



U.S. Army BRAC 2005 Site Investigation Work Plan Fort Monmouth

Final 25-September-2007

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Acronyms and Abbreviations

Acronym	Full Title
°C	Degrees Celsius
µg/L	Micrograms per liter
amsl	Above mean sea level
AST	Aboveground Storage Tank
ASTM	American Society for Testing and Materials
B/N	Base/Neutrals
bgs	Below ground surface
Bldg	Building
BRAC	Base Realignment and Closure
BTEX	Benzene, Toluene, Ethylbenzene, and Xylenes
Cabrera	Cabrera Services, Inc.
CECOM	Communications and Electronics Command
COC	Chain-of-Custody
CWA	Charles Wood Area
DCE	Dichloroethene
DPW	Directorate of Public Works
ECP	Environmental Condition of Property
EM	Electromagnetic Induction
EM31	Geonics EM31
EM61	Geonics EM61MK2
ETD&L	Electronics Technology Devices Laboratory
FID	Flame Ionization Detector
FTMM	Fort Monmouth
GC/MS	Gas Chromatography/Mass Spectroscopy
GPR	Ground-Penetrating Radar
GPS	Global Positioning System
GWSL	Groundwater Screening Level
GWTS	Groundwater Treatment System
HRC	Hydrogen Releasing Compound
HRR	Historical Records Review
HSA	Historical Site Assessment
HVAC	Heating, Ventilation, and Air Conditioning
IH	Industrial Hygiene
IRP	Installation Restoration Program
kVA	Kilovolt-ampere
m	Meter
MC	Munitions Constituents
MEC	Munitions and Explosives of Concern
mg/kg	Milligrams per kilogram
MMRP	Military Munitions Response Program
MP	Main Post
MTBE	Methyl tert-butyl ether
NAD	North American Datum
NFA	No Further Action
NJDEP	New Jersey Department of Environmental Protection
OQA	Office of Quality Assurance

Acronym	Full Title
ORC	Oxygen Release Compound
PCB	Polychlorinated Biphenyl
PCE	Tetrachloroethene
PID	Photoionization Detector
QA/QC	Quality Assurance/Quality Control
QC	Quality Control
R&D	Research and Development
RAM	Radioactive Material
RCRA	Resource Conservation and Recovery Act
REC	Recognized Environmental Condition
RI	Remedial Investigation
RL	Reporting Limit
RR	Railroad
Shaw	Shaw Environmental, Inc.
SI	Site Investigation
SOP	Standard Operating Procedure
SRWM	Site Remediation Waste Management
STP	Sewage Treatment Plant
SVE	Soil Vapor Extraction
TAL	Target Analyte List
TCE	Trichloroethene
TCL	Target Compound List
TPHC	Total Petroleum Hydrocarbon Content
USACE	U.S. Army Corps of Engineers
USACHPPM	U.S. Army Center for Health Promotion and Preventive Medicine
USAEHA	U.S. Army Environmental Hygiene Agency
USEPA	U.S. Environmental Protection Agency
UST	Underground Storage Tank
UTM	Universal Transverse Mercator
UXO	Unexploded Ordnance
VI	Vapor Intrusion
VO	Volatile Organics
VOA	Volatile Organic Analysis
VOC	Volatile Organic Compound
VSI	Visual Site Inspection

1 Introduction and Scope of Work

The U.S. Army Corps of Engineers (USACE), Baltimore District, tasked Shaw Environmental, Inc. (Shaw) to conduct a site investigation (SI) in support of an environmental condition of property (ECP) assessment. Shaw prepared this Work Plan under USACE Architectural and Engineering Services Contract Number W912DR-05-D-0026. Fort Monmouth (FTMM) was selected in 2005 for closure under the Base Realignment and Closure (BRAC) program.

This SI Work Plan has been produced in accordance with the scope of work dated September 1, 2006, and modified September 15, 2006, except where modified by the Army in response to stakeholder concerns during the preliminary planning stages of this project.

1.1 Project Background

The Army's mission under BRAC 2005 is to close or realign installations and expeditiously transfer surplus properties as directed by BRAC law. As part of this process, it is necessary for the Army to identify and document the environmental liabilities associated with installations where the BRAC action will involve the disposal of property. The ECP process is the mechanism to provide a summary of the current environmental condition of a property.

The ECP process was designed to reduce or eliminate the occurrence of incomplete site characterizations and to save time and funding by reducing the need for extended or duplicative investigations, thereby aiding the Army in expediting the disposal of BRAC 2005 real property.

For FTMM, the Phase I ECP Assessment was conducted by Shaw in 2006 and 2007. The final Phase I ECP Report for FTMM was completed on January 29, 2007 (1). Using the results of the Phase I ECP Report, Shaw completed Phase II ECP sampling recommendations for FTMM. The Phase II sampling recommendations were developed for specific areas of concern where no existing data or insufficient data were present to fully evaluate the environmental condition of the property. These sampling approaches were discussed with the Army at project meetings held on March 13, 2007, and March 27, 2007. The sampling approaches contained in this Work Plan have been modified in light of direction provided at the meetings.

A Historical Site Assessment (HSA) was completed in January 2007 for FTMM by Cabrera Services, Inc. (Cabrera) (2). Recommendations for SI activity related to radioactive material (RAM) were prepared by Cabrera based on the HSA results. The Army has begun planning for the completion of these scoping surveys. A Radiological Scoping Survey Plan is being prepared and will be issued under a separate cover. **Appendix A** of this document contains the health and safety plan for this SI as well as the site safety plan for the radiological scoping surveys. Radiological scoping surveys are planned for Building (Bldg) 275, Bldg 283, Bldg 292, and Bldg 2540. The text of this

work plan identifies radiological scoping survey buildings where they coincide with SI activities.

1.2 Project Objectives

The purpose of the SI is to move forward with the recommendations made as part of the Phase I ECP and HSA to determine whether hazardous substances, petroleum products, or radiological substances have been disposed or released on the property and to obtain defensible evidence that confirms that releases have or have not occurred.

The goals of the SI are to further assess the level of environmental liability of each area of concern and to close data gaps that resulted from the review of National Archives conducted as part of the Historical Records Review (HRR) and reviews of Army archives and material at FTMM conducted as part of the Phase I ECP. If contamination is not identified above the appropriate site-specific cleanup standards or action levels during the SI, it shall be concluded that no further action (NFA) to investigate the site is required.

The SI should provide sufficient data to either render a professional opinion that there is no reasonable basis to suspect the presence of environmental contamination; or indicate that contaminants have been released or disposed at the locations identified as concerns in the Phase I and are present at concentrations that require additional characterization and/or remediation. The SI provides information to obtain order of magnitude estimates of the general nature and extent of contamination and is not designed to fully satisfy the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act or the level of inquiry necessary to select remedial measures.

As part of the ECP, radiological issues are examined through a graded approach that begins with the HSA. The Phase II objectives for radiological characterization include the planning and implementation of scoping surveys. The work plan for characterizing the potentially impacted radiological sites is included as **Addendum 1**.

1.3 Scope of Work Plan

This Work Plan contains a discussion of the field sampling procedures applicable to the SI activities to be conducted at FTMM and the site-specific sampling approach to be conducted for sites identified in the Phase I ECP. Site health and safety requirements will be performed in accordance with procedures described in the Site-Specific Health and Safety Plan for FTMM, New Jersey (**Appendix A**).

1.4 Work Plan Organization

This Work Plan has been organized into the following sections:

- Section 1 discusses the project scope and site background.

- Section 2 discusses the various field activities that will be utilized in the completion of the SI field sampling.
- Section 3 presents the site-specific field sampling approach for FTMM including sampling tables and maps for each SI site.
- Section 4 presents the sample management and analysis requirements including sample preservation, bottle requirements, holding times, and method detection limits per analyte.
- Section 5 presents a summary of the reporting requirements for the SI.
- Section 6 presents the references cited in the Work Plan.
- Figures for the entire Work Plan are presented after Section 6.
- **Appendix A** is the Site-Specific Health and Safety Plan for FTMM.
- **Appendix B** is the applicable FTMM Standard Operating Procedures (SOPs).
- **Appendix C** is a compilation of pertinent historical figures and aerial photographs.
- **Addendum 1** is the Radiological Scoping Survey Plan for Sites Classified as Impacted by the HSA.

1.5 Property Description and History

The following sections provide summary information on past and present land use and the history of the facility.

1.5.1 Property Location and Description

FTMM is located in the central-eastern portion of New Jersey in Monmouth County, approximately 45 miles south of New York City, 70 miles northeast of Philadelphia, and 40 miles north of Trenton, the state capital. The Atlantic Ocean is approximately 3 miles to the east. FTMM falls within the Boroughs of Eatontown, Oceanport, and Tinton Falls. The areas surrounding FTMM are characterized by a mixture of residential, commercial, and light industrial uses. A review of the land use plans for the surrounding municipalities shows that land uses are compatible with those along the inside perimeter of FTMM. FTMM occupies approximately 1,126 acres and is currently comprised of two operational areas, the Main Post (MP) and the Charles Wood Area (CWA). The two areas are located about 2 miles from one another (3).

The primary mission of FTMM is to provide command, administrative, and logistical support for the U.S. Army Communications and Electronics Command (CECOM) Headquarters (4). The support provided by the installation includes tenant activities consisting of the performance of research, development, procurement, and production

of prototype communications and electronics equipment for use by the U.S. Armed Forces. The MP provides supporting administrative, training, and housing functions, as well as many of the community and industrial facilities for FTMM. These facilities are distributed across the property, with no distinct clustering of functions. The CWA is used primarily for research and development (R&D), testing, housing, and recreation. The CWA R&D and testing facilities occupy the southwest corner of the subpost. Residential areas are located in the northwest corner and along the southeastern boundary, and the golf course occupies the northeast corner (4). Currently, the workforce population at FTMM includes approximately 537 members of the active military, 8,602 civilians, 3,200 permanent contractors, 514 family members, and 30,300 retirees and family members in the area (5,6).

1.5.1.1 Main Post

The MP encompasses approximately 637 acres and contains a total of 397 buildings and structures (4). The MP is bounded by State Highway 35 to the west, Parkers Creek to the north, the New Jersey Transit Railroad (RR) to the east, and Main Street and State Highway 71 to the south. Universal Transverse Mercator (UTM) coordinate locations (North American Datum [NAD] 83, Zone 18, meters) for the MP include:

- Northeast Corner: 582178.33995, 4463977.92694
- Southeast Corner: 582755.27789, 4463525.90188
- Northwest Corner: 579532.14255, 4462789.29460
- Southwest Corner: 579698.14842, 4462269.63793

1.5.1.2 Charles Wood Area

The CWA, located 2 miles west of the MP, is composed of approximately 489 acres and contains a total of 241 buildings and structures (4). The CWA is bounded by the Garden State Parkway to the west, Tinton Avenue to the north, Maxwell Place and the New Jersey Transit RR to the east, and Pine Brook Road to the south. UTM coordinate locations for the CWA (NAD83, Zone 18, meters) include:

- Northeast Corner: 578997.83200, 4462033.09195
- Southeast Corner: 579386.98486, 4460899.58327
- Northwest Corner: 577293.44846, 4461472.84017
- Southwest Corner: 577466.30241, 4460271.56946

Prior to 1996, FTMM also included a third operational area – the Evans Area – located approximately 12 miles south of the MP. The Evans Area is excluded from this assessment due to the fact that it is being managed under the BRAC 1993 program (3).

Both the MP and the CWA are nearly level except for short, steep slopes along streams and waterways. Topographic gradient slopes gently to the east in both areas, within the drainage network of local tributaries to the Shrewsbury River. Elevations at the MP range from about 6 feet above mean sea level (amsl) at stream edges to 30 feet amsl near the center of the post. Elevations at the CWA range from about 27 to 60 feet amsl,

and the lowest elevations are along Wampum Brook near the eastern property boundary (4).

1.5.2 Historic Land Use

1.5.2.1 Main Post

The original FTMM Army camp, established for signal troop training in 1917, was located at Little Silver, New Jersey. The historic land use of the area included a one-mile horse racing track, Monmouth Park, established in 1870. The track was located in the vicinity of Patterson Army Health Clinic near the intersection of Broad Street and Park Avenue. Monmouth Park operated for 20 years. A larger Monmouth Park was reconstructed and opened on July 4, 1890. The oval track was centered on present day Greeley Field. The entire facility encompassed 640 acres (almost all of the MP area). Grandstands and a luxury hotel along Parkers Creek were part of the associated land uses. The Monmouth Park Race Track closed in 1893. Vacated buildings and structures fell into ruin and the hotel burned to the ground in 1915. The land was owned by Redacted - Privacy Act when it was evaluated for use by Camp Little Silver. The Army leased 468 acres from Redacted - Privacy Act on May 16, 1917. Prior to the Army's lease, the land had been farmed, producing a potato crop for approximately 4 years. The leased area was bounded on the north by the Shrewsbury River (currently referred to as Parker's Creek), on the west and south by a stone road from Eatontown, and on the east by the Oceanport-Little Silver Road. The condition of the land was reported as overgrown and infested with poison ivy. The land was purchased by the government in 1919 (7,8). Historical Army uses of the FTMM MP property are well documented in "A Concise History of the U.S. Army Communications-Electronics Life Cycle Management Command and Fort Monmouth, New Jersey" (7) and "Fort Monmouth: Landmarks and Place Names" (8).

1.5.2.2 Charles Wood Area

The CWA was acquired by the Army in 1941. The CWA tract included the former Monmouth County Country Club (originally Sun Eagles Country Club), Olmstead Gardens, and areas currently occupied by the golf course and Myer Center. FTMM personnel indicated an orchard was located in the golf course area prior to Army acquisition. The Sun Eagles Country Club was constructed in the 1920s and included a clubhouse (currently Gibbs Hall), an 18-hole golf course, a polo field, and an airfield (8). A 7,000 troop cantonment area was immediately built on the land, including barracks, mess halls, a school building, an office building, a recreation hall, a Post Exchange, an infirmary, and a Chapel (7,8). Historical Army uses of the FTMM CWA property are well documented in "A Concise History of the U.S. Army Communications-Electronics Life Cycle Management Command and Fort Monmouth, New Jersey" (7) and "Fort Monmouth: Landmarks and Place Names" (8).

1.5.3 Facility History

The MP of FTMM was established on June 17, 1917, as Camp Little Silver. The name of the Camp was changed after 3 months to Camp Alfred Vail. The initial mission of the

Camp was to train Signal Corps operators for service in World War I. In the first 19 months of the Camp's existence, 129 semi-permanent structures were built, a tent camp established on the site of a former swamp, and a parade ground established on the site of a former marsh. A radio laboratory and an airfield were constructed in 1918. After the war, Camp Vail was designated as the site of the Signal Corps School, the only training area for Signal Corpsmen in the country. All but four World War I structures were demolished by 1924 (7).

In 1925, the facility became a permanent post, and its name was changed to FTMM. The primary mission of FTMM continued to be Signal Corps training and electronics research. In 1934, laboratory operations were consolidated in a new facility, Squier Laboratory (Bldg 283). Research on radios and radar continued here until the early 1950s. During World War II, the pace of training increased tremendously at FTMM. The expanded laboratory effort was accomplished by starting new laboratories at other post facilities. Squier Laboratory continued to be the principal laboratory on the MP until 1954. In 1955 and 1956, 72 World War II wooden structures were demolished to make room for permanent structures. These new buildings were used for residential, administrative, commercial, and recreational purposes. A small number of additional administrative buildings were completed during the 1970s, 1980s, and 1990s (7).

Camp Charles Wood was purchased in 1941 and opened in 1942. The eastern half of the property was formerly a golf course, and the western half was residential and farmland. During World War II, the Camp was used for training Signal Corpsmen. Antenna shelters were constructed on 26.5 acres of land and used by the Signal Corps Laboratory for R&D purposes (7).

A new R&D facility, the Myer Center (Bldg 2700), was completed in 1954. R&D activities that had formerly been conducted at Squier Laboratory and some activities from the Evans Area were transferred to the Myer Center. To this day, laboratories within the Myer Center facility continue to develop state-of-the-art electronic and communications equipment for use by the U.S. Armed Forces (7).

The presence of RAM at FTMM has been predominantly limited to certain areas and functions of the installation. Historically, laboratory R&D in the areas of radio and electronics and use of vacuum tubes, radium dials, ionizing radiation-producing machines, and military support equipment such as night vision goggles that contain radioactive commodities, have been among the activities where RAM were most commonly used. Facilities, buildings, and rooms that contain or once contained equipment that produce X-rays via AC or DC sources of energy are not sources of radioactive contamination. This equipment, which includes medical and dental diagnostic X-ray machines, X-ray security inspection machines, X-ray diffraction, electron microscopes, X-ray fluorescence equipment, and some high-voltage electron tubes, only produce ionizing radiation when energized. Operation of this equipment will result in ionizing radiation fields being produced in and around the equipment only while activated, but will not result in radioactive contamination. Much of the activities of the past were performed as part of the Signal Corps Laboratories, first housed in the Squier Building (Bldg 283) and then in the Myer Center (Bldg 2700). Other work was

performed in the Evans Area of the base, which was closed in the late 1990s due to BRAC 1993 activities, and the work transferred to the CECOM Safety Office and laboratory in the CWA.

Presently, a research laboratory in Bldg 2540 in the CWA is the only site to regularly use and store RAM as part of the R&D activities performed on site. A designated storage area is set aside for drums containing material waiting for disposal, including tritium exit signs removed from FTMM buildings, smoke alarms containing RAM, and other instruments with associated check sources. These items are periodically taken to Wright Patterson Air Force Base for disposal/recycling. The administrative arm of the CECOM Safety Office is housed in the adjacent Bldg 2539 where they maintain files pertaining to the use of any RAM on the installation, as well as active Nuclear Regulatory Commission licenses, Army Radiation Authorizations for FTMM, and information on RAM use by the Army worldwide. See Section 5.8 of the Phase I ECP for a full discussion of issues related to RAM at FTMM (1). Recommendations for SI activity related to RAM were prepared by Cabrera based on the HSA results and will be conducted upon departure of current tenants from the FTMM property (45).

In 2006, an HRR report was published to document the condition of FTMM regarding munitions use. The HRR focused on properties eligible for action under the Military Munitions Response Program (MMRP). This includes sites classified as operational training ranges/areas, other munitions facilities, and facilities that were or are used for, or are permitted for the treatment or disposal of military munitions (28).

The purpose of the HRR was to collect the appropriate amount of information necessary to document historical information for MMRP eligible sites, operational training ranges/areas, and other munitions-related hazard sites at FTMM. The installation-wide HRR addressed munitions and explosives of concern (MEC) hazards (including unexploded ordnance [UXO]) and discarded military munitions, as well as munitions constituents (MC) (28).

There are typically three phases within the Army Range Program. The first phase involves a questionnaire called the Advanced Range Survey. This phase was not completed for FTMM. The second phase involved inventory of operational ranges and was conducted on FTMM on March 12, 2002. In 2003, the Phase 3 inventory was conducted to assess the potential for closed, transferring, and/or transferred ranges and sites with MEC (UXO or discarded military munitions) and/or MC sites that were potentially eligible for the MMRP.

1.6 Project Schedule

A project schedule for the entire SI is presented as **Figure 1-1**.

2 Field Activities

This section describes the methods to be used in conducting the SI field activities at FTMM. This work will include:

- Geophysical surveys.
- Surface and subsurface soil sampling.
- Surface water/sediment sampling.
- Groundwater sampling.
- Soil-gas and indoor air sampling.

This section also describes the collection procedures for field quality control (QC) samples, the decontamination procedures for sampling and heavy equipment, and the management procedures for investigation-derived wastes. Where applicable, all field activities will be conducted in accordance with New Jersey Department of Environmental Protection (NJDEP) Technical Requirements for Site Remediation (9).

2.1 Geophysical Survey

Geophysical techniques are useful for the investigation of buried waste containers, contaminant plumes, and subsurface anomalies. These techniques provide a cost-effective, non-intrusive means of screening, which can serve to focus and refine the scope of intrusive sampling and aid site characterization. The effectiveness of a particular technique depends on such factors as the physical properties of the subsurface soils, the size and nature of the materials being investigated (i.e., buried drums, underground storage tanks [USTs], etc.), the detail of the information developed, the selection of survey parameters, and site layout.

Two geophysical survey techniques commonly used for environmental investigations include: electromagnetic induction (EM) and ground-penetrating radar (GPR). These techniques will be used at FTMM for identifying subsurface anomalies which may represent USTs or other underground structures.

The following sections provide information concerning the proposed geophysical techniques and associated equipment, their limitations, and survey design considerations.

2.1.1 Electromagnetic Induction

EM involves generating a known electromagnetic field and measuring the secondary field that is thereby induced in the electrically conductive materials in the affected volume. The strength of the induced field is proportional to the electrical conductivity and may be used to detect and approximate the extent of subsurface contaminants, locate buried drums and other metal (conductive) objects, and map changes in natural hydrogeologic settings. The subsurface conductivity is most strongly affected by the presence of water and strongly conductive (metal) objects present within the sensing volume. Conductivity is also influenced by the presence of dissolved electrolytes in soil

or rock pore fluids. Contaminant plumes may be mapped if there is sufficient contrast in conductivity with background conditions.

EM is very effective for many common applications and allows rapid data collection and interpretation. Data can be continuously recorded using certain instruments.

Continuous data collection often permits results of higher density and higher resolution. In addition, continuous data collection may be more applicable for shallow depths up to 15 meters (m) below ground surface (bgs). EM survey data can be acquired at depths ranging from 0.75 to 60 m bgs. EM is strongly affected by aboveground metal including fences, cars, and utilities.

2.1.1.1 EM Survey Design Considerations

EM measurements are generally made either on a grid pattern or at discrete intervals along profile lines. It is critical to establish the survey grid carefully. Every data point must have unique location coordinates relative to this grid, this is usually done by concurrently streaming positions from a Global Positioning System (GPS) or total station into the Geonics EM61MK2 (EM61) or Geonics EM31 (EM31) metal detector data logger. The desired data resolution and the size and depth of the objects sought determine the spacing of measurement stations or survey lines. For locating individual objects or features, line spacings should be no more than 10 feet apart. Measurements are typically collected at higher densities, but are dependent on the survey objectives and can be adjusted accordingly. All site features (terrain, obstructions, tree canopy, etc.) and potential sources of noise and interference should be evaluated and accurately located so that the survey can be designed to minimize their effects. Site conditions, grid layout, measurement locations and rationale, calibration and quality assurance/quality control (QA/QC) measurements, data acquisition parameters, and survey notes will be recorded in the field logbook.

