FINAL

ENVIRONMENTAL RESTORATION PROGRAM SERVICES WORK PLAN FOR GROUNDWATER SAMPLING AND MONITORING WELL INSTALLATION FOR INSTALLATION RESTORATION PROGRAM SITES 4, 7, AND 9

NEW YORK AIR NATIONAL GUARD
(106TH RESCUE WING)
GABRESKI INTERNATIONAL AIRPORT
WESTHAMPTON BEACH, NEW YORK

March 2004

SCIENCE APPLICATIONS INTERNATIONAL CORPORATION

Contributed to the preparation of this document and should not be considered an eligible contractor for its review.

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FOR

INSTALLATION RESTORATION PROGRAM SITES 4, 7, AND 9

AT

NEW YORK AIR NATIONAL GUARD (106TH RESCUE WING) GABRESKI INTERNATIONAL AIRPORT WESTHAMPTON BEACH, NEW YORK

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ACRONYMS

ANG	Air National Guard
ASTM	American Society for Testing and Materials
bgs	below ground surface
EPA	U.S. Environmental Protection Agency
ID	inside diameter
IDW	investigation-derived waste
IRP	Installation Restoration Program
NTU	nephelometric turbidity unit
PID	photoionization detector
PM	project manager
PVC	polyvinyl chloride
QAPP	quality assurance project plan
QC	quality control
RAC	remedial action construction
RW	Rescue Wing
SAIC	Science Applications International Corporation
SOW	scope of work
SVOC	semivolatile organic compound
TAL	target analyte list
TCLP	toxicity characteristic leaching procedure
VOC	volatile organic compound

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1.0 INVESTIGATIVE APPROACH

1.1 WORK PLAN OBJECTIVES

The objectives of the sampling activities at Sites 4, 7, and 9 are to determine the horizontal extent of groundwater contamination. The initial round of groundwater sampling will be performed to provide current data on the areal extent of the plume. This information will be used to facilitate the design of the proposed remedial treatment systems (areal extent of the required treatment system). The remaining four sampling rounds will be performed quarterly, after installation of the treatment system, to monitor the effectiveness of the remedial system.

An air sparge system for remediation of both Sites 4 and 9 is currently planned as the most practical and efficient alternative to achieve the goals of the request for proposal. Air sparge systems are widely accepted as a form of remedial technology for this type of environmental setting by both the regulatory and government agencies.

Installation of the air sparge system at both Sites 4 and 9 will consist of installing multiple air sparge injection points at each site: 40 points at Site 4 and 6 points at Site 9. Each injection point will be installed using conventional hollow stem auger drilling techniques and will extend to a depth of approximately 45 to 65 ft below ground surface (bgs). The injection points will be polyvinyl chloride (PVC) riser pipe and a 5-ft PVC pre-packed well screen. Each site will have separate portable air sparge units that will contain an independent control panel for automatic operation. Once the injection points have been installed, the portable air sparge units will be staged. Lateral connections will be installed to each injection point for the purpose of injecting air into the surrounding aquifer. This will be accomplished by excavating through the in-situ soil and extending high-density polyethylene piping to each injection point. Each injection point will be completed in a 2- by 2-ft vault for protection.

Site 7 is used as a munition storage area and is located on an active runway; this eliminated the selection of a system that would require long-term physical presence, such as a building, at the site. Therefore, a bio remediation technology to remediate the volatile organic compound/semivolatile organic compound (VOC/SVOC) contamination at the site will be used. This will consist of the installation and operation of an oxygen release compound injection system.

A total of 17 monitoring wells will be purged and sampled. The samples will be analyzed for VOCs, SVOCs, target analyte list (TAL) metals, nitrate/nitrite, sulfate, and methane. Additional field parameters such as dissolved oxygen, pH, temperature, and turbidity will be collected to determine degradation rates.

1.2 GENERAL APPROACH

1.2.1 Groundwater Flow Direction

The initial activity to be performed on-site will be the determination of groundwater flow direction at Installation Restoration Program (IRP) Sites 4, 7, and 9 based on measuring current groundwater elevation measurements to determine the relative groundwater elevations.

1.2.2 Groundwater Plume Delineation

For the initial round of groundwater sampling, a total of 17 monitoring wells (Table 1) will be purged and sampled at IRP Sites 4, 7, and 9.

- Site 4 – SW-05, -06, -07, -10, -16, -21, -22, -23, and -24 (Figure 1)
- Site 7 – MW-23, -24, -103, -104, -105, and -106 (Figure 2)
- Site 9 – SW-08 and -09 (Figure 1)

The samples will be analyzed for VOCs, SVOCs, TAL metals, nitrate/nitrite, sulfate, and methane. Additional field parameters such as dissolved oxygen, pH, temperature, and turbidity will be collected to determine degradation rates.

After the completion of the remedial action construction (RAC), four rounds of quarterly groundwater sampling will be performed.

1.2.3 Soil Sampling

No soil samples are planned for collection as part of this scope of work (SOW).

1.2.4 Monitoring Well Installation

A total of two permanent groundwater monitoring wells will be installed at Site 7 as part of the remedial construction. The locations will be determined after evaluation of the initial groundwater sampling data. Additionally, one existing monitoring well (Site 7, MW-00X) will be removed and abandoned in accordance with state of New York requirements.

1.3 ANALYTICAL METHODS

A full discussion of analytical methods for all soil and groundwater samples collected is presented in the quality assurance project plan (QAPP), which is located in Appendix A.

1.4 DEVIATIONS FROM THE WORK PLAN

If during the execution of the RAC, it is identified that changes to the work plan are necessary to meet the objectives of the project, the Science Applications International Corporation (SAIC) project manager (PM) will verbally contact the Air National Guard (ANG)/Center for Environmental Restoration PM with the recommended changes. The recommendations will be followed up with written documentation of the required changes on an SAIC Field Change Order Form (see Figure 13-2 of the QAPP; Appendix A).

Table 1. Installation Restoration Program Sites 4,7, and 9

Well Identification	Diameter	Total Depth	Screen Interval	Distance To Water	Casing	Condition
Site 4 Monitoring Wells						
SW05	2 in.	39.4 ft	26 to 36 ft	26 ft	6-in. steel casing	Well labeled, well and casing in good condition
SW06	2 in.	32.6 ft	20 to 30 ft	24 ft	6-in. steel casing	Needs new well cap, well 1 ft below top of steel casing
SW07	2 in.	37.4 ft	25 to 35 ft	29 ft	6-in. steel casing	Well 6 in. from top of steel, well and casing in good condition
SW10	2 in.	38.8 ft	24.5 to 34.5 ft	26 ft	6-in. steel casing	Push on PVC well cap, well 3 ft from top of steel, needs riser
SW21	4 in.				No casing	Special locked cap, SAIC has key; well in good condition *(Note: Possibly a 2-in. well inside of a 4-in. PVC casing, could not open cap during site visit)*
SW22	4 in.				No casing	Special locked cap, SAIC has key; well in good condition *(Note: Possibly a 2-in. well inside of a 4-in. PVC casing, could not open cap during site visit)*
SDW16	1 in.	39.7 ft	29.7 to 39.7 ft		PVC	
SDW23	1 in.	32 ft		25 ft	4-in. PVC casing	Casing needs new 4-in. PVC cap
SDW24	1 in.	32 ft		24 ft	4-in. PVC casing	Push on PVC cap, no lock, well and casing in good condition
Site 7 Monitoring Wells						
MW-23	4 in.				No casing	Slip on cap, well in good condition
MW-24	4 in.	38.61 ft			PVC	Well destroyed. 27.5 ft from top of ground to bottom of well; 26.5 ft from top of broken casing to bottom of well
MW-103	2 in.	43.5 ft	28.5 to 43.5 ft		Conduit	
MW-104	2 in.	116 ft	(15-ft length)		4-in. steel casing	Screw on 2-in. cap, well in good condition, casing rusted

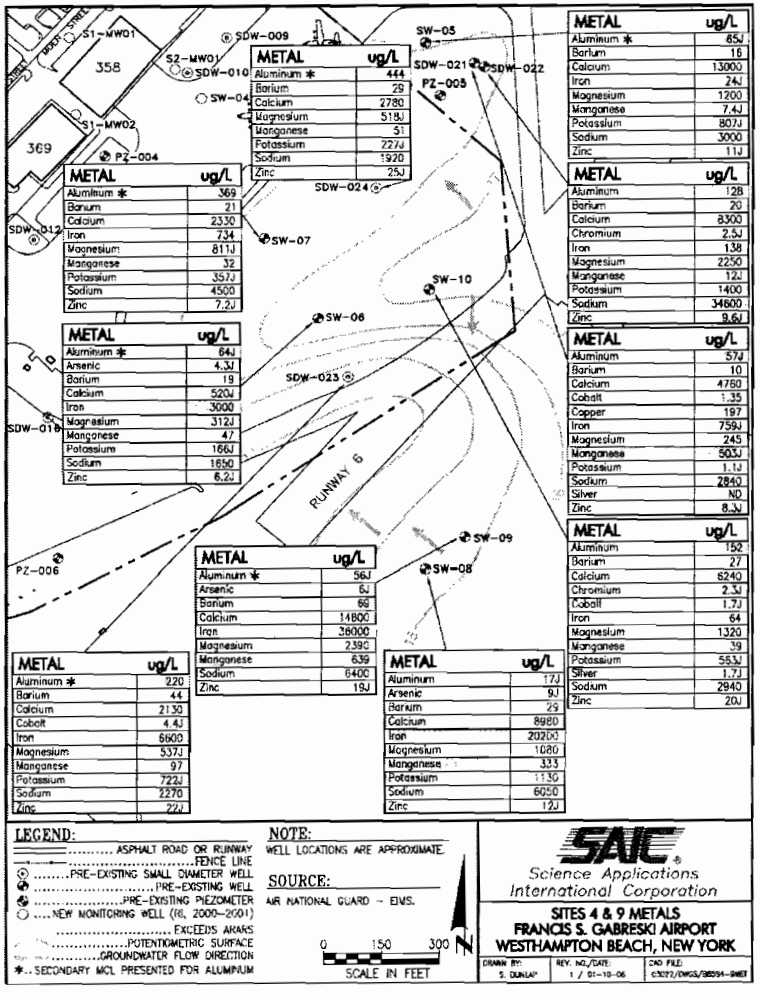
Table 1. Installation Restoration Program Sites 4,7, and 9 (continued)

Well Identification	Diameter	Total Depth	Screen Interval	Distance To Water	Casing	Condition
Site 7 Monitoring Wells (continued)						
MW-105	2 in.	68.3 ft	(20-ft length)		4-in. steel casing	Screw on 2-in.cap, well in good condition, casing rusted
MW-106	2 in.	53.3 ft	(15-ft length)		4-in. steel casing	Screw on 2-in. cap, well in good condition, casing rusted
Site 9 Monitoring Wells						
SW-08	2 in.	52.4 ft	40 to 50 ft	20 ft	4-in. steel casing	Push on PVC cap, no lock, well and casing in good condition
SW-09	2 in.	52.1 ft	40 to 50 ft	18 ft		Push on PVC cap, no lock, bailer fell into well, well and casing in good condition

PVC = Polyvinyl chloride.
SAIC = Science Applications International Corporation.

2004 Metals in Site 4 & 9 Groundwater

U.S. AIR FORCE



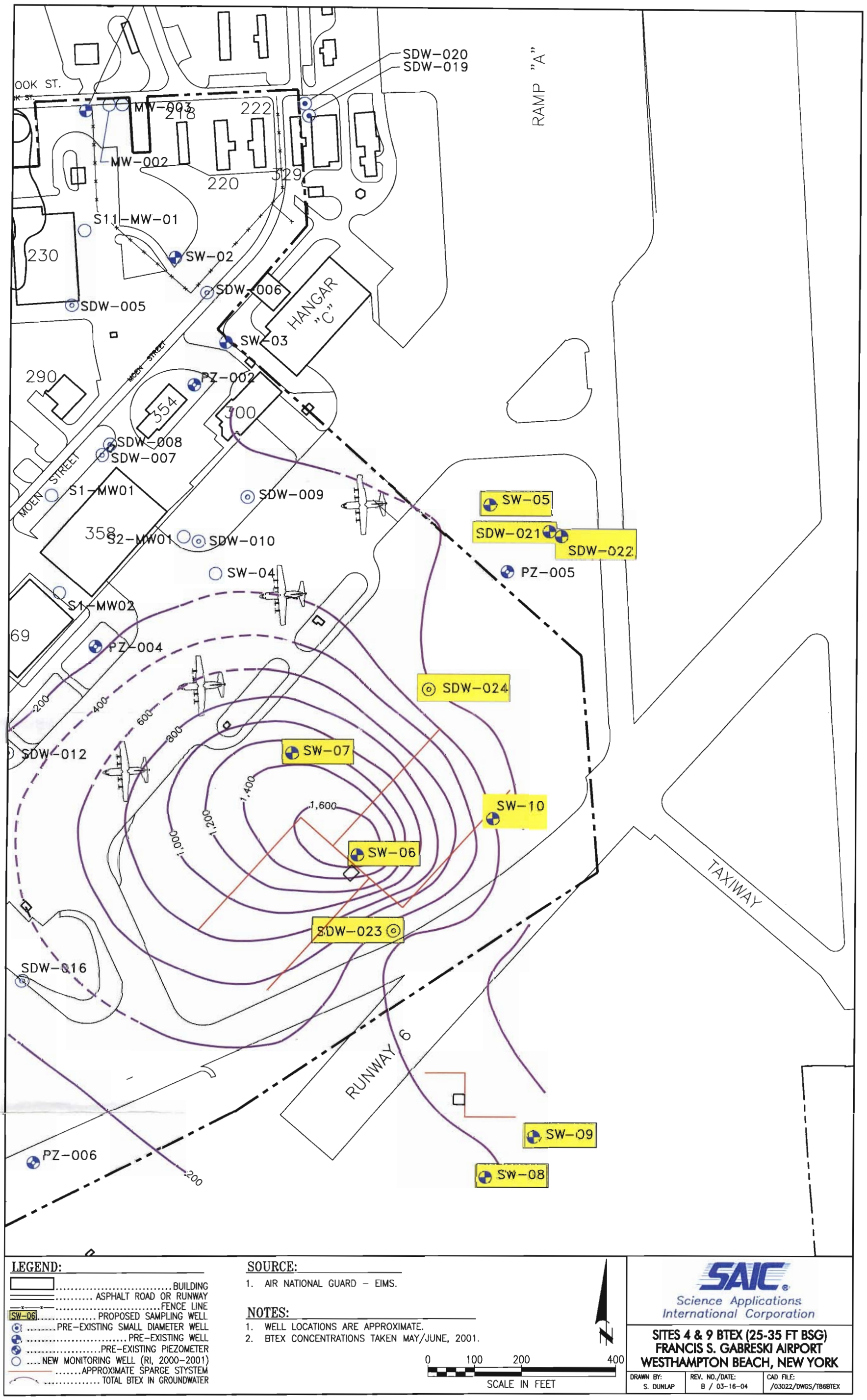


Figure 1. IRP Sites 4 and 9 Location Map

2.0 FIELD INVESTIGATION PROCEDURES

The sampling equipment to be used and the procedures to be followed are presented in the following sections. All field investigation procedures will be performed in accordance with the *Final Air National Guard Installation Restoration Program Investigation Protocol* (June 1998) and the New York Department of Health rules and regulations. Quality control (QC) sample collection, instrument calibration, and maintenance requirements for this project are presented in the QAPP (Appendix A). Potable water used for decontamination of field sampling equipment will be tested by collecting field/equipment blanks, as proposed in the QAPP (see Appendix A). Field activities will be conducted in accordance with the health and safety plan (Appendix B).

2.1 INVESTIGATIVE METHODS AND PROCEDURES

2.1.1 Soil Organic Vapor Survey

During the advancement of all borings, the retrieved soil core will be screened for the presence of organic vapors. Organic vapor measurements will be collected along the entire length of the soil core using a photoionization detector (PID). All organic vapor screening results will be recorded on the soil boring log. A positive PID reading will be defined for purposes of this investigation as exceeding 10 parts per million above background.

2.1.2 Monitoring Well Installation

All drilling activities (i.e., soil borings and monitoring wells) will be conducted by a state of New York-certified and licensed driller. Prior to any drilling activities, a review of all available utility maps provided by the 106th Rescue Wing (RW) Base and Gabreski Airport Civil Engineers will be conducted in the vicinity of the locations. In the event that any of the planned drilling locations are found to interfere with buried utilities or are located in an area subject to frequent flooding, the locations will be relocated as closely as possible to the original location. Relocated drilling locations will be approved by the Field Operations Manager.

All newly installed monitoring wells will be installed by a truck-mounted drill rig using hollow-stem augers having an inside diameter (ID) of 4.25 in. The maximum depth of the wells to be drilled is expected to be approximately 45 ft bgs. Soil samples will be collected continuously from all proposed monitoring wells to provide vertical geologic profiles. In addition, all RAC borings will be used to develop the baseline geologic profile.

2.1.2.1 Monitoring well construction

Each monitoring well will be constructed of 2-in.-ID, flush-threaded, PVC casing and screens, and a bottom cap. The screen length will be 10 ft. The screens will be constructed using 2-in.-diameter, machine-slotted, 0.010-in. PVC pipe coupled with a PVC solid riser pipe. The top of the screen will be placed approximately 3 ft above the top of the water table. The screened intervals of each well will be determined based on the depth to water measurements obtained from the temporary piezometers. Each wellhead will be completed with a watertight expandable plug.

The filter pack, bentonite seal, and grout placement procedures will be the same for all wells. The well annulus at the screen will be sand packed from 0.5 ft below the bottom of the well screen to 2 ft above the top of the well screen by the tremie pipe method, using a #1 or equivalent cleaned, washed, and bagged silica sand. A minimum 2-ft bentonite seal (measured before hydration), composed of 0.25-in. bentonite pellets, will be placed above the sand pack. Seals installed above the water table will consist of bentonite slurry, as required in the ANG Investigation Protocol (June 1998). The annulus around the casing will be filled with a bentonite/grout mixture. Three pounds of bentonite powder and 7 gal of potable water will be mixed with every 94-lb sack of grout after the well is set in the borehole to prevent the flow of any water along the casing.

2.1.2.2 Surface completions

All wells will be completed either by finishing the casing approximately 2.5 ft above the top of the borehole (short sections of casing may be required) or by flush surface mount. SAIC will contact the 106 RW Base and Gabreski Airport Civil Engineering Offices to determine whether a well should be completed with a flush mounting or above ground. For above grade completion, a protective steel pipe equipped with a locking cap will be set in the neat concrete grout around the well casing. The well number will be permanently marked on the locking cap. The grout will be built up around the pipe in a squared pad and will be sloped away to aid in runoff. All protective casing caps shall be provided with keyed-alike brass or stainless steel locks. The lock keys will be given to the 106 RW New York ANG's on-site representative. The protective casing pipe will not be painted.

Three 4-in.-diameter steel guard posts filled with cement will be placed around the protective steel riser pipe of monitoring wells. All guard posts will be painted yellow to increase visibility. The bases for the guard posts will be set into concrete and will extend at least 4 ft above the ground surface. Any well that is to be temporarily removed from service or left incomplete due to delays in construction will be capped with a watertight cap and equipped with a "vandal proof" cover.

Wells completed by flush surface mount will be flush with the land surface. The casing will be cut 2 to 3 in. below land surface and installed with a protective locking lid consisting of a cast-iron valve box assembly. The valve box will be placed in the center of the hole with the top just above the ground surface. Concrete will be placed around the annular space and sloped away from the valve box to divert drainage. The well will also be fitted with a watertight compression casing cap to prevent infiltration of surface water. The well number will be clearly marked on the valve box lid and well casing. All well assemblies will be secured with keyed-alike brass or stainless steel locks. The lock keys will be given to the 106 RW New York ANG's on-site representative.

2.1.2.3 Monitoring well development

The wells will be developed to ensure the effectiveness of the filter pack around the well screen and to remove fine-grained particles from the filter pack and formation. Before the well is developed, well headspace will be checked for organic vapors using a PID and recorded on a development log. The wells will be developed at least 24 h after well installation and completion to allow sufficient time for the grout to set. Development will be conducted by using a submersible pump or bailer, without the use of any type of acids, dispersing agents, or explosives. No water or other liquid will be introduced into the well during development other than formation water from that well. Care will be exercised to ensure that the screen is not damaged during development. Water from well development will be retained in drums, which are segregated by well. After development, the water level will be stable prior to sampling.

