Incident Notification and Communication Contact List (attached) Fax to CORE Health Services 225-292-8986	Project Manager should have these forms with him/her at all times (Contained in HS 020) Contact Program H & S Manager for blank electronic forms or obtain forms from: http://shawnet3.shawgrp.com/sites/eihs/federal/Lists/Announcements/DispForm.aspx?ID=8
11. Complete forms (typed electronically): *Chargeable Vehicle Accidents* • Vehicle Accident Report • Witness Statement Form(s) • Driving Record Certification (Procedure HS800) *Non-Chargeable Vehicle Accidents* • Vehicle Accident Report • Witness Statement Form(s) *Equipment, Property Damage and General Liability Incidents* • Equipment, Property Damage and General Liability Loss Report • Witness Statement Form(s) Email or Fax completed forms to Program H & S Manager	• Project Manager • Witnesses *As soon as possible – no later than 24 hours*	All vehicle accidents and /or all property damage	Email or fax to Program H & S Manager Health See Incident Notification and Communication Contact List (attached)	Supervisor should have these forms with him/her at all times (Contained in HS 020) Contact Program H & S Manager for blank electronic forms or obtain forms from: http://shawnet3.shawgrp.com/sites/eihs/federal/Lists/Announcements/DispForm.aspx?ID=8

Incident Notification, Reporting, and Management Procedure – AFP4

Action	Who / When	Under what circumstances	How	Notes
12. Complete these additional forms (typed electronically): *OSHA Recordable Cases* • Incident Investigation Report *First Aid Cases (Doctor's)* • Incident Investigation Report *Chargeable Vehicle Accidents* • Incident Investigation Report *Non-Chargeable Vehicle Accidents* • Incident Investigation Report *Equipment, Property Damage and General Liability Incidents* • Incident Investigation Report *Near Miss* • Incident Investigation Report	Project Manager *As soon as possible – no later than 72 hours of incident*		Email or fax to Program H & S Manager See Incident Notification and Communication Contact List (attached)	Supervisor should have these forms with him/her at all times (Contained in HS 020) Contact Program H & S Manager for blank electronic forms or obtain forms from: http://shawnet3.shawgrp.com/sites/eihs/federal/Lists/Announcements/DispForm.aspx?ID=8
		Near Misses as defined by HS020		
• SharePoint electronic Near Miss Report	*As soon as possible – no later than 96 hours of incident*	All other Near Misses	Contact Program H & S Manager	
Email or Fax completed forms to Program H & S Manager				Do not include any employee or project identification information – *these reports are anonymous*
13. Perform "Accident Review Board" (ARB) as required by HS020 - Coordinate through Program H & S Manager	Program H & S Manager *Within 10 days of incident*	OSHA Recordable Cases Chargeable Vehicle Accidents		
Perform "Incident Review Board" (IRB) to extract lessons learned - Coordinate through Program H & S Manager		Doctor's First Aid Cases Utility damage or significant property damage		An IRB is outside of the HS020 requirements for an ARB.

INCIDENT NOTIFICATION AND COMMUNICATION CONTACT LIST

Project Number: 131658 **Project Name / Location: Colonie FUSRAP, Colonie, NY**

Name	Phone Number(s)	Fax Number	E-mail
Shaw Notification Hotline/Helpdesk	866-299-3445 225-215-5056 (Outside Continental US)	N/A	N/A
CORE Health Services (Must be notified prior to or during transport to medical treatment center)	877-EHS-SHAW (877-347-7429)	225-292-8986	
Marcia Musgrave	419-425-6160 (office) 419-957-7142 (cell)	419-425-6039	marcia.musgrave@shawgrp.com
Program H & S Manager James Joice	419-424-4960 (office) 419-306-3637 (cell)	419-425-6039	james.joice@shawgrp.com
Project Manager Heather Fariello, CHMM	518-785-2346 (work) 518-396-9834 (cell)		heather.fariello@shawgrp.com
Program Manager Jeffrey Parks, P.G.	720-554-8187 (office) 720-480-6607 (cell)		jeffrey.parks@shawgrp.com
Federal ERC; CSL West H&S Manager – Dave Mummert	419-425-6129 (office) 419-348-1544 (cell)	419-425-6039	david.mummert@shawgrp.com
E&I H&S Director – Troy Allen	225-932-2579 (office) 225-229-1759 (cell)	225-987-3454	troy.allen@shawgrp.com

Note: Incident reports shall be faxed or emailed only to the Program H & S Manager (or Alternate H&S Manager) for review and proper distribution.

Revised July 20, 2010