It is anticipated that the EM61 or EM31 metal detector will be used to conduct the EM surveys. The EM61 or EM31 will be calibrated daily or according to the manufacturer's specifications. Daily pre- and post-survey static background readings and static calibration readings will be taken at fixed reference points to document instrument functionality and sensor drift. The survey data will be downloaded and plotted at least daily to determine the overall quality of the data and the consistency of the results with the survey team's concept of the site conditions. This is done so that additional or replacement data may be collected or the survey parameters adjusted, if necessary to meet the survey objectives. Replicate measurements will be taken to evaluate the precision of the instrument and the reproducibility of its measurements. Data processing parameters and any data corrections will be fully documented.

2.1.2 Ground-Penetrating Radar

GPR involves the transmission of an electromagnetic radar pulse into the subsurface and the measurement of the signal that is reflected back. GPR surveys provide continuous real-time data of subsurface anomalies as a picture-like display. GPR is useful in detecting three classes of subsurface anomalies including metal objects, layers/areas/objects of differing electrical properties, and disruptions in the layering of

the subsurface geologic materials. Buried metal objects, such as pipes, drums, catch basins, and USTs, typically show prominent hyperbolic signatures because of the high contrast in electrical conductivity between metals and soil materials. Buried materials of differing electrical properties, such as concrete or brick walls, or water or air-filled polyvinyl chloride pipes, can also be detected. In some cases, contamination in the soils or floating on the water table can be detected using GPR. GPR is also useful for delineating disruptions in the natural soil layering, resulting from excavations, disposal trenches, or voids. The quality of the GPR data is highly site-specific, and data quality and depth of penetration may vary dramatically across a given site. GPR uses shielded antennas, which are not affected by overhead power lines, as are EM techniques; however, high clay or water content in the soil or the presence of rebar in concrete may limit the depth of penetration of the signal. Depth penetration is a function of antenna frequency and site conditions and is commonly less than 3 m bgs.

2.1.2.1 GPR Survey Design Considerations

GPR measurements are generally made on profile lines over a grid. It is critical to establish the survey grid carefully. The desired data resolution and the size of the survey targets (e.g., drums, USTs, buried pipelines) determine the spacing of the survey lines. In general, a profile line must pass almost directly over an object for it to be detected. The optimal spacing of the profile lines is a function of both the size and the orientation of the targets. For example, in tracing linear features of known orientation such as utility lines, the majority of the profile lines should be collected perpendicular to the presumed path of the utility line to maximize the number of lines passing over it. The smaller the objects are, the more closely spaced the profile lines must be. Common profile line spacings range from 2 to 20 feet. Secondly, an appropriate antenna/transmitter must be selected. High frequency (1 gigahertz) antennas for concrete testing have very high resolution but minimal depth of penetration. Low frequency (80 megahertz), lower resolution antennas are used for stratigraphic mapping to a depth of several meters. Intermediate size (100-500 megahertz) antennas are typically most useful for environmental and infrastructure mapping.

Although GPR is not as susceptible to above-ground noise and interference problems as is EM, all surface features (e.g., ditches, surface metal, concrete) and subsurface features (e.g., utility lines, rebar) that could affect the survey interpretation will be noted. All potential sources of noise and obstructions will be located and evaluated before the survey, so that the survey can be designed to minimize the effects of interference.

After an optimal GPR survey configuration has been decided upon, the unit is activated, and the antenna is towed along one of the pre-arranged grid lines. An electronic mark will be placed at the beginning and end of each survey line, and on fixed increments along the line (either at marked positions or with an integrated survey wheel), so that the position of the data and anomalies on each radar line is readily apparent. The survey data will be reviewed in real-time on the system display as it is recorded. The GPR lines can be reviewed or plotted as necessary in the field to ensure that the data acquisition parameters and survey design are adequate, and the survey results are consistent with the survey team's concept of the site conditions. This is done so that

replicate data may be collected or the survey parameters adjusted, if necessary. Following acquisition of data in the field, the data will be downloaded to a PC for storage and for processing and analysis. Site conditions, grid layout, profile line locations and rationale, calibrations, and QA/QC measurements, data acquisition parameters, and survey notes will be logged in the field logbook.

Depths will be calibrated at multiple locations by surveying over objects or layers of known depth. Replicate measurements will be periodically taken to estimate the instrument precision.

2.2 Soil Sampling

2.2.1 Surface Soil Sampling

Soil samples will be collected to evaluate the impacts of study sites on surface and subsurface soil. Surface soil samples will be collected following the procedure presented in this section. Subsurface soil samples will be collected using either the direct-push or test pit procedures presented in Sections 2.2.2.1 and 2.2.2.2, respectively.

Once collected, all surface and subsurface soil samples will be handled in the same manner. The soil will be field screened with a properly calibrated combination photoionization detector (PID)/flame ionization detector (FID) instrument. To field screen the soil sample, a decontaminated stainless-steel trowel will be used to make a cross-sectional slice(s) of the soil sample, or to score a longitudinal line the length of the soil sample deep enough to expose a porous surface.

Soil sample collection for volatile organic analysis (VOA) will be performed with the use of a decontaminated small diameter-coring device in accordance with FTMM SOP SAM-0207, which is presented in **Appendix B**. Once volatile organic compound (VOC) sampling is completed, or if soil samples are only being collected for non-VOC analyses, the following procedure will be followed to homogenize the soil. A sufficient amount of soil from the specified sampling interval will be placed on a decontaminated stainless-steel tray. After any rocks or organic matter have been removed, the soil will be homogenized using the coning and quartering method (American Society for Testing and Materials [ASTM] C702-98). In this method, the soil will be thoroughly mixed by turning the entire sample over three times using a stainless-steel trowel. Following the last turning, the entire sample will be shoveled into a conical pile in the middle of the tray. The conical pile will then be carefully flattened to a uniform thickness and diameter by pressing down the apex with the trowel. The flattened soil will be divided into four equal quarters. The sampling personnel will then make a determination as to whether the amount of soil on the tray is larger than the volume of the sample bottles. If the amount of soil is larger, one or two quarters will be discarded. If two quarters are discarded, opposite quarters will be selected. After removal of one or more quarters, the entire coning and quartering sequence will be repeated until the amount of soil on the tray is approximately equal to the volume of the sample bottles to be filled. Then, the required soil volumes will be placed in the sample bottles.

At most locations, surface soil samples will be collected from under the vegetative mat with a decontaminated stainless-steel bucket auger or stainless-steel trowel. If the 6-inch interval closest to the ground surface is composed mostly of organic debris, it will be discarded. The 0- to 6-inch interval will only be sampled for non-VOC analysis. Samples for VOC analysis will be collected from the 6-inch interval between 18 and 24 inches bgs. All sample locations will be marked on a site map and GPS located.

2.2.2 Subsurface Soil Sampling

Subsurface soil samples may be collected for physical and chemical analysis from direct-push borings and test pits. Subsurface soil sampling activities will proceed as follows:

- a. All boring/well drilling permits will be secured, and the drillers will comply with all regulations required by the NJDEP.
- b. Clearance of underground utilities will be obtained from the applicable facility department for all soil boring, monitoring well and test pit locations.

A site geologist will be present during all drilling and subsurface soil sampling to maintain descriptive logs and collect appropriate samples for chemical and physical analysis. All drilling and sampling activities requiring the use of a drilling subcontractor will be performed by a New Jersey licensed well driller. All sample locations will be marked on a site map and GPS located.

2.2.2.1 Direct-Push Soil Sampling

Direct-push soil sampling will be conducted utilizing the Macro Core Sampler in accordance with FTMM SOP SAM-0204, which is presented in **Appendix B**. All sample locations will be marked on a site map and GPS located.

2.2.2.2 Test Pit Sampling

Test pit excavations will be conducted to investigate the location of a former drainage field and a former dry well in the area of Bldg 2525. Subsurface soil samples will be collected from the test pits to determine whether any releases may have occurred from the former structures.

Soil removed from the test pits will be staged on plastic sheeting or a tarp at least 3 feet from the test pit while excavating. Any soil exhibiting visible evidence of contamination (e.g., staining, odor, field instrumentation readings) will be sampled.

If the test pit is less than 2 feet deep, the sampler may enter the excavation to collect the soil samples using a stainless steel trowel. If the test pit is greater than 2 feet deep, the soil samples will be collected from the backhoe bucket in an area where the sample material is not in contact with the bucket or directly from the soil horizon using a stainless steel bucket auger with extension handles.

When the excavation and sampling is complete, all soil will be placed back into the excavation. The original grades will be followed as much as possible (e.g., top soil placed at top of excavation). After the backfill and compaction are complete, the area will be raked and seeded. All test pit locations will be marked on a site map and GPS located.

2.3 Sanitary System Sampling

Sampling of the sanitary waste system will be conducted from manholes. Samples will be collected by submerging the sample bottles directly into the waste stream utilizing a pond sampler. The top of the bottle should be immersed several inches under the water where possible to prevent floating debris or surface film from entering the sample container. All sample locations will be marked on a site map and GPS located.

2.4 Sediment Sampling

Sediment samples may be collected to evaluate the impact of study sites on the surrounding surface water bodies and drainage courses. Sediment sampling data will be screened according to the 1998 NJDEP Guidance for Sediment Quality Evaluations. To determine the impacts of a specific study site or building discharges on sediment quality, samples will be collected immediately downstream of outfalls to the surface water bodies. Sediment samples may also be collected downstream of the outfall location in a depositional portion of the water body to determine the migration of the sediment from the discharge point. Sediment samples will be collected from the furthest sample location downstream, moving upstream as the sampling progresses. In addition to streams and lakes, sumps at study sites may be sampled. All sediment samples will be screened with a properly calibrated PID or FID.

Sediment sample collection for VOA will be performed with the use of a decontaminated small diameter-coring device in accordance with FTMM SOP SAM-0207, which is presented in **Appendix B**. Once VOC sampling is completed, or if sediment samples are only being collected for non-VOC analyses, the following procedure will be followed to homogenize the sediment. Rocks, twigs, and other organic matter will be removed from the sample prior to homogenization if they are not considered part of the sample. Following removal of rocks, twigs, and other organic material, the sediment will be homogenized using the coning and quartering method (ASTM C702-98). In this method, the sediment will be thoroughly mixed by turning the entire sample over three times using a stainless-steel trowel. Following the last turning, the entire sample will be shoveled into a conical pile in the middle of the pan. The conical pile will then be carefully flattened to a uniform thickness and diameter by pressing down the apex with the trowel. The flattened sediment will be divided into four equal quarters. The sampling personnel will then make a determination as to whether the amount of sediment in the pan is larger than the volume of the sample bottles. If the amount of sediment is larger, one or two quarters will be discarded. If two quarters are discarded, opposite quarters will be selected. After removal of one or more quarters, the entire coning and quartering sequence will be repeated until the amount of sediment in the pan is approximately equal to the volume of the sample bottles to be filled. Then, the

required sediment volumes will be placed in the sample bottles. Sampling personnel will avoid decanting off the excess liquid during coning and quartering. A description of properties for all sediment samples (color, texture, odor, organic content, grain size) will be recorded in the field logbook immediately after sample collection.

All sediment sampling locations will be marked on a site map and GPS located. A description of the sampling point will be entered into the field logbook. The description will be adequate for the sampling point to be located in the future.

Sediment sampling of surface water bodies will be conducted from the shoreline. Sediment samples will be collected from beneath the organic build-up or detritus material, and decomposed organic material will be included in the sample. The decomposed organic material will be retained in the sample due to the potential for this interval to be impacted due to deposition and adsorption. Typical sampling depths may range from the top of sediment to a depth of 6 inches below the top of sediment. Samples will be collected with a decontaminated stainless-steel bucket auger, if there is little or no water on top of the sediment at the particular sampling location and if the water velocity is low. For sampling locations where the water velocity is high, a decontaminated stainless-steel corer or other device that eliminates sample washing will be used. This will ensure the integrity of the surface layer of sediment and minimize the loss of fine-grained material in the sediment. All sampling locations will be marked on a map and GPS located.

2.5 Groundwater Sampling

2.5.1 Groundwater Sampling via a Direct-Push Rig

Direct-push groundwater sampling will be conducted in accordance with FTMM SOP SAM-0204, which is presented in **Appendix B**. All sample locations will be marked on a site map and GPS located.

2.5.2 Groundwater Monitoring Well Sampling

Low-flow monitoring well purging and sampling will be conducted in accordance with FTMM SOP SAM-0223, which is presented in **Appendix B**.

2.6 Vapor Intrusion

Vapor Intrusion (VI) is the migration of organic compounds from the subsurface into overlying buildings (10). Per NJDEP guidance and consistent with U.S. Environmental Protection Agency (USEPA) policy, the NJDEP recommends investigation of VI where structures are within 100 feet horizontally or vertically of shallow groundwater contamination in excess of groundwater screening levels (GWSLs). In the case of the presence of petroleum hydrocarbon contamination (particularly benzene, toluene, ethylbenzene, and xylenes [BTEX]), a 30-foot distance criterion is utilized (11). Groundwater has been extensively evaluated at FTMM through the FTMM Installation Restoration Program (IRP) and analysis of groundwater samples in conjunction with individual UST closures under the FTMM UST program. Based on the location of

existing buildings and comparison of groundwater analytical results to the GWSL, VI was determined in the Phase I ECP to be a potential concern at the following locations:

- MP:
 - FTMM-53 (Bldg 699) – BTEX and methyl tert-butyl ether (MTBE) have been detected in groundwater above the GWSLs.
 - FTMM-59 (Bldg 1122) – Trichloroethene (TCE) has been detected in groundwater above the GWSL.
 - FTMM-61 (Bldg 283) – BTEX have been detected in groundwater above the GWSLs.
 - FTMM-64 (Bldg 812) – Benzene, xylene, tetrachloroethene (PCE), TCE, and dichloroethene (DCE) have been detected in groundwater above the GWSLs. Upon further evaluation of the distribution of groundwater contaminants in relation to existing structures at this location, VI is not a concern and further evaluation is not required at this location due to active remedial activities being conducted to remediate groundwater VOC contamination.
- CWA:
 - FTMM-22 (CW-1, Bldg 2700) – PCE, TCE, and DCE have been detected in groundwater above the GWSLs.
 - FTMM-58 (Bldg 2567) – Benzene, DCE, and MTBE have been detected in groundwater above the GWSLs.

All sampling procedures outlined in the October 2005 NJDEP VI Guidance (11) and the 2005 NJDEP Field Sampling Procedures Manual (12) will be followed for the collection of soil gas and indoor air.

2.6.1 Soil Gas Sampling

2.6.1.1 Near Slab Soil Gas Sampling

Near slab specifically refers to the collection of soil gas samples within 10 feet horizontally of a building's foundation. Per NJDEP VI guidance, the following requirements will be followed during all near slab sampling events:

- The near slab soil gas samples will be collected at the depth corresponding to the range between 2 feet and 5 feet below the depth of the slab (and a minimum of 5 feet bgs).
- The soil gas sample will be collected in the vadose zone, at least 1 foot above the capillary fringe.

- Soil gas samples will be collected at a minimum from two sides of the building being investigated (biased towards the delineated groundwater plume or soil contaminant source).
- A lab certified for an appropriate air method will analyze the samples (NJDEP – Site Remediation Waste Management [SRWM] Low Level USEPA TO-15 Method using 1-Liter or 6-Liter stainless steel canisters is the most common method).

An active soil gas collection method (i.e., the “pulling” of a vapor sample through a temporary probe to a collection device) will be employed. Manually-driven soil vapor probes constructed of steel and equipped with a hardened drop-off or retractable steel tip will be used. A small diameter inert tube will be inserted through the center of the rod and connected to the drive point. When the probe is retracted or pulled up, the probe is “open” for soil gas sampling. Soil gas sampling events will be avoided after sizeable rainfall. Near slab soil gas samples will be collected at a minimum depth of 5 feet bgs. In situations where the groundwater table is less than 5 feet, alternative sampling protocols may have to be employed. Collecting soil gas samples from below large impervious surfaces where vapor accumulation may occur, including garage floors, patios, parking lots, roads, and driveways may be proposed if necessary based on site-specific conditions.

An annular seal must be maintained by the soil against the probe rods. To verify the integrity of the seal, a tracer compound, typically iso-propanol, butane, or helium will be utilized. The tracer will be placed around the base of the probe and at the various connections in the sampling system prior to sample collection by wetting a paper towel and wrapping it around the test locations. The presence of the tracer compound in the analysis (generally in excess of 1,000 micrograms per liter [$\mu\text{g/L}$]) confirms a leak, and another sample should be collected until no leak is detected. Another method employs a shroud or plastic sheeting placed around the sample probe. An inert tracer gas (such as helium) is released under the sheeting. The initial soil gas samples (after purging) can be monitored using field-screening instruments for elevated concentrations (>5%).

Stainless steel canister sample containers will be utilized for the collection of near slab samples. Either 1-Liter or 6-Liter canisters may be employed. Prior to attaching the sample container, the vapor probe will be purged by drawing 3.0 volumes of air through the probe and connecting tubing. The volume is calculated as follows:

$$\text{Purge volume} = 3.0\pi r^2 h$$

where r is the inner radius of the probe and connecting tubing, and h is the length of the probe and connecting tubing. A low purge rate at a maximum of 200 ml per minute will be utilized.

For stainless steel canisters, the sample flow rate should be a maximum of 200 milliliters per minute, which corresponds to a sample time of 5 minutes for 1-Liter canisters. This maximum flow rate has been established due to the larger volume of

stainless steel canisters and the concern over short-circuiting. The certified laboratory will provide stainless steel canisters with pre-set regulators (based on the sample time prescribed by the investigator). Therefore, the sample time will be established in advance of the sampling event.

2.6.1.2 Sub-Slab Soil Gas Sampling

The collection of sub-slab soil gas involves drilling through the building's concrete slab and collecting a soil gas sample for field or laboratory analysis. Sub-slab soil gas samples will be collected concurrently with indoor air samples to assess VI and potential background contaminant sources. As a general rule, sub-slab soil gas sampling should be employed when the basement slab covers 50% or more of the building footprint. In these situations, it may be prudent to collect a combination of sub-slab soil gas samples from the concrete area and indoor air samples from the crawl space. The soil gas samples collected from the earthen areas should be collected according to the procedures for near slab soil gas sampling outlined in Section 2.6.1.1. The utilization of sub-slab soil gas sampling is also questionable when a high water table exists near the base of the sub-floor (less than 2 feet). Typically, vapors migrate through the most coarse and/or driest material. Depending on the analytical method, high moisture content in the soil gas sample can "mask" results. Additionally, reduced permeability of the soil in the capillary fringe area may limit the movement of soil gas.

Specifically, sub-slab soil gas samples can be collected when groundwater is as close as 2 feet below the building foundation if:

1. The seasonal high water table does not reach the building foundation.
2. The water table does not extend into fill material directly under the building foundation.
3. The capillary zone does not reach the building foundation.

A building walkthrough will be conducted prior to indoor air and/or sub-slab soil gas sampling to address:

- Detection of potential background sources of VOCs.
- Determination of the building construction.
- Recognition of points of VI in a structure.
- Identification of possible sample locations.
- Education of the occupants on VI and sampling procedures.

The building walkthrough will be conducted a minimum of one week before the actual indoor air or sub-slab soil gas sampling event. The *Indoor Air Building Survey and*

Sampling Form (Appendix B to the NJDEP VI Guidance [11]) will be completed in conjunction with the building walk through and sampling event.

A PID/FID detector will be utilized during building walkthroughs and surveys during VI investigations to determine items such as individual cans of solvents that can be identified as vapor sources and removed from the building in advance of the sampling event. The FTMM Directorate of Public Works (DPW) will determine if the building walk through should be conducted after normal business hours.

Under the right circumstances, the results of sub-slab soil gas sampling may be utilized to determine whether the VI pathway is currently complete for a particular building. This is appropriate when the source of the vapors is a contaminated groundwater plume under or in close proximity to the building in question. Investigators may want to collect sub-slab soil gas samples as an alternative to indoor air sampling in situations where indoor sources are likely to significantly affect indoor air quality.

The general condition of the slab and walls will be documented as part of the Building Survey form (which will be filled out during all sub-slab soil gas sampling events). The investigator will note the presence of sumps, cleanouts, and floor drains. In addition, the sub-slab sampling points will be installed in such a manner so as to provide a tight seal around the sampling point which serves to isolate the sub-slab environment from the inside of the building and allow for collection of samples which are representative of sub-slab vapor conditions. Subsurface conditions under the slab will be evaluated before drilling to determine the following:

- Depth to the high water table.
- Presence and location of underground utilities (e.g., electric, gas, water or sewer lines) located below the slab.
- Is a vapor barrier already in place under the slab?

Temporary sample probes will be utilized. Teflon tubing (1/8 to 3/8 in) draped with Teflon tape to create a snug fit when twisted into the hole will be utilized. Modeling clay, beeswax or other non-volatile emitting and non-shrinking materials may be utilized to minimize leaking from the drilled hole. Either 1-Liter or 6-Liter stainless steel canisters will be employed. The sub-slab soil gas samples will be analyzed using the NJDEP – SRWM Low Level USEPA TO-15 Method.

The sample flow rate will be a maximum of 200 milliliters per minute, which corresponds to a sample time of 5 minutes for 1-Liter canisters. The investigator may want to collect the sub-slab soil gas sample over a 24-hour period, especially when indoor air samples are being done concurrently. However, samples times up to 24 hours are acceptable (excluding instantaneous or grab samples). The certified laboratory provides 6-Liter stainless steel canisters with pre-set regulators (based on the sample time prescribed by the investigator). Therefore, the sample time must be established in advance of the sampling event. Investigators can determine a draw rate prior to the sub-slab soil gas

sampling event through the installation of a test probe and subsequent draw rate determination with a purge pump.

Prior to attaching the sample container, the vapor probe will be purged by drawing 3.0 volumes through the probe and connecting tubing as outlined above in Section 2.6.1.1.

Vapor probes will be installed in central locations on the slab. Positions near the perimeter of the slab are subject to dilution and will be avoided. The number and placement of the test points should be determined on a site-specific basis with deliberation given to occupied spaces, segmented areas within larger areas, and use of the building.

Sub-slab soil gas results will be utilized for comparison to other data sets (e.g., groundwater, indoor air, and ambient air). Results from a sub-slab soil gas investigation should be compared to the NJDEP soil-gas screening levels.

2.6.2 Indoor Air Sampling

Indoor air samples will be collected concurrently with ambient air and sub-slab soil gas samples.