During well development, field parameter measurements will be obtained from each monitoring well. For this testing, specific conductance, pH, and temperature will be measured at intervals of one well volume until three successive readings yield equivalent values within the following ranges:

- Specific conductance (temperature corrected): ± 10% m/mhos,
- pH: ± 0.1 standard units,
- Temperature: ± 1.0°C, and
- Turbidity > 10 nephelometric turbidity units (NTUs).

The volume of water present in the well will be calculated as follows:

$$\text{Volume of Well in Gallons} = (0.0408) \times \text{Well Diameter in inches}^2 \times \text{Feet of Water Column}$$

Well development will continue until the temperature, specific conductance, and pH have stabilized and the groundwater removed is visibly clear or the well has been developed for 6 h, whichever comes first. A well development log will be used to record the volume of water removed during the development effort and the associated stabilization parameters, including turbidity.

2.1.2.4 Drilling documentation

A geologist will be present at each operating drill rig to log soil samples on a boring log, monitor drilling operations, record soil data, monitor and record the well installation procedures of that rig, and prepare well construction diagrams. Each geologist will be responsible for only one operating rig. The lithologic descriptions will be recorded on a boring log for each well location using the Unified Soil Classification System and described according to the American Society for Testing and Materials (ASTM) D2488-90, "Description and Identification of Soils (Visual-Manual Procedure)." In addition, a monitoring well construction log will be completed for each well.

2.2 FIELD SCREENING

2.2.1 Soil Samples

No soil sample collection is planned as part of this SOW.

2.2.2 Groundwater Samples

A total of 17 monitoring wells will be purged and sampled. The samples will be analyzed for VOCs, SVOCs, TAL metals, nitrate/nitrite, sulfate, and methane. Additional field parameters such as dissolved oxygen, pH, temperature, and turbidity will be collected to determine degradation rates.

3.0 SAMPLE COLLECTION PROCEDURES

3.1 GROUNDWATER

3.1.1 Groundwater Samples

Groundwater samples collected from monitoring wells will be accomplished by using low-flow purging techniques in order to increase the degree of confidence in sample representativeness and groundwater quality results. Each monitoring well will be purged immediately prior to sample collection using either a bladder or peristaltic pump. The pump or bottom of the tubing will be positioned near the middle of the screened interval of the well to ensure that standing water is removed and fresh formation water is drawn into the well. Low-flow purging techniques (flow rate of <100 mL/min) will be used in conjunction with a flow-through cell to measure the following water quality parameters: pH, specific conductivity, turbidity, dissolved oxygen, oxidation-reduction potential, and temperature. Purging will be considered complete when the indicator parameters of pH, temperature, conductivity, and turbidity have stabilized to within the following limits:

- pH ± 0.1 pH units,
- Temperature ± 1°C,
- Conductivity ± 10%, and
- Turbidity < 10 NTUs.

In the event that wells recharge extremely slow and are unable to be micropurged, the well will be purged dry, allowed to recharge, and sampled for VOCs when a sufficient volume of water has entered the well. Groundwater for the remaining analytical parameters will be collected as sufficient water fills the well.

All groundwater samples collected from the permanent monitoring wells will be submitted to a fixed-base laboratory for the following analysis:

- VOCs: U.S. Environmental Protection Agency (EPA) Method SW-846 8260B,
- SVOCs: EPA Method 8270B,
- TAL Metals: EPA Method SW-846 6010B/7000,
- Nitrate/Nitrite and Sulfate: EPA 300.0, and
- Methane: RSKSOP-175.

A full discussion of the appropriate sample containers and preservative requirements are provided in the QAPP, which can be found in Appendix A.

3.2 LAND SURVEYING

All monitoring wells installed during the RAC will be surveyed by a New York state-registered surveyor to determine their locations and elevations. All survey points shall be referenced both horizontally and vertically. Boring locations will be surveyed off a permanent marker (e.g., manhole cover, fire hydrant, etc.). A permanent benchmark will be established near the site and will be tied to the National Geodetic Vertical Datum mean sea level. Positions and coordinates of all permanent points within the control traverse shall be shown on the base map. Soil borings and monitoring wells will be surveyed to the nearest 0.1 ft horizontally and the nearest 0.01 ft elevation.

3.3 FIELD QUALITY CONTROL SAMPLING

All field QC sampling procedures and methods are fully discussed in the QAPP, which is located in Appendix A.

4.0 EQUIPMENT DECONTAMINATION PROCEDURES

To prevent cross-contamination, all non-dedicated sampling equipment (i.e., Macro-core samplers) will be decontaminated before use and between samples using the following procedure. Sampling equipment will be washed using a brush and laboratory-grade detergent (Alconox™), followed by a rinse with drinking-quality water, ASTM Type II reagent grade water, and an isopropanol alcohol rinse. In the event of inclement weather, it will be acceptable to have an ASTM Type II water rinse. Decontaminated sampling equipment that will not be immediately used will be allowed to air dry and will be wrapped in aluminum foil. Wrapped equipment will be stored in such a manner as to reduce the potential for accidental contamination.

Testing and monitoring equipment (e.g., probes, thermometers, etc.) that come into contact with soil or water samples will be decontaminated by being rinsed with an ASTM Type II reagent water, and rinsed with isopropanol alcohol when appropriate. Some sensitive field-testing equipment should not be rinsed with isopropanol. Equipment will then be allowed to dry completely before being used. This decontamination procedure will be followed prior to each use of the equipment.

Decontamination of drilling and testing equipment (i.e., drill rig equipment, augers, and PVC pipe) will be performed prior to use and between borehole/monitoring well installations. Equipment will be moved to a site-specific decontamination area where the equipment will be thoroughly steam-cleaned or hand washed. A decontamination pad will be constructed to catch the water from any steam-cleaning operations. The pad will consist of a plastic liner approximately 40 by 40 ft and sloped to the center so that the water will accumulate to be pumped into the proper containers for disposal. Water from decontamination activities will be handled as investigation-derived waste (IDW), as outlined in Chapter 6.0.

5.0 BOREHOLE ABANDONMENT PROCEDURES

Well abandonment will follow the following procedures. Overboring or removal of the casing to the greatest extent possible, followed by perforating any casing left in place. All casing and well installations in the upper 5 ft of the boring, or within 5 ft of the proposed level of excavation, must be removed. Sealing by pressure injection with cement bentonite grout, using a tremie pipe or other method acceptable to the state of New York, must extend the entire length of the boring to 5 ft bgs or the proposed excavation level. The screened interval of the borehole must be sealed separately and tested to ensure its adequacy before sealing the remainder of the borehole. The upper 5 ft must be backfilled with appropriate native materials compacted to avoid settlement.

6.0 INVESTIGATION-DERIVED WASTES

During the RAC, a certain amount of waste material (soil cuttings) will be produced as a result of investigative activities. SAIC will be responsible for the sampling, characterizing, containment, and labeling of all wastes generated during this project. All IDW generated, including drill spoils, development and purge waters, and decontamination sludge and water, will be containerized and staged at a central location on Base designated by the 106 RW Civil Engineer.

Soil cuttings will be produced during the installation of soil borings and monitoring wells. Soil cuttings will be preliminarily characterized by monitoring for organic vapors emissions with a PID. All soil cuttings from drilling activities will be containerized at the time of drilling. Proper management and disposal of cuttings will be determined after subsequent sampling has been completed and laboratory analytical results obtained. Composite soil IDW samples will be collected from staged wastes in batches of no more than eight drums per sample. Each soil IDW sample will be submitted to the fixed-based laboratory for analysis of the toxicity characteristic leaching procedure (TCLP) VOCs, SVOCs, and metals.

Drums containing purge and development waters will also be sampled for IDW characterization. Composite samples will be collected from no more than eight drums per sample. Each liquid IDW sample will be submitted to the fixed-base laboratory for analysis of TCLP VOCs, SVOCs, and metals.

All IDW containers will be properly marked to indicate their contents, the collection date, contractor's name and phone number, and container identification number at the time of initial use. The 106 RW Civil Engineer, or appropriate designee, will be responsible for signing all manifests and disposing of hazardous wastes generated during this project.

7.0 PROJECT SCHEDULE AND DELIVERABLES

The project schedule has been developed based on tasks included in the SOW. Figure 3 illustrates the general project schedule for the RAC activities at the 106 RW in West Hamptonbeach, New York.

8.0 SITE INSPECTION REPORT

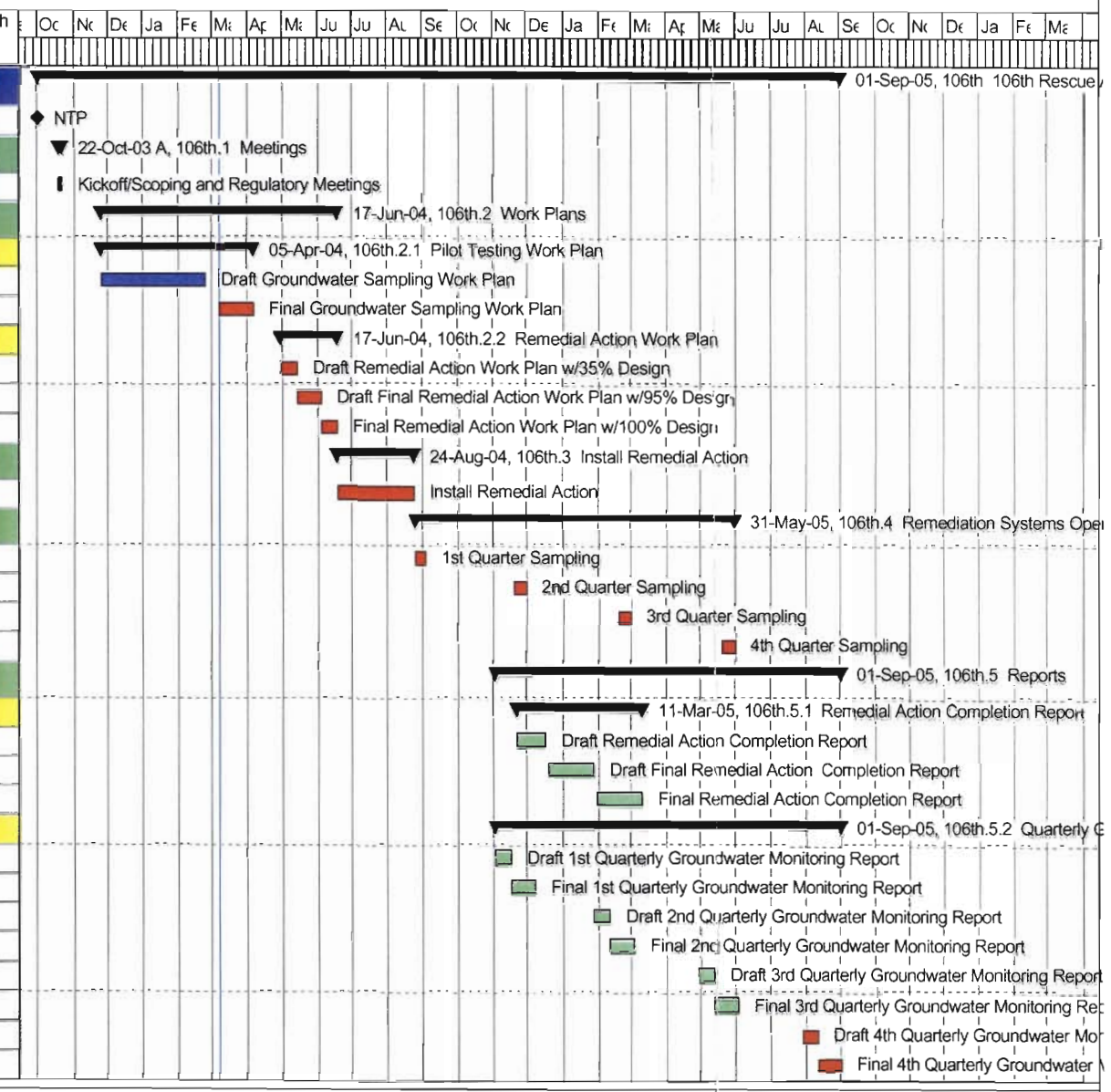
SAIC will prepare an abbreviated draft technical memorandum detailing the results of the initial groundwater sampling event. The memorandum will be submitted, as per the distribution list in the request for proposal, for review.

9.0 REFERENCE

ANG (Air National Guard) 1998. *Final Air National Guard Installation Restoration Program (IRP) Investigation Protocol*, Air National Guard Readiness Center, Andrews Air Force Base, MD, June.

106th Rescue Air National Guard | Gabreski | 15-Mar-04 16:35

Activity ID	Activity Name	Original Duration	Start	Actual Start	Finish	Actual Finish
106th	**106th Rescue Air National Guard**	485.0d	01-Oct-03 A	01-Oct-03	01-Sep-05	
A1000	NTP	0.0d	01-Oct-03 A	01-Oct-03		
106th.1	**Meetings**	3.0d	20-Oct-03 A	20-Oct-03	22-Oct-03 A	22-Oct-03
A1010	Kickoff/Scoping and Regulatory Meetings	3.0d	20-Oct-03 A	20-Oct-03	22-Oct-03 A	22-Oct-03
106th.2	**Work Plans**	141.0d	25-Nov-03 A	25-Nov-03	17-Jun-04	
106th.2.1	**Pilot Testing Work Plan**	91.0d	25-Nov-03 A	25-Nov-03	05-Apr-04	
A1020	Draft Groundwater Sampling Work Plan	14.0d	25-Nov-03 A	25-Nov-03	24-Feb-04 A	24-Feb-04
A1050	Final Groundwater Sampling Work Plan	23.0d	08-Mar-04 A	08-Mar-04	05-Apr-04	
106th.2.2	**Remedial Action Work Plan**	34.0d	30-Apr-04		17-Jun-04	
A1070	Draft Remedial Action Work Plan w/35% Design	10.0d	30-Apr-04		13-May-04	
A1100	Draft Final Remedial Action Work Plan w/95% Design	15.0d	14-May-04		03-Jun-04	
A1130	Final Remedial Action Work Plan w/100% Design	10.0d	04-Jun-04		17-Jun-04	
106th.3	**Install Remedial Action**	47.0d	18-Jun-04		24-Aug-04	
A1160	Install Remedial Action	48.0d	18-Jun-04		24-Aug-04	
106th.4	**Remediation Systems Operation**	192.0d	25-Aug-04		31-May-05	
A1170	1st Quarter Sampling	8.0d	25-Aug-04		03-Sep-04	
A1180	2nd Quarter Sampling	8.0d	19-Nov-04		30-Nov-04	
A1190	3rd Quarter Sampling	8.0d	18-Feb-05		01-Mar-05	
A1200	4th Quarter Sampling	8.0d	20-May-05		31-May-05	
106th.5	**Reports**	208.0d	04-Nov-04		01-Sep-05	
106th.5.1	**Remedial Action Completion Report**	74.0d	22-Nov-04		11-Mar-05	
A1210	Draft Remedial Action Completion Report	20.0d	22-Nov-04		17-Dec-04	
A1240	Draft Final Remedial Action Completion Report	30.0d	20-Dec-04		28-Jan-05	
A1270	Final Remedial Action Completion Report	30.0d	31-Jan-05		11-Mar-05	
106th.5.2	**Quarterly Groundwater Monitoring Report**	208.0d	04-Nov-04		01-Sep-05	
A1290	Draft 1st Quarterly Groundwater Monitoring Report	10.0d	04-Nov-04		17-Nov-04	
A1320	Final 1st Quarterly Groundwater Monitoring Report	15.0d	18-Nov-04		08-Dec-04	
A1340	Draft 2nd Quarterly Groundwater Monitoring Report	10.0d	28-Jan-05		10-Feb-05	
A1370	Final 2nd Quarterly Groundwater Monitoring Report	15.0d	11-Feb-05		03-Mar-05	
A1390	Draft 3rd Quarterly Groundwater Monitoring Report	10.0d	29-Apr-05		12-May-05	
A1420	Final 3rd Quarterly Groundwater Monitoring Report	15.0d	13-May-05		02-Jun-05	
A1440	Draft 4th Quarterly Groundwater Monitoring Report	10.0d	29-Jul-05		11-Aug-05	
A1470	Final 4th Quarterly Groundwater Monitoring Report	15.0d	12-Aug-05		01-Sep-05	



Actual Work | Summary
Remaining Work
Critical Remaining Work
Milestone

RAC at 106th Rescue Wing - Gabreski Airport

Figure 3. Project Schedule

APPENDIX A
QUALITY ASSURANCE PROJECT PLAN

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FINAL
QUALITY ASSURANCE PROJECT PLAN
FOR THE
ENVIRONMENTAL RESTORATION
PROGRAM SERVICES
WORK PLAN FOR
GROUNDWATER SAMPLING AND
MONITORING WELL INSTALLATION
FOR
INSTALLATION RESTORATION
PROGRAM SITES 4, 7, AND 9
AT
NEW YORK AIR NATIONAL GUARD
(106TH RESCUE WING)
GABRESKI INTERNATIONAL AIRPORT
WESTHAMPTON BEACH, NEW YORK

MARCH 2004

Contract No. DAHA90-01-D-0008
Delivery Order 27

Prepared for
ANG/CEVR
New York Air National Guard,
West Hamptonbeach, New York

Prepared by
Science Applications International Corporation
Oak Ridge, Tennessee

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ACRONYMS

ANG	Air National Guard
ANG/CEVR	Air National Guard Environmental Restoration Branch
CLP	Contract Laboratory Program
COC	chain-of-custody
DQO	data quality objective
EPA	U.S. Environmental Protection Agency
EPH	extractable petroleum hydrocarbon
ERP	Environmental Restoration Program
FOM	Field Operations Manager
FCO	Field Change Order
FCR	Field Change Request
FSP	field sampling plan
GC	gas chromatograph
HSP	health and safety plan
IRP	Installation Restoration Program
MS	matrix spike
MSD	matrix spike duplicate
NIST	National Institute of Standards and Testing
NYANG	New York Air National Guard
OVA	organic vapor analyzer
PARCCS	precision accuracy, representativeness, comparability, completeness, and sensitivity
PID	photoionization detector
PgM	program manager
PM	project manager
QA	quality assurance
QC	quality control
QAPP	quality assurance project plan
RAC	Remedial Action Construction
RPD	relative percent difference
SAIC	Science Applications International Corporation
SVOC	semivolatile organic compound
TPH	total petroleum hydrocarbon
VOC	volatile organic compound
WP	Work Plan

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1.0 PROJECT DESCRIPTION

The sampling activities associated with the remedial action construction (RAC) are to perform five rounds of groundwater sampling at three Installation Restoration Program (IRP) sites (i.e., Site 4 – Aircraft Refueling Apron Ditch, Site 7 – Former Fire Training Area, and Site 9 – Ramp Drainage Outfall).

Development of the RAC Work Plan (WP) will provide an overall technical strategy and approach to the sites requiring investigation based on the project closeout activities. The WP also summarizes the potential federal and state applicable or relevant and appropriate requirements, including state policy and procedures, the rationale for all field and analytical work, and the approach for acquiring field data. The RAC WP includes a field sampling plan (FSP), quality assurance project plan (QAPP), and health and safety plan (HSP). As part of the RAC WP, this QAPP provides information regarding data collection and quality assurance (QA) activities and procedures to ensure valid data are collected during the RAC.

This site-specific QAPP presents the overall policies, data quality objectives (DQOs), and specific QA and quality control (QC) requirements that will be employed during the field effort for RAC at the 106th Rescue Wing, West Hamptonbeach, New York. The QAPP establishes guidelines for field sampling, documentation, laboratory analysis, QA/QC procedures, and reporting requirements that will result in data of known quality. Qualitative and quantitative goals for precision, accuracy, representativeness, comparability, completeness, and sensitivity (PARCCS) are defined in the QAPP to ensure that the data will meet the needs of the end user.

The specific objectives of the field effort include the following:

- initiate a remedial action to treat volatile organic compound (VOC) contamination in the groundwater,
- perform five rounds of groundwater sampling, and
- operate and maintain the remedial actions for a period of 1 year and determine the system effectiveness.

Data collected to meet the above objectives will be analyzed at a fixed-base analytical laboratory for definitive data.

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2.0 ORGANIZATION AND RESPONSIBILITIES

2.1 ORGANIZATION

The contractor will conduct an RAC at the sites to remediate contamination at IRP Sites 4, 7, and 9. This work will be performed under the direction of the Air National Guard (ANG). Air National Guard Environmental Restoration Branch (ANG/CEVR) manages the Environmental Restoration Program (ERP) and related activities.

2.2 AUTHORITY AND RESPONSIBILITY

2.2.1 Air National Guard

The ANG/CEVR ERP Coordinator is responsible for the implementation of the ERP and related activities at the installation, including technical and contractual direction of activities performed at the site.

2.2.2 Science Applications International Corporation

Science Applications International Corporation (SAIC) is responsible for all activities involved in conducting the RAC. SAIC is responsible for day-to-day execution of the project, programmatic decisions, meeting milestones, and transmitting deliverables. The project team will include the following key personnel.

- *The Program Manager* (PgM) will be responsible for the overall execution of this project, for contract negotiation or modification, for organizational coordination, and for maintaining an open line of communication with the New York ANG (NYANG) project manager (PM).

- *The Project Manager* will directly supervise the project team, direct field operations, and coordinate contractor and subcontractor support. The PM will be the technical interface between NYANG and the project team.

- *The Field Operations Manager* (FOM) is responsible for direct supervision of all field operations including planning, conducting, and overseeing all field personnel, including subcontractors.

- *The Manager of QA/QC* will be responsible for ensuring that effective procedures and controls are implemented to achieve a high level of project accuracy. Details of the QA/QC Manager's duties are provided in other sections of this QAPP.

- *The Health and Safety Manager* will be responsible for assuring that threats from physical and chemical hazards are mitigated through effective execution of the HSP.

- *The Analytical Services Manager* is responsible for all subcontracted laboratory and data validation performance including data management; reviewing analytical data from field and fixed-base laboratories; and determining compliance with appropriate analytical QA/QC requirements, DQOs, and turn around-time requirements; and data verification. The data verification and validation process is performed independently of the laboratory program to assist in determining whether the data meet the DQOs.

- *The Site Geologist* will be an experienced geologist present at each operating rig. The site geologist is responsible for logging samples, monitoring drilling operations, recording soil and groundwater data, monitoring and recording the well installation procedures of that rig, and preparing the boring logs and well diagrams. Each geologist will have sufficient tools and professional equipment on-site and in operable condition to efficiently perform his/her duties.

2.2.3 Subcontractor Requirements

SAIC is responsible for the cost, schedule, and quality of all work performed under this contract delivery order, including the work of subcontractors. SAIC will hire subcontractors to provide services in any area where support to contractor efforts is required. SAIC's PM will maintain oversight of the subcontractors' completion of specific tasks with respect to technical performance, quality, and adherence to cost and schedule. All subcontractor activity will adhere to applicable site procedures, policies, and the project QAPP. This requirement will be included in all contracts between the contractor and subcontractor. Failure of a subcontractor to comply with requirements of the QAPP, or other contractual requirements, may be viewed as a breach of contract and grounds for contract termination. The fixed-base analytical laboratory selected for this project is Chemtech Environmental Laboratories.

Procurement of laboratory subcontractors for analyzing environment samples shall be strictly controlled. Only fixed-based laboratories approved by the state of New York, which have a demonstrated capability to provide the level of data quality required for this project, will be employed.

Elements of analytical services procurement criteria for the fixed-based laboratory include the following.

- Demonstrated ability to perform the analyses required at a specific capacity.
- Ability to handle the types of material to be analyzed, including all applicable licenses and permits.
- Demonstrated ability to perform the types of analysis and QC required.
- Demonstrated ability to produce documentation and deliverables required for this project, including analytical results, and electronic data.
- Capability and availability of laboratory equipment and personnel.

3.0 DATA QUALITY OBJECTIVES

DQOs are quantitative and qualitative statements specified to ensure that data of known and appropriate quality are obtained during the RAC activities. To ensure that data generated during field activities are adequate to support decisions regarding the objectives and the method by which decisions will be made, DQOs must be established in the project planning process. DQOs are based on the specific use of the data collected. Data obtained during this RAC will provide the basis for decisions on future actions at the site and to ensure sites are within compliance standards. Specifically, the data collected during this investigation will be used to

- Characterize sources of contamination and pathways.
- Determine the nature and extent of contamination.
- Make recommendations for additional investigation or decision documents.

The quantitative measurements that estimate the true value or actual concentration of a physical property always involve some level of uncertainty. The uncertainty associated with a sample generally results from: (1) natural variability (heterogeneity) of the sample, (2) sample handling operations and conditions, (3) spatial and temporal patterns, and (4) analytical variability. These uncertainties must be estimated in order to obtain reliable data and to make appropriate decisions about remediation alternatives. If the level of uncertainty can be quantified, then it can be compared to standard quantitative indicators, the DQOs, for data quality. By quantifying the level of uncertainty, a decision maker will be able to use the results derived from the data collected.

3.1 QUALITY MANAGEMENT

SAIC has overall responsibility for QA activities during this project. The QA/QC Manager or a designee will be responsible for ensuring all QC procedures are followed. The QA/QC Manager or their designee will be responsible for conducting audits to verify that the QA Program is implemented in compliance with project-specific requirements and U.S. Environmental Protection Agency (EPA) regulations. Immediate corrective actions will be taken at any time it is deemed necessary, and verification of corrective actions shall be provided. All QC procedures will be performed in accordance with this QAPP.

3.2 DATA QUALITY OBJECTIVE LEVELS

DQOs are divided into two data quality levels. These levels express the uncertainty level a decision maker is willing to accept when considering analytical data results derived from environmental investigation activities. They are a management tool used to decrease the probability of data leading to an incorrect conclusion.

Fixed-base laboratory data for this RAC will encompass all QC elements required for definitive level data with summary form deliverables.

3.2.1 Screening Level Data

Screening level data are generated by rapid, less precise methods of analysis with less rigorous sample preparation. Sample preparation steps may be restricted to simple procedures such as dilution with a solvent, instead of elaborate extraction/digestion and cleanup or direct matrix introduction. Screening data

provide analyte identification and potentially supply limited quantitation, although the quantitation may be relatively imprecise.

This level is characterized by the use of hand-held instruments that may identify the presence of a class of compounds, without actually identifying or quantifying a specific compound. This level of data may be used for (1) delineation of contaminated zones, (2) gross determination of analytes in samples, or (3) health and safety screening.

Field-grade analytical instruments that allow identification of compounds and, in some instances, quantification with moderate accuracy and precision limits are also considered to produce field screening data. Normally, field-grade analytical instruments are used in a mobile or temporary laboratory on-site.

Screening level data for the field effort at NYANG will be required for field measurement data. Field measurement data are specified for the following activities:

- Health and Safety Monitoring – Health and safety monitoring will be performed with portable hand-held instruments or calorimetric response levels. The intended use of the data is to identify the presence or absence of contaminants during site activities. Since extensive QC is not required for health and safety monitoring, definitive confirmation is not required.

- Field Measurements – Routine field measurements, such as water level measurements, pH, and conductivity measurements may also provide input for site characterization. Definitive confirmation is not required because the intended use of data is primarily for monitoring site conditions.

- Field Screening – Field screening of soil and groundwater samples using a photoionization detector (PID) or an organic vapor analyzer (OVA) provides preliminary qualitative data and helps prioritize samples for further analysis or disposal. These data are for semi-quantitative screening purposes only and will not require definitive confirmation.

3.2.2 Definitive Level Data

Definitive data are generated using rigorous analytical methods, such as approved EPA reference methods. Data are analyte-specific, with confirmation of analyte identity and concentrations. Methods produce tangible raw data (e.g., chromatograms, spectra, digital values) in the form of paper printouts or computer-generated electronic files. Data may be generated at the site or at an off-site location, as long as the QA/QC requirements are satisfied.

This level is characterized by fixed-base laboratory analysis or sample analysis at sophisticated mobile laboratories. Analytical protocols provide data at lower detection limits, information on a wide range of calibrated analytes, matrix recovery information, laboratory process control information, and produce analytical data at known levels of precision and accuracy. EPA accepted methods, such as those in Solid Waste Method 846 (SW-846) (EPA 1998), the National Pollution Discharge Elimination System, and Contract Laboratory Program (CLP) are utilized for definitive data.

4.0 QUALITY CONTROL FOR SAMPLE COLLECTION AND ANALYSIS

The overall QC objective is to develop and implement procedures that will ensure sufficient quality in field sample collection, field gas chromatographs (GCs) analysis, fixed-base laboratory analysis, and reporting that will meet the needs of end users of the data. Documentation requirements, including field logbooks, chain-of-custody (COC) forms, and Field Change Order (FCO) requests are located in other sections of the QAPP. This chapter presents overall analytical QC from the time of collection through analysis. DQOs expressed and PARCCS objectives of the analytical data are discussed in Chapter 5.0.

4.1 SAMPLE COLLECTION

Procedures for collecting soil and groundwater samples will follow the WP and will conform to the *Final Air National Guard Installation Restoration Program Investigation Protocol (ANG 1998)* and EPA protocols. The FOM is responsible for ensuring that samples are collected using properly decontaminated equipment and contained in properly cleaned sample containers. The steps required for sample control and identification, data recording, and COC documentation are discussed in Chapter 6.0 of this QAPP.

Prior to beginning each type of sampling event, the FOM will meet with the assigned sampling personnel and review the purpose and objectives of the event. This meeting will provide final clarification of the sampling event details. Topics of review and discussion will include items such as sampling locations, types of samples to be collected, number of samples to be collected, sample numbering, parameter(s) to be analyzed, sampling procedures, equipment decontamination procedures, and COC requirements.

Equipment decontamination is an integral part of the data collection and QA process. The implementation of proper decontamination practices and procedures will begin in the field prior to the use of sample collection equipment. All field sampling equipment will be decontaminated before use and after each sample location.

4.2 FIELD QUALITY CONTROL SAMPLES

Field duplicate samples, field blanks, equipment rinsates, and trip blanks will be submitted to the analytical laboratories to provide the means to assess the quality of the data resulting from the field sampling program. Field and trip blank samples will be analyzed to check for procedural contamination and ambient conditions at the site that may have caused sample contamination. Duplicate samples will be submitted under a non-indicative sample identification to provide a QA check on analytical procedures and results. The QC samples and associated frequencies for this project are described below.

- **Trip Blanks** – Trip blanks are used to detect contamination by VOCs during shipping and handling. Trip blanks are 40-mL vials of analyte-free water and are preserved with hydrochloric acid (HCL) to a pH of ≤2. The laboratory performing the analysis will supply trip blanks. Trip blanks must have zero headspace and should not be opened in the field. One trip blank set will be placed in each cooler containing samples for VOC analysis and be submitted to the fixed-base laboratory. The number of 40-mL vials comprising a trip blank is laboratory dependent. The number of vials required will be specified by the selected fixed-base laboratory. Trip blanks will be analyzed for the definitive dataset and not as screening data.

- **Field Blanks** – Field blanks are QA/QC samples intended to determine if any of the water used during the field investigation contains detectable concentrations of any organic or inorganic analytes

that may impact the quality of the samples. Field blanks are samples of the source of water used for decontamination and steam cleaning. At a minimum, one sample for each source of water will be collected. Field blanks will be analyzed for the same parameters as the original samples of interest by the fixed-base laboratory. Field blanks will be collected and analyzed at a frequency of one per mobilization per source. American Society for Testing and Materials Type II water used for final rinsing, and the tap water used for initial cleaning, are sources of water that are commonly sampled.

- **Equipment Blanks** – Equipment blanks are used as a measure of the effectiveness of the decontamination process. Equipment blanks are samples of the final analyte-free water rinse from equipment cleaning and are submitted to the fixed-base laboratory for analysis. The equipment blanks will be analyzed for the same analytes as the primary samples that are collected. Samples will be collected for every major type or piece of sampling equipment at a frequency of 1 for every 10 investigative samples collected per sample matrix per site for fixed-base laboratory analysis.

- **Field Duplicates** – Field duplicates are used to assess the precision of sampling techniques and to provide checks on laboratory and field procedures. Field duplicates will be collected at a 10% frequency for fixed-base confirmation analysis of all samples.

- **Matrix Spike/Matrix Spike Duplicate (MS/MSD)** – MS and MSD samples are samples from a specific media that have been spiked at the laboratory with known quantities of analytes. MS and MSDs are used to determine the accuracy and precision of the laboratory analyses as well as matrix interferences. Data from MS and MSD sample recovery supply percentage recovery information so the laboratory can evaluate its measurement accuracy and precision. MS and MSD samples are equal portions of a single initial sample that have been spiked with specific analytes in known quantities and must meet certain laboratory requirements to be acceptable. The total number of MS/MSD samples will be at a frequency of 1 per 20 samples collected per sample matrix or every 14 days, whichever is more frequent, for fixed-base laboratory analysis. Field GC analysis will require one MS/MSD per matrix at the beginning of the project.

4.3 ANALYTICAL PARAMETERS

Analysis of soil and groundwater samples, taken in accordance with the FSP for the site, will be performed in accordance with analytical procedures that conform to EPA guidelines published in the *Test Methods of Evaluating Solid Waste, Physical/Chemical Methods-SW-846)*(EPA 1998*)*. Analytical results will be reported using CLP-type documentation. The analyte list will consist of VOCs, semivolatile organic compounds (SVOCs), and total petroleum hydrocarbons (TPHs). CLP-type summary forms without raw data will be required to meet fixed-base laboratory analytical data quality levels required for the RAC. Analytical QA/QC requirements are discussed in Chapter 5.0 of this QAPP.

4.3.1 Fixed-Base Laboratory

All fixed-base laboratory analysis will require 30-day turn-around for data package deliverables. Fixed-base laboratory analysis of water samples for VOCs will be analyzed using SW-846 Method 8260B with purge and trap sample preparation Method 5030. Soil samples for VOCs will be analyzed using SW-846 Method 8260B with sample preparation Method 5035. Water and soil samples for SVOC analysis at the fixed-base laboratory will be analyzed using SW-846 Method 8270C with sample preparation for water samples by preparation Method 3510, separatory funnel extraction, or Method 3520, liquid-liquid extraction. Soil sample preparations will be extracted utilizing Method 3550, sonication. No tentatively identified compounds will be reported for any GC/mass spectroscopy method. TPH will be analyzed using SW-846 modified Method 8015. Extraction preparation methods of soil and water samples

will be required. Soils will be extracted for extractable petroleum hydrocarbons (EPHs) using Method 3550, sonication. Waters will be extracted for EPH using Method 3510 or Method 3520.

All soil samples for the RAC will be reported on a dry weight basis. Tables 4-1 and 4-2 list soil quantitation limits on a wet weight basis. Actual quantitation limits will be higher for environmental soil/sediment samples based on the moisture content for each sample.

4.4 SAMPLE PRESERVATION AND HOLDING TIMES

Sample containers and preservatives used to maintain samples designated for chemical analysis will be provided by the laboratory performing the analysis. The preferred container types will be I Chem Series 300 bottles or equivalent. The bottles must be pre-cleaned and traceable to the laboratory that performed the cleaning. The lot number of the containers and reagents used for preservatives must be traceable to the laboratory (or supplier) that performed the initial assay. Certificates of cleanliness must be provided by the laboratory (or supplier) and kept in the project file.

All samples for chemical analysis will be placed on ice as soon as possible following collection. All samples will be chilled to 4 ± 2°C and maintained at that temperature through transport and subsequent storage at the analytical laboratory. Holding times, sample volumes, and preservative requirements for fixed-base and field laboratories are shown in Table 4-3. Samples analyzed by the field GC will not require acid preservation but will be maintained at 4 ± 2°C.

Table 4-1. Practical Quantitation Limits for Volatile Organic Compounds in Soil and Water Using SW-846 GC/MS Method 8260B

Volatiles	CAS Number	Practical Quantitation Limits	
		Water (µg/L)	Soil (µg/kg)
Chloromethane	74-87-3	1	10
Bromomethane	74-83-9	1	10
Vinyl Chloride	75-01-4	1	10
Chloroethane	75-00-3	1	10
Methylene Chloride	75-09-2	2	10
Acetone	67-64-01	5	10
Carbon Disulfide	75-15-0	1	10
1,1-Dichloroethane	75-35-3	1	10
1,1-Dichloroethane	156-59-4	1	10
trans-1,2-Dichloroethane	156-60-5	1	10
Chloroform	67-66-3	1	10
1,2-Dichloroethane	107-06-2	1	10
2-Butanone	78-93-3	5	10
1,1,1-Trichloroethane	71-55-6	1	10
Carbon Tetrachloride	56-23-5	1	10
Bromodichloromethane	75-27-4	1	10
1,2-Dichloropropane	78-87-5	1	10
cis-1,3-Dichloropropene	10061-01-5	1	10
Trichloroethene	79-01-6	1	10
Dibromochloromethane	124-48-1	1	10
1,1,2-Trichloroethane	79-00-5	1	10
Benzene	71-43-2	1	10
trans-1,3-Dichloropropene	10061-02-6	1	10
Bromoform	75-25-2	1	10
4-Methyl-2-pentanone	108-01-1	5	10
2-Hexanone	591-78-6	5	10
Tetrachloroethene	127-18-4	1	10
1,1,2,2-Tetrachloroethane	79-34-5	1	10
Toluene	108-88-3	1	10
Chlorobenzene	108-90-7	1	10
Ethylbenzene	100-41-4	1	10
Styrene	100-42-5	1	10
cis-1,2-Dichloroethene	156-59-4	1	10
Vinyl Acetate	108-05-4	5	10
Xylenes (total)	1330-20-7	1	10

Sample quantitation limits are highly matrix-dependant. The quantitation limits listed herein are provided for guidance and may not always be achievable.
Quantitation limits listed for soil/sediment are based on wet weight. Normally, data are reported on a dry weight basis; therefore, quantitation limits will be higher based on the % dry weight in each sample.
CAS = Chemical Abstract Service.
GC/MS = Gas chromatograph/mass spectroscopy.