A laboratory holding a current certification/accreditation from NJDEP Office of Quality Assurance (OQA) for the NJDEP – SRWM Low Level USEPA TO-15 Method will be utilized to provide the canisters and to perform the analyses.

A minimum of one indoor air sample will be collected from the ground floor at each parcel using 6-Liter stainless SUMMA canisters. If a basement or crawlspace exists, a second canister air sample will be collected as part of the minimum requirements. Breathing zone height (3-5 feet) will be targeted for ground floor sample collection and basement samples will be positioned as close as possible to the potential intrusion area(s) (e.g., sumps, major cracks in foundation). One ambient (outdoor) sample will be taken per parcel concurrently with the indoor samples to assist in evaluating background contaminant levels. This ambient air sample will be taken at breathing zone height and located in a reasonably representative area (e.g., not immediately next to auto traffic or other potential sources). Air samples will be collected over a 24-hour period and air filters will be utilized for each canister to prevent clogging.

Indoor air results will be compared to the NJDEP indoor air screening levels.

2.7 Decontamination Procedures for Sampling

Decontamination procedures for aqueous and non-aqueous sampling equipment will be conducted in accordance with FTMM SOP SAM-0206, which is presented in **Appendix B**.

2.8 Field QC Samples

Field QC samples for aqueous and non-aqueous sampling will be conducted in accordance with FTMM SOP SAM-0202, which is presented in **Appendix B**.

2.9 Management of Investigation-Derived Wastes

2.9.1 Liquid Wastes

Liquid wastes generated as part of the sampling process include development, purge and decontamination waters. Disposal will be dependant on whether the wastewaters are deemed contaminated. To determine whether the wastewaters are contaminated, field instrument readings and previous analytical data will be used to characterize it. Water not considered contaminated can be re-applied directly to the ground surface and permitted to percolate back to groundwater system. Care should be taken to avoid nuisance situations such as pooling or runoff by monitoring the discharge rate and percolation rate as not to cause undue concern. When water is considered contaminated, the water generated can be reapplied back only if the following conditions are met:

- The water is not permitted to migrate off site.
- There is no potential for contaminating a previously uncontaminated aquifer.
- The discharge will not cause an increase to ground surface soil contamination.

If the above conditions cannot be met, the water will be collected and secured at a single location. Collected water may be subsequently re-applied to ground surface, if based on analytical data, there are indications that the above conditions can be met. If not, arrangements for proper disposal will be coordinated with the facility.

2.9.2 Soil and Sediment Wastes

Soil and sediment wastes may be generated from drilling operations or sampling activities. Where materials are known (via field instrumentation or visual observation) or suspected (historic information) to be contaminated, the soil or sediment may be disposed of on-site provided the following conditions are met:

- The soil/sediment is considered non-hazardous.
- No potential to contaminate an uncontaminated aquifer exists.
- The disposal of soil/sediment will not erode or flow off site or on site into uncontaminated areas.
- The potential to create a health hazard to adjoining property owners through airborne exposure is nonexistent.

If any of the above conditions cannot be met on-site, the material will be placed in containers (e.g., drums) and stored in a secured area of the site. Proper disposal of the waste material will be coordinated with the facility.

2.9.3 Miscellaneous Wastes

All disposable sampling equipment as well as personal protective equipment not considered hazardous waste will be contained and disposed of as specified in FTMM SOP SAM-0223. Miscellaneous wastes deemed to be hazardous waste based on analytical data will be disposed of in accordance with *Hazardous Waste Identification, Collection, Storage and Disposal Procedures at Fort Monmouth*.

3 Site-Specific Sampling Approach

This section outlines the parcel specific investigations to be conducted. The field sampling methodologies referenced herein (i.e., surface soil sampling, sediment sampling, geophysical surveys, etc.) are summarized in **Section 2.0**, and details pertaining to the analytical program are included in **Section 4.0**. The water, soil, and sediment analytical programs for individual parcels are comprised of various combinations of Volatile Organics (VO) +10, Base/Neutrals (B/N) +15, Total Petroleum Hydrocarbon Content (TPHC), Target Compound List (TCL)+30 for organics, and Target Analyte List (TAL) metals, depending on site-specific history.

3.1 Parcel 13 – Former Barracks (Bldgs 2004 – 2016)

3.1.1 Site Description

Parcel 13 is located in the northeast portion of CWA and is currently a paved parking lot. This area was identified on historic aerial photographs as formerly occupied by barracks. Based on review of aerial photographs, the barracks were demolished before 1963 (13). Plan No. 520, “Gas Distribution, Gasoline and Fuel Storage, CWA,” dated January 16, 1956 (**Appendix C**), was reviewed for CWA as part of the Phase I ECP. The plan depicts numerous fuel oil USTs that existed within Parcel 13 in 1956 in association with the former barracks. It is not known if these USTs have been removed. Additional information can be found in Section 5.4 of the Phase I ECP (1).

3.1.2 Previous Investigations

No previous investigations were identified within this parcel.

3.1.3 Site Investigation Sampling

A review of documented UST removal locations versus the location of former buildings within Parcel 13 was conducted. Based on this review, it was determined that no UST removals have been documented at the locations of the former barracks within Parcel 13. In order to determine the absence/presence of formerly utilized USTs and the potential release from the USTs, geophysical surveys, soil sampling, and groundwater sampling will be conducted throughout Parcel 13.

Field investigation activities at this site will be constrained by use of the parking lot. Sampling activities will be coordinated with FTMM personnel and the parking lot cordoned-off in sections to allow geophysics and sampling.

See **Table 3-1** for a summary of proposed field activities and **Figure 3-1** for sample locations.

Table 3-1
Parcel 13 Sampling Location, Rationale and Analytical

Sample Location	Sample Media	Sample Location Rationale	Analytical Suite
300-ft x 950-ft former barracks area	A geophysical survey will be conducted over the 300-ft by 950-ft former barracks area. The geophysical investigation will consist of an EM survey throughout the parcel followed by a targeted GPR survey of anomalies identified by the EM survey.		
13SS-A1:C10 (30 samples)	Surface soil	Soil samples to be collected from the 0-6" bgs interval from Geoprobe® soil borings in a grid configuration (to be conducted on 100-ft centers) to investigate the potential release from former heating oil USTs associated with the former barracks. If the sample location is paved, the sample will be collected from the 6-inch interval below the pavement sub-base. Sample data will indicate whether contaminant releases, if any, have occurred from the previous USTs into the soil.	TPHC, VO+10 (25% of TPHC > 1,000 mg/kg)
13SB-A1:C10 (30 samples)	Subsurface soil	Soil samples to be collected from the 0-6" interval directly above the water table (estimated to be 5 to 12 feet bgs) from each Geoprobe® soil boring in the grid (to be conducted on 100-ft centers) to investigate the potential release from former heating oil USTs associated with the former barracks. Field screening of the entire Geoprobe® soil core will be conducted using PID and FID meters. An additional sample interval may be collected if warranted based on the field screening results. Sample data will indicate whether contaminant releases, if any, have occurred from the previous USTs into the soil.	TPHC, VO+10 (25% of TPHC > 1,000 mg/kg)
13GW-C2, C4, C6, C8, C10 (5 samples)	Groundwater	Groundwater samples to be collected from the specified Geoprobe® soil borings in the grid to investigate the potential release from former heating oil USTs associated with the former barracks. Groundwater samples will be collected on 200 foot centers in the down-gradient portion of the sampling grid. Sample data will indicate whether contaminant releases, if any, have occurred from the previous USTs into the groundwater.	VO+10, B/N+15

3.2 Parcel 14 – Former Barracks and Former Residential Housing Area in Northwest Portion of CWA

3.2.1 Site Description

Parcel 14 is located in the northwest portion of CWA and is currently undeveloped. This area was identified on historic aerial photographs as formerly occupied by barracks and residential housing. The barracks identified within this parcel were in place in aerial photographs from 1947 and 1957 (**Appendix C**). Based on the time at which these previous barracks existed (1940s and early 1950s), it is likely that fuel oil was the primary heating fuel and individual USTs were likely utilized for the storage of fuel oil at

each individual building. It is not known if the USTs associated with the barracks were ever removed. Housing had replaced the original barracks within the parcel by 1963 (13). The housing was in place until 2002 and was identified on Plan No. 520, "Gas Distribution, Gasoline and Fuel Storage, CWA," dated January 16, 1956 (**Appendix C**), as being supplied by gas distribution lines. The housing was demolished between 2001 and 2003 and the area has been undeveloped since 2004. Additional information pertaining to this parcel can be found in Section 3.3, Section 5.4, and Appendix G of the Phase I ECP (1).

3.2.2 Previous Investigations

No previous investigations have been conducted to investigate possible fuel oil USTs associated with the former barracks.

3.2.3 Site Investigation Sampling

A review of documented UST removal locations versus the location of former buildings within Parcel 14 was conducted. Based on this review, it was determined that few UST removals have been documented at the locations of the former barracks that existed within Parcel 14 in the 1940s and early 1950s. In order to determine the absence/presence of formerly utilized USTs and the potential release from the USTs, geophysical surveys, soil sampling, and groundwater sampling will be conducted throughout Parcel 14.

Parcel 14 is largely unused. There should be very limited impact to FTMM operations. One exception is the parking area north of Bldg 2700 and Corregidor Road. Sampling and geophysical surveys will be coordinated with FTMM personnel and sections of the lot cordoned-off to allow field investigations.

See **Table 3-2** for a summary of proposed field activities and **Figure 3-2** for sample locations.

Table 3-2
Parcel 14 Sampling Location, Rationale and Analytical

Sample Location	Sample Media	Sample Location Rationale	Analytical Suite
Entire Parcel (approximately 77 acres)	A geophysical survey will be conducted over the entire parcel. The geophysical investigation will consist of an EM survey followed by targeted GPR of anomalies identified by the EM survey.		
14SS-A1:O23 (150 samples)	Surface soil	Soil samples to be collected from the 0-6" bgs interval from the Geoprobe® soil boring grid (to be conducted on 100-ft centers) to investigate the location of potential heating oil tanks associated with the former barracks. If the sample location is paved, the sample will be collected from the 6-inch interval below the pavement sub-base. Sample data will indicate whether contaminant releases, if any, have occurred from the previous USTs into the soil.	TPHC, VO+10 (25% of TPHC > 1,000 mg/kg)

Sample Location	Sample Media	Sample Location Rationale	Analytical Suite
14SB-A1:O23 (150 samples)	Subsurface soil	Soil samples to be collected from the 6-inch interval directly above the water table from each Geoprobe® soil boring in the grid (to be conducted on 100-ft centers) to investigate the location of potential heating oil tanks associated with the former barracks. Field screening of the entire Geoprobe® soil core will be conducted using PID and FID meters. An additional sample interval may be collected if warranted based on the field screening results. Sample data will indicate whether contaminant releases, if any, have occurred from the previous USTs into the soil.	TPHC, VO+10 (25% of TPHC > 1,000 mg/kg)
14GW-B22, D14, D16, D18, D20, D22, L19, L21, L23, M17, O2, O4, O6, O8, O10, O11, O13, O15, O17 (19 samples)	Groundwater	Groundwater samples to be collected from the specified Geoprobe® soil borings in the grid to investigate the location of potential heating oil tanks associated with the former barracks. Sample data will indicate whether contaminant releases, if any, have occurred from the previous USTs into the groundwater.	VO+10, B/N+15
B9MW09B, B10MW10B (2 samples)	Groundwater	Groundwater samples to be collected from the existing monitoring wells to investigate the location of potential heating oil tanks associated with the former barracks. Sample data will indicate whether contaminant releases, if any, have occurred from previous USTs into the groundwater.	VO+10, B/N+15

3.3 Parcel 15 – Bldg 2700

3.3.1 Site Description

The Myer Center facility (Bldg 2700) is located in the CWA of FTMM at the intersection of Pearl Harbor Avenue and Corregidor Road. Bldg 2700 is a four-story building with a basement totaling approximately 673,000 square feet in size. The building footprint totals approximately 171,000 square feet. It was built in 1954 and has an extensive history of laboratory operations, photoprocessing, and paint spraying booths. Various laboratory processes were noted in a 1955 Industrial Hygiene (IH) Survey, following the construction of the Myer Center. Operations included electrochemical research, growing and shaping of crystals, various plating operations, mixing of magnetic powders, machining, welding, spray painting, use of solvents for equipment cleaning, and other miscellaneous laboratory operations utilizing standard laboratory chemicals (14). By 1959, additional operations included shock and vibration testing of certain components; glass blowing; a plastics laboratory which made plastic castings, laminates, and forms sprayed with polyester resins; and a ceramics laboratory (15). A satellite dispensary and dental clinic was present in 1972 that serviced 2,610 employees in the Myer Center (16). During the 2006 Visual Site Inspection (VSI) performed as part of the Phase I ECP, the Dental Clinic was no longer operational at

Bldg 2700. According to FTMM personnel, no chemical wastes have been discharged to the sanitary sewer since the mid-1980s. Activities at Bldg 2700 have since been converted primarily to administrative functions. Current waste management practices prohibit the discharge of any materials, other than water and biodegradable soaps, into the sanitary sewer system. Additional information pertaining to this parcel can be found in Section 4.3.1, Section 4.3.2.1.4, Section 4.3.2.1.6, Section 4.3.2.2.2, Section 4.3.2.2.5, Section 4.3.2.2.6, Table 4-3, Table 5-1, Section 5.13.3, and Table 5-19 of the Phase I ECP (1).

Concurrent with the performance of the ECP, an HSA was conducted to evaluate the historical use of RAM at FTMM (2). The presence of RAM at FTMM has been predominantly limited to certain areas and functions of the installation. Historically, laboratory R&D in the areas of radio and electronics use of vacuum tubes and radium dials, the use of ionizing radiation-producing machines, and military support equipment such as night vision goggles that contain radioactive commodities, have been among the most common uses of RAM. Facilities, buildings, and rooms that contain or once contained equipment that produce X-rays via AC or DC sources of energy are not sources of radioactive contamination. This equipment, which includes medical and dental diagnostic X-ray machines, X-ray security inspection machines, X-ray diffraction, electron microscopes, X-ray fluorescence equipment, and some high voltage electron tubes, only produce ionizing radiation when energized. Operation of this equipment will result in ionizing radiation fields being produced in and around the equipment only while activated, but will not result in radioactive contamination. Much of the activities of the past were performed as part of the Signal Corps Laboratories, first housed in the Squier Building (Bldg 283) and then in the Myer Center (Bldg 2700). Other work was performed in the Evans Area of the base, which was closed in the late 1990s due to BRAC 1993 activities and the work transferred to the CECOM Safety Office and laboratory in the CWA.

Currently, only two active “wet labs” still exist in Bldg 2700, neither is for RAM: one (2C211) for battery testing and fabrication and the other (2D310) is used in the handling of crystals and welding (contains solvents and corrosives). Most rooms in the building today are computer labs and office space. Bldg 2700 originally had three radiological labs, which were completely renovated into administrative areas, which included the removal of all laboratory equipment/furniture and the capping of all plumbing in those rooms, approximately 10 years ago when ARL moved out of the building. No RAM have been used at this location since 1997, effectively qualifying the majority of the building as non-impacted. DPW contracted to remove all tritium exit signs in 2004 (Ameresco was the lighting replacement contractor). No indications of RAM or contamination were observed. An extract of the Radiation Inventory for Year 1995 shows the listing of a Photometer containing four sources of Carbon-14, totaling 200 microcuries. Data for this Photometer, other than its listing as being identified with the Coding system as “C-04” and used in Bldg 2700, Room 4D312. Leak test data was not available since each source is less than the 100 microcurie limit requirement for leak testing of sealed sources. According to leak test data for other sealed sources used in this building (Cobalt-57 Mossbauer Source, Bldg 2700, Room 4C111), affected areas used for radioactive commodities indicate no contamination above the lower limits of

detection, and therefore, no contamination would be present in the sinks leading to the Acid Neutralization Pit either (2).

Prior to the construction of Bldg 2700, Parcel 15 was occupied by barracks, latrines, warehouses, and a motor pool (13,17,18). Based on the time at which these previous facilities existed (1940s and early 1950s), it is likely that fuel oil was the primary heating fuel and individual USTs were likely utilized for the storage of fuel oil at each individual building. A review of documented UST removal locations versus the location of former buildings within Parcel 15 was conducted. Based on this review, it was determined that no UST removals have been documented to have occurred at the locations of numerous former buildings within Parcel 15.

3.3.2 Previous Investigations

U.S. Army Environmental Hygiene Agency (USAEHA) sampling of Bldg 2700 effluent from 1974-1975 showed discharges of alkaline cleaning agents; high concentrations of (hexavalent) chromium that were likely rinse water from a chrome plating operation; 93-94 percent sodium hydroxide slugs; sulfuric acid that was likely a dip solution used to activate a metal surface for plating; copper pickling waste; sodium dichromate as part of a cleaning agent; parabenzoquinone likely from photographic processing effluent; ammonium persulfate from the printed circuit manufacturing shop; and acetone. Samples were collected from each of the two former wastewater treatment lime pits serving Bldg 2700 prior to discharge to the CWA sewage treatment plant (STP). The purpose of the investigation was to characterize the wastewater because the FTMM STP was scheduled to be replaced by the local sewerage authority (19).

The CW-1 site is one of two wastewater treatment lime pits located next to the Myer Center facility (Bldg 2700). The CW-1 has been investigated under the FTMM IRP. In fiscal year 1992, DPW personnel collected limestone and sludge samples from the pit to evaluate the potential for environmental contaminants being present. Analytical testing of the sample material identified elevated levels of organic contaminants.

A cleanup action ensued which generated ninety-two 55-gallon drums of Resource Conservation and Recovery Act (RCRA) waste. Following the cleanup action, fresh limestone chips were placed into the pit as a precautionary measure. Current hazardous waste management practices prohibit the discharge of corrosive wastes into the wastewater treatment lime pit system. Due to the presence of elevated levels of organic contaminants being identified in the pit prior to the cleanup action, an SI was conducted to evaluate the potential impact to soil and groundwater.

Under the SI phase, soil borings were drilled on each side of the lime pit. Both soil and groundwater samples were analyzed for TCL+30 parameters and TAL metals. In reference to the four soil samples, no compounds of concern were detected above NJDEP Direct Contact Soil Cleanup Criteria. TCE, PCE, and 1,2-DCE were detected in downgradient monitoring wells above NJDEP Groundwater Quality Criteria and remedial investigation (RI) activities were conducted.

Under the RI phase, a passive soil gas survey was conducted at the CW-1 site in March 1996 to delineate the extent of lateral soil contamination at the site and aid in the placement of additional monitoring wells. Results of the soil gas survey determined that compounds of concern were migrating horizontally in site soil. Three new monitoring wells were installed at the CW-1 site during the first week of May 1996. One deep well was installed next to the lime pit to determine the vertical extent of contamination both in soil and groundwater. The other two wells were placed downgradient of the contaminant plume. The RI phase delineated the vertical and horizontal extent of the contaminant plume. At present, the contaminant plume has not encroached upon the Myer Center facility.

A remedial design was completed and approved by the NJDEP in August 1997. The selected remedial technologies involved using a combination of air sparging and soil vapor extraction (SVE) techniques. Construction of the selected remedial alternative was completed in April 1998. In January 2002, two groundwater recovery wells (RW-1 & RW-2) were installed in the source area and two additional air sparge points (SPG-3 and SPG-4) were installed to further enhance source area remediation. Groundwater recovery system wells RW-1 and RW-2 were connected to a newly constructed groundwater treatment system (GWTS). The GWTS was designed to capture and treat contaminated groundwater in the source area and reduce the elevated concentrations of detected chlorinated hydrocarbons as well as achieve hydraulic control in the source area and beyond. The GWTS utilized an air stripper to remove dissolved-phase chlorinated hydrocarbons from impacted groundwater extracted from the recovery wells. The air stripper effluent was polished via two in-series 500-pound granular activated carbon units prior to final discharge to the sanitary sewer.

In addition to groundwater extraction, recovery wells RW-1 and RW-2 and source area monitoring wells MW-28 and MW-29 were tied into the SVE system to further enhance removal of vapor phase chlorinated hydrocarbons in the source area. Air sparge wells SPG-1, SPG-2, SPG-3, and SPG-4 were installed to enhance the stripping of volatile chlorinated hydrocarbons from source area groundwater, where they were subsequently captured by the vapor extraction at RW-1, RW-2, MW-28, MW-29, SVE-1, and SVE-2. The vapor phase carbon units were upgraded from two in-series 55-gallon drums to two in-series 1,000-pound vapor phase units capable of a substantial SVE airflow increase. The flow upgrade resulted in a substantial increase of contaminant mass removal rates. As part of the 2002 system upgrade, the wastewater treatment lime pit was demolished and all existing limestone was removed and properly disposed. A new sewer pipe was installed in order to maintain the existing sewer connection.

The GWTS was turned off in May of 2005 based upon available groundwater data. To date, the GWTS remains inactive. The DPW will commence injecting hydrogen releasing compounds (HRCs) into site groundwater during FY07 and FY08 with the goal of achieving groundwater compliance by FY10. Injection of HRC is subject to requirements pursuant to N.J.A.C. 7:26E-4.1(a)4 and N.J.A.C. 7:26E-6.3(c) related to the performance of a pilot study and approval of a permit-by-rule. Currently, twelve groundwater monitoring wells are sampled on a quarterly basis.

The CW-2 site is the second wastewater treatment lime pit located next to the Myer Center facility (Bldg 2700). The CW-2 wastewater treatment lime pit is located on the east side of the Myer Center facility, near the former electrical substation. The CW-1 has been investigated under the FTMM IRP. The wastewater treatment lime pit was constructed concurrently with the Myer Center facility in 1952. The pit was designed to treat corrosive wastes generated from laboratory activities operating within the facility. The pit was a concrete vault measuring 7 by 13 by 8 feet in height and contained limestone chips. Corrosive waste discharge lines originating from the south and east wings of Bldg 2700 were plumbed to the pit. The effluent discharge line exiting the pit was connected to the sanitary sewer.

In fiscal year 1992, DPW personnel collected limestone and sludge samples from the pit to evaluate the potential for environmental contaminants being present. Analytical testing of the sample material identified elevated levels of organic contaminants. A cleanup action ensued which generated ninety-one 55-gallon drums of RCRA waste. Following the cleanup action, fresh limestone chips were placed into the pit as a precautionary measure. Due to the presence of organic contaminants being identified in the pit prior to the cleanup action, the focus of the SI was to evaluate the potential impact to soil and groundwater. Under the SI phase, soil borings were drilled on each side of the lime pit. In the absence of field instrument readings and visible staining, one soil sample was collected from each boring at an interval just above the water table. In addition, each boring was converted to a monitoring well in order to evaluate groundwater quality.