Table 4-2. Practical Quantitation Limits for Semivolatile Organic Compounds in Soil and Water Using SW-846 (GC/MS) Method 8270C

Semivolatiles	CAS Number	Practical Quantitation Limits	
		Groundwater (µg/L)	Low Soil/Sediment (µg/kg)
Phenol	108-95-2	10	330
bis(2-Chloroethyle)ether	111-44-4	10	330
2-Chlorophenol	95-57-8	10	330
1,3-Dichlorobenzene	541-73-1	10	330
1,4-Dichlorobenzene	106-46-7	10	330
1,2-Dichlorobenzene	95-50-1	10	330
2-Methylphenol	95-48-7	10	330
2,2'-oxybis (1-Chloropropane)	108-60-1	10	330
4-Methylphenol	106-44-5	10	330
N-Nitroso-di-n-propylamine	621-64-7	10	330
Hexachloroethane	67-72-1	10	330
Nitrobenzene	98-95-3	10	330
Isophorone	78-59-1	10	330
2-Nitrophenol	88-75-5	10	330
2,4-Dimethylphenol	105-67-9	10	330
bis(2-Chloroethoxy)methane	111-91-1	10	330
2,4-Dichlorophenol	120-83-2	10	330
1,2,4-Trichlorobenzene	120-82-1	10	330
Naphthalene	91-20-3	10	330
4-Chloroaniline	106-47-8	10	330
Hexachlorobutadiene	87-68-3	10	330
4-Chloro-3-methylphenol	59-50-7	10	330
2-Methylnaphthalene	91-57-6	10	330
Hexachlorocyclopentadiene	77-47-4	10	330
2,4,6-Trichlorophenol	88-06-2	10	330
2,4,5-Trichlorophenol	95-95-4	25	800
2-Chloronaphthalene	91-58-7	10	300
2-Nitroaniline	88-74-4	25	800
Dimethylphthalate	131-11-3	10	330
Acenaphthylene	208-96-8	10	330
2,6-Dinitrotoluene	606-20-2	10	330
3-Nitroaniline	99-09-2	25	800
Acenaphthene	83-32-9	10	330
2,4-Dinitrophenol	51-28-5	25	800
4-Nitrophenol	100-02-7	25	800
Dibenzofuran	132-64-9	10	330
2,4-Dinitrotoluene	121-14-2	10	330
Diethylphthalate	84-66-2	10	330
4-Chlorophenyl-phenyl-ether	7005-72-3	10	330
Fluorene	86-73-7	10	330
4-Nitroaniline	100-01-6	25	800
4,6-Dinitro-2-methylphenol	534-52-1	25	800
N-nitrosodiphenylamine	86-30-6	10	330
4-Bromophenol-phenylether	101-55-3	10	330
Hexachlorobenzene	118-74-1	10	330
Pentachlorophenol	87-86-5	25	800
Phenanthrene	85-01-8	10	330

Table 4-2. Practical Quantitation Limits for Semivolatile Organic Compounds in Soil and Water Using SW-846 (GC/MS) Method 8270C (continued)

Semivolatiles	CAS Number	Practical Quantitation Limits	
		Groundwater (µg/L)	Low Soil/Sediment (µg/kg)
Anthracene	120-12-7	10	330
Carbazole	86-74-8	10	330
Di-n-butylphthalate	84-74-2	10	330
Fluoranthene	206-44-0	10	330
Pyrene	129-00-0	10	330
Butylbenzylphthalate	85-68-7	10	330
3,3'-Dichlorobenzidine	91-94-1	10	330
Benzo(*a*)anthracene	56-55-3	10	330
Chrysene	218-01-9	10	330
bis(2-Ethylhexyl)phthalate	117-81-7	10	330
Di-n-octylphthalate	117-84-0	10	330
Benzo(*b*)fluoranthene	205-899-2	10	330
Benzo(*k*)fluoranthene	207-08-9	10	330
Benzo(*a*)pyrene	50-32-8	10	330
Indeno(1,2,3-*cd*)pyrene	193-39-5	10	330
Dibenz(*a,h*)anthracene	53-70-3	10	330
Benzo(*g,h,i*)perylene	191-24-2	10	330
TPH	N/A	100	100

Notes: Sample quantitation limits are highly matrix-dependant. The quantitation limits listed herein are provided for guidance and may not always be achievable.
Quantitation limits listed for soil/sediment are based on wet weight. Normally, data are reported on a dry weight basis; therefore, quantitation limits will be higher based on the % dry weight in each sample.
CAS = Chemical Abstract Service.
GC/MS = Gas chromatograph/mass spectroscopy.
TPH = Total petroleum hydrocarbon.

Table 4-3. Sample Volumes, Containers, Preservation, and Holding Times

Analyte Group Soils	Container	Minimum Sample Size	Preservative	Holding Time
VOCs	4-oz glass jar with Teflon®-lined cap	100 g	Cool, 4°C preserve at laboratory	14 d
SVOCs or TPH	8-oz glass jar with Teflon®-lined cap	200 g	Cool, 4°C	14 d (extraction) 40 d (analysis)
Waters				
VOCs	Two 40-mL glass vials with Teflon®-lined septum (no headspace)	80 mL	HCl to pH <2 Cool, 4°C	14 d
SVOCs	Two L amber glass bottle with Teflon®-lined lid	1,000 mL	Cool, 4°C	7 d (extraction) 40 d (analysis)

Note: One investigative water sample in 20 will be tripled in volume for the laboratory to perform appropriate laboratory quality control analysis.
TPH = Total petroleum hydrocarbon.
SVOC = Semivolatile organic compound.
VOC = Volatile organic compound.

5.0 PRECISION, ACCURACY, REPRESENTATIVENESS, COMPARABILITY, COMPLETENESS, AND SENSITIVITY OBJECTIVES

This chapter presents general objectives for the level of QC expressed as PARCCS for the analytical data. The accuracy, precision, and sensitivity of laboratory analytical data must satisfy the QC acceptance criteria of the analytical protocols for approved EPA methods in the fixed-base laboratory and project specific requirements for the field GC.

5.1 QUALITY ASSURANCE OBJECTIVE FOR ACCURACY

Accuracy is defined as the degree of difference between measured or calculated values and the true value. The closer the numerical value of the measurement comes to the true value, or actual concentration, the more accurate the measurement. Analytical accuracy is expressed as the percent recovery of a compound or element that has been added to the environmental sample at a known concentration before analysis. The following is used to calculate percent recovery:

$$\text{Accuracy} = \text{Percent recovery} = \frac{A_r - A0}{A_f} \times 100\,\%$$

where

A_r = Total amount detected in spiked sample,
A_0 = Amount detected in unspiked sample,
A_f = Amount of spike added to sample.

5.1.1 Organic Analysis Accuracy

Analytical accuracy will be ensured by performing all method-specified and project-modified QC steps. Surrogate recoveries will be monitored for method compliance for all analysis in the fixed-base laboratory with the exception of TPH. Table 5-1 lists the surrogate recovery acceptance criteria for all organic parameters requiring surrogate additions (SVOCs and VOCs).

In addition to surrogate recoveries, fixed-base laboratory accuracy for VOC, SVOC, and TPH analysis will be evaluated by analyzing an MS/MSD sample at a minimum frequency of 1 per 20 samples of similar matrix. Table 5-2 lists spike compounds and recovery criteria for MS/MSD samples in the fixed-base laboratory for SVOCs and VOCs. TPH advisory limits will be established by the fixed-base laboratory through the use of control charting.

The general objective for analytical accuracy for organic analysis is to meet 90% of all surrogate compound recoveries (Table 5-1) and MS/MSD recoveries (Table 5-2).

Table 5-1. EPA Quality Assurance Fixed-Base Laboratory Objectives for Accuracy of Surrogate Spike Analysis

Fraction	Surrogate Compound	Water % Recovery Limits	Low/Med Soil % Recovery Limits
VOA	4-Bromofluorobenzene	86-115	74-121
VOA	Dibromofluoromethane	86-118	80-120
VOA	Toluene-d_8	88-110	81-117
SVOA	Nitrobenzene-d_5	35-114	23-120
SVOA	2-Fluorobiphenyl	43-116	30-115
SVOA	p-Terphenyl-d_{14}	33-141	18-137
SVOA	Phenol-d_5	10-110	24-113
SVOA	2-Fluorophenol	21-110	25-121
SVOA	2,4,6-Tribromophenol	10-123	19-122
SVOA	2-Chlorophenol-d_4	33-110 (Advisory)	20-130 (Advisory)
SVOA	1,2-Dichlorobenzene-d_4	16-110 (Advisory)	20-130 (Advisory)

Note: These limits are for advisory purposes only. They are not used to determine if a sample should be re-analyzed.
EPA = U.S. Environmental Protection Agency.
SVOA = Semivolatile organic analysis.
VOA = Volatile organic analysis.

Table 5-2. EPA Quality Assurance Objectives for Laboratory Accuracy and Precision of Matrix Spike/Matrix Spike Duplicate Analysis

		Water		Soil	
Fraction	Matrix Spike Compound	Duplicate RPD	Percent Recovery Limits	Duplicate RPD	Percent Recovery Limits
VOA	1,1-Dichloroethene	19	60-136	50	36-161
VOA	Trichloroethene	20	66-136	27	43-140
VOA	Chlorobenzene	17	68-136	33	54-138
VOA	Benzene	22	73-144	27	48-150
VOA	Toluene	17	68-138	27	51-141
SVOA	Acenaphthene	31	46-118	19	31-137
SVOA	1,4-Dichlorobenzene	28	36-97	27	28-104
SVOA	2,4-Dinitrotoluene	38	24-96	47	28-89
SVOA	n-Nitroso-di-propylamine	38	41-116	38	41-126
SVOA	Pyrene	31	26-127	33	35-142
SVOA	1,2,4-Trichlorobenzene	28	39-98	23	38-107
SVOA	4-Chloro-3-methylphenol	42	23-97	33	26-103
SVOA	2-Chlorophenol	40	27-123	50	25-102
SVOA	4-Nitrophenol	50	10-80	50	11-114
SVOA	Pentachlorophenol	50	9-103	47	17-109
SVOA	Phenol	42	12-110	35	26-90

EPA = U.S. Environmental Protection Agency.
SVOA = Semivolatile organic analysis.
RPD = Relative percent difference.
VOA = Volatile organic analysis.

5.2 QUALITY ASSURANCE OBJECTIVE FOR PRECISION

Precision is defined as the reproducibility, or degree of agreement, among duplicated (collocated) sample measurements of the same quantity. The closer the numerical values of the measurements come to each other, the more precise the measurement is. Analytical precision is expressed as a percentage of the difference between results of duplicate samples for a given compound. Relative percent difference (RPD) is calculated as:

$$RPD = \frac{|C_1 - C_2|}{\frac{C_1 + C_2}{2}} \times 100$$

where

C_1 = Concentration of the compound in the sample,
C_2 = Concentration of the compound in the duplicate/replicate.

Sample collection precision will be measured by the analysis of field duplicate samples. Sample collection precision criteria will be twice the analytical precision criteria. The overall goal for precision is 90% of all data generated by laboratory methods to be within required or method-recommended control limits.

5.2.1 Organic Analysis Precision

Precision of fixed-base laboratory SVOCs and VOCs will be monitored using MS/MSD RPD values (Table 5-2). TPH precision will be monitored using MS and MSD analysis of a fuel standard. The advisory precision limits should not exceed 15% RPD for TPH.

5.3 QUALITY ASSURANCE OBJECTIVE FOR SENSITIVITY

Sensitivity is the limit of detection for instrumental and chemical analysis. The achievement of method detection limits depends partially on instrument sensitivity to ensure the data quality through constant instrument performance. Quantitation limits for SVOCs, VOCs, and TPH are listed in Tables 4-1 and 4-2 for fixed-base laboratory analysis. All soil/sediment samples will be reported on a dry weight basis. The quantitation limits presented in Tables 4-1 through 4-3 for soils/sediments will be adjusted based on the moisture content of each sample.

5.4 QUALITY ASSURANCE OBJECTIVES FOR COMPLETENESS, REPRESENTATIVENESS, AND COMPARABILITY

Completeness is defined as the amount of valid (useable) data obtained as compared to the planned amount and is expressed as a percentage of measurements judged to be valid. The percent of completeness for analytical data can be expressed by the following formula:

$$\text{Completeness} = \frac{\text{Number of useable valid data points reported}}{\text{Total number of analysis for each parameter analyzed}} \times 100$$

The completeness goal for the fixed-base and field analysis is 90%.

Representativeness expresses the degree to which data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition. Representativeness is a qualitative parameter dependent on the proper design of the sampling program and proper laboratory protocol. The sampling networks are designed to provide data

representative of facility conditions. During development of these networks, consideration was given to past waste disposal practices, existing analytical data, physical setting, and site processes. Representativeness will be ensured by using proper sampling techniques, and using analytical procedures. Representativeness is ensured in the laboratory by proper sample storage, analysis, extraction, and digestion within the proper required holding times and acceptable instrument calibration and operation.

Comparability is a qualitative parameter that expresses the confidence with which one dataset can be compared with another, and is limited to the other parameters because only when precision and accuracy are known, can data be compared with confidence. The extent to which existing and planned analytical data will be comparable depends on the similarity of sampling and analytical methods. The procedures used to obtain the planned analytical data, as documented in this QAPP, are expected to provide comparable data. Field and laboratory procedures greatly affect comparability. To optimize comparability, only specific methods and protocols that have been selected, specified as appropriate, and modified as necessary for the RAC will be used. By using consistent sampling and analysis procedures, all datasets will be comparable within a specific site and between sites at the installation to ensure that remedial action decisions and priorities are based on a consistent database. Comparability will be further ensured by the analysis of EPA standard reference materials, establishing that analytical procedures are generating valid data.

6.0 SAMPLE IDENTIFICATION AND CHAIN-OF-CUSTODY REQUIREMENTS

Sample COC procedures require that the possession and handling of samples from the moment of collection through analysis be documented by written record. The record must clearly reflect the movement of the samples through the COC to ensure the sample has been controlled and has not been tampered with in any way. A sample is judged in custody when one of the following criteria has been met:

- The sample is in one's actual physical possession.
- The sample is in one's clear field of view after being in one's physical possession.
- The sample is in one's physical possession and is then locked up in a secure container so that no one can tamper with it.
- The sample is kept in a secured area that is restricted to authorized personnel only.

6.1 SAMPLE IDENTIFICATION

A standardized numbering system will be used to identify all samples collected during water and soil sampling activities. The numbering system provides a tracking procedure to ensure accurate data retrieval of all samples taken. A listing of the sample identification numbers will be maintained by the FOM who will be responsible for enforcing the use of the standardized numbering system during all sampling activities. Sample identification for all samples collected during the RAC will follow the following format.

This code consists of eight alphanumeric characters in four information groups

- Station type (two characters),
- IRP site identifier (two characters),
- Sample type, and
- Sample sequence.

Examples:

IRP Site 7 Soil Boring = SB07-SU01
IRP Site 7 Monitoring Well = MW07-GW01

6.1.1 Station Type

The third segment will consist of a two-digit sampling method identifier. MW and SB will be used to identify monitoring wells and soil borings, respectively.

6.1.2 Environmental Restoration Program Site Designator

All samples collected during this field effort will be identified by an eight-character code, beginning with the two-digit code that signifies the IRP site number (i.e., 04, 07, and 09).

6.1.3 Sample Type

The two-character sample type code identifies the general source type and media of the sample. Sample type codes that may be applicable to this field project are as follows:

- DS Soil sample from drum containing cuttings,
- DW Decontamination water,
- EB Equipment blank,
- FB Field blank,
- GW Groundwater,
- RS Field duplicates,
- SS Surface soil,
- SU Subsurface soil,
- TB Trip blank, and
- BG Background sample.

6.1.4 Sample Sequence Qualifier

The last set of two digits will sequentially identify the vertical samples taken from a single location.

6.1.5 Soil Boring and Monitoring Well Identification

Soil borings will be sequentially numbered and include the IRP site number as follows:

IRP Site 7 Soil Boring = SB07-SU01
IRP Site 7 Monitoring Well = MW07-GW01

6.2 SAMPLE LABELS

All samples will be identified with a label attached directly to the container. Sample label information will be completed using waterproof black ink and will contain the following information:

- Company name and site,
- Sample number,
- Parameters to be analyzed, and
- Preservative (if any).

6.3 CHAIN-OF-CUSTODY RECORD

To maintain a record of sample collection, a COC record will be filled out for each sample destined for field and fixed-base analysis at each sampling location, for the transfer of samples between sample custodians, shipment, and receipt by the laboratory. A copy of the standard contractor's COC record is shown in Figure 6-1. Sample COC procedures require that the possession and handling of the sample from the moment of its collection through analysis be documented by written record. The record must clearly reflect the movement of the sample through the COC to ensure the sample has been controlled and has not been tampered with in any way. Each time the samples are transferred, the signatures of the person relinquishing and receiving the samples, as well as the date and time of transfer, will be documented.

Chain-of-Custody

COC NO:

PROJECT NAME:	REQUESTED PARAMETERS	LABORATORY NAME:
PROJECT NUMBER:		LABORATORY ADDRESS:
PROJECT MANAGER:		PHONE NO:
Sampler (Signature) (Printed Name)		

Sample ID	Date Collected	Time Collected	Matrix	No. of Bottles/Vials:	OVA SCREENING	OBSERVATIONS, COMMENTS, SPECIAL INSTRUCTIONS

RELINQUISHED BY:	Date/Time	RECEIVED BY:	Date/Time	TOTAL NUMBER OF CONTAINERS:	Cooler Temperature:
COMPANY NAME:		COMPANY NAME:		Cooler ID:	
RECEIVED BY:	Date/Time	RELINQUISHED BY:	Date/Time		
COMPANY NAME:		COMPANY NAME:			
RELINQUISHED BY:	Date/Time	RECEIVED BY:	Date/Time		
COMPANY NAME:		COMPANY NAME:			

Figure 6-1. Chain-of-Custody Form

6.4 TRANSFER OF CUSTODY AND SHIPMENT

Prior to the shipment of samples, the COC record will be signed and dated by a member of the field team who has verified that those samples indicated on the COC record are indeed being shipped. After packaging has been completed, the samples will be sealed within the cooler, and custody seals, signed and dated by a member of the field team, will be place over the lid edge of each cooler. Field samples will be delivered without custody seals.

All samples will be shipped by courier (such as Federal Express) to the fixed-base laboratory. Field screening samples will be hand delivered to the field GC. Fixed-base samples will be transported, generally each day, by field personnel from the installation to the courier location for subsequent shipment to the laboratory. Upon receipt of the samples at the laboratory, the receiver will complete the transfer by dating and signing the COC record. If shipped by commercial courier, the air bill number and shipping data will be transcribed to the COC in the appropriate signature/date block. A copy of the air bill is to be kept with the field copy of the COC form to reflect specific shipping information.

6.5 LABORATORY SAMPLE RECEIVING AND STORAGE

- Upon receipt, the sample custodian will inspect sample containers for integrity. The presence of leaking or broken containers will be noted on the laboratory's Sample Receipt Form and communicated to the field sampling representative. The sample custodian will sign the COC record with the date and time of receipt, thus assuming custody of the samples.

- The information on the COC record will be compared with the information on the sample tags and labels to verify exact sample identity. Any inconsistencies will be immediately resolved with the field sampling representative before sample analysis proceeds.

- Samples will be moved to a locked restricted access sample storage refrigerator maintained at 4 ± 2°C. The laboratory is required to document all internal custody transfers.

- The laboratory will submit copies of appropriate COCs with each data package and return original COCs at the end of the project.

7.0 DOCUMENTATION PROCEDURES

Logbooks will be bound notebooks with water-resistant or waterproof pages, and sequentially numbered by either mechanical overprint or handwritten entry. All entries will be legible and made with black, waterproof ink. No pages will be removed from a logbook. For any page partially filled with an entry, a line will be drawn diagonally from below the last line entry to the bottom of the page. Blank pages will be identified by writing "page intentionally left blank." Individuals making entries will sign and date the bottom of each page of their respective logbooks. Corrections will be marked through with a single line, initialed, and dated. No "white-out," erasure, or other obliteration will be accepted. At the end of each day, all logbooks are to be turned in to the FOM so that he/she may assess the entries for completeness.

7.1 FIELD OPERATIONS MANAGER LOGBOOK

The FOM will maintain a site logbook that summarizes daily field activities but does not contain the same level of detail as the field sampling logbooks. The site logbook will be used to record daily weather conditions, personnel, activities, and references the appropriate field logbooks and data forms for various field activities. It will be used to record all field changes in scope with supporting rationale.

The following entries, as minimum, will be included in the site logbook:

- Day, date, time arrived on-site, time daily activities completed, weather conditions, names, titles, organizations of personnel present on-site, and individuals responsible for maintaining respective field logbooks.
- Name, title, and organization of visitors on-site.
- Reference to other logbooks or field data forms maintained for documentation of field activities.
- Brief description of daily site activities, (i.e., locations, volume, number, amount, etc.).
- Record all custody and transfer details, including air bill numbers, analytical request forms, COC forms, sample label numbers, and laboratories to which samples were shipped, or reference to applicable field logbooks containing specific information.
- List of equipment decontaminated, number of decontamination events, and exceptions to approved procedures, if necessary. In lieu of recording this information, specific field logbook(s) documenting these activities will be referenced.
- List of instrument calibrations, calibrating personnel, and page number(s) of the calibration log.
- List of equipment malfunctions or breakdowns occurring along with disposition, (i.e., repair, replacement, etc.), with effect on overall project.
- Record deviations from scope of WP. If a Field Change Request (FCR) is used, record the number; otherwise, record details and effect on overall project.
- Record of all telephone calls relating to field activities.

7.2 FIELD SAMPLING LOGBOOKS

The field sampling logbooks will detail the specific activities of the sampler(s) or sampling teams. The following entries, as minimum, will be included in the field logbook:

- Day; date; time arrived on-site; time daily activities completed; weather conditions; and names, titles, and organizations of personnel involved in the task.
- Name, title, and organization of visitors on-site.
- Specific description of all activities in detail, or reference to forms used to record applicable information.
- Specific details of field tests conducted with references to field data forms or other data records completed.
- Volumes of water purged, number of drums filled, etc.
- Specific descriptions of samples collected, listing label numbers, sample containers, and volumes, preservation methods, packaging, COC form number(s), and any other pertinent information available.
- List of decontamination events, including personnel, time, equipment, and procedures.
- List of instrument calibrations, including a description of any problems encountered.
- List of equipment malfunctions, including a brief description of dispositions (i.e., repair or replacement).