Both soil and groundwater samples were analyzed for TCL+30 parameters and TAL metals. In reference to the four soil samples, only polychlorinated biphenyls (PCBs) were detected in one soil sample slightly above NJDEP Direct Contact Soil Cleanup Criteria. PCE was detected in one downgradient monitoring well slightly above NJDEP Groundwater Quality Criteria. As of 2002, 15 consecutive quarterly rounds of groundwater samples had been collected for subsequent analysis. Arsenic and lead were detected in three of the four site monitoring wells above NJDEP Groundwater Quality Criteria. Under the RI phase, a passive soil gas survey commenced at the CW-2 site in December 1995. The purpose of the soil gas survey was to delineate the lateral extent of soil contamination at the site and to use the survey data to aid in the placement of additional monitoring wells if required. Results of the soil gas survey were negative.

An RI report requesting an NFA determination was submitted to the NJDEP. No response has been received from the NJDEP. The CW-2 Wastewater Treatment Lime Pit was demolished in 2002. All limestone was removed from the pit prior to demolition activities and the limestone was properly disposed.

3.3.3 Site Investigation Sampling

As discussed in Section 3.3.2, the former lime pits were formerly connected to sanitary sewer and have been extensively investigated under the FTMM IRP. However, no evaluation of potential historical discharges to the stormwater system from Bldg 2700

has been conducted. A review of stormwater management plans and historical documents was conducted to evaluate potential discharge locations, and sediment sampling will be conducted to evaluate the potential impact of previous Bldg 2700 activities to stormwater outfall locations associated with Bldg 2700.

Through previous investigations conducted under the IRP, groundwater VOC contamination has been identified in close proximity to Bldg 2700. Per NJDEP guidance and consistent with USEPA policy, the NJDEP recommends investigation of VI where structures are within 100 feet horizontally or vertically of shallow groundwater contamination in excess of GWSLs (11). The downgradient migration pathway for VOC (chlorinated ethenes) contaminants is in the direction of Bldg 2700, and these contaminants have been detected above the GWSLs within 100 feet of Bldg 2700. Therefore, VI at Bldg 2700 will be further evaluated as detailed in this Work Plan through the collection of near slab and sub-slab soil gas samples.

A review of documented UST removal locations versus the location of former buildings within Parcel 15 was conducted. Based on this review, it was determined that no UST removals have been documented to have occurred at the locations of numerous former barracks within Parcel 15. Geophysical surveys, soil sampling, and groundwater sampling will be conducted north, northeast, and southwest of Bldg 2700.

Numerous logistical challenges may be encountered at this site during field investigation activities. Collection of near slab and sub-slab soil vapor samples may be required after normal business hours if operations within Bldg 2700 prohibit the sampling during business hours. Geophysical surveys and Geoprobe® sampling around the building will have to be closely coordinated with FTMM personnel. This work may have to be performed off-hours if sections of the parking lot cannot be cordoned-off.

See **Table 3-3** for a summary of proposed field activities and **Figure 3-3** for sample locations.

Table 3-3
Parcel 15 Sampling Location, Rationale and Analytical

Sample Location	Sample Media	Sample Location Rationale	Analytical Suite
Former Barracks Areas (three areas – 9 acres total)		A geophysical survey will be conducted to target areas within the parcel in which former barracks existed. The geophysical investigation will consist of an EM survey followed by targeted GPR of anomalies identified by the EM survey.	

Sample Location	Sample Media	Sample Location Rationale	Analytical Suite
15SS-A1:18 (18 samples)	Surface soil	Soil samples to be collected from the 0-6" bgs interval from the Geoprobe® soil boring grid (to be conducted on 50-ft center due to close spacing of former barracks in this area) to investigate the location of potential heating oil tanks associated with the former barracks north of Bldg 2700. If the sample location is paved, the sample will be collected from the 6-inch interval below the pavement sub-base. Sample data will indicate whether contaminant releases, if any, have occurred from the previous USTs into the soil.	TPHC, VO+10 (25% of TPHC > 1,000 mg/kg)
15SB-A1:18 (18 samples)	Subsurface soil	Soil samples to be collected from the 6" interval directly above the water table from each Geoprobe® soil boring in the grid (to be conducted on 50-ft center due to close spacing of former barracks in this area) to investigate the location of potential heating oil tanks associated with the former barracks north of Bldg 2700. Field screening of the entire Geoprobe® soil core will be conducted using PID and FID meters. An additional sample interval may be collected if warranted based on the field screening results. Sample data will indicate whether contaminant releases, if any, have occurred from the previous USTs into the soil.	TPHC, VO+10 (25% of TPHC > 1,000 mg/kg)
15SS-B1:E4 (13 samples)	Surface soil	Soil samples to be collected from the 0-6" bgs interval from the Geoprobe® soil boring grid (to be conducted on 100-ft center) to investigate the location of potential heating oil tanks associated with the former barracks northeast of Bldg 2700. If the sample location is paved, the sample will be collected from the 6-inch interval below the pavement sub-base. Sample data will indicate whether contaminant releases, if any, have occurred from the previous USTs into the soil.	TPHC, VO+10 (25% of TPHC > 1,000 mg/kg)
15SB-B1:E4 (13 samples)	Subsurface soil	Soil samples to be collected from the 6" interval directly above the water table from each Geoprobe® soil boring in the grid to investigate the location of potential heating oil tanks associated with the former barracks northeast of Bldg 2700. Field screening of the entire Geoprobe® soil core will be conducted using PID and FID meters. An additional sample interval may be collected if warranted based on the field screening results. Sample data will indicate whether contaminant releases, if any, have occurred from the previous USTs into the soil.	TPHC, VO+10 (25% of TPHC > 1,000 mg/kg)
15SS-F1:K6 (22 samples)	Surface soil	Soil samples to be collected from the 0-6" bgs interval from the Geoprobe® soil boring grid (to be conducted on 100-ft center) to investigate the location of potential heating oil tanks associated with the former barracks southwest of Bldg 2700. If the sample location is paved, the sample will be collected from the 6-inch interval below the pavement sub-base. Sample data will indicate whether contaminant releases, if any, have occurred from the previous USTs into the soil.	TPHC, VO+10 (25% of TPHC > 1,000 mg/kg)

Sample Location	Sample Media	Sample Location Rationale	Analytical Suite
15SB-F1:K6 (22 samples)	Subsurface soil	Soil samples to be collected from the 6" interval directly above the water table from each Geoprobe® soil boring in the grid to investigate the location of potential heating oil tanks associated with the former barracks southwest of Bldg 2700. Field screening of the entire Geoprobe® soil core will be conducted using PID and FID meters. An additional sample interval may be collected if warranted based on the field screening results. Sample data will indicate whether contaminant releases, if any, have occurred from the previous USTs into the soil.	TPHC, VO+10 (25% of TPHC > 1,000 mg/kg)
15GW-1:6 (6 samples)	Groundwater	Groundwater samples to be collected from the specified Geoprobe® borings to investigate the groundwater downgradient of potential heating oil tanks associated with the former barracks. Sample data will indicate whether contaminant releases, if any, have occurred from the previous USTs into the groundwater.	TCL+30 (w/o pesticides or PCBs), TAL Metals
Monitoring well UST-2337-65 (1 sample)	Groundwater	Groundwater samples to be collected from the specified monitoring well to investigate the groundwater downgradient of potential heating oil tanks associated with the former barracks. Sample data will indicate whether contaminant releases, if any, have occurred from the previous UST operations into the groundwater. Additionally, monitoring well analysis will be used as a reference for comparison with Geoprobe® results.	TCL+30 (w/o pesticides or PCBs), TAL Metals
15SD-1:3 (3 samples)	Sediment	Sediment samples collected from the 0-6" bgs interval to investigate potential discharges from Bldg 2700. Sample locations are from discharge of underground stream diversion near southwest end of Bldg 2525, 30" reinforced concrete stormwater pipe outfall, and additional outfall location noted during site visit. All sample locations located south of the walking bridge near the southwest portion of Bldg 2525; outfall location on the western side of Shrewsbury Creek.	TCL+30 (w/o pesticides), TAL Metals
15SD-1D:3D (3 samples)	Sediment	Sediment samples collected from a six-inch interval between 1-2' bgs (may be adjusted based on sediment thickness) to investigate potential discharges from Bldg 2700.	TCL+30 (w/o pesticides), TAL Metals
15SG-1 through 15SG-15	Near slab soil gas	15 near slab soil gas samples will be collected at Bldg 2700. Groundwater flow direction is from the west and VOCs have been detected above GWSLs east of the building. Therefore, 12 sample locations will be biased to the walls of Bldg 2700 on the west side of the courtyard. Three locations will be biased to the walls of Bldg 2700 on the east side of the courtyard due to close proximity of the building to groundwater contamination.	NJDEP – SRWM Low Level USEPA TO-15 Method

Sample Location	Sample Media	Sample Location Rationale	Analytical Suite
15SG-16 through 15SG-30	Sub-slab soil gas	15 sub-slab soil gas samples will be collected in the western portion of Bldg 2700 in central locations of the basement. Because this is an active laboratory facility and material is stored in the basement that could contribute to positive detections of VOCs in indoor air (paint storage), sub-slab soil gas will be sampled in lieu of indoor air within the basement in order to determine VI contributions from groundwater contamination. The exact location of these sub-slab samples will be determined based on a site visit to the Bldg 2700 basement level.	NJDEP – SRWM Low Level USEPA TO-15 Method

3.4 Parcel 27 – Southwestern Corner CWA

3.4.1 Site Description

Parcel 27 is located in the southwest portion of CWA and includes the Environmental Test Facility (Bldg 2704), former Pulse Power Center (Bldg 2707), Sheet Metal Shop (Bldg 2502), Machine Shop (2503), Paint and Fabrication Facility (2506), and a Former Motor Pool (2501).

Bldg 2704 has been used as an environmental test chamber since 1965. Chemical use in this building is limited to hydraulic fluid and standard shop chemicals (i.e., petroleum-based solvents, oils and greases). While current waste handling practices are modern, historical waste handling practices are unknown. The building has multiple floor drains which, according to engineering drawings, are connected to the storm sewer.

Bldg 2707 was used by the Electronics Technology Devices Laboratory (ETD&L) until their move to Adelphi, Maryland as part of the BRAC 1993 realignment initiative. Previous ETD&L activities at the facility included the R&D of high power/high voltage components and sub-systems for military applications.

During personnel interviews, a possible former debris disposal area was identified in the north-central portion of the parcel at the end of Academy Road (20). Additional information pertaining to this parcel can be found in Section 3.4.1.2, Table 3-5, Section 4.3.2.2.2, Section 4.3.2.2.3, Section 4.3.2.2.4, Section 4.3.2.2.6, Section 4.4.4.2, Table 4-3, Section 5.1.1, Section 5.1.1.1, Section 5.4.1, Section 5.5.2, Section 5.5.4, Table 5-1, Table 5-7, Section 5.8, Table 5-16, Section 5.13.9, and Section 5.13.10 of the Phase I ECP (1).

3.4.2 Previous Investigations

The CW-3A landfill, approximately 2.6 acres in size, is located due north of Bldg 2707 and adjacent to Parcel 27 along Pearl Harbor Avenue. The CW-3A landfill was investigated under the FTMM IRP. Please refer to Sections 5.2.1 and 5.9 of the Phase I ECP for additional information about landfills on FTMM property (1).

Numerous former USTs were associated with buildings throughout Parcel 27. The USTs have been removed under the FTMM UST Management Program and are summarized within the FTMM Phase I ECP Report (1).

3.4.3 Site Investigation Sampling

No evaluation of potential historical discharges to the stormwater system from Bldg 2704 has been conducted. A review of stormwater management plans and historical documents was conducted to evaluate potential discharge locations and sediment sampling will be conducted to evaluate the potential impact of previous Bldg 2704 activities to stormwater outfall locations associated with Bldg 2704.

Bldgs 2502, 2503, 2504, 2506, and 2507 have an extensive history of vehicle and industrial related activities. The entire area immediately surrounding these buildings is paved and natural surface water drainage is to the northeast. A site reconnaissance was conducted in spring 2007 and sample locations for soil were selected at depositional locations northeast of these buildings to evaluate potential impact from industrial and vehicle related activities at these buildings.

A geophysical survey will be conducted to evaluate a potential burial area at the end of Academy Road.

None of the sampling proposed for Parcel 27 should interfere with FTMM operations. There are limited logistical constraints associated with this site.

See **Table 3-4** for a summary of proposed field activities and **Figure 3-4** for sample locations.

Table 3-4
Parcel 27 Sampling Location, Rationale and Analytical

Sample Location	Sample Media	Sample Location Rationale	Analytical Suite
120-ft x 150-ft debris burial area		A geophysical survey will be conducted over the 120-ft by 150-ft potential debris burial area. The geophysical investigation will consist of an EM survey followed by targeted GPR of anomalies identified by the EM survey.	
27SS-1:2 (2 samples)	Surface soil	Surface soil samples to be collected from the 0-6" interval in the wooded area to the northeast of Bldg 2507, in areas that display evidence of surface drainage and deposition to investigate potential discharges from Bldg 2507.	TCL+30 (w/o pesticides), TAL Metals
27SD-1:2 (2 samples)	Sediment	Sediment samples collected from the 0-6" bgs interval to investigate potential discharges from Bldg 2704. Sample locations are at the stormwater outfall and downstream of that location. Sample locations also address outfall for Bldg 2700.	TCL+30 (w/o pesticides), TAL Metals
27SD-1D:2D (2 samples)	Sediment	Sediment samples collected from a six-inch interval between 1-2' bgs (may be adjusted based on sediment thickness) to investigate potential discharges from Bldg 2704.	TCL+30 (w/o pesticides), TAL Metals

3.5 Parcel 28 – Former Eatontown Laboratory

3.5.1 Site Description

Parcel 28 encompasses Bldg 2525 – the former Eatontown Laboratory complex, constructed in 1941-1942. The Eatontown Signal Laboratory was renamed Watson Laboratories in 1945 and subsequently moved to Rome, New York in 1951 (7).

It was reported that Bldg 2525 had been a chemical laboratory known as Eatontown Labs around the 1940s. This information was confirmed by FTMM site plans showing the Eatontown Laboratory complex. Plan No. 6148/1015 dated September 3, 1941, shows Bldg 2525 (numbered 1 through 6 for the six bays) and nine other buildings numbered 7 through 15 (**Appendix C**). This plan also depicts three separate septic tanks and leach fields and one underground transformer vault. The main sanitary sewer line from the building is shown to discharge to a septic tank and leach field east of the building. A review of the DPW map and engineering drawings repository indicated a 2-inch “acid proof drain” leading from Bay 1 to a dry well southeast of the building. Floor drains were shown to discharge to the brook northwest of the building (22). Building revitalization plans show all floor drains were later connected to the sanitary sewer system.

Bldg 2525 was included in the Watson Laboratory complex in the mid-1940s. Crystal growing and processing operations were conducted in the Watson Laboratory building located in the southwest portion of the CWA in the early 1950s. Operations included cleaning of crystals, quartz etching, soldering, and gold (and other metal) plating, which was conducted in Bldg 2532. These operations involved chemicals such as carbon tetrachloride, ammonium bifluoride, cadmium sulfate, and sulfuric acid. Crystal etching was also noted in Bldg 2538 using ammonium bifluoride. Other processes associated with the Watson Laboratories included machining of metals and remelting lead in Bldg 2533; growing of crystals and physical chemistry in Bldg 2534; and machining of crystals in Bldg 2538 (14,23,24). In 1951, the laboratories were moved to Rome, New York (7).

Following the 1951 Watson Laboratories move, the Aviation Research and Development Command Laboratory was moved from the Myer Center to Bldg 2525. This laboratory operation occupied the building until 1978. A 1978 IH Survey reported ozalid reproduction in Room 5101 of Bldg 2525 (25). Building revitalization plans show all floor drains connected to the sanitary sewer system (26). No sumps or floor drains were noted during the 2006 VSI. The use of the building has been strictly administrative since the late 1990s, as confirmed during the VSI.

Prior to 1997, the building was used to house electronics laboratories. No chemical usage was associated with the electronics laboratories. Geothermal well fields used for the heating of facilities within Parcel 28 are present at multiple locations throughout the parcel.

Parcel 28 also contains the CECOM laboratory and radiological testing facility housed in Bldg 2540. This building contains a gamma irradiator, Radiac calibrators, a storage room for low-level radioactive material with multiple radioactive sources from the demilitarization of commodities, a nuclear counting laboratory, and several health physics laboratories. A survey of the interior of Bldg 2540 will be performed as part of the radiological scoping surveys.

The 1993 Environmental Research, Inc. Aerial Photographic Site Analysis noted a fenced open storage area and possible tank pads in the northern portion of Parcel 28, to the northeast of Bldg 2525 (13). Additional information pertaining to this parcel can be found in Section 4.3.2.2.1, Section 4.3.2.2.6, Section 4.4.4.2, Section 5.4, Section 5.8, Section 5.13.3, Table 5-1, Section 5.13.7, Table 5-16, and Appendix G of the Phase I ECP (1).

3.5.2 Previous Investigations

Multiple former USTs associated with buildings throughout Parcel 27 have been removed under the FTMM UST Management Program and are summarized within the FTMM Phase I ECP Report (1). However, no investigations have been conducted to evaluate the potential impact from previous operations associated with the Eatontown and Watson Laboratory facilities (area around Bldg 2525) or the former open storage and possible tank pads in the northern portion of the parcel.

The field activities proposed for Parcel 28 should have limited impact to FTMM activities. The geophysical survey will partially be performed in the Bldg 2525 parking lot. Sections of the lot will have to be cordoned-off to complete the survey and will be coordinated with FTMM personnel.

3.5.3 Site Investigation Sampling

See **Table 3-5** for a summary of proposed field activities and **Figure 3-5** for sample locations.

Table 3-5
Parcel 28 Sampling Location, Rationale and Analytical

Sample Location	Sample Media	Sample Location Rationale	Analytical Suite
Former septic tank and dry well associated with Bldg 2525.		A geophysical investigation consisting of a GPR survey will be conducted over a 125-ft x 125-ft area 650-ft east of Bldg 2542 and 175-ft north of Bldg 2541 to investigate the location of former septic tank southeast of Bldg 2525, and a 100-ft x 100-ft area adjacent to Bldg 2542 to investigate the former drywell southeast of Bldg 2525.	
200-ft x 800-ft former shops and labs area and concrete vault		A geophysical survey will be conducted over the 200-ft by 800-ft area to investigate former USTs associated with former Bldgs T-7, T-8, and T-9. The geophysical investigation area is extended to the north to investigate the location of a 500-gal septic tank associated with Bldgs T-7 and T-10 – the associated leach field was removed during installation of the geothermal well field. The geophysical investigation will consist of both an EM and GPR survey of the entire area.	

Sample Location	Sample Media	Sample Location Rationale	Analytical Suite
28TP-1A/B:4A/B (8 samples)	Subsurface soil	Soil samples to be collected from test pits to investigate the location of the former drainage field from Bldg 2525. Sample collection depths will be determined by visual observations and by field monitoring instrument readings. Sample data will indicate whether contaminant releases, if any, have occurred from the previous septic system discharges into the soil.	TCL+30 (w/o pesticides), TAL Metals
28GW-1 (1 sample)	Groundwater	Groundwater sample to be collected from a Geoprobe® boring to investigate the location of the former drainage field from Bldg 2525. Sample data will indicate whether contaminant releases, if any, have occurred from the previous septic system discharges into the groundwater.	TCL+30 (w/o pesticides/PCBs), TAL Metals, ammonia, nitrate, nitrite
28SS-1:2 (2 samples)	Surface soil	Soil samples to be collected from the 0-6" bgs interval from the Geoprobe® soil borings to investigate the location of the former drainage field from former Bldgs 13, 14, and 15. Sample data will indicate whether contaminant releases, if any, have occurred from the previous septic system discharges into the soil.	TCL+30 (w/o pesticides), TAL Metals
28SB-1:2 (2 samples)	Subsurface soil	Soil samples to be collected from the 6" interval directly above the water table from each Geoprobe® soil boring to investigate the location of the former drainage field from former Bldgs 13, 14, and 15. Field screening of the entire Geoprobe® soil core will be conducted using PID and FID meters. An additional sample interval may be collected if warranted based on the field screening results. Sample data will indicate whether contaminant releases, if any, have occurred from the previous septic system discharges into the soil.	TCL+30 (w/o pesticides), TAL Metals
28GW-2 (1 sample)	Groundwater	Groundwater sample to be collected from the specified Geoprobe® soil boring to investigate the location of the former drainage field from former Bldgs 13, 14, and 15. Sample data will indicate whether contaminant releases, if any, have occurred from the previous septic system discharges into the soil.	TCL+30 (w/o pesticides/PCBs), TAL Metals, ammonia, nitrate, nitrite
28SS-3:5 (3 samples)	Surface soil	Soil samples to be collected from the 0-6" bgs interval to investigate the former fenced storage area west of Bldg 2290 (west side of Guam Lane) and the former pads immediately to the south, identified in aerial analysis.	TCL+30 (w/o pesticides), TAL Metals

Sample Location	Sample Media	Sample Location Rationale	Analytical Suite
28SB-3 (1 sample)	Subsurface soil	Soil sample to be collected from the specified Geoprobe® soil boring to investigate the former pads in the northern section of Parcel 28. Field screening of the entire Geoprobe® soil core will be conducted using PID and FID meters. An additional sample interval may be collected if warranted based on the field screening results.	TCL+30 (w/o pesticides), TAL Metals
28GW-3 (1 sample)	Groundwater	Groundwater sample to be collected from the specified Geoprobe® soil boring to investigate the former pads identified in aerial analysis of the northern section of Parcel 28. Sample data will indicate whether contaminant releases, if any, have occurred from former activities in this area.	TCL+30 (w/o pesticides/PCBs), TAL Metals
28TP-5A/B (2 samples)	Subsurface soil	Soil samples to be collected from the test pit to investigate the location of the former dry well southeast of Bay 1 of Bldg 2525. Sample collection depths will be determined by visual observations and by field monitoring instrument readings. Sample data will indicate whether contaminant releases, if any, have occurred from the previous discharges into the soil.	TCL+30 (w/o pesticides), TAL Metals
28GW-4 (1 sample)	Groundwater	Groundwater sample to be collected from the specified Geoprobe® boring to investigate the location of the former dry well southeast of Bay 1 of Bldg 2525. Sample data will indicate whether contaminant releases, if any, have occurred from the previous discharges into the groundwater.	TCL+30 (w/o pesticides/PCBs), TAL Metals
28SD-1:2 (2 samples)	Sediment	Sediment samples collected from the 0-6" bgs interval to investigate potential discharges from former 3" floor drain discharge Bldg 2525 and downstream location.	TCL+30 (w/o pesticides), TAL Metals
28SD-1D:2D (2 samples)	Sediment	Sediment samples collected from a six-inch interval between 1-2' bgs (may be adjusted based on sediment thickness) to investigate potential discharges from Bldg 2525.	TCL+30 (w/o pesticides), TAL Metals

3.6 Parcel 34 – Bldg 2567

3.6.1 Site Description

Bldg 2567 is a combination mini-mart and gasoline station located at the corner of Hope Road and Laboratory Road in the CWA. Bldg 2567 is a one-story building built on slab and is approximately 1,335 square feet in size. The facility sells gasoline and other household commodities to active, reserve, and retired military personnel and their dependents. No automotive repair work is conducted at this site. The gasoline portion of the facility consists of three USTs and two fuel dispensing pumps. Each pump is equipped with six hose attachments for dispensing fuel. All three tanks are 10,000 gallons in capacity and store various grades of unleaded gasoline.