7.3 FINAL EVIDENCE FILE DOCUMENTATION

Records will be kept by the PM to document the QA/QC activities and to provide support for possible evidential proceedings. The following outline of project file requirements applies:

- Communications
  - Internal
  - External
- QA/QC
  - Procedures
  - COC
  - Audit Reports
  - FCR Forms
  - Nonconformance/Corrective Action Reports
- Technical Information
  - Analytical Data
  - Field Data
  - Site Logbook
  - Field Sampling Logbooks
  - Field Data Record Forms

  - Graphic Resources
  - Data Quality Acceptance
  - Calculations/Evaluations
  - Regulatory Compliance

- Project Management
  - Project Schedule
  - Budget
  - Site Database Information

- Health and Safety
  - Plans/Procedures
  - Audits Reports

- Documents
  - Plans
  - Reports
  - Relevant Publications

All evidential file documentation will be maintained by the contractor under its internal project file system. Copies of all records will be maintained by the contractor for the project continuity. The PM will ensure that the QA/QC control records are properly stored and retrievable.

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8.0 CALIBRATION PROCEDURES AND FREQUENCY FOR MEASUREMENT DATA

8.1 FIELD MEASUREMENTS

Groundwater sample measurements such as specific conductance, temperature, turbidity, pH, survey data, and health and safety monitoring will be performed and recorded in the field. The primary QA objectives of field activities where measurements will be taken are to verify that QC checks are performed, verify that measurements were obtained to the degree of accuracy consistent with their intended use, and provide documentation of adherence to the measurement procedures.

Measurement data will be generated in many field activities including:

- Documenting measurement times and weather conditions;
- Locating and determining elevations of sampling locations;
- Using a PID or OVA to make qualitative organic vapor screening measurements from samples prior to disposal segregation or health and safety monitoring;
- Measuring pH, conductivity, turbidity, and temperature; and
- Field GC screening.

The instruments will be calibrated according to manufacturers' specifications before and after each field use, or as otherwise required. Where necessary, instruments will be calibrated each day during field use.

8.1.1 Surveying

Surveying of all well and soil boring locations at the Installation will be conducted to provide a common frame of reference for RAC activities. All proposed sample locations will be flagged prior to the beginning of the sampling effort. All sample collection locations, including soil and groundwater, will be surveyed. Surveying will be completed to an accuracy of ± 0.1 ft horizontally and ± 0.01 ft vertically. All benchmarks used will be traceable to a United States Geological Survey marker.

8.1.2 Organic Vapor Analyzer

The OVA or PID is calibrated daily to an isobutylene standard following manufacturer specifications. The instrument's operation and calibration are checked periodically each sampling day using a solvent-base magic marker, or flammable organic, noting needle deflection (Table 8-1).

8.1.3 Specific Conductance Meter

Calibration is performed at the start of each sampling day using a standard solution of potassium chloride. Adjustment knobs on the meter will be used to set the meter to read the value of the standard. The meter must read within 10% of the standard to be considered in control and should read within 5% (7% is considered a

Table 8-1. Field Measurement Equipment Calibration Frequency

Instrument	Calibration Standard	Frequency	Tolerance
OVA	10 ppm methane	Daily	NA
Specific Conductance Meter	KCI	Daily	±10%
pH Meter	NIST-traceable standards	Minimum of twice daily	0.1 pH units
Temperature Meter	NIST-traceable thermometer	Prior to first measurement after mobilization of field effort	1°C
Turbidity Meter	Standard turbidity suspension	Prior to first measurement and after every well	±3 NTU
Field GC	Three-point calibration	One per cycle	± 10%
	One-point calibration	Daily	N/A

GC = Gas chromatograph.
KCI = Potassium chloride.
NA = Not applicable.
NIST = National Institute of Standards and Testing.
NTU = Nephelometric turbidity unit.
OVA = Organic Vapor Analysis.
ppm = Parts per million.

warning level). If the calibration indicates the meter is out of control, a backup unit should be employed; if one is not available, the data will be flagged to note the percent difference between the meter and the standard calibration solution. Readings from conductivity meters lacking calibration adjustments are normally stable; thus, calibration checks are usually limited to checks at the beginning and the end of the sampling day.

8.1.4 pH Meter

Calibration is performed at the start of each sampling day using National Institute of Standards and Testing (NIST)-traceable buffer solutions, which bracket the pH range expected in the samples. Calibration knobs are used to set the meter to read the value of the standard. The meter is then checked during the sampling period, using at least one standard. If the reading varies more than one-tenth of a unit between calibration checks, the frequency of the checks must be increased.

8.1.5 Temperature Meter

Temperature is measured either using a thermistor built into the specific conductance meter, or by a separate thermometer unit. The frequency of calibration; however, is a minimum; should the unit experience erratic or out-of-tolerance readings, additional checks will be performed. Technicians should be especially mindful of subjecting the unit to harsh conditions (e.g., shock, extreme cold, etc.).

8.1.6 Turbidity Meter

Calibration is performed at the start of each day's sampling event and confirmed before the start of each new well. Calibration is achieved by immersing the probe of the turbidity meter into a clean beaker three quarters full of turbidity suspension standard and adjusting the turbidity meter readout to the known standard turbidity. Should a calibration check fail to indicate a correct reading, the turbidity probe must be decontaminated again and a fresh turbidity suspension standard used.

8.2 ANALYTICAL DATA

Analytical data for RAC includes all data generated by the fixed-base laboratory. Before any laboratory instrument is used as a measuring device, the instrument response to known reference materials traceable

to NIST or other EPA-approved standards must be determined. The manner in which various instruments are calibrated is dependent on the particular type of instrument and its intended use. All sample measurements will be made within the calibrated range of the instrument.

Laboratory calibrations typically consist of two types, initial and continuing calibration. Initial calibration procedures establish the calibration range of the instrument and determine instrument response over that range. Typically, three to five analyte concentrations are used to establish instrument response over a concentration range. The instrument response over its range is expressed as a correlation coefficient or by a response factor (e.g., for GC and GC/mass spectroscopy).

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9.0 DATA REDUCTION, VERIFICATION, AND REPORTING

Data reduction is the process of converting raw data to a useable format. Data verification is the process of evaluation procedures, which assess the usability of data at an intended data quality level or DQO.

9.1 FIELD DATA

The field data that will be collected during RAC can generally be characterized as either objective or subjective data. Objective data include all direct measurements, such as field screening/analytical parameters and water level measurements. Subjective data include activity descriptions and observations.

9.1.1 Field Data Reduction

All field data will be recorded by field personnel in bound field notebooks and on standard forms. For example, during RAC field activities, the field team member supervising the drilling and/or sampling activities will keep a chronological log of activities, a vertical descriptive log of lithologies encountered, other pertinent information (i.e., staining, odors, field screening, working conditions, water levels, etc.), and a labor and materials accounting in his/her bound notebook.

After checking the validity of data in the field notes and on standard forms, the PM will be responsible for entering pertinent data into data files. Where appropriate, the data files will be set up for direct input into the project database. Subjective data will be filed as hardcopies for later review by the PM and for incorporation into technical reports, as appropriate.

9.1.2 Field Data Substantiation

Substantiation of field activities is primarily a verification that proper procedures were followed while taking measurements related to samples, locations, and survey information, etc.

Typical measurements include:

- Soil sample location measurement;
- Water level measurements;
- OVA/PID readings; and
- pH, temperature, turbidity, and specific conductance.

Field measurements are considered valid provided that

- calibration records for field measurement equipment are properly maintained;
- training records exist which document that field personnel are familiar with standard procedures for taking measurements; and
- verification that calculations and observations are accurately recorded and transcribed.

Verification of objective field and technical data will be performed at two different levels. On the first level, data will be substantiated at the time of collection by following standard procedures and QC checks. At the second level, data will be substantiated by the PM, who will review the data to ensure that the correct codes and units have been included. After data reduction into tables or the project database, the

PM will review datasets for anomalous values. Any inconsistencies or anomalies discovered will be resolved immediately, if possible, by seeking clarification from field personnel responsible for collecting the data. Subjective field and technical data will be substantiated by the PM, who will review field reports for reasonableness and completeness. In addition, random checks of sampling and field conditions will be made by the PM and QA Manager who will check recorded data at that time to confirm the recorded observations. Whenever possible, peer review will also be incorporated into the data substantiation process, particularly for subjective data, to maximize the consistency among field personnel.

9.2 LABORATORY DATA VERIFICATION

All definitive data collected during RAC will be internally verified by the Analytical Services Manager. This will be accomplished by reviewing the data packages for method QC compliance, including calibration frequency and acceptance criteria, method blank analysis, and MS analysis. The Analytical Services Manager will also verify that the sample analysis was performed within the proper holding times, that turn-around time requirements were met, and that sample analysis are compared against the COC for completeness.

10.0 ANALYTICAL DATA REPORTING AND VALIDATION

10.1 FIXED-BASE LABORATORY DATA REPORTING AND VALIDATION

10.1.1 Fixed-Base Laboratory Data Reporting

Complete sample data packages from the fixed-base laboratory are required to be submitted to the Analytical Services Manager within 30 days of sample receipt. Data packages must contain the appropriate CLP-type forms for each analysis (Table 10-1). Analytical results will be required to be delivered electronically in commercial CLP-type Form 1 information for a summary database spreadsheet.

10.1.2 Fixed-Base Laboratory Data Validation

Validation will follow the general logic of *EPA Contract Laboratory Program National Functional Guidelines for Organic Data Review*, October 1999, (Organic Functional Guidelines). Because raw data will not be submitted by the laboratory, any reference to raw data review in the Functional Guidelines will not be required. The data packages will be forwarded to the data validators after initial verification by the Analytical Services Manager.

Table 10-1. Fixed-Base Laboratory Data Package Deliverables

Method Requirements	Deliverables
Holding time information and methods requested	Signed chain-of-custody forms
Discussion of laboratory problems	Case narratives
Organics	
Sample results	CLP Form 1 or equivalent
Surrogate recoveries. Surrogates to be used in VOCs and SVOCs. TPH will not require a surrogate spike	CLP Form 2 or equivalent
Matrix spikes/spike duplicate. One spike and spike duplicate per 20 samples of similar matrix for VOCs, SVOCs, and TPH	CLP Form 3 or equivalent
Method blank data	CLP 4 Form or equivalent
GC/MS tuning for VOCs/SVOCs	CLP 5 Form or equivalent
GC/MS or GC initial calibration data for VOCs, SVOCs, and TPH	CLP 6 Form or equivalent
TPH identification summary form	CLP 10 Form or equivalent
GC/MS or GC continuing calibration data	CLP 7 Form or equivalent
GC/MS internal standard area data and analytical sequence	CLP 8 Form or equivalent

CLP = Contract Laboratory Program.
GC/MS = Gas chromatograph/mass spectroscopy.
SVOC = Semivolatile organic compound.
TPH = Total petroleum hydrocarbon.
VOC = Volatile organic compound.

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11.0 PERFORMANCE AND SYSTEM AUDITS

Audits may consist of two types, system audits and performance audits. The purpose of a system audit is to determine whether appropriate project systems are in place. Performance audits are used to indicate whether those systems are functioning properly. Audits will be conducted by the Contractor's project QA Manager, as tasked by the PM, to verify the existence of an effective QC system. Additionally, the audit will evaluate the level of compliance of that system in terms of adherence to QC measures, standards, records, project documentation, and control.

11.1 PROJECT SYSTEM AUDITS

The QA Manager may periodically, on an unannounced basis, call for a system audit. The PM will respond by submitting the QAPP. When audits are conducted, they will determine whether the QAPP is in place and whether the operations called for by the QAPP have been performed. Results of project audits will be reported to the PM. External audits may be conducted in conjunction with, or at the direction of, NYANG or the regulatory authority.

11.2 TECHNICAL PERFORMANCE AUDITS

Technical performance audits will be conducted by the project QA Manager on an ongoing basis during the project. All numerical analyses, including manual calculations, mapping, and computer support activities, will be documented and will be subject to performance audits in the form of QC procedural reviews, mathematical re-analysis, and peer review. Technical peer review is the responsibility of the PM. All records of numerical analyses will be legible, reproduction quality, and complete enough to permit logical reconstruction by a qualified objective reviewer.

11.3 FIELD AUDITS

A field performance audit may be conducted by the Analytical Services Manager at the beginning of the field effort. The Analytical Services Manager will closely monitor the mobile laboratory's performance continually throughout the course of the fieldwork. The purpose of the field audit is to ensure that proper methods and protocols detailed in this QAPP are consistently practiced in the field. Audits will be performed using tailored checklists prepared by the QC Manager. The requirements and audit questions to be developed will be as specific as possible and will focus on significant investigation techniques. Checklists are encouraged to be completed to the maximum extent possible to give a complete picture of field techniques using a structured approach.

Field operation records will be reviewed to verify that field-related activities were performed in accordance with appropriate project procedures. Items reviewed will include, but are not limited to, field equipment calibration records, daily field logs, and COC documentation.

Upon audit completion, an audit report containing observations and findings and recommended corrective actions will be submitted to the PM.

11.4 LABORATORY AUDITS

The laboratory QA Manager has the responsibility of monitoring the internal QA Program. The contractor will verify that standardized QA Programs are in effect to provide objective oversight of laboratory procedures. Additionally, copies of internal QA reports will be requested to ensure standards of quality performance are in effect.

12.0 PREVENTIVE MAINTENANCE

Preventive maintenance is an organized program of actions taken to maintain proper instrument and equipment performance and to prevent instruments and equipment from failing during use. An adequate preventive maintenance program increases reliability of a measurement system and minimizes downtime of field and laboratory instruments.

12.1 FIELD EQUIPMENT

Field equipment will be properly calibrated, charged, and in good working condition before the beginning of each working day. Manufacturers' specifications define the required equipment checks for each type of field equipment used. Non-operational field equipment will be removed from service and a replacement will be immediately obtained within 24 h. Significant repairs to field equipment will not be performed in the field.

All field instruments will be properly protected against inclement weather during the field investigation. Each instrument is specially designed to maintain its operating integrity during variable temperature ranges that are representative of ranges that will be encountered during working conditions. At the end of each working day, all field equipment will be taken out of the field and placed in a cool, dry room for overnight storage.

All subcontractor equipment (e.g., drilling rig) will arrive at the site in proper working condition. All lubricating and hydraulic motor oils will be checked by the subcontractor before the start of each work day to ensure all fluid reservoirs are full and there are no leaks. Before the start of each work day, the FOM will also inspect all equipment for fluid leaks. If a leak is detected, the equipment will be removed from service for repair or replacement.

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13.0 CORRECTIVE ACTION PROTOCOLS

The QA Manger will prepare a formal report of all initial nonconformance issues. The programmatic impact of a nonconformance, such as the lack of or a failure to use an appropriate procedure, will be determined by the QA Manger and reported to the project management staff. A corrective action plan and implementation schedule will be required, and the PM will be responsible for ensuring that immediate action to correct the nonconformance has been initiated. The PM will be responsible for ensuring the successful implementation of the corrective action plan and ensuring that no additional work that is dependent on the nonconforming action is performed until the nonconformance is corrected. Corrective action may include re-analyzing samples if holding times permit, re-sampling, and evaluating and amending sampling and analytical processes.

The PM will be responsible for ensuring that the corrective action adequately addresses the nonconformance. The QA Manager will ensure that corrective actions for nonconformance are implemented by

- evaluating all reported nonconformances,
- controlling additional work on nonconforming items,
- maintaining the log on nonconformances, and
- ensuring nonconformance and corrective action reports are included in the site documentation files.

Following implementation of satisfactory corrective action, the QA Manager will conduct follow-up activities sufficient to verify implementation of the corrective action. Such confirmation will be documented, along with any other recommendations, in a formal close-out of the nonconformance. The closeout report will be distributed to all appropriate project management personnel.

13.1 FIELD CORRECTIVE ACTION

The initial responsibility for monitoring the quality of field measurements and observations lies with field personnel. The FOM and the PM are responsible for verifying that QC procedures are being followed. This requires that the FOM assess the correctness of field methods and the ability to meet QA objectives. If a problem occurs that might jeopardize the integrity of the project or cause some specific QA objective not to be met, it is the responsibility of all field project staff to report all suspected nonconformances by initiating a nonconformance report and submitting it to the PM.

The PM will submit a copy of the nonconformance report to the QA Manager for formal investigation. An appropriate corrective action will then be decided upon and implemented. The PM will document the problem, the corrective action, and the results, using the form shown in Figure 13-1. Copies of the documentation form will be provided to the PM and the QA Manager.

The SAIC PM or his/her designee is responsible for all site activities. In this role, he/she may, at times, be required to adjust the site activities to accommodate site-specific needs. When it becomes necessary to modify a program, the responsible person notifies the SAIC PM of the anticipated change and implements the necessary changes after obtaining the approval of the SAIC PgM and the ANG PM. All changes in the program will be documented on the FCO form that will be signed by the initiators and the SAIC PM (Figure 13-2). The FCO form for each document will be numbered serially, as required. The FCO form shall be attached to the file copy of the affected document. The SAIC PM must approve the change in writing or verbally before field implementation. If unacceptable, the action taken during the period of deviation will be evaluated in order to determine the significance of any departure from established practices and action taken.

NONCONFORMANCE REPORT	DATE OF NCR	NCR NUMBER
	LOCATION OF NONCONFORMANCE	PAGE ____OF ____
INITIATOR (NAME/ORGANIZATION/PHONE	FOUND BY	DATE FOUND
RESPONSIBLE ORGANIZATION / INDIVIDUAL		PROGRAM
		PROJECT

DESCRIPTION OF NONCONFORMANCE

CATEGORY ___ ___ ___ ___ ___

[A] INITIATOR: _____ DATE _____

QA/QC OFFICER _____ DATE _____

YES ❑ NO ❑ CAR REQ'D

DISPOSITION:

PROBABLE CAUSE:

ACTIONS TAKEN TO PREVENT RECURRENCE:

PROPOSED BY:

[B] _____ NAME _____ DATE

JUSTIFICATION FOR ACCEPTANCE

INITIATOR:

[C] _____ NAME _____ DATE

VERIFICATION OF DISPOSITION AND CLOSURE APPROVAL

REINSPECTION/RETEST REQUIRED YES ❑ NO ❑ IF YES: _____ RESULT _____ DATE

QUALITY ASSURANCE:

[D] _____ NAME _____ DATE

Figure 13-1. Nonconformance Report

Instructions for completion of the Nonconformance Report
COMPLETE THIS FORM USING BLACK INK ONLY

Date of NCR	Enter the current date.
NCR Number	Obtain the NCR number from the NCR Coordinator.
Location of Nonconformance	Enter the location of the nonconforming item.
Page ___ of ____	Enter the page of the total number of pages.
Initiator:	Enter the name, organization, and phone number of the person initiating the NCR.
Found by:	Enter the name of the person who identified the nonconformance.
Date found:	Enter the date the nonconformance was identified.
Responsible Organization / Individual:	Enter the name of the organization / individual that is responsible for correcting the nonconformance.
Description of Nonconformance:	Initiator will describe in detail the nonconforming item or service; sign, date, and return the NCR for the QA/QC Officer.
Category:	Write in the number(s) of the category which best describes the nonconformance.
Disposition, Probable Cause, and Actions Taken to Prevent Recurrence:	The responsible organization / individual will describe how the nonconformance is to be corrected, give the probable cause, if known; specify actions taken to prevent recurrence, if applicable; sign, date, and return to the initiator for signature.
Justification for Acceptance:	The initiator writes the reason for accepting the explanations given in Section B of the NCR form; and signs and dates the form where indicated. If not acceptable, the initiator returns the NCR to the NCR Coordinator.
Verification of Disposition and Closure Approval:	QA/QC Officer should mark the appropriate box and sign and date in the space allotted.