The tanks and piping at the site are constructed of double-walled fiberglass. Continuous leak detection monitoring at the site is accomplished through the use of liquid leak sensors that have been placed in the interstitial spaces of the tanks and piping. Automatic tank gauges have also been installed within the tanks which continuously monitor the product levels within each tank (27). Additional information pertaining to this parcel can be found in Section 5.2.1.3 and Section 5.4 of the Phase I ECP (1).

3.6.2 Previous Investigations

Bldg 2567 has been investigated under the FTMM IRP and is designated as Site FTMM-58. Four single-walled steel gasoline USTs were replaced by the existing tanks as part of a renovation project that was initiated as a result of one UST failing a tightness test. Tank removals included three 10,000-gallon gasoline USTs, one 6,000-gallon gasoline UST, one 1,000-gallon heating oil UST, and one 550-gallon used oil UST. The heating oil and used oil USTs were both removed in December 1991. The four gasoline USTs were removed in February 1993. Approximately 1,000 cubic yards of petroleum contaminated soil was excavated and stockpiled for off-site disposal. A preliminary assessment was conducted at the site, and five monitoring wells were installed. Groundwater samples have been collected and analyzed for VOA+15 and lead. Benzene, 1,2-DCE, MTBE, and lead were initially detected above NJDEP Groundwater Quality Criteria.

Subsequently, consecutive quarterly rounds of groundwater samples have been collected for analysis. Benzene, xylenes, tert-butyl alcohol, and MTBE were detected in two of the five site monitoring wells above NJDEP Groundwater Quality Criteria. A remedial design that addresses groundwater contamination was submitted to the NJDEP. The remedial approach selected for the Bldg 2567 site involves the use of monitored natural attenuation. A Classification Exception Area for site groundwater was filed with the NJDEP. A Geoprobe® investigation was performed in early 2004 to further evaluate site groundwater conditions. An RI report summarizing these findings was prepared and was submitted to the NJDEP in February 2006. The Army is waiting for NJDEP approval of this document. Currently, as part of a monitoring program, seven groundwater monitoring wells are sampled on a quarterly basis. Due to the target date of 2011 for property transfer under the 2005 BRAC program, the cleanup strategy was re-evaluated. The current cleanup strategy includes oxygen release compound (ORC) injections and the continued monitoring of groundwater as a key component of the monitored natural attenuation program. Injection of ORC is subject to requirements pursuant to N.J.A.C. 7:26E-4.1(a)4 and N.J.A.C. 7:26E-6.3(c) related to the performance of a pilot study and approval of a permit-by-rule. ORC injections will be performed in 2007 and 2008. Site closeout is anticipated for 2011.

3.6.3 Site Investigation Sampling

Through previous investigations conducted under the IRP, groundwater VOC contamination has been identified in close proximity to Bldg 2567. Per NJDEP guidance and consistent with USEPA policy, the NJDEP recommends investigation of

VI where structures are within 100 feet horizontally or vertically of shallow groundwater contamination in excess of GWSLs. In the case of petroleum hydrocarbon contamination (particularly BTEX), a 30-foot distance criteria is utilized (11). Petroleum hydrocarbon contaminants have been detected above the GWSLs within 30 feet of the building. Therefore, VI at Bldg 2567 will be further evaluated as part of this Work Plan through the collection of near slab and sub-slab soil gas samples.

There are limited logistical issues with this field sampling program. The collection of the sub-slab soil gas sample will be coordinated with the building manager.

See **Table 3-6** for a summary of proposed field activities and **Figure 3-6** for sample locations.

Table 3-6
Parcel 34 Sampling Location, Rationale and Analytical

Sample Location	Sample Media	Sample Location Rationale	Analytical Suite
34SG-1 (1 sample)	Sub-slab soil gas	One sub-slab soil gas sample will be collected within Bldg 2567 in a central location of the building. Because this is a minimart associated with an active fueling station, sub-slab soil gas will be sampled in lieu of indoor air.	NJDEP – SRWM Low Level USEPA TO-15 Method
34SG-2:3 (2 samples)	Near slab soil gas	Two near slab soil gas samples will be collected at Bldg 2567. Groundwater flow direction is to the southeast and VOCs have been detected above GWSLs south and east of the building. Therefore, the sample locations will be biased to the southeast corner of the building.	NJDEP – SRWM Low Level USEPA TO-15 Method

3.7 Parcel 38 – Former Outdoor Pistol Range (1940 - 1955)

3.7.1 Site Description

Parcel 38 is located in the northwestern portion of the MP, directly west of Bldg 200. The former Outdoor Firing Range was used from approximately 1940 through 1955. The small arms firing that occurred at the former Pistol Range (1935-1940 Pistol Range) directly west of Bldg 292 was relocated to this location around 1940 when the STP was constructed on the old range location. Range structures and the backstop berm at the former Outdoor Firing Range (1940-1955) have been removed/demolished. Munitions associated with the former Outdoor Firing Range are assumed to be small arms ammunition only; therefore, no MEC and limited MC are anticipated. The primary MC associated with small arms ranges is lead. Other MC include antimony, arsenic, copper, tin, zinc, iron, strontium, magnesium, and lead azide. Additional information pertaining to this parcel can be found in Section 4.3.4, Section 5.2.1.2, Section 5.2.2, and Section 5.10 of the Phase I ECP (1).

3.7.2 Previous Investigations

This site was originally included in the IRP. The IRP recommendation was for NFA. This determination was approved by the NJDEP. However, this site has been reclassified for possible further investigation based on results of the HRR.

3.7.3 Site Investigation Sampling

Sampling has not been conducted at the former Outdoor Firing Range (28). Therefore, the HRR was evaluated to ascertain the location of the former berm, and a soil sampling grid will be established to evaluate the potential impact from previous pistol range operations in the area of the former berm.

See **Table 3-7** for a summary of proposed field activities and **Figure 3-7** for sample locations.

Table 3-7
Parcel 38 Sampling Location, Rationale and Analytical

Sample Location	Sample Media	Sample Location Rationale	Analytical Suite
38SS-A1:C8 (24 samples)	Surface soil	Soil samples to be collected from the 0-6" bgs interval (below topsoil or pavement sub-base) from a sample grid (to be conducted on 15-ft centers) to investigate the former pistol range berm.	TAL Metals

3.8 Parcel 39 – Bldg 1150 (Vail Hall)

3.8.1 Site Description

Parcel 39 is located in the southwestern portion of the MP and encompasses the area between Bldg 1150 (Vail Hall) and Mill Creek. Bldg 1150 is utilized for administrative purposes. Within the basement is a large Uninterruptible Power Supply Room, emergency generator, floor drains, and a sump pump strictly for high water table events (discharges to basin behind building and ultimately to Parkers Creek). Film developing activities formerly occurred in the basement of the building. Additional information pertaining to this parcel can be found in Section 4.3.2.1.5, Section 4.4.4.2, and Table 4-3 of the Phase I ECP (1).

3.8.2 Previous Investigations

The M-2 Landfill (Parcel 40) is located on the south bank of Mill Creek directly south of Parcel 39. Under the SI phase, surface water samples were collected from Mill Creek and surface water monitoring continues under the IRP within close proximity to Parcel 39.

3.8.3 Site Investigation Sampling

Surface water monitoring conducted in relation to Parcel 40 adequately addresses the quality of surface water in proximity to parcel 39; however, sediment within Mill Creek has not been evaluated in relation to operations within Bldg 1150. Sediment sampling will be conducted to determine the impact of Bldg 1150 operations on sediment at potential discharge locations from Bldg 1150 along Mill Creek.

See **Table 3-8** for a summary of proposed field activities and **Figure 3-8** for sample locations.

Table 3-8
Parcel 39 Sampling Location, Rationale and Analytical

Sample Location	Sample Media	Sample Location Rationale	Analytical Suite
39SD-1:2 (2 samples)	Sediment	Sediment samples collected from the 0-6" bgs interval to investigate potential discharges from Bldg 1150. Samples are located at the closest point in the creek from the drainage basin located across the parking area at the rear of the building and at the downstream stormwater outfall.	TCL+30 (w/o pesticides), TAL Metals
39SD-1D:2D (2 samples)	Sediment	Sediment samples collected from a six-inch interval between 1-2' bgs (may be adjusted based on sediment thickness) to investigate potential discharges from Bldg 1150.	TCL+30 (w/o pesticides), TAL Metals
39SS-1 (1 sample)	Surface soil	Soil sample collected from the 0-6" bgs interval to investigate potential discharges from Bldg 1150. Sample is located at the outfall of a clay pipe leading from the direction of Bldg 1150.	TCL+30 (w/o pesticides), TAL Metals

3.9 Parcel 43 – Bldg 1122 (Do-It-Yourself Auto Repair)

3.9.1 Site Description

Bldg 1122 houses a modern “do-it-yourself” vehicle repair shop. Bldg 1122 is a one-story building built on a slab and is approximately 11,600 square feet in size. Furniture paint stripping was reported in the Woodworking Craft Shop section of Bldg 1122 in 1973 (29).

All vehicle repairs are done by FTMM personnel and are performed inside the building. Degreasing solvents are used and generate hazardous waste from these operations (30). Pneumatic lifts are present. Floor drains in the bays and satellite accumulation room were noted during the 2006 VSI. The floor drains, previously connected to the car wash facility in Bldg 1124, were sealed off in June 2007. A 1993 renovation plan, which details the replacement of the floor drains, shows that the drains are connected to the sanitary sewer system (31). The 2006 Stormwater Pollution Prevention Plan states “Floor drains, located near the pneumatic lifts, have been closed off.” A former oil/water separator was associated with this building. Used oil is collected in a 55-gallon drum

stored inside the shop. When filled, the contents are pumped into a 995-gallon double-walled aboveground storage tank (AST) located between the repair shop and the car wash (Bldg 1124). The enclosed car wash facility is located to the east of the repair shop. All wash water is recycled and reused and an active oil/water separator is in place (32). Additional information pertaining to this parcel can be found in Section 4.3.2.1.2, Section 4.4.3.2, Section 5.1.1.2.1, Section 5.1.7.1, and Table 5-5 of the Phase I ECP (1).

3.9.2 Previous Investigations

Bldg 1122 has been investigated under the FTMM IRP as Site FTMM-59. There have been two USTs removed from the Building 1122 area. The DPW removed one UST located west of Bldg 1122 in June 1994. The UST was a 1,500 gallon single-walled steel tank used for storing # 2 fuel oil. During tank closure activities, a petroleum discharge to site soil and groundwater was identified. In accordance with NJDEP UST Site Assessment activity requirements, all petroleum contaminated soils have been removed and disposed. In addition, the DPW installed two monitoring wells to determine any adverse impact to groundwater.

The DPW removed a 550-gallon waste oil UST from beneath the pavement north of the building. During the UST removal, the subsurface evaluator did not identify any holes in the tank and did not observe any potentially contaminated soil. Following soil excavation and soil removal, five post-excavation samples were collected and analyzed for TPHC and organic and inorganic TCL compound plus 40 tentatively identified compounds. TPHC was detected below the NJDEP criteria of 10,000 mg/kg.

The area of the former waste oil tank removal was the focus of a remedial investigation performed by Weston in 2005. PCE was initially detected at levels above NJDEP Groundwater Quality Criteria. Detected PCE concentrations may be attributable to the former 550-gallon single wall steel waste oil UST removed from the site on January 6, 1992. However, according to the UST Closure and SI Report prepared by Roy F. Weston, Inc., all post-excavation sample results were below the proposed NJDEPE subsurface cleanup criteria (46). PCE was not detected in any of the post-excavation samples which were analyzed for TPHC and PP+40. The UST Closure Report was submitted to NJDEP on 02/26/96. Subsequent to the 2005 RI, consecutive quarterly rounds of groundwater samples have been collected for analysis. Surface water sampling points (Mill Creek) currently exist downgradient from the site and are being monitored. PCE continues to be quantified in one of the two site monitoring wells above NJDEP Groundwater Quality Criteria.

Also reported in the 2005 RI report, a Geoprobe® investigation was performed in April 2004 to further evaluate site soil and groundwater conditions and potential contaminant migration under the FTMM IRP. The investigation determined there was a release of # 2 fuel oil to the site. The investigation to determine the extent of the petroleum contamination was conducted in-house and concluded that the extent of the release was localized. A well sump was installed for the removal of free-phase product. No free-phase product has been observed. An RI report summarizing these findings was

submitted to the NJDEP in October of 2005. To date, no response has been received from the NJDEP.

Currently, as part of the monitoring program for this IRP site, five groundwater monitoring wells are sampled on a quarterly basis. The cleanup strategy is to continue compliance monitoring of surface water and five groundwater monitoring wells as a key component of monitored natural attenuation. Due to the target date of 2011 for property transfer under the 2005 BRAC program, the cleanup strategy was re-evaluated. The current cleanup strategy includes two years of HRC injections to enhance monitored natural attenuation. Injection of HRC is subject to requirements pursuant to N.J.A.C. 7:26E-4.1(a)4 and N.J.A.C. 7:26E-6.3(c) related to the performance of a pilot study and approval of a permit-by-rule. HRC will be injected into a localized area in 2007 and 2008. Site closeout is anticipated to occur in 2011.

3.9.3 Site Investigation Sampling

As discussed in Section 3.9.2, Bldg 1122 has been extensively investigated under the FTMM IRP. However, no evaluation of potential impact to sediment in Mill Creek has been conducted. A review of stormwater management plans and historical documents was conducted to evaluate potential discharge locations, and sediment sampling will be conducted to evaluate the potential impact of previous Bldg 1122 activities on sediment locations within Mill Creek.

Through previous investigations conducted under the IRP, groundwater VOC contamination has been identified in close proximity to Bldg 1122. Per NJDEP guidance and consistent with USEPA policy, the NJDEP recommends investigation of VI where structures are within 100 feet horizontally or vertically of shallow groundwater contamination in excess of GWSLs (11). PCE is the sole contaminant detected above the GWSLs within 100 feet of Bldg 1122, and no degradation products have been observed. Therefore, VI at Bldg 1122 will be further evaluated as part of this Work Plan through the collection of near slab soil gas samples, sub-slab soil gas samples, and indoor air samples.

See **Table 3-9** for a summary of proposed field activities and **Figure 3-9** for sample locations.

Table 3-9
Parcel 43 Sampling Location, Rationale and Analytical

Sample Location	Sample Media	Sample Location Rationale	Analytical Suite
43SD-1:3 (3 samples)	Sediment	Sediment samples collected from the 0-6" bgs interval to investigate potential discharges from Bldg 1122.	TCL+30 (w/o pesticides), TAL Metals
43SD-1D:3D (3 samples)	Sediment	Sediment samples collected from a six-inch interval between 1-2' bgs (may be adjusted based on sediment thickness) to investigate potential discharges from Bldg 1122.	TCL+30 (w/o pesticides), TAL Metals

Sample Location	Sample Media	Sample Location Rationale	Analytical Suite
43SG-1:2 (2 samples)	Near slab soil gas	Two near slab soil gas samples will be collected at Bldg 1122. Groundwater flow direction is to the northwest and VOCs have been detected above GWSLs north and northeast of the building. Therefore, the sample locations will be biased to the northeast corner of the building.	NJDEP – SRWM Low Level USEPA TO-15 Method
43SG-3:4 (2 samples)	Sub-slab soil gas	Two sub-slab soil gas samples will be collected within the northeast portion of Bldg 1122 (Autocraft) in central locations of the building. Because this is a facility utilized for auto repair, sub-slab soil gas will be sampled in lieu of indoor air.	NJDEP – SRWM Low Level USEPA TO-15 Method
43IA-1:2 (2 samples)	Indoor air	One indoor air sample will be collected from within Bldg 1122 in the southwest portion of the facility (Arts and Crafts). One ambient air sample will be collected from outside the building.	NJDEP – SRWM Low Level USEPA TO-15 Method

3.10 Parcel 49 – Former Squier Laboratory Complex, Museum Storage Facility, and MP Battery Test Facility

3.10.1 Site Description

Parcel 49 encompasses the buildings associated with the former Squier Laboratory and other facilities with similar operational histories in the north-central portion of the MP. The Squier Laboratory Complex included Bldgs 283, 285, 288, 292, 293, 298, S-5, S-6, S-6 Annex, S-9, S-10, S-11, S-12, and S-15. Bldgs 289, 290, 291, 294, 295, L-3, T-45, X-9, and X-7 have a similar operational history and are included in Parcel 49 along with the Squier Laboratory buildings. Historic aerial photographs and site plans are included in **Appendix C** for reference as to known former building locations. Many of the “buildings” were identified as part of the Squier Laboratory Complex in historic reports, without any indication of the specific location of these facilities. It is assumed that these buildings were small, temporary, and/or auxiliary structures in the immediate vicinity of Squier Laboratory and nearby buildings, such that they did not warrant individual identification on historic site plans of the area. In 1934, FTMM laboratory operations were consolidated in a new facility, Squier Laboratory. Squier Laboratory continued to be the principal laboratory on post until 1954 when the new R&D facility, Myer Center (Bldg 2700), was opened. The Squier Laboratory complex supported the Signal Corps Laboratories’ research into batteries and electronics coatings. Environmental conditions were identified for some of the laboratory operations based on the size and intensity of historical operations and the timeframe during which the services took place. A detailed description of process operations that took place in this area is presented in Section 4.3.2 of the FTMM Phase I ECP (1). Environmental concerns associated with Squier

Laboratory operations include the use of chemicals, solvents, radioisotopes, and metals when waste handling procedures may not have been sufficiently protective to preclude a release to the environment. The potential for a release to the environment from laboratory operations in the following buildings is considered to be a Recognized Environmental Condition (REC):

- Squier Laboratory in Bldg 283. Bldg 283 has a long and extensive history of laboratory operations.
- Bldg 288 was historically used for reproduction and photo processing.
- Bldg 291 formerly housed the Crystal Section where crystals were grown.
- Bldg 292 formerly housed the Climatic Section where testing of electronic equipment at environmental extremes was conducted.
- Former Bldg 293 housed a battery testing operation. A ground stain was observed emanating from the vicinity of Bldg 293 in aerial photographs taken in 1969 and 1974 (17). Aerial photographs are included in **Appendix C**. This Bldg 293 was destroyed by a fire. A second Bldg 293 was constructed. The new building is currently used for battery testing. Current battery testing operations are not considered a REC.
- Bldg 294 formerly housed a shock and vibration testing operation.
- Bldg 295 was used for R&D fabrication for reinforced plastics.
- Operations in Bldgs S-5, S-9, S-10, S-11, and S-12 used various laboratory chemicals in hoods for the manufacture and testing of dry cell batteries.
- Bldg L-3 was used for paint experimentation.
- Bldg T-45 was used for the experimental manufacture of storage batteries.
- Bldg X-9 was used for testing gasoline engines.
- Bldg X-7 was used for mixing acids.

A corollary investigation of the historical use of RAMs was conducted by Cabrera. A Special Investigation Report issued in 1951 for the Squier Signal Laboratory Director discussed a wipe test performed on samples of aluminum covered with polonium lacquer (approximately 230 microcuries) to ensure that no hazard was present at Bldg 283. Bldg 292 serves as storage space for the communications-electronics museum. This storage space contains or contained a Chinese radio and a vacuum tube where radiological commodities identified with radiological readings above background levels, and radium-contaminated components found in a posted radioactive storage locker. This storage space once contained 65 items containing RAM, but numerous non-radioactive items have since been removed (2).

Recommendations for SI activity related to RAM were prepared by Cabrera based on the HSA results and will be conducted at Bldg 283 and Bldg 292 upon departure of current tenants from the FTMM property (45). Additional information pertaining to this parcel can be found in Section 3.3, Section 4.3.2.1.1, Section 4.3.2.1.2, Section 4.3.2.1.6, Section 4.4.4.2, Table 4-3, Section 4.4.4.3, Table 4-4, Section 4.6.2.7, Section 5.1.1.2.1, Section 5.8, Table 5-16, Section 5.13.3, Section 5.13.4, Section 5.13.6, and Section 5.13.9 of the Phase I ECP (1).

3.10.2 Previous Investigations

Multiple former USTs associated with buildings throughout Parcel 49 have been removed under the FTMM UST Management Program and are summarized within the FTMM Phase I ECP Report (1). Bldg 283 groundwater and soil contamination associated with former USTs that were removed is currently being addressed under the FTMM IRP as site FTMM-61.

3.10.3 Site Investigation Sampling

As noted in Section 3.10.2, numerous former USTs have been removed within Parcel 49 and contamination identified in association with the former USTs at Bldg 283 is currently being addressed under the FTMM IRP. However, limited evaluation of potential discharges related to previous building operations has been conducted within Parcel 49. A review of historical site plans, IRP documents, sanitary plans, and stormwater management plans was conducted to evaluate potential discharge locations throughout the parcel.

See **Table 3-10** for a summary of proposed field activities and **Figure 3-10** for sample locations.

Table 3-10
Parcel 49 Sampling Location, Rationale and Analytical

Sample Location	Sample Media	Sample Location Rationale	Analytical Suite
49SS-1:2 (2 samples)	Surface soil	Soil samples collected from the 0-6" bgs interval from Geoprobe® borings located north of Bldg 293 and east of former Bldg 289 to investigate potential discharges from previous industrial activities within the buildings.	TCL+30 (w/o pesticides), TAL Metals, cyanide
49SB-1:2 (2 samples)	Subsurface soil	Soil samples collected from the 6" interval directly above the water table from Geoprobe® borings located north of Bldg 293 and east of former Bldg 289 to investigate potential discharges from previous industrial activities within the buildings. Field screening of the entire Geoprobe® soil core will be conducted using PID and FID meters. An additional sample interval may be collected if warranted based on the field screening results.	TCL+30 (w/o pesticides), TAL Metals, cyanide

Sample Location	Sample Media	Sample Location Rationale	Analytical Suite
49GW-1:2 (2 samples)	Groundwater	Groundwater samples collected from the specified Geoprobe® borings located north of Bldg 293 and east of former Bldg 289 to investigate potential discharges from previous industrial activities within the buildings.	TCL+30 (w/o pesticides/PCBs), tertiary butyl alcohol (TBA)
49SS-3:4 (2 samples)	Surface soil	Soil samples collected from the 0-6" bgs interval from Geoprobe® borings located at loading docks of Bldg 283 to investigate potential historical discharges from previous laboratory operations.	TCL+30 (w/o pesticides), TAL Metals, cyanide
49SB-3:4 (2 samples)	Subsurface soil	Soil samples collected from the 6" interval directly above the water table from Geoprobe® borings located at loading docks of Bldg 283 to investigate potential historical discharges from previous laboratory operations. Field screening of the entire Geoprobe® soil core will be conducted using PID and FID meters. An additional sample interval may be collected if warranted based on the field screening results.	TCL+30 (w/o pesticides), TAL Metals, cyanide
49SS-5:6 (2 samples)	Surface soil	Soil samples collected from the 0-6" bgs interval from Geoprobe® borings located at loading dock and garage doors of Bldg 292 to investigate potential historical discharges from previous laboratory operations.	TCL+30 (w/o pesticides), TAL Metals, cyanide
49SB-5:6 (2 samples)	Subsurface soil	Soil samples collected from the 6" interval directly above the water table from Geoprobe® borings located at loading docks and garage doors of Bldg 292 to investigate potential historical discharges from previous laboratory operations. Field screening of the entire Geoprobe® soil core will be conducted using PID and FID meters. An additional sample interval may be collected if warranted based on the field screening results.	TCL+30 (w/o pesticides), TAL Metals, cyanide
49SS-7:8 (2 samples)	Surface soil	Soil samples collected at doorways within courtyard of Bldg 283 to investigate potential historical discharges from previous laboratory operations.	TCL+30 (w/o pesticides), TAL Metals, cyanide
49SS-9	Surface soil	Soil sample collected at eastern doorway within of Bldg 291 to investigate potential historical discharges from previous laboratory operations.	TCL+30 (w/o pesticides), TAL Metals, cyanide
49SS-10:13 (4 samples)	Surface soil	Soil samples collected around the concrete slab for former Bldg 293 (immediately north of current building) to investigate potential discharges from the fire which destroyed the building.	TCL+30 (w/o pesticides), TAL Metals, cyanide
296MW07, 283MW03, 283MW01, B4MW0B4 (4 samples)	Groundwater	Groundwater samples collected from the existing monitoring wells located along the northern perimeter of the former Squier Complex area to evaluate groundwater on a parcel-wide basis.	TCL+30 (w/o pesticides), TBA, TAL Metals, cyanide

Sample Location	Sample Media	Sample Location Rationale	Analytical Suite
49SD-1, 49SD-1D (2 samples)	Sediment	Sediment samples to be collected from the 0-6" bgs interval and a six-inch interval between 1-2' bgs to investigate potential discharges from the former septic system that was associated with former Bldg 78.	TCL+30 (w/o pesticides), TAL Metals, cyanide
49SD-2, 49SD-2D (2 samples)	Sediment	Sediment samples to be collected from the 0-6" bgs interval and a six-inch interval between 1-2' bgs to investigate potential discharges from sump pumps identified within the basement of Bldg 283.	TCL+30 (w/o pesticides), TAL Metals, cyanide
49SD-3, 49SD-3D (2 samples)	Sediment	Sediment samples to be collected from the 0-6" bgs interval and a six-inch interval between 1-2' bgs to investigate potential downgradient impact to sediment from the sump pumps in the basement of Bldg 283 and the former septic discharge from former Bldg 78.	TCL+30 (w/o pesticides), TAL Metals, cyanide

3.11 Parcel 50 – IRP Sites FTMM-54, FTMM-55, and FTMM-61

3.11.1 Site Description

Site FTMM-54 is a former fuel distribution facility which was abandoned. The tanks and distribution piping were rediscovered during a renovation project at Bldg 296. The facility dates back to the 1940s and is located on Sherrill Avenue. The UST system was comprised of ten 1,000-gallon tanks which stored various types of fuel products. These products were distributed from remote pumping islands located over 450 feet from the UST field and within 50 feet of Parkers Creek (a sensitive estuarine marsh area).

FTMM-55 is the site of a former UST system which was located at Bldg 290. The site formerly served as a motor pool for a military unit that has since left FTMM.

Site FTMM-61 is located off of Sherrill Avenue in the northern section of the MP. On August 28, 1997, a 3,000-gallon steel UST (No. 0081533- 229) was removed. The tank was used to store gasoline. The UST was located within the courtyard of Bldg 283. Additional information pertaining to this parcel can be found in Section 5.2.1.1, Table 5-10, Section 5.13.2, and Appendix G of the Phase I ECP (1).

3.11.2 Previous Investigations

The Bldg 296 site, the Bldg 290 site, and the M-18 Landfill are located in close proximity to one another (44). Due to the close proximity, the RI results for all three sites were reported in one RI Report. This report, submitted to the NJDEP in October 2003, presents a groundwater flow and transport model to evaluate the migration of benzene and metals in groundwater.

FTMM-54: Bldg 296. Between November and December 1993, the previously unknown fuel distribution system was removed and the source of contamination was eliminated. Benzene and lead were detected in site monitoring wells above NJDEP Groundwater Quality Criteria. An NFA determination was requested for this site. Currently, as part of the monitoring program, seven groundwater monitoring wells are sampled on a quarterly basis. The cleanup strategy is to continue compliance monitoring of seven groundwater monitoring wells pending NJDEP review.

FTMM-55: Bldg 290. The UST tanks at this location were used to store gasoline and they were both removed on September 2, 1994. On July 2, 1996, a construction activity identified gasoline-contaminated soil within 50 feet of the former UST site. Soils were removed and disposed of in accordance with NJDEP requirements. Additional soil and groundwater samples were collected in March 1998 to further delineate the area of contamination. No additional contaminated soils were identified within the area of concern. Arsenic and lead were detected in site monitoring wells above NJDEP Groundwater Quality Criteria. An NFA determination was requested for this site. The cleanup strategy is to continue compliance monitoring of two groundwater monitoring wells pending NJDEP review.

FTMM-61: Bldg 283. Approximately 400 cubic yards of contaminated soil (associated with the removed UST) was removed and disposed of in accordance with NJDEP requirements. Benzene, ethyl benzene, toluene, and lead were detected above the NJDEP Groundwater Quality Criteria. The cleanup strategy is to inject ORC for two years and continue compliance monitoring of groundwater (six wells quarterly) and surface water. This is a key component of monitored natural attenuation. ORC injection is anticipated for 2007 and 2008. Injection of ORC is subject to requirements pursuant to N.J.A.C. 7:26E-4.1(a)4 and N.J.A.C. 7:26E-6.3(c) related to the performance of a pilot study and approval of a permit-by-rule.

3.11.3 Site Investigation Sampling

Through previous investigations conducted under the IRP, groundwater VOC contamination has been identified in close proximity to Bldg 283. Bldg 283 is a two-story building with a basement and totals approximately 76,500 square feet in size. The footprint of Bldg 283 covers approximately 50,000 square feet. Per NJDEP guidance and consistent with USEPA policy, the NJDEP recommends investigation of VI where structures are within 100 feet horizontally or vertically of shallow groundwater contamination in excess of GWSLs. In the case of the presence of petroleum hydrocarbon contamination (particularly BTEX), a 30-foot distance criteria is utilized (11). These contaminants have been detected above the GWSLs within 30 feet of the Bldg 283. Therefore, VI at Bldg 283 will be further evaluated as part of this Work Plan through the collection of near slab soil gas samples and indoor air samples. No sub-slab soil gas samples will be collected at Bldg 283 due to the observation of groundwater intrusion within the basement during the 2006 VSI.

Because this investigation approach involves collecting samples from inside active buildings, there are numerous logistical issues to be considered. Collection of indoor air samples may have to be performed off hours.

See **Table 3-11** for a summary of proposed field activities and **Figure 3-11** for sample locations.

Table 3-11
Parcel 50 Sampling Location, Rationale and Analytical

Sample Location	Sample Media	Sample Location Rationale	Analytical Suite
50SG-1:5 (5 samples)	Near slab soil gas	Five near slab soil gas samples will be collected at Bldg 283. Groundwater flow direction is to the northwest and VOCs have been detected above GWSLs in groundwater within the courtyard area of Bldg 283 and near the northwestern corner of the building. Therefore, four sample locations will be biased to the walls of Bldg 283 on the northwest side of the courtyard (50SG-1:4) in the vicinity of monitoring well 283MW02, and one will be located at the northwestern corner of the building (50SG-5).	NJDEP – SRWM Low Level USEPA TO-15 Method
50IA-10 (10 samples)	Indoor air	Approximately nine indoor air samples will be collected from within Bldg 283. One additional ambient air sample will be collected from outside the building. Locations depicted on Figure 3-11 are approximate and may be modified at the time of sampling based on observations of the building interior during sampling activities. Sample locations will be biased towards the potential source area and potential migration pathways (sumps, major cracks in floor, floor drains, etc.). Sample locations will include the basement as well as the first floor of the building. One ambient air sample will be collected from outside the building.	NJDEP – SRWM Low Level USEPA TO-15 Method

3.12 Parcel 51 – 750 Area, 500 Area, 600 Area, 1100 Area – Former Barracks

3.12.1 Site Description

Parcel 51 is located in the central portion of the MP and encompasses the 500 Area, 600 Area, 750 Area, and 1100 Area former barracks. Plan No. 506, “Gas and Fuel Storage Tanks Distribution System” dated January 22, 1956 (**Appendix C**), was reviewed for the MP as part of the Phase I ECP. The plan depicts numerous fuel oil USTs that existed within Parcel 51 in 1956 in association with the former barracks. Additional information pertaining to this parcel can be found in Section 4.4.3.2, Section 4.4.4.2, Section 4.4.4.3, Section 5.1.1.2.1, Section 5.2.1.1, Section 5.4, Section 5.4.2, and Appendix G of the Phase I ECP (1).

3.12.2 Previous Investigations

Numerous USTs associated with former barracks and current buildings within the 500, 600 and 1100 Area have been removed under the FTMM UST program and are summarized within the FTMM Phase I ECP Report (1). A review of documented UST removal locations versus the location of former buildings within Parcel 51 was conducted. Based on this review, it was determined that no UST removals have been documented at the locations of numerous former barracks within Parcel 51 throughout the 750 Area (current motor pool); within the northern portion of the 1100 Area, and around the east and south perimeter of the 600 Area.

A soil investigation and remedial action was recently conducted in portions of the 400, 700, and 800 Building areas. The only portion of Parcel 51 that was included within this investigation was the southwestern corner of the parcel associated with Bldgs 787, 788, and 789 (33).

3.12.3 Site Investigation Sampling

In order to determine the absence/presence of formerly utilized USTs and the potential release from the USTs; geophysical surveys, soil sampling, and groundwater sampling will be conducted throughout the 750 Area (current motor pool); within the northern portion of the 1100 Area, and around the east and south perimeter of the 600 Area. See **Table 3-12** for a summary of proposed field activities and **Figure 3-12** for sample locations.

The field activities at this site cover a large area and will require careful coordination with FTMM personnel. Geophysical surveys and Geoprobe® sampling will be conducted adjacent to the McAfee Center. Prior notification will be required due to security concerns. Additionally, geophysical surveys and Geoprobe® sampling will take place across the 750 Area. Surveys will either be performed during off hours or sections of the parking lot will be cordoned-off.

Table 3-12
Parcel 51 Sampling Location, Rationale and Analytical

Sample Location	Sample Media	Sample Location Rationale	Analytical Suite
Former Barracks Areas (11 Acres)		A geophysical survey will be conducted at three locations throughout the parcel to determine the presence/absence of USTs associated with former barracks. The geophysical investigations will consist of an EM survey followed by targeted GPR of anomalies identified by the EM survey. One survey will be conducted around the east and south perimeter of the 600 Area to investigate potential USTs not addressed under previous removals and investigations; one survey will be conducted in the footprint of former barracks in the 1100 Area; and one survey will be conducted in the footprint of former barracks in the 750 Area (current motor pool) not addressed as part of the 700 Residential Communities Initiative project.	

Sample Location	Sample Media	Sample Location Rationale	Analytical Suite
51SS-A10:I12 (51 samples)	Surface soil	Soil samples to be collected from the 0-6" bgs interval from the Geoprobe® soil boring grid (to be conducted on 100-ft center) to investigate the location of potential heating oil tanks associated with the former barracks around the eastern and southern perimeter of the 600 Area. If the sample location is paved, the sample will be collected from the 6-inch interval below the pavement sub-base. Sample data will indicate whether contaminant releases, if any, have occurred from the previous UST operations into the soil.	TPHC, VO+10 (25% of TPHC > 1,000 mg/kg)
51SB-A10:I12 (51 samples)	Subsurface soil	Soil samples to be collected from the 6" interval directly above the water table from each Geoprobe® soil boring in the grid to investigate the location of potential heating oil tanks associated with the former barracks around the eastern and southern perimeter of the 600 Area. Field screening of the entire Geoprobe® soil core will be conducted using PID and FID meters. An additional sample interval may be collected if warranted based on the field screening results. Sample data will indicate whether contaminant releases, if any, have occurred from the previous UST operations into the soil.	TPHC, VO+10 (25% of TPHC > 1,000 mg/kg)
51SS-J1:K9 (18 samples)	Surface soil	Soil samples to be collected from the 0-6" bgs interval from the Geoprobe® soil boring grid (to be conducted on 100-ft center) to investigate the location of potential heating oil tanks associated with the former barracks in the 1100 Area (former Bldgs 1111 through 1118). If the sample location is paved, the sample will be collected from the 6-inch interval below the pavement sub-base. Sample data will indicate whether contaminant releases, if any, have occurred from the previous UST operations into the soil.	TPHC, VO+10 (25% of TPHC > 1,000 mg/kg)
51SB-J1:K9 (18 samples)	Subsurface soil	Soil samples to be collected from the 6" interval directly above the water table from each Geoprobe® soil boring in the grid to investigate the location of potential heating oil tanks associated with the former barracks in the 1100 Area (former Bldgs 1111 through 1118). Field screening of the entire Geoprobe® soil core will be conducted using PID and FID meters. An additional sample interval may be collected if warranted based on the field screening results. Sample data will indicate whether contaminant releases, if any, have occurred from the previous UST operations into the soil.	TPHC, VO+10 (25% of TPHC > 1,000 mg/kg)
51SS-L1:R9 (57 samples)	Surface soil	Soil samples to be collected from the 0-6" bgs interval from the Geoprobe® soil boring grid (to be conducted on 100-ft center) to investigate the location of potential heating oil tanks associated with the former barracks in the 750 Area. If the sample location is paved, the sample will be collected from the 6-inch interval below the pavement sub-base. Sample data will indicate whether contaminant releases, if any, have occurred from the previous UST operations into the soil.	TPHC, VO+10 (25% of TPHC > 1,000 mg/kg)

Sample Location	Sample Media	Sample Location Rationale	Analytical Suite
51SB-L1:R9 (57 samples)	Subsurface soil	Soil samples to be collected from the 6" interval directly above the water table from each Geoprobe® soil boring in the grid to investigate the location of potential heating oil tanks associated with the former barracks southwest of Bldg 2700. Field screening of the entire Geoprobe® soil core will be conducted using PID and FID meters. An additional sample interval may be collected if warranted based on the field screening results. Sample data will indicate whether contaminant releases, if any, have occurred from the previous UST operations into the soil.	TPHC, VO+10 (25% of TPHC > 1,000 mg/kg)
51GW-A10, A12, C12, E12, G12, I1, I3, I5, I10, I12, K1, K3, K5, K7, K9, L9, N9, P9, R3, R5, R7, R9 (22 samples)	Groundwater	Groundwater samples to be collected from the specified Geoprobe® borings to investigate the groundwater downgradient of potential heating oil tanks associated with the former barracks. Sample data will indicate whether contaminant releases, if any, have occurred from the previous UST operations into the groundwater.	VO+10, B/N+15

3.13 Parcel 52 – Bldg 699 – Army/Air Force Exchange Services Gas Station

3.13.1 Site Description

Bldg 699 is a full-service gas station and convenience store located on the south side of Saltzman Avenue in the central portion of the MP. Bldg 699 was constructed in 1953 and has been used as a service station since that time. Bldg 699 is a one-story building built on slab and is approximately 4,628 square feet in size. Additional information pertaining to this parcel can be found in Section 5.2.1.1, Section 5.4, Section 5.13.2, and Appendix G of the Phase I ECP (1).

3.13.2 Previous Investigations

The Bldg 699 tank system was comprised of six 10,000-gallon USTs with two remote pumping islands. The six USTs were removed in April 2007 and replaced with two 10,000-gallon ASTs. The USTs stored various grades of gasoline. On November 5, 1984, a tank tightness test identified a .333 gallon per hour leak in two of the USTs. No action was taken until 1989 when a line leak was identified; subsequently, the piping was excavated and replaced. Since that time, a groundwater pump system (to recover free product and to control the plume) has been operating in conjunction with a quarterly groundwater monitoring program. Thirteen monitoring wells were installed at the site in order to delineate the extent of the contaminant plume. Subsequently, consecutive quarterly rounds of groundwater samples have been collected for analysis. BTEX and MTBE have been detected both in soil and groundwater above NJDEP Direct Contact Soil Cleanup Criteria and Groundwater Quality Criteria. A remedial action work plan specifying the installation of an air sparging/SVE system, plus an expanded

groundwater pump and treat system, was submitted and approved by the NJDEP. In addition, the use of enzyme enhanced bioremediation products were stipulated for the localized treatment of soils in dense silt and clay areas. Construction of the selected remedial alternative was completed in January of 2001. Currently, as part of a monitoring program, thirteen groundwater monitoring wells are sampled on a quarterly basis. The cleanup strategy is to continue remedial action operation (air sparge, SVE, pump and treat system) activities and monitoring efforts at the Bldg 699 site. Shutdown of the treatment system is expected in FY08 and quarterly groundwater monitoring of 13 wells will be performed for two years after shutdown.

3.13.3 Site Investigation Sampling

Through previous investigations conducted under the IRP, groundwater VOC contamination has been identified in close proximity to Bldg 699. Per NJDEP guidance and consistent with USEPA policy, the NJDEP recommends investigation of VI where structures are within 100 feet horizontally or vertically of shallow groundwater contamination in excess of GWSLs. In the case of petroleum hydrocarbon contamination (particularly BTEX), a 30-foot distance criteria is utilized (11). These contaminants have been detected above the GWSLs within 30 feet of Bldg 699. Therefore, VI at Bldg 699 will be further evaluated as part of this Work Plan through the collection of near slab and sub-slab soil gas samples.

Because sampling activities will be conducted indoors, coordination with FTMM personnel will be required.

See **Table 3-13** for a summary of proposed field activities and **Figure 3-13** for sample locations.

Table 3-13
Parcel 52 Sampling Location, Rationale and Analytical

Sample Location	Sample Media	Sample Location Rationale	Analytical Suite
52SG-1:2 (2 samples)	Sub-slab soil gas	Two sub-slab soil gas samples will be collected within Bldg 699 in central locations of the building. Because this is an active service station with active fueling stations and automotive service bays, sub-slab soil gas will be sampled in lieu of indoor air.	NJDEP – SRWM Low Level USEPA TO-15 Method
52SG-3:4 (2 samples)	Near slab soil gas	Two near slab soil gas samples will be collected at Bldg 699. Groundwater flow direction is to the south and VOCs have been detected above GWSLs north of the building. Therefore, the sample locations will be biased to the north side of the building.	NJDEP – SRWM Low Level USEPA TO-15 Method

3.14 Parcel 57 – Former Coal Storage and Railroad Unloading – 800 Area

3.14.1 Site Description

Parcel 57 is located in the south-central portion of the MP in the area of Bldgs 1007 and 801. Historic site plans, aerial photographs, and information obtained during personnel interviews indicates a coal storage area and fuel unloading area formerly existed in the south-central portion of the MP along the former RR in the vicinity of Bldgs 1007 and 801. The potential coal storage area was identified in photographs from 1947, 1957, and 1963 (17). A geothermal well field is present north of Bldg 800. Additional information pertaining to this parcel can be found in Section 3.3, Section 5.4, Section 5.13.1, and Appendix G of the Phase I ECP (1).

3.14.2 Previous Investigations

No previous investigations have been conducted in relation to the former coal storage area.

3.14.3 Site Investigation Sampling

Soil and groundwater sampling will be conducted in order to determine the impact of historic coal and fuel unloading and storage activities in the area of the former RR. See **Table 3-14** for a summary of proposed field activities and **Figure 3-14** for sample locations.

Geoprobe® sampling will be conducted from sections of the Commissary parking lot. These activities will have to be performed off hours or after cordoning-off sections of the parking lot.