CATEGORIES

1. Logbook	2. Training	3. Sample Collection
4. Chain of Custody	5. Sample Handling /Packaging	6. Preservation
7. Hold Time	8. Calibration	9. Health and Safety
10. Regulatory Compliance	11. Laboratory Deliverable	12. Well Emplacement
13. Records Management	14. Document Control	15. Document Reviews
16. Milestone	17. Other (procedure, management)	

Figure 13-1. Nonconformance Report (continued)

FCO NO._____

PROJECT_____

CONTRACT NO._____

REQUESTER IDENTIFICATION

NAME _____ ORGANIZATION _____ PHONE _____

TITLE _____ SIGNATURE _____

BASELINE IDENTIFICATION

BASELINE(S) AFFECTED O COST O SCOPE O MILESTONE O METHOD OF ACCOMPLISHMENT

AFFECTED DOCUMENT (TITLE, NUMBER, AND SECTION)_____

DESCRIPTION OF CHANGE

JUSTIFICATION

IMPACT OF NOT IMPLEMENTING REQUEST

PARTICIPANTS AFFECTED BY IMPLEMENTING REQUEST

COST ESTIMATE $ _____ ESTIMATOR SIGNATURE_____

PHONE_____ DATE_____

PREVIOUS FCR AFFECTED O YES O NO; IF YES, FCR NO_____

CLIENT PROJECT MANAGER _____ DATE _____

CLIENT QA SPECIALIST _____ DATE _____

SAIC H&S MANAGER SIGNATURE_____ DATE _____

(IF APPLICABLE)

Figure 13-2. Example of a Field Change Order Form

The SAIC PM for the site is responsible for controlling, tracking, and implementing the identified changes. Reports on all changes will be distributed to all affected parties, including the ANG PM. ANG will be notified whenever program changes in the field are made.

13.2 LABORATORY CORRECTIVE ACTION

The initial responsibility to monitor the quality of an analytical system lies with the analyst. In this regard, the analyst will verify that all QC procedures are followed and that the results of analysis of QC samples are within acceptance criteria. This requires that the analyst assess the correctness of all of the following items, where appropriate:

- Sample preparation procedures,
- Initial calibration,
- Calibration verification,
- Method blank result, and
- Laboratory control standards.

If this assessment reveals that any of the QC acceptance criteria have not been met, as defined by the laboratory's most recent Laboratory QA Plan, CLP Standards, or EPA SW-846 standards, the analyst must immediately assess the analytical system to correct the problem. The analyst notifies his/her supervisor, section leader, or QA coordinator of the problem and, if possible, identifies the potential cause(s) and makes appropriate corrective action recommendations.

The identification of the corrective action obviously depends on the nature of the problem. For example, if a continuing calibration verification is determined to be out of process control, the corrective action may require recalibration of the analytical system and re-analysis of all samples since the last acceptable continuing calibration standard.

Sample-related QC samples (e.g., MS and MSD) provide an indication of matrix effects on analyses and do not require re-analysis if method-related QC samples (e.g., method blanks, MSs, and MSDs) indicate acceptable performance.

When the appropriate corrective action measures have been defined and the analytical system is determined to be in control, the analyst documents the problem, the corrective action, and the data, thereby clearly demonstrating that the analytical system is in control. Copies of the documentation are provided to appropriate management staff members and the QA Manager for eventual addition to the project files.

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14.0 QUALITY ASSURANCE REPORTS TO MANAGEMENT

The PM will rely on written reports and memoranda documenting data assessment activities, quality audits, nonconformances, corrective actions, and quality notices. A copy of all significant QA reports will be forwarded to the appropriate management levels for review and oversight.

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15.0 REFERENCES

Air National Guard (ANG) 1998. *Final Air National Guard Installation Restoration Program (IRP) Investigation Protocol*, Air National Guard Readiness Center, Andrews Air Force Base, MD, June.

EPA 1998. *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, SW-846, 3rd Edition, Rev. 5, EPA, Office of Solid Waste, Washington, D.C., April.

EPA 1999. *Contract Laboratory Program National Functional Guidelines for Organic Data Review, EPA-540/R-99-008*, (NTIS PB99-963506), October.

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APPENDIX B

HEALTH AND SAFETY PLAN

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FINAL
HEALTH AND SAFETY PLAN
FOR THE
ENVIRONMENTAL RESTORATION
PROGRAM SERVICES
WORK PLAN FOR
GROUNDWATER SAMPLING AND
MONITORING WELL INSTALLATION
FOR
INSTALLATION RESTORATION
PROGRAM SITES 4, 7, AND 9

NEW YORK AIR NATIONAL GUARD
(106TH RESCUE WING)
GABRESKI INTERNATIONAL AIRPORT
WESTHAMPTONBEACH, NEW YORK

MARCH 2004

Contract No. DAHA90-01-D-0008
Delivery Order 27

Prepared for
ANG/CEVR
New York Air National Guard,
West Hamptonbeach, New York

Prepared by
Science Applications International Corporation
Oak Ridge, Tennessee

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ACRONYMS

ACGIH	American Conference of Governmental Industrial Hygienists
ANG	Air National Guard
bgs	below ground surface
C	ceiling
CFR	*Code of Federal Regulations*
CHSM	Corporate Health and Safety Manager
DEET	N,N-diethyl-m-toluamide
FOM	Field Operations Manager
HSP	health and safety plan
IRP	Installation Restoration Program
JP	jet petroleum
MSDS	Materials Safety Data Sheet
NYANG	New York Air National Guard
OSHA	Occupational Safety and Health Administration
PEL	permissible exposure level
PID	photoionization detector
PM	project manager
PPE	personal protective equipment
PVC	polyvinyl chloride
RAC	Remedial Action Construction
RW	Rescue Wing
SAIC	Science Applications International Corporation
SSO	Site Safety Officer
STEL	short-term exposure limit
TCE	trichloroethylene
TLV	threshold limit value
TWA	time-weighted average

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1.0 INTRODUCTION

1.1 PURPOSE AND POLICY

The purpose of this health and safety plan (HSP) is to establish personnel protection standards and mandatory safety practices and procedures for all work conducted at the 106th Rescue Wing (RW) at the New York Air National Guard (NYANG), West Hamptonbeach, New York. The HSP assigns responsibilities, establishes standard operating procedures, and provides for contingencies that may arise while performing the Environmental Restoration Program remedial action construction (RAC).

The provisions of the HSP are mandatory for all on-site field personnel. Any supplemental plans used by subcontractors must conform to this HSP. All personnel who engage in on-site project activities must be familiar with this HSP and comply with its requirements.

1.2 APPLICABILITY

This HSP, which was developed specifically for operations at the 106 RW, is structured to assign responsibilities, establish personal protection standards and mandatory safety procedures, and provide for contingencies that may arise while operations are being conducted at the sites. This HSP complies with, but does not replace, federal health and safety regulations as set forth in 29 *Code of Federal Regulations* (*CFR*) 1910 and 1926.

The provisions of the HSP are mandatory for all on-site employees engaged in hazardous material management activities including, but not limited to, initial site reconnaissance, hydrogeologic investigation, mobilization, project operations, and demobilization.

Changing and/or unanticipated site conditions may require modification of this site HSP to maintain a safe and healthy work environment. Any proposed changes to this HSP must be reviewed with the Engineering and Environmental Management Group Health and Safety Manager or designee, prior to change implementation. If this is not feasible, the project manager (PM) may modify the HSP and record all changes in the field notebook. Under no circumstances will modifications to this HSP conflict with federal, state, or local health and safety regulations.

1.3 LOCATIONS OF AREAS OF CONCERN

The sites are located at the 106 RW, NYANG Base, West Hamptonbeach, New York. The sites are described below.

- **Installation Restoration Program (IRP) Site 4 (Aircraft Refueling Apron Site)** – Site 4 encompasses a grassy area adjacent to the refueling apron, southeast of Building 358. The refueling apron was used from the 1950s through the 1980s. Fuel was pumped from the on-base Petroleum, Oil, and Lubricant Tank Farm, located approximately 3,000 ft southeast of the refueling apron, to fuel outlets in a depressed concrete area at the apron. Spills of hydraulic oil, trichloroethylene (TCE), and unknown amounts of fuel have been reported at the site. Surface drainage from Site 4 discharges to a drainage ditch at an outfall located approximately 800 ft south of the refueling apron. This discharge location has been designated Site 9.

- **IRP Site 7 (Former Fire Training Area)** – The site was used for fire training exercises by the Air Force between 1943 and 1971. The area was an unlined pit where waste fuels, solvents, and jet fuel were poured directly over the ground and ignited for fire training exercises. Air National Guard (ANG) paved the area in 1971 and a concrete bermed area was constructed in 1978. Use of the site for fire training was discontinued by ANG in 1986. Groundwater contamination, in the form of volatile and semivolatile hydrocarbons, is present in low levels.

- **IRP Site 9 (Ramp Drainage Outfall)** – Site 9 is located approximately 1,100 ft south of the refueling apron (Site 4). The site consists of an outfall, which receives drainage from the refueling apron, several hangers, and a drainage ditch. The groundwater plume from Site 4 is migrating into the area of Site 9.

1.4 SCOPE OF WORK

This field effort addresses specific operations necessary to conduct RAC at the 106 RW. Field activities to be conducted include installing subsurface soil borings for the installation monitoring wells using direct push, or auger methods, and collecting groundwater samples. Potential contaminants, which have been identified, include TCE; jet petroleum (JP)-4; JP-8; waste oils; and benzenes, toluene, ethyl benzene, and xylenes compounds.

The objectives of the sampling activities at Sites 4, 7, and 9 are to determine the horizontal extent of groundwater contamination and to facilitate the design of the proposed remedial treatment systems.

A total of 17 monitoring wells will be purged and sampled. The samples will be analyzed for volatile organic compounds, semivolatile organic compounds, target analyte list metals, nitrate/nitrite, sulfate, and methane. Additional field parameters, such as dissolved oxygen, pH, temperature, and turbidity will be collected to determine degradation rates.

In addition to the sampling effort, the following activities will occur at Site 7. Install and develop two monitoring wells to a depth of 45 ft below ground surface (bgs) using conventional hollow stem auger drilling techniques (approximately 15 ft below the water table) consisting of 2-in., Schedule 40 polyvinyl chloride (PVC) and a 10-ft screen. Removal and abandonment of one monitoring well. This well was installed in 1984 to a depth of 40-ft and is constructed of 2-in galvanized steel. This well will be abandoned in accordance with state of New York requirements.

Installation of the air sparge system at both Sites 4 and 9 will consist of installing multiple air sparge injection points at each site, 40 points at Site 4, and 6 points at Site 9. Each injection point will be installed using conventional hollow stem auger drilling techniques and will extend to a depth of approximately 45 to 65 ft bgs. The injection points will be PVC riser pipe and a 5-ft PVC pre-packed well screen. Each site will have separate portable air sparge units that will contain an independent control panel for automatic operation. Once the injection points have been installed, the portable air sparge units will be staged. Lateral connections will be installed to each injection point for the purpose of injecting air into the surrounding aquifer. This will be accomplished by excavating through the in situ soil and extending the high-density polyethylene piping to each injection point. Each injection point will be completed in 2- by 2-ft vault for protection.

1.5 HEALTH AND SAFETY PLANNING

The risk of skin contact with potentially contaminated soil or water will be minimized by the use of administrative (i.e., minimize hand contact and tool use) controls and the use of personal protective

clothing (e.g., impermeable gloves/Tyvek™). Inhalation of vapors during drilling and groundwater sampling will be minimized by administrative (i.e., upwind positioning of workers, optimizing work/minimizing exclusion zone times) controls and the use of respiratory protection if action levels are exceeded. Ingestion of contaminated materials will be minimized by good personal hygiene during decontamination (i.e., thoroughly washing face and hands with soap and water before eating or drinking).

A photoionization detector (PID) capable of detecting total volatile organic and chlorinated organic vapors will be used to monitor for organic and chlorinated organic vapors. The PID will be used on a continuous basis, typically every 5 to 10 min, to monitor the breathing zone in the immediate vicinity of the investigative operations.

1.6 RESPONSIBILITIES

All contractors and subcontractors are required to ensure that on-site employees, visitors, and their suppliers/vendors comply with the minimum standards set forth by the Occupational Safety and Health Administration (OSHA), the contractor's or subcontractor's site HSP, and with applicable regulations issued by governmental entities. Contractor and subcontractor personnel are required to know, understand, and comply with the safety regulations that apply to their operations. The provisions of this HSP, along with the applicable regulations issued by governmental entities, will be strictly adhered to by the contractor(s) and their personnel involved in site investigation activities.

The Site Safety Officer (SSO) will determine the appropriate personal protective equipment (PPE) and ensure that it is properly worn at all times. The SSO has the right to modify PPE or to evacuate the site at any time.

1.7 STAFF ORGANIZATION, QUALIFICATIONS, AND RESPONSIBILITIES

This section presents the lines of authority, responsibilities, and communication procedures concerning site safety and health and emergency response. It includes key Science Applications International Corporation (SAIC) and subcontractor personnel. All fieldwork will be under the supervision of the SAIC Field Operations Manager (FOM). The SAIC FOM will oversee normal and emergency work and will perform any required emergency notification. Table 1-1 identifies the individuals who will fill key roles for the project field activities.

Table 1-1. Staff Organization

Position	Name	Phone
Program Manager, SAIC	David Bunn	(865) 481-4658
Health and Safety Manager, SAIC	Steve Davis CIH, CSP	(865) 481-4755
Project Manager, SAIC	Larry Tyner	(865) 481-8704
Field Operations Manager, SAIC	Kevin Heaphy	(516) 250-6465
Site Safety and Health Officer, SAIC	Jeff Laidlaw	(410) 984-5882

CIH = Certified Industrial Hygienist.
CSP = Certified Safety Professional.
SAIC = Science Applications International Corporation.

The key personnel assigned to the field activity positions presented in Table 1-1 represent those individuals who will work on the project. However, personnel availability will dictate the actual roster of individuals who will perform field activities. In the event that personnel other than those presented in Table 1-1 are assigned to the project, SAIC will provide the names of those individuals to the personnel responsible for

ensuring conformance with SAIC Corporate, SAIC Engineering and Environmental Management Sector, and Air National Guard policies and procedures.

1.7.1 SAIC Program Manager

Specific health and safety responsibilities of the program manager include

- coordinating with ANG personnel,
- ensuring that PMs satisfy SAIC and ANG health and safety requirements,
- ensuring that project staff implement the project site HSP,
- ensuring that projects have the necessary resources to operate safely, and
- ensuring that project personnel have the appropriate regard for safe job performance.

1.7.2 SAIC Health and Safety Manager

The specific responsibilities of the Health and Safety Manager include

- coordinating with ANG health and safety personnel,
- reviewing and approving HSPs,
- approving downgrades in PPE or protective procedures, and
- interfacing with project personnel through routine communications and audits of selected projects.

1.7.3 SAIC Project Manager

The SAIC PM is responsible for overall project execution. The responsibilities of the PM include

- coordinating with ANG, including reporting accidents and incidents immediately and submitting written reports within 2 working days;
- ensuring implementation of the project HSP;
- ensuring adequate resources are allocated to fully implement the HSP in the field;
- maintaining auditable project documentation of all required records;
- ensuring that a qualified SSO is designated; and
- maintaining a current copy of the project HSP.

1.7.4 SAIC Field Operations Manager

The SAIC FOM will oversee the field activities associated with the project and will be responsible for site accessibility, safety, and quality assurance. The FOM's qualifications include, at a minimum, Hazardous Waste Operations and Emergency Response worker and supervisor training, experience with similar projects, and knowledge of and understanding of the project HSP. Specific responsibilities of the FOM are listed below

- enforcing compliance with the project HSP;
- coordinating on-site operations, including subcontractor activities;

- ensuring that subcontractors follow the requirements of this HSP;
- coordinating and controlling any emergency response actions; and
- maintaining current copies of the project HSP; *ANG Safety and Health Requirements Manual*; and the *SAIC Environmental Compliance and Health and Safety Program (EC&HS) Manual* on-site.

1.7.5 SAIC Site Safety Officer

The SAIC SSO is responsible for making health and safety decisions, for specific health and safety activities, and for verifying the effectiveness of the health and safety program. The SSO's qualifications include, at a minimum, Hazardous Waste Operations and Emergency Response worker and supervisor training, experience with similar projects, knowledge of and understanding of the project HSP, and the ability to use the required monitoring equipment. The SSO has primary responsibility for the following:

- implementing and verifying compliance with this HSP and reporting to the FOM, PM, and Health and Safety Manager any deviations from anticipated conditions;
- completing the health and safety debrief in Environmental Compliance and Health and Safety Procedure 20;
- documenting deficiencies identified in the daily inspections, procedures, and timetables for correction and notifying the responsible parties;
- stopping work or upgrading protective measures (including protective clothing) if uncontrolled health and safety hazards are encountered. The SSO must also authorize resumption of work following correction of the adverse condition(s);
- ensuring that site personnel have access to this plan and are aware of its provisions;
- conducting a site-specific pre-entry health and safety briefing covering potential chemical and physical hazards, safe work practices, and emergency procedures;
- maintaining on-site auditable record documentation;
- confirming that all on-site personnel have received the training listed in the "Training Requirements" chapter (Chapter 4.0) of this HSP;
- verifying that the project HSP's emergency points of contact are correct;
- ensuring that all monitoring equipment is operating according to the manufacturer's specifications and performing field checks of instrument calibration;
- ensuring that monitoring for potential on-site exposures is conducted in accordance with this HSP;
- updating the project HSP (field changes) to ensure that it adequately identifies all tasks and significant hazards at the site, and notifying project personnel and the SAIC Health and Safety Manager of changes;
- investigating accidents and near accidents and reporting (in concert with FOM) same to the PM and the Health and Safety Manager;

- conducting daily "tailgate" safety briefings; and
- controlling visitor access to the exclusion zone.

1.7.6 Subcontractor Field Manager

The Subcontractor Field Manager will oversee the field activities of his/her employees. He/she is responsible for enforcing the field requirements of this HSP. The Subcontractor Field Manager's qualifications include, at a minimum, Hazardous Waste Operations and Emergency Response worker and supervisor training, experience with similar projects, and knowledge of and understanding of the project HSP. Specific responsibilities are

- ensuring that his/her personnel on-site follow the requirements of the project HSP and any other applicable health and safety requirements (i.e., OSHA, equipment-specific controls, and state requirements);
- verifying that this HSP adequately addresses the hazards and controls of the subcontracted work, and supplementing the information in the HSP, if necessary;
- ensuring the safe operation of any subcontractor equipment;
- coordinating on-site operations of his/her personnel; and
- maintaining any required documentation (e.g., drill rig manual) specific to his/her operations.

2.0 SAFETY AND HEALTH RISK ANALYSIS

2.1 CHEMICAL HAZARDS

The groundwater at the sites has been characterized by sampling during the multiple historical investigations at each site. The list of chemicals is based on the comprehensive results of these historical investigations. The chemical toxicological properties and permissible exposure levels (PELs) are shown in Table 2-1. A hazards analysis has been prepared for each general task. The results of the hazards analysis are presented in Table 2-2.

From an occupational health standpoint, given that any potential exposure to site personnel will be only for a short period of time (intermittent for several days), the suspected low levels of contaminants are not a major concern. However, the groundwater is not characterized, so the potential for exposure to elevated levels of these contaminants may exist. Overviews of the hazards associated with exposure to the chemicals potentially on-site are presented below in terms of

PEL	Permissible Exposure Limit
C	Ceiling
TLV	Threshold Limit Value [American Conference of Governmental Industrial Hygienists (ACGIH) Guidance]
TLV-STEL	TLV–Short-term Exposure Limit (ACGIH Guidance)
TWA	Time-Weighted Average

OSHA PELs, ACGIH TLVs, and TWAs are defined as concentrations for an 8-h work day, 40-h work week to which almost all workers may be repeatedly exposed, day after day, without adverse effects.

STEL is defined as the concentration to which workers can be exposed for short time periods without irritation, tissue damage, or narcosis sufficient to cause impairment of self-rescue of precipitate accidental injury. It is a 15-min TWA that should not be exceeded at any time during the workday. A C value is a concentration that should not be exceeded at any time in any workday.

The following potential exposures may exist at the site:

- skin contact with contaminated soil or water;
- inhalation of vapors; and
- ingestion of contaminated soil dusts, especially if poor personal hygiene is practiced.

Skin contact with potentially contaminated soil or water will be minimized by wearing personal protective clothing (as described in Chapter 3.0). Inhalation of vapors during excavation or water sampling will be minimized by air monitoring, engineering controls, and the use of respiratory protection if action levels are exceeded. To prevent ingestion of contaminants, proper decontamination and personal hygiene are required. Eating, drinking, chewing tobacco or gum, smoking, or applying cosmetics are prohibited, except as approved by the SSO.

Table 2-1. Recommended Exposure Limits and Other Properties of Hazardous Compounds Potentially Existing On-site

Organic Compounds	Exposure Limits	STEL (ppm)	IDLH[a] (ppm)	Odor Threshold (ppm)	MSDS Remark(s)
Trichloroethylene	50 ppm[b]	100 ppm	1,000 ppm	82	Inhalation of vapors may cause headache, nausea, vomiting, dizziness, drowsiness, irritation of respiratory tract, and loss of consciousness. Liquid may be irritating to skin and eyes. Prolonged skin contact may result in dermatitis. Eye contact may result in temporary corneal damage Ingestion may cause nausea, vomiting, headaches, dizziness, and gastrointestinal irritation Chronic effects of overexposure may include damage to kidneys, liver, lungs, blood, or central nervous system. Carcinogen. Colorless liquid with chloroform-like odor
Benzene					
Ethylbenzene					
Toluene					
Xylenes					
Bentonite	0.05 mg/m^3	NA	NA	NA	Avoid breathing dusts (for minor silica component)
Gasoline	300 ppm	500 ppm	NA	NA	
Hydrochloric acid (used to preserve water samples)	5-ppm ceiling	NA	50 ppm	7 mg/m3	Eye: May cause irreversible eye injury. Vapor or mist may cause irritation and severe burns. Contact with liquid is corrosive to the eyes and causes severe burns. May cause painful sensitization to light. May cause conjunctivitis Skin: May be absorbed through the skin in harmful amounts. Contact with liquid is corrosive and causes severe burns and ulceration. May cause photosensitization in certain individuals Ingestion: May cause circulatory system failure. Causes severe digestive tract burns with abdominal pain, vomiting, and possible death. May cause corrosion and permanent tissue destruction of the esophagus and digestive tract Inhalation: Causes severe irritation of upper respiratory tract with coughing, burns, breathing difficulty, and possible coma. May cause pulmonary edema and severe respiratory disturbances
Isopropyl alcohol (used for equipment decontamination)					

Table 2-1. Recommended Exposure Limits and Other Properties of Hazardous Compounds Potentially Existing On-site (continued)

Organic Compounds	Exposure Limits	STEL (ppm)	IDLH[a] (ppm)	Odor Threshold (ppm)	MSDS Remark(s)
Nitric acid (used to preserve water samples)					
Liquinox (used for decontamination	NA	NA	NA	NA	Skin contact may prove locally irritating, causing drying and/or chapping. Ingestion may cause discomfort and/or diarrhea

[a]National Institute for Occupational Safety and Health (NIOSH) *Pocket Guide to Chemical Hazards*, 1997.
[b]*Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices for 1999*, American Conference of Governmental Industrial Hygienists.
IDLH = Immediately dangerous to life and health.
MSDS = Material Safety Data Sheet.
NA = Not available.
ppm = Parts per million.
STEL = Short-term exposure level.

Table 2-2. Hazards Analysis

Safety and Health Hazards	Controls	Monitoring
Soil Boring Installation and Subsurface Soil Sampling Using Hollow-Stem Auger and Direct-push Drilling Technology		
General safety hazards (powered machinery, moving equipment, slips, and falls)	Level D PPE plus hard hat, buddy system. No employees under lifted loads. Exclusion zone around rig, only necessary and experienced personnel within exclusion zone, functional back-up alarm, functional kill switch or "deadman" switch, and standard procedures	Daily site safety inspections Weekly rig inspections
Traffic accident	Compliance with EEMS EC&HS Procedure 110, Vehicle Operation (valid drivers license, seat belt use, routine vehicle inspections)	Visual
Struck by moving vehicles/equipment	Traffic control by 36-in. plus tall traffic cones, barricade tape, and/or sawhorse barricades (more substantial barriers required as traffic hazard increases). Vehicle(s) placed between workers and oncoming traffic. High-visibility safety vests in traffic areas. Flashing rotating beacon in high-traffic parking areas or brief roadwork. MUTCD-compliant traffic control plan for work in road/street, roadside parking strip, sidewalk, or shoulder. All required lane closure permits from local traffic control authority must be attached to individual site sheet for work in DOT right of way. Rig/fork truck equipped with functional back-up alarm. Artificial lighting provided for work after twilight	Visual
Noise	Hearing protection within 25 ft of rig unless equipment-specific sound level monitoring indicates noise <85 dBA	Daily safety inspections
Fire (fuels)	Fuel stored in safety cans with flame arresters Fire extinguisher rated ≥20B 25 to 75 ft from flammables storage Flammables cabinet for indoor storage of ≥25 gal No ignition sources in fuel storage areas Fuel storage areas marked with "No Smoking or Open Flame" signs Bonding (metal-to-metal contact) during pouring Gasoline-powered equipment shut down during fueling	Daily safety inspections
Exposure to chemicals (see Table 2-1)	PPE (Level D) including nitrile or PVC gloves (changed at least twice daily and immediately if contaminated) for contact with potentially contaminated material. Medical clearance for HAZWOPER work. HAZWOPER 40-h training (plus 8-h supervisor training, as applicable) Minimal contact, wash face and hands prior to taking anything by mouth Fifteen-minute eyewash if corrosive water sample preservatives are being poured, eyewash bottles if water samples are being added to pre-preserved bottles	PID or equivalent and other sampling, as appropriate Stop work if breathing zone readings exceed 5 ppm
Temperature extremes	Administrative controls as per 3.4.2 Cool/warm break area Chilled/warmed drinks (see standard procedures)	Temperature measurements

Table 2-2. Hazards Analysis (continued)

Safety and Health Hazards	Controls	Monitoring
Biological hazards (bees, ticks, wasps, snakes, and poison ivy)	PPE (boots, work clothes, tape pant legs, as needed) Insect repellant, as necessary Snake chaps for work in areas with undergrowth	Visual survey
Electric shock	Identification and clearance of overhead and underground utilities Stay at least 10 ft from overhead lines	Visual of all work areas Permits/clearance
Groundwater Sampling, Surface Soil Sampling, and Sample Preservation		
General safety hazards (moving equipment, slips, and falls)	Level D PPE, buddy system and standard procedures	Daily site safety inspections Weekly rig inspections
Traffic accident	Compliance with EEMS EC&HS Procedure 110, Vehicle Operation (valid drivers license, seat belt use, routine vehicle inspections)	Visual
Struck by moving vehicles/equipment	Traffic control by 36-in. plus tall traffic cones, barricade tape, and/or sawhorse barricades (more substantial barriers required as traffic hazard increases). Vehicle(s) placed between workers and oncoming traffic. High-visibility safety vests in traffic areas. Flashing rotating beacon in high-traffic parking areas or brief roadwork. MUTCD-compliant traffic control plan for work in road/street, roadside parking strip, sidewalk, or shoulder. All required lane closure permits from local traffic control authority must be attached to individual site sheet for work in DOT right of way. Rig/fork truck equipped with functional back-up alarm. Artificial lighting provided for work after twilight	Visual
Noise	None	None
Fire (fuels)	Fuel stored in safety cans with flame arresters Fire extinguisher rated ≥20B 25 to 75 ft from flammables storage Flammables cabinet for indoor storage of ≥25 gal No ignition sources in fuel use/storage areas Fuel storage areas marked with "No Smoking or Open Flame" signs Bonding (metal-to-metal contact) during pouring Gasoline-powered equipment shut down and allowed to cool during fueling	Daily safety inspections
Exposure to chemicals (see Table 2-1)	PPE (Level D) including nitrile or PVC gloves (changed at least twice daily and immediately if contaminated) for contact with potentially contaminated material. Medical clearance for hazardous waste work. 40-h HAZWOPER and current refresher for workers. Eight-hour additional supervisor training for FM, SSO, and all other on-site supervisors. Wash hands before eating or drinking. Nitrile gloves for chemical/contaminant contact. Chemical containers labeled with identity and hazard. MSDSs on site for all chemicals in use. Site-specific training must address chemicals,	Breathing zone monitoring with 10.2 eV PID. Stop work if breathing zone readings exceed 5 ppm for more than 1 min Daily site safety inspections

Table 2-2. Hazards Analysis (continued)

Safety and Health Hazards	Controls	Monitoring
	hazards, and proper handling. Minimal contact, wash face and hands prior to taking anything by mouth Fifteen-minute eyewash if corrosive water sample preservatives are being poured, eyewash bottles if water samples are being added to pre-preserved bottles	
Temperature extremes	Administrative controls as per Section 3.4.2 of this health and safety plan Cool/warm break area Chilled/warmed drinks (see standard procedures)	Temperature measurements
Portable electrical tools and all portable electrical equipment must be connected through ground fault circuit interrupters	Portable electrical tools and all portable electrical equipment must be connected through GFCIs	Portable electrical tools and all portable electrical equipment must be connected through GFCIs
Concrete Coring		
General safety hazards (rotating machinery, moving equipment slips, and falls)	Level D modified PPE, buddy system Exclusion zone around coring, only necessary and experienced personnel within exclusion zone, site-specific training	Daily site safety inspections
Traffic accident	Compliance with EEMS EC&HS Procedure 110, Vehicle Operation (valid drivers license, seat belt use, routine vehicle inspections)	Visual
Struck by moving vehicles/equipment	Traffic control by 36-in. plus tall traffic cones, barricade tape, and/or sawhorse barricades (more substantial barriers required as traffic hazard increases). Vehicle(s) placed between workers and oncoming traffic. High-visibility safety vests in traffic areas. Flashing rotating beacon in high-traffic parking areas or brief roadwork. MUTCD-compliant traffic control plan for work in road/street, roadside parking strip, sidewalk, or shoulder. All required lane closure permits from local traffic control authority must be attached to individual site sheet for work in DOT right of way. Rig/fork truck equipped with functional back-up alarm. Artificial lighting provided for work after twilight	Visual
Noise	Hearing protection within 25 ft of coring, unless site-specific monitoring indicates noise <85 dBA	Daily safety inspections
Fire (fuels)	Fuel stored in safety cans with flame arresters Fire extinguisher rated ≥20B 25 to 75 ft from flammables storage	Daily safety inspections
Temperature stress Fire Chemical exposure	If temperature is above 80°F or below 40°F, administrative controls will be implemented (i.e, cooled or warmed drinks, routine breaks in heated or shaded area, and provisions for emergency heating or cooling) Fire extinguisher rated 2A and 5B (serviced annually and inspected monthly) in all fuel use areas	Visual

Table 2-2. Hazards Analysis (continued)

Safety and Health Hazards	Controls	Monitoring
Hazardous material shipping	Medical clearance for hazardous waste work. 40-h HAZWOPER and current refresher for workers. Eight-hour additional supervisor training for FM, SSO, and all other on-site supervisors. Wash hands before eating or drinking. Nitrile gloves for chemical/contaminant contact. Chemical containers labeled with identity and hazard. MSDSs on site for all chemicals in use. Site-specific training must address chemicals, hazards, and proper handling See FTP 651 for guidance	Visual Breathing zone monitoring with 10.2 eV PID. Stop work if breathing zone readings exceed 5 ppm for more than 1 min
Biological hazards (bees, ticks, wasps, snakes, and poison ivy)	PPE (Level D modified) tape pant legs, as needed Insect repellant, as necessary Snake chaps for work in areas with undergrowth	Visual survey
Electric shock	Identification and clearance of overhead and underground utilities Stay at least 20 ft from overhead lines Portable electrical tools and all portable electrical equipment must be connected through GFCIs	Visual survey of all work areas Permits/clearances

dBA = Decibels as recorded on the A-weighted scale of a standard sound level meter.
DOT = U.S. Department of Energy.
EC&HS = Environmental Compliance and Health and Safety Program.
EEMG = Engineering and Environmental Management Group.
FM = Field Manager.
FTP = Field Technical Procedure.
GFCI = Ground fault circuit interrupter.
HAZWOPER = Hazardous Waste Operations and Emergency Response.
MSDS = Material Safety Data Sheet.
PID = Photoionization detector.
PPE = Personal protective equipment.
ppm = Parts per million.
PVC = Polyvinyl chloride.
SSO = Site Safety and Health Officer.

2.2 PHYSICAL HAZARDS

2.2.1 Construction Hazards

Employees must implement safe work practices in accordance with OSHA regulations while working on-site. In addition to the hazardous substances and environments present on-site, other physical hazards may exist from the drilling and sampling process, including risk of injury while working in or around heavy equipment. Work areas must be kept clear of stockpiled materials. Work areas will be barricaded to protect both public and operational personnel.

2.2.2 Heavy Equipment

Operation of heavy equipment in drilling activities presents potential physical hazards to personnel. Only experienced trained personnel shall operate heavy equipment. Affected personnel shall stay two times the greatest extended length of any piece of equipment away unless given specific permission to approach by the operator. PPE such as steel-toed shoes, safety glasses or goggles, and hard hats should be worn whenever such equipment is present. Personnel should, at all times, be aware of the location and operation of heavy equipment and take precautions to avoid getting in the way of their operation. Traffic safety vests should be worn by personnel working near heavy equipment.

2.2.3 Noise Hazards

The primary noise hazard at this site is from the heavy equipment. All personnel within 25 ft of operating equipment shall wear hearing protective devices (either muffs or plugs). The Site Manager or SSO will determine and enforce any other noise protection requirements deemed appropriate.

2.2.4 Fire/Explosion

Field activities could cause sparking. Flammable liquids are present in the form of diesel and gasoline for operation of equipment, and potential petroleum wastes and solvents. A PID will be used to monitor the work area atmosphere, as determined by the PM and SSO.

2.2.5 Temperature Extremes

The use of protective equipment, if required, may create heat stress. Monitoring of personnel wearing personal protective clothing should commence when the ambient temperature is 70°F or above. Monitoring requirements are presented in Section 3.4.2 of this HSP.

Cold stress may also be a hazard due to the time of year fieldwork is proposed. NYANG has multiple heated buildings and warm fluids available to offset cold-induced hazards. Unscheduled breaks in work will be taken on an as-needed basis to ensure site workers maintain a comfort level against cold conditions.

2.3 BIOLOGICAL HAZARDS

2.3.1 Ticks and Lyme Disease

Lyme disease, associated with bites from deer ticks, is most prevalent in the eastern United States. These ticks are believed to be the main carriers of the disease and have been found on and spread by deer, household pets, birds, and other warm-blooded animals.

Prevention of Lyme disease consists of repelling ticks and preventing tick bites. The only recognized repellent is N,N-diethyl-m-toluamide (DEET). DEET is generally considered to be safe and is used in a variety of over-the-counter insect and tick repellents.

2.3.2 Poisonous Plants

Poison ivy and poison oak may be present at the site. Personnel should be educated on the appearance of these plants to reduce chance of contact.

2.3.3 Animals

Insects such as bees and wasps may be found on-site. Personnel who may have allergic reactions should keep their personal first aid kit on-site.

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3.0 PERSONNEL PROTECTION AND MONITORING

3.1 MEDICAL SURVEILLANCE

All personnel on the site will have successfully completed a pre-placement or periodic/update physical examination within the last 12 months. This examination will comply with 29 *CFR* 1910.120 medical requirements for hazardous waste site workers. The contractor shall employ a licensed occupational health physician with knowledge and experience in the hazards associated with the project to provide the medical examinations and surveillance herein.

Subcontractors shall be responsible for medical surveillance of their employees and providing documentation to the SSO.

3.2 SITE-SPECIFIC TRAINING

The SSO will be responsible for ensuring required training is provided to employees. Documentation and certification must be provided to the SSO.

3.3 PERSONAL PROTECTIVE EQUIPMENT

Level D protection will be worn for initial entry of personnel into the site and initially for all activities. Level D protection consists of

- standard work clothes (Tyvek™ coveralls are recommended if there is a possibility of contact with contaminated soils);
- safety glasses;
- safety boots;
- nitrile, latex, or vinyl gloves – mandatory during all sampling activities;
- hard hat; and
- splash protection if contact with contaminated liquid is possible.

3.4 MONITORING REQUIREMENTS

3.4.1 Routine Monitoring for Organic Vapors

Monitoring for organic vapors in the breathing zone will be conducted with a PID with a 10.2 probe or a flame ionization detector instrument capable of detecting total volatile organic and chlorinated organic vapors. Readings will be taken under the following circumstances:

- upon initial entry onto the site,
- when weather conditions change,

- while work is in progress on the site, and
- when work begins on another portion of the site.

3.4.2 Monitoring for Temperature Extremes

Temperature stress hazards will be controlled, as required, by guidance from the ACGIH temperature stress guidelines (ACGIH 2000), modified to fit SAIC's activities.

It is the responsibility of the SSO and each crew member to ensure that temperature stress controls are adequate for the site conditions and tasks. All crew members (and specifically the SSO) are empowered and expected to stop or modify work and to take any necessary precautions to prevent temperature-related illnesses. This responsibility is in addition to the controls presented in this section.

The ambient temperature will be measured at 2-h intervals during the day using a dry-bulb thermometer or a wet-bulb globe temperature index monitor placed at the work location and in the same conditions experienced by the workers. If the temperatures reach or exceed 70°F or reach or fall below 40°F, temperature stress controls will be implemented. All temperature monitoring results, physiological monitoring results (e.g., pulse rates, oral temperature, ear canal temperature), and temperature stress controls (e.g., breaks, fluids, heated or cooled rest areas) will be documented in field records using logbooks, the inspection form in Attachment 1, or other equivalent method.

3.4.2.1 Heat stress

General controls for the prevention of heat-stress-induced illness include making fluids readily available, using the buddy system, taking scheduled or unscheduled breaks in a cooler area, providing shade, scheduling work during cooler parts of the day, providing forced ventilation, encouraging physical fitness, and application of prudent judgment by the SSO and crew. Specific requirements include those below, and are shown in Tables 2-3 and 2-4.

1. If ambient temperatures reach or exceed 70°F, workers will be allowed to take unscheduled breaks, as needed, in a cooler area. A break is defined as minimal physical activity (sitting or standing) and should be accomplished in the shade, if possible.

2. If ambient temperatures reach or exceed, or are expected to reach or exceed, 70°F, site-specific training will include heat-stress recognition and control and first aid for heat-stress-induced illnesses.

3. If ambient temperatures reach or exceed, or are expected to reach or exceed, 70°F, cooled water and Gatorade® or equivalent drink will be made conveniently available to site workers, and site workers will be encouraged to drink frequently.

4. If personnel are required to use impermeable protective clothing at ambient temperatures exceeding 70°F, a physiological monitoring (e.g., pulse rate, ear canal temperature, or oral temperature) protocol will be implemented, as specified in Table 2-3. Physiological monitoring will be performed within 1 min of stopping work. The action levels and appropriate actions are presented in Table 2-4.

Table 2-3. Maximum Intervals for Physiological Monitoring of Heat Strain

Dry-Bulb Temperature or WBGT (°F)	Work Time (minutes) Impervious Clothing – PPE		
	Light[a]	Moderate[b]	Heavy[c]
Less than 70	NL	NL	NL
70 to 74.9	120	90	60
75 to 79.9	90	60	45
80 to 84.9	60	45	30
85 to 89.9	45	30	15
90 to 94.9	30	15	10
95 to 99.9	15	10	5
100 to 104.9	Not allowed	Not allowed	Not allowed
105 or more	Not allowed	Not allowed	Not allowed

Note: The length of breaks associated with physiological monitoring will be determined by the results of physiological monitoring coupled with the Site Safety Officer's judgment of site conditions, worker fitness, other controls such as cooling systems or fans, and other relevant factors.

[a]Light work consists of performing light hand or arm work. Examples include preparing and packaging samples, classifying subsurface soil samples, supervising a sampling crew, operating a drill rig or other heavy equipment, and assisting the driller. The work performed by the driller, driller's helper, sample manager, and geologist during subsurface soil sampling is typically light work.

[b]Moderate work consists of walking, lifting, or pushing for more than 50% of the work period. Tasks such as those of the driller's helper during well installation meet this definition if the physical work occupies more than 50% of the work period.

[c]Heavy work consists of pick-and-shovel work or similar strenuous activity that takes place over more than 50% of the work period. Manual brush clearing, hand augering, manual drum moving, and similar tasks fall in this category if they meet the time requirement.

NL = No limit.

PPE = Personal protective equipment.