Table 3-14
Parcel 57 Sampling Location, Rationale and Analytical

Sample Location	Sample Media	Sample Location Rationale	Analytical Suite
57SS-A1:C9 (15 samples)	Surface soil	Soil samples to be collected from the 0-6" bgs interval from the Geoprobe® soil boring grid (to be conducted on 100-ft centers) to investigate the former coal storage location. If the sample location is paved, the sample will be collected from the 6-inch interval below the pavement sub-base. Sample data will indicate whether contaminant releases, if any, have occurred from the previous activities associated with the storage of coal into the soil.	TCL+30 (w/o pesticides), TAL Metals

Sample Location	Sample Media	Sample Location Rationale	Analytical Suite
57SB-A1:C9 (15 samples)	Subsurface soil	Soil samples to be collected from the 0-6" interval directly above the water table from each Geoprobe® soil boring in the grid (to be conducted on 100-ft centers) to investigate the former coal storage location. Field screening of the entire Geoprobe® soil core will be conducted using PID and FID meters. An additional sample interval may be collected if warranted based on the field screening results. Sample data will indicate whether contaminant releases, if any, have occurred from the previous operations associated with the storage of coal into the soil.	TCL+30 (w/o pesticides), TAL Metals
57GW-A1, A3, A5, A7, A9 (5 samples)	Groundwater	Groundwater samples to be collected from the specified Geoprobe® soil borings in the grid to investigate the former location of coal storage. Sample data will indicate whether contaminant releases, if any, have occurred from the previous coal storage operations into the groundwater. A permanent well will be installed and groundwater sampled for PCB analysis if PCBs are identified above comparison criteria in subsurface soil.	TCL+30 (w/o pesticides/PCBs), TAL Metals

3.15 Parcel 61 – Bldg 1075 – Patterson Army Health Clinic

3.15.1 Site Description

Parcel 61 is in the south-central portion of the MP and encompasses Patterson Army Health Clinic (Bldg 1075) and the surrounding land. Bldg 1075 was constructed in 1961 to house Patterson Army Hospital. Bldg 1075 has been used continuously since that time although it was downgraded to a health clinic in 1995. Operations in the 1960s, 1970s, and 1980s included x-ray processing and laboratory operations. Operations in the building extensively used mercury containing equipment, developing chemicals, and other chemicals/waste associated with medical operations.

During the 2006 VSIs, numerous floor drains were observed in the basement that lead to the pneumatic sewage ejector and into the sanitary sewer (34). Additional information pertaining to this parcel can be found in Section 4.3.2.1.3, Section 4.3.2.1.4, Section 4.4.4.2, Table 4-3, Section 4.4.4.3, Table 4-4, Section 5.1.1.2.1, Section 5.1.9.1, Section 5.12, and Section 5.13.5 of the Phase I ECP (1).

3.15.2 Previous Investigations

One former UST associated with Bldg 1075 was removed under the FTMM UST Management Program and is summarized within the FTMM Phase I ECP Report (1). No previous investigations have been conducted in relation to former operations in Bldg 1075.

3.15.3 Site Investigation Sampling

A review of historical site plans, sanitary plans, and stormwater management plans was conducted to evaluate potential discharge locations throughout the parcel and a site reconnaissance was conducted to evaluate potential discharge locations around the building. It was determined that stormwater from Bldg 1075 discharges northwest of Bldg 975. See **Table 3-15** for a summary of proposed field activities and **Figure 3-15** for sample locations.

There are no substantial logistical constraints to performing this sampling.

Table 3-15
Parcel 61 Sampling Location, Rationale and Analytical

Sample Location	Sample Media	Sample Location Rationale	Analytical Suite
61SD-1:2 (2 samples)	Sediment	Sediment samples collected from the 0-6" bgs interval to investigate potential historic discharges to stormwater from Bldg 1075. 61SD-1 will be collected directly at stormwater outfall MP 17 and 61SD-2 will be collected downstream.	TCL+30 (w/o pesticides), TAL Metals
61SD-1D:2D (2 samples)	Sediment	Sediment samples collected from a six-inch interval between 1-2' bgs (may be adjusted based on sediment thickness) to investigate potential historic discharges to stormwater from Bldg 1075.	TCL+30 (w/o pesticides), TAL Metals
61SS-1	Surface soil	Soil sample collected from the 0-6" bgs interval located near door at the southeastern corner of Bldg 1075 to investigate potential historical discharges from previous hospital operations.	TCL+30 (w/o pesticides), TAL Metals, cyanide
61SS-2 61SS-3	Surface soil	Soil samples collected from the 0-6" bgs interval at loading docks of Bldg 1075 to investigate potential historical discharges from previous hospital operations and loading/unloading of chemicals and supplies in the area of the loading dock.	TCL+30 (w/o pesticides), TAL Metals, cyanide
61SS-4	Surface soil	Soil sample collected from the 0-6" bgs interval near basement doors at northeast corner of Bldg 1075 to investigate potential historical discharges from previous hospital operations.	TCL+30 (w/o pesticides), TAL Metals, cyanide

3.16 Parcel 69 – Bldg 900 – Former Vehicle Repair/Motor Pool

3.16.1 Site Description

Parcel 69, Bldg 900, is a former tactical motor pool. It is located in the southeastern portion of the MP and has been utilized for general storage for approximately the past 10 years. The building formerly contained a waste oil tank immediately outside the building that was connected by a fill pipe originating from inside the building (removed). A storm sewer inlet was observed in the parking lot in close proximity to the building during the 2006 VSIs. A boiler was formerly located outside the building. A 1993 USAEHA report cites a TCE parts cleaner and 500-gallon aboveground waste oil tank being present at the building at the time of the 1993 site visit (35). The tank has been removed from the building. All TCE parts cleaners were eliminated from use (MP and CWA) in February of 1994 under Environmental Program Requirements Project FM0094F088.

Solvents were previously used for cleaning vehicle parts at various locations throughout FTMM. Both the military and its contractors operated solvent parts cleaners. These solvent parts cleaners consisted of a tank and sink with a nozzle. The military used Super Agitine in its parts cleaners, while the contractor used Siloo Tyme II. Each parts cleaner held about 30 gallons of fluid, which was reused until it needed changing. Fluid changes occurred every 4 months to every 3 years depending on location and usage (35).

Additional information pertaining to this parcel can be found in Section 4.3.2.1.7, Section 5.4, Section 5.4.2, and Appendix G of the Phase I ECP (1).

3.16.2 Previous Investigations

Two former USTs associated with Bldg 900 have been removed under the FTMM UST Management Program and are summarized within the FTMM Phase I ECP Report (1). No previous investigations have been conducted in relation to former operations in Bldg 900.

3.16.3 Site Investigation Sampling

A review of historical site plans, sanitary plans, and stormwater management plans was conducted to evaluate potential discharge locations throughout the parcel and a site reconnaissance was conducted to evaluate potential discharge locations. It was determined that stormwater from Bldg 900 discharges to Oceanport Creek northwest of Bldg 977 and north of Bldg 908. See **Table 3-16** for a summary of proposed field activities and **Figure 3-16** for sample locations.

There are limited logistical constraints to the completion of this sampling.

Table 3-16
Parcel 69 Sampling Location, Rationale and Analytical

Sample Location	Sample Media	Sample Location Rationale	Analytical Suite
69SD-1:2 (2 samples)	Sediment	Sediment samples collected from the 0-6" bgs interval to investigate potential historic discharges to stormwater from Bldg 900. 69SD-1 will be collected directly at stormwater outfall within Oceanport Creek upstream of Murphy Drive and 69SD-2 will be collected from the stormwater outfall discharging to Oceanport Creek downstream of Murphy Drive.	TCL+30 (w/o pesticides), TAL Metals
69SD-1D:2D (2 samples)	Sediment	Sediment samples collected from a six-inch interval between 1-2' bgs (may be adjusted based on sediment thickness) to investigate potential historic discharges to stormwater from Bldg 900.	TCL+30 (w/o pesticides), TAL Metals
69SS-1:4 (4 samples)	Surface soil	Soil samples collected from the 0-6" bgs interval from Geoprobe® borings located in vicinity of former waste oil AST (69GP-1), within parking area directly outside the Bldg 900 (69GP-2 and 69GP-3), and downgradient of Bldg 900 (69GP-4).	TCL+30 (w/o pesticides), TAL Metals, cyanide
69SB-1:4 (4 samples)	Subsurface soil	Soil samples collected from the 6" interval directly above the water table from Geoprobe® borings located in vicinity of former waste oil AST (69GP-1), within parking area directly outside the Bldg 900 (69GP-2 and 69GP-3), and downgradient of Bldg 900 (69GP-4). Field screening of the entire Geoprobe® soil core will be conducted using PID and FID meters. An additional sample interval may be collected if warranted based on the field screening results.	TCL+30 (w/o pesticides), TAL Metals, cyanide
49GW-1, 49GW-4 (2 samples)	Groundwater	Groundwater samples collected from the area of the former waste oil AST (69GP-1) and downgradient of Bldg 900 (69GP-4).	TCL+30 (w/o pesticides/PCBs)

3.17 Parcel 70 – Bldg 551 – Former Photoprocessing

3.17.1 Site Description

Parcel 70, Bldg 551, is located in the central portion of the MP on Todd Avenue, directly north of Oceanport Creek. The building housed a classroom and photo processing operation, which was located in the western portion of the building (20). Chemicals documented to have been utilized included carbon tetrachloride and photographic chemicals. Additional information pertaining to this parcel can be found in Section 4.3.2.1.6 and Section 5.13.6 of the Phase I ECP (1).

3.17.2 Previous Investigations

One former UST associated with Bldg 551 was removed under the FTMM UST Management Program and is summarized within the FTMM Phase I ECP Report (1).

No previous investigations have been conducted in relation to former operations in Bldg 551.

3.17.3 Site Investigation Sampling

A review of historical site plans, sanitary plans, and stormwater management plans was conducted to evaluate potential discharge locations throughout the parcel and a site reconnaissance was conducted in spring 2007 to evaluate potential discharge locations. Two cast-iron pipe outfalls were identified south of Bldg 551 along the north bank of Oceanport Creek during the 2007 site reconnaissance. See **Table 3-17** for a summary of proposed field activities and **Figure 3-17** for sample locations.

There are limited logistical constraints to the completion of this sampling.

Table 3-17
Parcel 70 Sampling Location, Rationale and Analytical

Sample Location	Sample Media	Sample Location Rationale	Analytical Suite
70SS-1 (1 sample)	Surface soil	Soil sample collected from the 0-6" bgs interval to investigate potential discharges associated with former photo processing operations at Bldg 551. Sample is located at the exterior door to the former photo processing facility in the courtyard of the building.	TCL+30 (w/o pesticides), TAL Metals
70SD-1:2 (2 samples)	Sediment	Sediment samples collected from the 0-6" bgs interval to investigate potential discharges from Bldg 551. Samples are located at the outfalls of 4" cast iron pipes discharging to Oceanport Creek.	TCL+30 (w/o pesticides), TAL Metals
70SD-1D:2D (2 samples)	Sediment	Sediment samples collected from a six-inch interval between 1-2' bgs (may be adjusted based on sediment thickness) to investigate potential discharges from Bldg 551.	TCL+30 (w/o pesticides), TAL Metals

3.18 Parcel 76 – 200 Area, 300 Area – Former Barracks

3.18.1 Site Description

Parcel 76 is located in the northern portion of the MP and encompasses the former 300 Area barracks and current residential housing within the 200 series of buildings. Plan No. 506, "Gas and Fuel Storage Tanks Distribution System" dated January 22, 1956, was reviewed for MP as part of the Phase I ECP. The plan depicts numerous fuel oil USTs that existed within Parcel 76 in 1956 in association with the former barracks and current residential housing. Additional information pertaining to this parcel can be found in Section 5.4 and Appendix G of the Phase I ECP (1).

3.18.2 Previous Investigations

Numerous USTs associated with current residential buildings within the 200 Area have been removed under the FTMM UST program and are summarized within the FTMM Phase I ECP Report (1).

3.18.3 Site Investigation Sampling

A review of documented UST removal locations versus the location of former buildings and associated USTs within Parcel 76 was conducted. Based on this review, it was determined that no UST removals have been documented at the locations of numerous former 300 Area Barracks (currently an open maintained grass area) and the location of the possible UST associated with existing Bldg 230. See **Table 3-18** for a summary of proposed field activities and **Figure 3-18** for sample locations.

The sampling will be performed in close proximity to military housing units. Coordination with FTMM personnel will be required and the sampling may have to be performed around the schedule of residents.

Table 3-18
Parcel 76 Sampling Location, Rationale and Analytical

Sample Location	Sample Media	Sample Location Rationale	Analytical Suite
225-ft x 825-ft former barracks area		A geophysical survey will be conducted over the 225-ft by 825-ft area associated with the former 300 Area barracks and a 80-ft by 80-ft area associated with the former UST associated with Bldg 230. The geophysical investigation will consist of an EM survey followed by targeted GPR of anomalies identified by the EM survey.	
76SS-A1:C9 (27 samples)	Surface soil	Soil samples to be collected from the 0-6" bgs interval from the Geoprobe® soil boring grid (to be conducted on 100-ft centers) to investigate the location of potential heating oil tanks associated with the former barracks. If the sample location is paved, the sample will be collected from the 6-inch interval below the pavement sub-base. Sample data will indicate whether contaminant releases, if any, have occurred from the previous UST operations into the soil.	TPHC, VO+10 (25% of TPHC > 1,000 mg/kg)
76SB-A1:C9 (27 samples)	Subsurface soil	Soil samples to be collected from the 0-6" interval directly above the water table from each Geoprobe® soil boring in the grid (to be conducted on 100-ft centers) to investigate the location of potential heating oil tanks associated with the former barracks. Field screening of the entire Geoprobe® soil core will be conducted using PID and FID meters. An additional sample interval may be collected if warranted based on the field screening results. Sample data will indicate whether contaminant releases, if any, have occurred from the previous UST operations into the soil.	TPHC, VO+10 (25% of TPHC > 1,000 mg/kg)

Sample Location	Sample Media	Sample Location Rationale	Analytical Suite
76GW-A1, A3, A5, A7, A9 (5 samples)	Groundwater	Groundwater samples to be collected from the specified Geoprobe® soil borings in the grid to investigate the location of potential heating oil tanks associated with the former barracks. Sample data will indicate whether contaminant releases, if any, have occurred from the previous UST operations into the groundwater.	VO+10, B/N+15
76SS-1:2 (2 samples)	Surface soil	Soil samples to be collected from the 0-6" bgs interval from Geoprobe® soil borings to investigate the location of a potential heating oil tank associated with existing Bldg 230. If the sample location is paved, the sample will be collected from the 6-inch interval below the pavement sub-base. Sample data will indicate whether contaminant releases, if any, have occurred from the previous UST operations into the soil.	TPHC, VO+10 (25% of TPHC > 1,000 mg/kg)
76SB-1:2 (2 samples)	Subsurface soil	Soil samples to be collected from the 0-6" interval directly above the water table from each Geoprobe® soil boring to investigate the location of a potential heating oil tank associated with existing Bldg 230. Field screening of the entire Geoprobe® soil core will be conducted using PID and FID meters. An additional sample interval may be collected if warranted based on the field screening results. Sample data will indicate whether contaminant releases, if any, have occurred from the previous UST operations into the soil.	TPHC, VO+10 (25% of TPHC > 1,000 mg/kg)
76GW-1	Groundwater	Groundwater sample to be collected from the specified Geoprobe® soil boring to investigate the location of a potential heating oil tank associated with Bldg 230. Sample data will indicate whether contaminant releases, if any, have occurred from the previous UST operations into the groundwater.	VO+10, B/N+15

3.19 Parcel 79 – 400 Area Former Barracks

3.19.1 Site Description

Parcel 79 is located on the MP east of Oceanport Avenue and encompasses the 400 Building Area. Plan No. 506, "Gas and Fuel Storage Tanks Distribution System" dated January 22, 1956, was reviewed for MP as part of the Phase I ECP. The plan depicts numerous fuel oil USTs that existed within Parcel 79 in 1956 in association with the former 400 Area barracks. Additional information pertaining to this parcel can be found in Section 3.4.1.1, Table 3-3, Section 4.3.2.1.7, Section 5.4, Section 5.4.2, Section 5.9, Section 5.13.1, Section 5.17, and Appendix G of the Phase I ECP (1).

3.19.2 Previous Investigations

Numerous USTs associated with former barracks, current buildings, and former bulk petroleum storage within Parcel 79 have been removed under the FTMM UST program and are summarized within the FTMM Phase I ECP Report (1).

A soil investigation and remedial action was recently conducted in portions of the 400, 700, and 800 Building areas. The portion of Parcel 79 that was included within this investigation was south of Leonard Avenue (33).

3.19.3 Site Investigation Sampling

A review of documented UST removal locations versus the location of former buildings within Parcel 79 was conducted. Based on this review, it was determined that no UST removals have been documented at the locations of numerous former barracks within Parcel 79 in the vicinity of the baseball field bound by Fisher Avenue to the north, Caesar Avenue to the east, Leonard Avenue to the south, and Oceanport Avenue to the west. See **Table 3-19** for a summary of proposed field activities and **Figure 3-19** for sample locations.

There are limited logistical constraints to the completion of the Parcel 79 sampling.

Table 3-19
Parcel 79 Sampling Location, Rationale and Analytical

Sample Location	Sample Media	Sample Location Rationale	Analytical Suite
A 400-ft by 600-ft Former Barracks Area		A geophysical survey will be conducted through the current baseball field area to determine the presence/absence of USTs associated with former 400 Area barracks. The geophysical investigations will consist of an EM survey followed by targeted GPR of anomalies identified by the EM survey.	
79SS-A2:A7 79SS-B2:B7 79SS-C2:C7 79SS-D1:D7 79SS-E1:E7 (32 samples)	Surface soil	Soil samples to be collected from the 0-6" bgs interval from the Geoprobe® soil boring grid (to be conducted on 100-ft center) to investigate the location of potential heating oil tanks associated with the former 400 Area barracks in the area of the current baseball field. If the sample location is paved, the sample will be collected from the 6-inch interval below the pavement sub-base. Sample data will indicate whether contaminant releases, if any, have occurred from the previous UST operations into the soil.	TPHC, VO+10 (25% of TPHC > 1,000 mg/kg)
79SB-A1:E7 (32 samples)	Subsurface soil	Soil samples to be collected from the 6" interval directly above the water table from each Geoprobe® soil boring in the grid to investigate the location of potential heating oil tanks associated with the former 400 Area barracks in the area of the current baseball field. Field screening of the entire Geoprobe® soil core will be conducted using PID and FID meters. An additional sample interval may be collected if warranted based on the field screening results. Sample data will indicate whether contaminant releases, if any, have occurred from the previous UST operations into the soil.	TPHC, VO+10 (25% of TPHC > 1,000 mg/kg)

Sample Location	Sample Media	Sample Location Rationale	Analytical Suite
79GW-A2, A4, A6, B7, D7, E6, E4, E2 (8 samples)	Groundwater	Groundwater samples to be collected from the specified Geoprobe® borings to investigate the groundwater downgradient of potential heating oil tanks associated with the former barracks. Sample data will indicate whether contaminant releases, if any, have occurred from the previous UST operations into the groundwater.	VO+10, B/N+15

3.20 Parcel 80 – Former Bldgs 105 and 106 – Former Photoprocessing

3.20.1 Site Description

Parcel 80 includes former Bldgs 105 and 106. Bldgs 105 and 106 were located northeast of Oceanport Avenue, directly southeast of the current credit union (Bldg 495). Locations of the former buildings are depicted on Plan 506 – Gas and Fuel Storage Tanks Distribution System (**Appendix C**). These buildings served as photo processing facilities from the 1940s until they were demolished in the 1980s. An open grassed area is present southeast of Bldg 495 where Bldgs 105 and 106 previously existed.

Bldg 105 was listed as part of the Printing Plant in 1975 and 1986 (36,37). Operations in Bldg 105 included the use of PCE during 1981 (38). Operations noted at Bldg 106 in 1950 and 1958 included arc lamp photography, letter press printing, photograph developing, and carbon arc sensitizing (39). Additional information pertaining to this parcel can be found in Appendix A of the Phase I ECP (1).

3.20.2 Previous Investigations

One former UST associated with former Bldg 106 was removed under the FTMM UST Management Program and is summarized within the FTMM Phase I ECP Report (1). No previous investigations have been conducted in relation to former operations in Bldgs 105 and 106.

3.20.3 Site Investigation Sampling

Soil and groundwater sampling will be conducted in order to determine the impact of historic building operations in the area of former Bldgs 105 and 106. See **Table 3-20** for a summary of proposed field activities and **Figure 3-20** for sample locations.

There are limited logistical constraints to the completion of the Parcel 80 sampling.

Table 3-20
Parcel 80 Sampling Location, Rationale and Analytical

Sample Location	Sample Media	Sample Location Rationale	Analytical Suite
80SS-1:4 (4 samples)	Surface soil	Soil samples to be collected from the 0-6" bgs interval from the Geoprobe® soil borings to investigate the location of former printing plant Bldgs 105 and 106. Sample data will indicate whether contaminant releases, if any, have occurred from the previous printing activities into the soil.	TCL+30 (w/o pesticides), TAL Metals
80SB-1:4 (4 samples)	Subsurface soil	Soil samples to be collected from the 0-6" interval directly above the water table from each Geoprobe® soil boring to investigate the location of former printing plant Bldgs 105 and 106. Field screening of the entire Geoprobe® soil core will be conducted using PID and FID meters. An additional sample interval may be collected if warranted based on the field screening results. Sample data will indicate whether contaminant releases, if any, have occurred from the previous operations associated with the printing plant.	TCL+30 (w/o pesticides), TAL Metals
80GW-1:2 (2 samples)	Groundwater	Groundwater samples to be collected from the specified Geoprobe® soil borings to investigate the former location of printing plant Bldgs 105 and 106. Sample data will indicate whether contaminant releases, if any, have occurred from the previous printing operations into the groundwater.	TCL+30 (w/o pesticides/PCBs), TAL Metals

3.21 Parcel 83 – Northeast MP – Former Photoprocessing, Former Vehicle Maintenance, Former Coal Storage and Railroad Unloading, Maintenance Shops

3.21.1 Site Description

This parcel is located in the northeastern portion of the MP and is associated with numerous current and former industrial processes and vehicle operations, including former vehicle wash platforms; former photo processing and printing plants; current and former vehicle maintenance areas; former heating plants; former refrigerant repair; former coal storage; and current and former carpentry, plumbing, and electrical shops.

Historic motor pool operations associated with this parcel include activities at former Bldg 44; former Bldgs 64, 159, 161, and 163; and Bldg 166. Former building locations are depicted on Plan No. 504 – Sanitary Sewer System (1944) provided in **Appendix C**. Former Bldg 44 was a motor vehicle maintenance and repair facility per the 1980 Installation Assessment (40). The building was located directly east of the southeast

corner of Bldg 116. No other information was obtained for this former building during record searches. Former Bldg 64, located north of Bldg 167, was identified as a motor vehicle and heavy equipment repair facility in the 1950s (15,24). Former Bldgs 159, 159a, 159b were the roads and grounds shop with motor vehicle and large equipment repair facilities located in the northeast corner of the MP behind Bldgs 167 and 173. U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM) archive reports noted motor pool operations in this building including testing and tuning of engines, cleaning of parts with kerosene, steam cleaning using alkali products, acetylene welding, and general automotive maintenance (23,24). Former Bldgs 161 and 163 served as the Post transportation motor pool and were located directly south of Bldg 159. USACHPPM archives noted motor pool operations in this building including testing and tuning engines, battery charging, acetylene welding, parts cleaning with kerosene, and outdoor steam cleaning of vehicles with alkaline cleaners (15,23,24,41). Bldg 166 was formerly a motor vehicle repair shop for maintenance and repair of large diesel engines including charging and filling of batteries with sulfuric acid.