WBGT = Wet-bulb globe temperature.

Table 2-4. Action Levels for Physiological Monitoring of Heat Strain

Action Levels	Action
Monitoring results below action level: –pulse rate ≤110 beats per minute –ear canal temperature ≤100°F –oral temperature ≤ 99.6°F	Return to work
Monitoring results exceeding action level: –pulse rate >110 beats per minute –ear canal temperature >100°F –oral temperature > 99.6°F	Rest in shaded or air-conditioned area until monitoring results fall below action levels. Re-measure (pulse rate or temperature) after 5 min of rest
Monitoring results exceeding action level after 5 min of rest: –pulse rate >110 beats per minute –ear canal temperature >100°F –oral temperature > 99.6°F	Implement additional heat-stress controls, potentially including shading the work area, rearranging the task to share workload, providing personal cooling devices, modifying PPE, or shortening the work cycle by one-third

PPE = Personal protective equipment.

3.4.2.2 Cold stress

Critical factors in preventing cold stress disorders are adequate clothing and staying dry. The SSO and FOM will ensure the capability to quickly move individuals who become wet to a sheltered, warm area. The following specific steps will be taken [adapted from the ACGIH TLV booklet (ACGIH 2000)]:

- If ambient temperatures are 40°F or below, site training will include prevention of cold injury, cold-injury symptoms, and cold-injury first aid.

- If ambient temperatures are 40°F or below, and there is a potential for workers to become significantly wet (splashed or soaked), the SSO will ensure that at least one of the following controls is in place: (1) a sufficient supply of dry, warm clothing is immediately available; (2) employees wear clothing appropriate for water contact (e.g., immersion-survival suits, neoprene chest waders, wet suit); or (3) a heated break area is immediately available.

- A heated break area will be provided if ambient temperatures are below 32°F.

- At a minimum, breaks will be taken in a warm area every 120 min if ambient temperatures are below 32°F.

- Workers will be allowed to take unscheduled breaks, if needed, in a warm area.

If the equivalent chill temperature (temperature combined with the effect of wind) is less than -29°F, outdoor work will be discontinued or effective engineering controls such as windscreens, temporary shelters, or portable heating units will be used.

3.5 DUST CONTROL

If drilling operations or other forms of excavation generate a sustained visible dust cloud, a water mist will be applied to reduce dust generation. If the mist is not effective in reducing dust generation, personnel will don respirators (half-face or full-face, as appropriate, for analyzer readings) with combination organic vapor – high-efficiency particulate air filter cartridges (such as Mine Safety Appliance's GMC-H cartridges).

4.0 SITE CONTROL MEASURES, ACCIDENT PREVENTION, AND CONTINGENCY PLAN

4.1 SITE CONTROL MEASURES

The site control measures discussed in this section will be implemented to minimize potential contamination of workers, protect the public from potential site hazards, and to control access to the sites. Site control involves the physical arrangement and control of the operation zones and the methods for removing contaminants from workers and equipment.

Barricades and barricade tape will be used to delineate an exclusion zone around a drilling area. The barriers should be set in a 25-ft radius (as practical) around the work area. An opening in the barricades at the support zone (upwind of the equipment) will serve as the personnel and equipment exit point. All entries to and exits from the drilling work area will be made at this opening to control potential sources of contamination.

The SSO will ensure that all site visitors are logged in the project notebook and that all personnel who enter the work zone do so only with permission of the SSO after a field briefing of the current activities and potential site hazards.

4.2 SAFE WORK PRACTICES

To ensure a strong safety awareness program during all field activities, personnel must have adequate training, this HSP must be communicated to the employees, and standing orders must be developed and communicated to the on-site personnel. Standing orders for personnel entering the exclusion zone are as follows:

- Eating, drinking, chewing gum, or tobacco and smoking are prohibited in the contaminated or potentially contaminated area where the possibility for transfer of contamination exists.
- Matches or lighters are prohibited in the zone.
- No personal vehicles are allowed in either the exclusion or contamination reduction zones.
- Check in and check out are mandatory at access control points.
- The buddy system will be used at all times when performing sampling for hazardous material.
- All PPE will be used as specified.
- Discovery of unusual or unexpected conditions will result in immediate evaluation and reassessment of site conditions and health and safety practices.
- Conduct site-specific pre-entry safety briefings prior to on-site work.
- All field crew members should make use of their senses to alert them to potentially dangerous situations in which they should not become involved (i.e., presence of strong, irritating, or nauseating odors).

- Prevent, to the extent possible, spillages. In the event spillage occurs, contain liquid if possible.

- Prevent splashing of the contaminated materials.

The following guidelines will be followed while working on-site:

- Heavy equipment: Only qualified operators will be allowed to operate heavy equipment. Subcontractors will be required to use the safe work guidelines included in the OSHA General Industry (29 *CFR* 1910) and Construction Industry (29 *CFR* 1926) Standards.

- Power lines: When operating heavy equipment, such as direct-push rigs, near power lines, workers will take care to ensure that the boom or rigging is always kept at a safe distance from power lines (20-ft minimum). Any underground utility lines must also be located and appropriate precautions taken before any drilling is done.

- Electrical equipment: All electrical equipment will be properly grounded and class approved for the location.

- Machine guarding: All machinery on-site will be properly guarded to prevent contact with rotating shafts, blades, or gears.

- Flammable materials: When work involves flammable materials, adequate ventilating and control of all ignition sources will be maintained. This may include
  - nonsparking tools,
  - explosion-proof equipment (intrinsically safe),
  - class-approved electrical equipment,
  - no smoking or open lights, and
  - no welding.

4.3 HEAVY EQUIPMENT OPERATIONS

Before any drilling activity, efforts will be made to determine whether underground installations will be encountered and, if so, where these installations are located. Hard hats and safety boots, at a minimum, must be worn within 50 ft of the drill rig. The FOM or SSO will provide constant on-site supervision of the drilling subcontractor to ensure that all health and safety requirements are being met. If deficiencies are noted, work will be stopped and corrective action will be taken (i.e., retrain and purchase additional safety equipment). Reports of health and safety deficiencies and the corrective action taken will be forwarded to the PM.

4.4 COMMUNICATION

A communication network must be set up to alert site personnel of emergencies and to summon outside emergency assistance. Where voice communication is not feasible, an alarm system (i.e., sirens, horns, etc.) should be set up to alert employees of emergencies. Radio communication may also be used to communicate with personnel in the exclusion zone. Where phone service is not readily available, radios or portable phones should be used to communicate with outside agencies. Site personnel should be trained on the use of the site emergency communication network. Emergency phone numbers should be posted on or near the phone or radio used for outside communication. The SSO is responsible for establishing the communication network before the start of work and for explaining it to all site personnel during the site safety briefing.

4.5 PERSONAL INJURY

In case of personal injury at the site, the following procedures will be followed:

- Another team member (buddy) will signal the field team leader that an injury has occurred.
- A field team member trained in first aid can administer treatment to an injured worker.
- The victim will then be transported to the nearest hospital or medical center. If necessary, an ambulance will be called to transport the victim.
- The FOM or SSO is responsible for making certain that an accident report form is completed. This form is to be submitted to the Corporate Health and Safety Manager (CHSM) and the Human Resources Director. Follow-up action must be taken to correct the situation that caused the accident.
- All personal injury must be reported in writing to the CHSM and the Human Resources Director. The SSO or FOM is responsible for completing the accident report form included in Attachment 1.
- Contact the appropriate personnel per the contact list (Attachment 2) and following the guidance in the Emergency Response Plan (Attachment 3).

4.6 INCIDENT REPORT

In the event of an injury or illness, work is to be stopped until the SSO and the CHSM have determined the cause of the incident and have taken the appropriate action. Any injury or illness, regardless of severity, is to be reported.

4.7 SPILL OR HAZARDOUS MATERIALS RELEASE

Small spills are to be immediately reported to the SSO and dealt with according to the chemical manufacturer's recommended procedures. Spills or release of hazardous materials, which result in human exposure or off-site environmental contamination, are to be promptly reported by the SSO to the proper authorities and appropriate measures taken to contain and/or collect the material for approved storage and disposal.

4.8 RECORD KEEPING

All personnel will review the HSP before beginning field activities. The SSO and the PM are responsible for documenting training.

The SSO will conduct a Site Safety Briefing prior to each shift. All attendees shall sign the attendance sheet.

Any accident or exposure incident will be investigated and a report prepared according to Sections 4.5 through 4.7 of this HSP.

All instrument readings and calibrations, PPE use and changes, health and safety-related issues, and deviations from or problems with this HSP will be recorded in the Site Logbook.

4.9 MATERIAL SAFETY DATA SHEETS/EMPLOYEE "RIGHT-TO-KNOW"

As part of the Corporate Hazard Communication Program, Materials Safety Data Sheets (MSDSs) are to be kept on every hazardous material or wastes encountered at the work site. This will include any hazardous material purchased for calibration gas or decontamination purposes. The MSDSs are to be used to provide employees and subcontractors with information on the hazardous materials or wastes. The MSDSs for this work will be maintained in a central work area identified in the site-specific training.

5.0 REFERENCES

ACGIH (American Conference of Governmental Industrial Hygienists) 1999. *Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices.*

ACGIH (American Conference of Governmental Industrial Hygienists) 2000. *Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices.*

NIOSH (National Institute for Occupational Safety and Health) 1997. *Pocket Guide to Chemical Hazards.*

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ATTACHMENT 1
REPORTING FORMS

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EQUIPMENT CALIBRATION

PROJECT NAME: **PROJECT NO:**

IDENTIFIER	DESCRIPTION	BACKGROUND READING	PRE	ADJUSTMENT (IF NEEDED)	POST	NAME	DATE

TAILGATE SAFETY MEETING LOG	
PROJECT NAME:	**PROJECT NO:**
DATE: M Tu W Th F Sa Su TIME:	
WEATHER:	
WORKING CONDITIONS:	
PPE:	
ITEMS DISCUSSED:	
THE FOLLOWING INDIVIDUALS ATTENDED THE DAILY TAILGATE SAFETY MEETING (SIGNATURES)	

SITE SAFETY AND HEALTH OFFICER

ACCIDENT INVESTIGATION REPORT

Vertical/Horizontal:

Accident Log No		**Dated**	
Today's Date		**This form completed by**	
Investigated	**YES/NO**	**If yes, who by**	
Date Investigated			

	Nature/Location of injury	
1	Head & Neck	
2	Eyes	
3	Back & Spinal Column	
4	Chest	
5	Abdomen	
6	Buttock & Pelvis	
7	Thigh	
8	Knee	
9	Lower Leg	
10	Ankle	
11	Foot	
12	Toes	
13	Shoulder	
14	Upper Arm	
15	Elbow	
16	Forearm	
17	Wrist/Hand	
18	Finger/Thumb	
19	Non-localised/internal	
20	Ribs	

	Nature of Injury	
1	Open Wounds & Lacerations	
2	Bruising with intact skin	
3	Foreign Bodies in various sites	
4	Crushing	
5	Sprains/strains	
6	Fractures/Dislocations	
7	Burns	
8	Nerve injuries	
9	Traumatic Amputations	
10	Concussion	
11	Asphyxiation/Poisoning by Gas /Fume	
12	Asphyxiation/Poisoning other than by Gas/Fume	
13	Poisoning other than by Gas/Fume	
14	Electric Shock	
15	Fatal	
16	Septic	
17	Irradiation	
18	Shock other than Electric	

Treatment Given: ☐ ☐ ☐ ☐
(detail of Emergency First Aid etc.)

Back to Work: **Home:** **Doctor:** **Hospital:**

Patients Signature:_____ **First Aider Signature:**_____

Print Name: _____

Reviewers	Action	Signature	Date Received/Sent
Nominated Supervisor	**Complete Sections 1 & 2**		
Line Manager	**Complete Section 3**		
Health & Safety Representative	**Review Section 3 and complete Section 4**		
Health & Safety Advisor	**Review report, report to HSE if Lost Time & file.**		

ACCIDENT INVESTIGATION REPORT

Vertical/Horizontal:

Please read the following information before completing this form:-

- **Where possible the scene shall remain undisturbed until photographs have been taken. In the case of a serious accident the accident scene must remain undisturbed pending the investigation.**
- **Where accidents cause injury and result in absence the following day then they will be classed as LOST TIME. If the absence lasts for more than 3 days the accident becomes REPORTABLE. The Health & Safety Advisor must be informed to notify the HSE.**
- **Please ensure statements are taken from the relevant parties and forwarded with any associated documentation such as photocopies of Safety Documents, Work Order Cards, Photographs/Sketches of the accident scene, to the Health & Safety Advisor.**

SECTION 1 – NOMINATED SUPERVISOR/REPORTER OF INCIDENT

Accident Details

Name of Injured Person:	**Department/Company**
Date:	**Has the injury resulted in lost time? YES/NO**
Where did the Accident take place:	

Accident Details

Name of Person Reporting Incident:	**Department/Company**
Date:	**Location of Incident:**

Has the Drug & Alcohol Policy been implemented as a result of the accident: YES/NO

SECTION 2 – NOMINATED SUPERVISOR/REPORTER OF ACCIDENT

Details of the Injured Party

Name:	**Personnel No:**
Address:	**Designation:** **Department:** **Company:**
Nature of Injury/Accident:	
Date Occurred:	
Date Reported:	

Precise location of accident:

Investigation

I can confirm that I visited the scene of the accident at: hrs on / /
Immediate Causes: What unsafe acts or conditions caused the event?
Secondary Causes: What human, organisational or job factors caused the event?
Remedial Action: What actions have been taken or require to be taken to prevent a re-occurrence?
Statement from Injured Party / Reporter of the accident:
Name (Block capitals): **Signed:** **Date:**

Statement from Nominated Competent Person in Charge of the Investigation:
Name: (Block Capitals) **Signed:** **Date:**

Witness No. 1 Statement:		
Name: (Block Capitals)	**Signed:**	**Date:**
Witness No. 2 Statement:		
Name: (Block Capitals)	**Signed:**	**Date:**

PLEASE ATTACH ADDITIONAL STATEMENTS OR SUPPORTING DOCUMENTATION
SECTION 3 – HEALTH & SAFETY REPRESENTATIVE

Verify the facts of the investigation report and comment:
Length of service, experience and training of injured party:

Plant/Apparatus previous repair/service/overhaul date?
Review recommendations and state progress:
Additional comments on worst possible outcome, likelihood of re-occurrence and recommendations:

SECTION 4 – HEALTH & SAFETY

Review the investigation and comment on preventability, worst possible outcome & likelihood of re-occurrence:

Once this form has been initially filled in it must be forwarded to Jan Mackenzie, Health & Safety Advisor, SAIC Ltd, 5 Redwood Place, Peel Park Business Park, East Kilbride, G74 5PB

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ATTACHMENT 2
EMERGENCY CONTACTS AND
AIR MONITORING ACTION LEVELS

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EMERGENCY CONTACTS

In the event of any situation or unplanned occurrence requiring assistance, the appropriate contact(s) will be made from the list below. For emergency situations, contact will first be made with the Field Operations Manager, who will notify emergency personnel, and then contact the appropriate response teams. This emergency contacts list must be kept in an easily accessible location at the site.

106th Rescue Wing, New York Air National Guard

Contact	Phone Number
Jerry Webb, Lt. Col	(631) 288-7349
Fire Department	(631) 288-7534
Security	(631) 288-7478
Ambulance	(631) 288-7333

Medical Emergency

Contact	Phone Number
Hospital Peconic Bay Primary Med Care	(631) 288-2273

Fastest route to hospital:

See directions on Figure Att. 2-1.

Travel time from site: 2 min.

Air Monitoring Action Levels

Concentration of Organic Vapor in Breathing Zone	Action
> 5 ppm total organics	Stop work until levels dissipate, or ventilate area

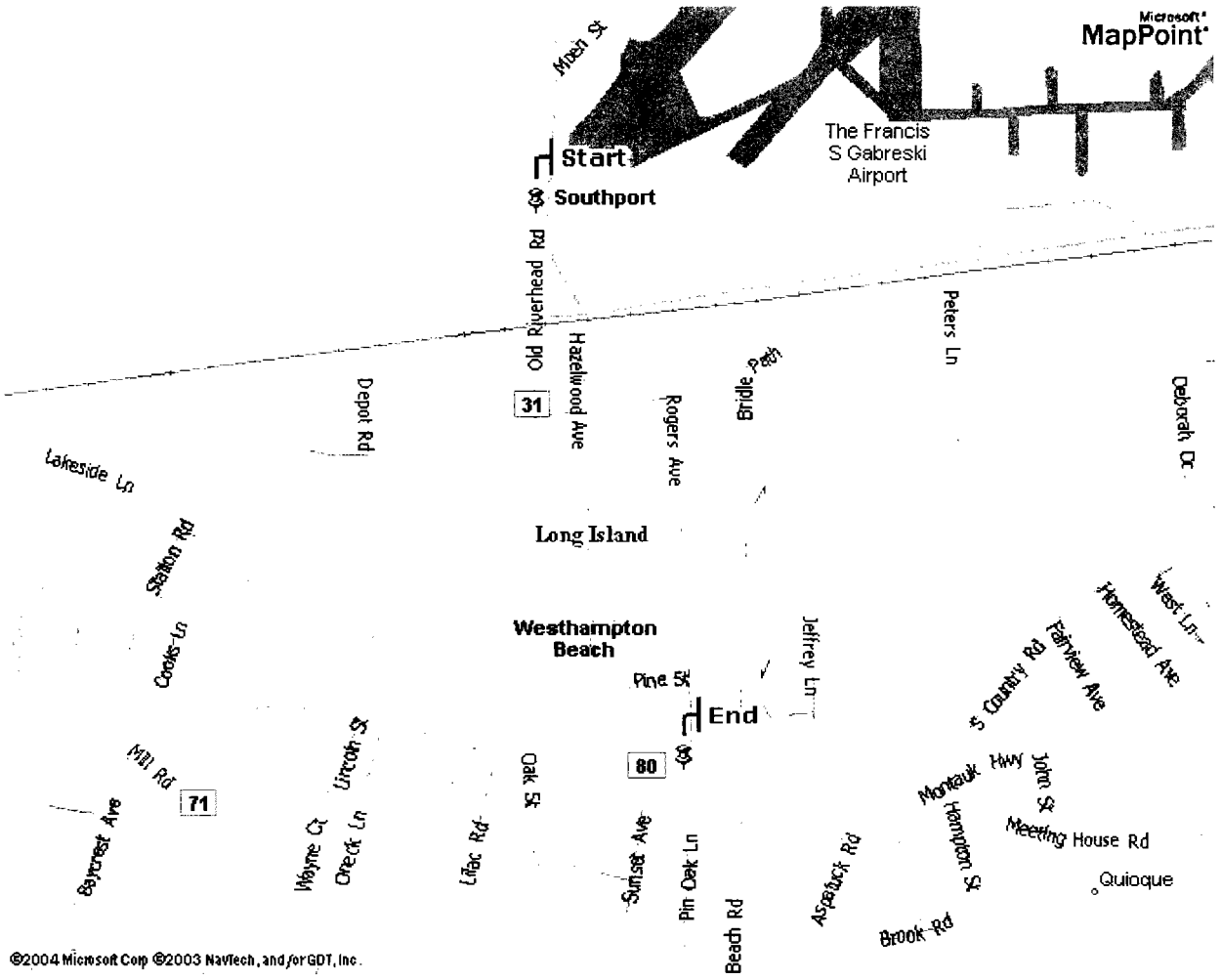

Figure Att-2-1. Hospital Route Map

ATTACHMENT 3
EMERGENCY RESPONSE PLAN

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EMERGENCY RESPONSE PLAN

Paramedics will be summoned in the event of a serious injury; they will arrange to transport the victim to the nearest appropriate facility. A first aid kit will be available at the site for use in case of minor injuries. If anyone receives a splash or particle in the eye, the portable eyewash will be used to irrigate the eye for 15 min. If direct contact with contaminants occurs, affected skin areas should be washed immediately with soap and water.

In the event of serious trauma or unknown chemical exposure, the affected employee will be stabilized by an employee(s) while others consult the emergency phone number list and telephone for immediate ambulance support.

Workers with suspected back or neck injuries are NOT to be moved until professional emergency assistance arrives.

At least one person at the site will have current certification in first aid and cardiopulmonary resuscitation.

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