Former Bldg 197 was utilized for lawn mower repair, and a 1993 USAEHA air report lists a TCE parts cleaner having been present at this facility (35). Bldg 197 was formerly located across the street from Bldg 280 in the northern portion of the MP.

Bldg 279 is a former vehicle repair shop and currently houses heating, ventilation, and air conditioning (HVAC) and plumbing shops. The HVAC portion of the building is where vehicle maintenance was formerly conducted. Operations described included vehicle testing and repair, parts cleaning and battery charging (14,15,23,24,29,39). Motor Pool operations included former waste oil ASTs and TCE parts cleaners. All TCE parts cleaners were eliminated from use (MP and CWA) in February of 1994 under Environmental Program Requirements Project FM0094F088.

Historically, Bldg 280 has been used as a carpentry shop in support of post maintenance. The building has also been used as a paint shop including use and storage of paint thinner, lead-based paint, oil-based paint, aerosol paint cans, and aerosol solvent cans. According to the 1999 chemical inventory, this building also housed a welding shop. Machining, grinding, welding, soldering, and blacksmithing have also been reported in Bldg 280 since the 1950s (14,23). At the time of the 2006 VSIs, Bldg 280 was still utilized as carpentry and metals/welding shops.

Bldg 281 was used for repairing refrigerant containing equipment from the 1950s into the 1970s. Chemicals utilized included carbon tetrachloride, Freon (and other refrigerants), methyl chloride, sulfur dioxide, Varsol and methyl chloroform (trichloroethane). Bldg 281 also housed a machine shop where machining and blacksmithing was performed, and silver brazing occasionally using cadmium containing brazing wire was reported in 1973.

Bldg 483 was historically used for soldering and parts cleaning using organic solvents and dry cleaning fluid. Bldg 483 was demolished prior to 1997. Bldg 485 was used for the cleaning and repair of electrical equipment. Historical operational use of the

building included using organic solvents (14,15,24,39). Bldg 485 was demolished in 1997 (42).

Solvents were previously used for cleaning vehicle parts at various locations throughout FTMM. Both the military and its contractors operated solvent parts cleaners. These solvent parts cleaners consisted of a tank and sink with a nozzle. The military used Super Agitine in its parts cleaners, while the contractor used Siloo Tyme II. Each parts cleaner held about 30 gallons of fluid, which was reused until it needed changing. Fluid changes occurred every 4 months to every 3 years depending on location and usage (35).

The potential for a release to the environment from shop operations including the use of solvents, petroleum products, and metals when waste handling procedures may not have been sufficiently protective to preclude a release to the environment. Additional information pertaining to this parcel can be found in Section 3.3, Section 3.4.1.1, Table 3-3, Section 4.3.2.1.1, Section 4.3.2.1.2, Section 4.3.2.1.3, Section 4.3.2.1.7, Section 5.1.1, Section 5.1.1.2, Section 5.1.1.2.1, Section 5.1.1.2.3, Section 5.2.1, Section 5.4.2, Section 5.5.2, Section 5.8, Section 5.12, Section 5.13.1, Section 5.13.3, Section 5.13.8, Table 5-2, Table 5-5, Table 5-16, Appendix E, Appendix G, and Appendix J of the Phase I ECP (1).

3.21.2 Previous Investigations

Specific activities and buildings identified in this parcel have not been previously investigated.

3.21.3 Site Investigation Sampling

Soil and groundwater sampling will be conducted in order to determine the impact of historic building operations in the area of former vehicle maintenance and shop facilities. See **Table 3-21** for a summary of proposed field activities and **Figure 3-21** for sample locations.

Table 3-21
Parcel 83 Sampling Location, Rationale and Analytical

Sample Location	Sample Media	Sample Location Rationale	Analytical Suite
83SS-A1:B5 (10 samples)	Surface soil	Soil samples to be collected from the 0-6" bgs interval from the Geoprobe® soil boring grid (to be conducted on 100-ft centers) to investigate the former coal storage location. If the sample location is paved, the sample will be collected from the 6-inch interval below the pavement sub-base. Sample data will indicate whether contaminant releases, if any, have occurred from the previous activities associated with the storage of coal into the soil.	TCL+30 (w/o pesticides), TAL Metals

Sample Location	Sample Media	Sample Location Rationale	Analytical Suite
83SB-A1:B5 (10 samples)	Subsurface soil	Soil samples to be collected from the 0-6" interval directly above the water table from each Geoprobe® soil boring in the grid (to be conducted on 100-ft centers) to investigate the former coal storage location. Field screening of the entire Geoprobe® soil core will be conducted using PID and FID meters. An additional sample interval may be collected if warranted based on the field screening results. Sample data will indicate whether contaminant releases, if any, have occurred from the previous operations associated with the storage of coal into the soil.	TCL+30 (w/o pesticides), TAL Metals
83GW-A1, A3, A5 (3 samples)	Groundwater	Groundwater samples to be collected from the specified Geoprobe® soil borings in the grid to investigate the former location of coal storage. Sample data will indicate whether contaminant releases, if any, have occurred from the previous coal storage operations into the groundwater.	TCL+30 (w/o pesticides/PCBs), TAL Metals
83SS-1:2 (2 samples)	Surface soil	Soil samples collected from the 0-6" bgs interval from Geoprobe® borings located in vicinity of former Bldg 44 - motor vehicle maintenance and repair facility.	TCL+30 (w/o pesticides), TAL Metals
83SB-1:2 (2 samples)	Subsurface soil	Soil samples collected from the 6" interval directly above the water table from Geoprobe® borings located in vicinity of former Bldg 44 - motor vehicle maintenance and repair facility. Field screening of the entire Geoprobe® soil core will be conducted using PID and FID meters. An additional sample interval may be collected if warranted based on the field screening results.	TCL+30 (w/o pesticides), TAL Metals
83GW-1	Groundwater	Groundwater sample collected from vicinity of former Bldg 44 - motor vehicle maintenance and repair facility.	TCL+30 (w/o pesticides/PCBs), TBA
83SS-3:7 (5 samples)	Surface soil	Soil samples collected from the 0-6" bgs interval from Geoprobe® borings located south of Bldg 159 and east of Bldgs 167 and 173 to evaluate previous motor repair and fueling activities at former buildings 64, 159, 161 and 163.	TCL+30 (w/o pesticides), TAL Metals
83SB-3:7 (5 samples)	Subsurface soil	Soil samples collected from the 6" interval directly above the water table from Geoprobe® borings located south of Bldg 159 and east of Bldgs 167 and 173 to evaluate previous motor repair and fueling activities at former buildings 64, 159, 161 and 163. Field screening of the entire Geoprobe® soil core will be conducted using PID and FID meters. An additional sample interval may be collected if warranted based on the field screening results.	TCL+30 (w/o pesticides), TAL Metals

Sample Location	Sample Media	Sample Location Rationale	Analytical Suite
83GW-3, 5, 7 and monitoring well 161MW01 (4 samples)	Groundwater	Groundwater samples collected from vicinity of former motor repair and fueling activities at former buildings 64, 159, 161 and 163.	TCL+30 (w/o pesticides/PCBs), TBA 161MW01 will include PCBs but not pesticides
83SS-8	Surface soil	Soil sample collected from the 0-6" bgs interval from Geoprobe® borings located directly east of service door entrance to Bldg 166 to evaluate potential release from historical motor vehicle maintenance and repair activities that occurred in the building.	TCL+30 (w/o pesticides), TAL Metals
83SB-8	Subsurface soil	Soil sample collected from the 6" interval directly above the water table from Geoprobe® borings located directly east of service door entrance to Bldg 166 to evaluate potential release from historical motor vehicle maintenance and repair activities that occurred in the building. Field screening of the entire Geoprobe® soil core will be conducted using PID and FID meters. An additional sample interval may be collected if warranted based on the field screening results.	TCL+30 (w/o pesticides), TAL Metals
83GW-8	Groundwater	Groundwater sample collected from Geoprobe® borings located directly east of service door entrance to Bldg 166 to evaluate potential release from historical motor vehicle maintenance and repair activities that occurred in the building.	TCL+30 (w/o pesticides/PCBs), TBA
83SS-9:11 (3 samples)	Surface soil	Soil samples collected from the 0-6" bgs interval from Geoprobe® borings located in vicinity of service entrances to Bldgs 279 and 280 to evaluate potential releases from previous vehicle maintenance and shop activities.	TCL+30 (w/o pesticides), TAL Metals
83SB-9:11 (3 samples)	Subsurface soil	Soil samples collected from the 6" interval directly above the water table from Geoprobe® borings located in vicinity of service entrances to Bldgs 279 and 280 to evaluate potential releases from previous vehicle maintenance and shop activities. Field screening of the entire Geoprobe® soil core will be conducted using PID and FID meters. An additional sample interval may be collected if warranted based on the field screening results.	TCL+30 (w/o pesticides), TAL Metals
83GW-10	Groundwater	Groundwater sample collected from Geoprobe® borings located in vicinity of service entrances to Bldg 279 to evaluate potential releases from previous vehicle maintenance and shop activities.	TCL+30 (w/o pesticides/PCBs), TBA
83SS-12:13 (2 samples)	Surface soil	Soil samples collected from the 0-6" bgs interval from Geoprobe® borings located in vicinity of Bldg 281 and former Bldg 485 to evaluate potential releases from previous HVAC maintenance and solvent cleaning activities.	TCL+30 (w/o pesticides), TAL Metals

Sample Location	Sample Media	Sample Location Rationale	Analytical Suite
83SB-12:13 (2 samples)	Subsurface soil	Soil samples collected from the 6" interval directly above the water table from Geoprobe® borings located in vicinity of Bldg 281 and former Bldg 485 to evaluate potential releases from previous HVAC maintenance and solvent cleaning activities. Field screening of the entire Geoprobe® soil core will be conducted using PID and FID meters. An additional sample interval may be collected if warranted based on the field screening results.	TCL+30 (w/o pesticides), TAL Metals
83GW-12	Groundwater	Groundwater sample collected from Geoprobe® borings located in vicinity of Bldg 281 and former Bldg 485 to evaluate potential releases from previous HVAC maintenance and solvent cleaning activities.	TCL+30 (w/o pesticides/PCBs)
83SS-14:17 (4 samples)	Surface soil	Soil samples collected from the 0-6" bgs interval from Geoprobe® borings located in vicinity of former Bldgs 197 and 483 to evaluate potential releases from previous engine maintenance and solvent cleaning activities.	TCL+30 (w/o pesticides), TAL Metals
83SB-14:17 (4 samples)	Subsurface soil	Soil samples collected from the 6" interval directly above the water table from Geoprobe® borings located in vicinity of former Bldgs 197 and 483 to evaluate potential releases from previous engine maintenance and solvent cleaning activities. Field screening of the entire Geoprobe® soil core will be conducted using PID and FID meters. An additional sample interval may be collected if warranted based on the field screening results.	TCL+30 (w/o pesticides), TAL Metals
83GW-14, 83GW-17 (2 samples)	Groundwater	Groundwater samples collected from Geoprobe® borings located in vicinity of former Bldgs 197 and 483 to evaluate potential releases from previous engine maintenance solvent cleaning activities.	TCL+30 (w/o pesticides/PCBs), TBA
83SS-18:21 (4 samples)	Surface soil	Soil sample to be collected from the 0-6" bgs interval to investigate the former electrical transformer storage location east of Bldg 173.	PCBs, TPHC

3.22 Sanitary Sewer System

3.22.1 Site Description

Currently, FTMM maintains a sewage collection system that consists of approximately 23 miles of underground distribution lines and 19 sewage pump stations. Five of the pump stations are located at CWA and the remainder of the pump stations are located throughout MP (32). The sewage collection system ultimately connects to the local sewerage authority (Two Rivers Water Reclamation Authority) at two connection points, one at the MP and one at CWA (43). Analytical sampling conducted in mid-2002 of the sewage discharge at both junction points indicated that FTMM is not a significant

industrial user and does not require any treatment of the discharge, nor does FTMM require a significant industrial user permit from the NJDEP.

Prior to the current configuration of the sewage system, FTMM maintained two government-owned STPs (one STP on the MP and the other on CWA). The MP had a pre-1941 STP and a second STP constructed in 1941 when the former was taken offline. The CWA STP was constructed in 1942. Sewage was treated at government owned plants until 1975 when the FTMM collection system was tied into the regional system. Additional information pertaining to this parcel can be found in Section 5.13.11 of the Phase I ECP (1).

3.22.2 Previous Investigations

The MP STP was investigated as part of the IRP (FTMM-19), and the NJDEP approved the recommendation for NFA in 1996. The CWA STP was investigated as part of the IRP (FTMM-27), and NFA was approved by the NJDEP. A pre-1941 STP operated at the MP has been investigated as part of the IRP (FTMM-20) and an RI report was submitted to the NJDEP in March 2004. No response has been received from the NJDEP.

The USAEHA 1976 Water Quality Engineering Special Study stated that effluents from the Myer Center posed a threat to the acceptability of waste discharged from the CWA of FTMM to the regional sewer authority. Strong acids and bases discharged from the facility were a cause for concern, should the connection to the regional sewer authority occur (19).

Following the initial visits by the USAEHA in 1975 and 1976, an extensive effort was undertaken to locate sources of industrial waste in the Myer Center. Various samples from shops were forwarded by the U.S. Army Electronics Command Environmental Office to USAEHA for chemical analysis and walk-through inspections of labs were made. Disposal recommendations were made by USAEHA. The Facilities Engineer also worked with USAEHA on options for use of the CWA STP as a pre-treatment facility. According to FTMM personnel, no chemical wastes have been discharged to the sanitary sewer since the mid-1980s. Activities at Bldg 2700 have since been converted primarily to administrative functions. Current waste management practices prohibit the discharge of any materials, other than water and biodegradable soaps, into the sanitary sewer system.

Analytical sampling conducted in mid-2002 of the sewage discharge at both junction points indicated that FTMM is not a significant industrial user and does not require any treatment of the discharge, nor does FTMM require a significant industrial user permit from the NJDEP.

3.22.3 Site Investigation Sampling

Review of FTMM engineering drawings as part of the ECP indicated there were numerous sinks and floor drains tied into the sanitary sewage collection system at laboratories and testing facilities. Because these connections to the sewage collection

system were made prior to modern waste handling procedures, discharge of hazardous substances to the collection system was likely. Of particular concern is the potential for recalcitrant chemicals such as mercury. In order to determine the potential release of mercury from former laboratory activities and miscellaneous industrial processes, sampling of the existing sanitary sewer waste stream will be conducted at select locations. All samples will be collected from the sanitary sewer system at the first available location downgradient of the building or specified former activity to be investigated. Potential sample locations include manhole access and clean-out locations. The final sample locations will be selected utilizing the advice of qualified personnel familiar with the system and will be biased towards locations of potential historic sediment deposition.

This sampling will be coordinated with FTMM personnel to gain access to the sewer system.

See **Table 3-22** for a summary of proposed field activities.

Table 3-22
Sanitary Sewer System Sampling Location, Rationale and Analytical

Sample Location	Sample Media	Sample Location Rationale	Analytical Suite
680SAN-1	Sanitary waste	Sample to be collected downgradient of former Bldg 680 to investigate potential mercury discharge into the sanitary sewer resulting from the former storage and use of mercury bichloride.	Mercury
283SAN-1	Sanitary waste	Sample to be collected downgradient of Bldg 283 to investigate potential mercury discharge into the sanitary sewer resulting from the former use of mercury in various laboratory instruments and physical chemistry measurements using mercury. The sample location will serve to investigate potential discharges due to historic mercury reclamation at former Bldgs S-5 and S-12 and heating of mercury compounds at Bldg 288.	Mercury
292SAN-1	Sanitary waste	Sample to be collected downgradient of Bldg 292 to investigate potential mercury discharge into the sanitary sewer resulting from the former storage and use of mercury in various instruments and manufacture of mercury electrodes. The selected sampling location will also serve to investigate potential mercury discharges from former mercury use at Bldg 293 in battery testing and former Bldg 294 in the development of plastics and rubber.	Mercury
814SAN-1	Sanitary waste	Sample to be collected downgradient of Bldg 814 to investigate potential mercury discharge into the sanitary sewer resulting from the former use of mercury related to routine dental work.	Mercury

Sample Location	Sample Media	Sample Location Rationale	Analytical Suite
834SAN-1	Sanitary waste	Sample to be collected downgradient of former Bldgs 834 and 835 to investigate potential mercury discharge into the sanitary sewer resulting from the former use of mercury related to routine dental work.	Mercury
1075SAN-1	Sanitary waste	Sample to be collected downgradient of Bldg 1075 to investigate potential mercury discharge into the sanitary sewer resulting from the use of mercury in the development of x-rays and other medical imaging.	Mercury
209SAN-1	Sanitary waste	Sample to be collected downgradient of Bldg 209 to investigate potential mercury discharge into the sanitary sewer resulting from the former use of mercury containing equipment during the time the building served as a hospital.	Mercury
285SAN-1	Sanitary waste	Sample to be collected downgradient of Bldg 285 to investigate potential mercury discharge into the sanitary sewer resulting from the former use of mercury in metal plating, chemical laboratory activities and miscellaneous industrial processes.	Mercury
2700SAN-1	Sanitary waste	Sample to be collected downgradient of Bldg 2700 to investigate potential mercury discharge into the sanitary sewer resulting from the former storage and use of mercury in various laboratories, including the Photographic Branch, Electrochemical Research, the ET&D Laboratory, and mercuric chloride use and disposal from the Printed Circuit Manufacturing Shop. The sample location will be selected encompassing all sanitary sewer connections from Bldg 2700, including the former acid neutralization tank connections.	Mercury

3.23 Electrical Substations

3.23.1 Site Description

Presently, five electrical substations are maintained and operated by the DPW. Three substations are located on the MP and two substations are located in the CWA. Secondary containment is provided at all five substations, and each site is managed under the DPW's Spill Prevention, Control and Countermeasures program (27).

MP – Bldg 288. This facility is a modern electrical substation, constructed following discontinuation of PCB contaminated electrical equipment, located northeast of Bldg 288. The substation consists of a 34,500-volt, 3,000 kilovolt-amperes (kVA) transformer and a 4,160-volt air switch. The transformer contains 520 gallons of non-PCB oil. The air switch is a dry unit and contains no oil.

MP – Bldg 978. This facility is an electrical substation located adjacent to Bldg 978 and also serves as the delivery point for metering of electrical power to the MP. The substation consists of three 34,500-volt, 5,000 kVA transformers and six 167 kVA transformers. The first 5,000 kVA transformer, manufactured by General Electric,

contains 2,155 gallons of non-PCB oil. The second 5,000 kVA transformer, also manufactured by General Electric, contains 1,540 gallons of non-PCB oil. The third 5,000 kVA transformer, manufactured by Allis Chalmers, contains 1,313 gallons of non-PCB oil. The six 167 kVA transformers each contain 546 gallons of non-PCB oil.

MP – Bldg 1231. This facility is an electrical substation located adjacent to Bldg 1231. The substation consists of two 34,500-volt, 5,000 kVA transformers, one large circuit breaker, and one pole mounted type transformer (50 kVA). One 5,000 kVA transformer contains 2,704 gallons of non-PCB oil. The second 5,000 kVA transformer contains 3,100 gallons of non-PCB oil. The circuit breaker contains 220 gallons of non-PCB oil. The 50 kVA transformer contains approximately 40 gallons of non-PCB oil.

CWA – Bldg 2700. This facility is a modern electrical substation that supports the Myer Center (Bldg 2700) facility. The substation consists of two 12,500-volt, 7,500 kVA transformers. Each transformer contains 1,523 gallons of non-PCB oil. The current electrical substation at Bldg 2700, constructed following discontinuation of PCB contaminated electrical equipment, replaced a pre-existing electrical substation located to the southeast.

CWA – Bldg 2716. This facility is an electrical substation located adjacent to Bldg 2704. The substation consists of two 34,500-volt, 10,000 kVA transformers that both contain 2,142 gallons of non-PCB oil. Additional information pertaining to this parcel can be found in Section 4.4.4 of the Phase I ECP (1).

3.23.2 Previous Investigations

No PCB sampling activities have been conducted at the electrical substations.

3.23.3 Site Investigation Sampling

Based on the period of operation of electrical substations located adjacent to Bldgs 978, 1231, 2716 and the former substation east of the Myer Center (southeast of the current substation serving this facility), it is likely that operations included the use of PCB-containing equipment. In order to determine if historic use of potential PCB-containing equipment has resulted in the release of PCBs from electrical substations at FTMM, soil samples will be collected from substation transformer yards adjacent to Bldgs 978, 1231, 2716, and the former Myer Center substation. Substations adjacent to Bldgs 288 and 2700 were constructed following discontinuation of PCB contaminated electrical equipment; therefore, no sampling of these facilities is required.

This sampling will be coordinated with the electrical shop for sample locations within fenced areas.

See **Table 3-23** for a summary of proposed field activities and **Figures 3-22 through 3-25** for sample locations.

Table 3-23
Electrical Substations Sampling Location, Rationale and Analytical

Sample Location	Sample Media	Sample Location Rationale	Analytical Suite
978SS-1:9 (9 samples)	Surface soil	Soil samples collected from the 0-6" bgs interval to investigate potential discharges associated with former PCB containing electrical equipment. Two samples are located on each side of the substation yard and one sample at the outfall of the yard drain. Sample data will indicate whether contaminant releases, if any, have occurred from the previous activities associated with the use of PCB-containing equipment.	PCBs
1231SS-1:9 (9 samples)	Surface soil	Soil samples collected from the 0-6" bgs interval to investigate potential discharges associated with former PCB containing electrical equipment. Two samples are located on each side of the substation yard and one sample at the outfall of the yard drain. Sample data will indicate whether contaminant releases, if any, have occurred from the previous activities associated with the use of PCB-containing equipment.	PCBs
2700SS-A1:D4 (14 samples)	Surface soil	Soil samples collected from the 0-6" bgs interval from a sampling grid (on 15-ft centers) to investigate potential discharges associated with former PCB containing electrical equipment. Sample data will indicate whether contaminant releases, if any, have occurred from the previous activities associated with the use of PCB-containing equipment.	PCBs
2716SS-1:9 (9 samples)	Surface soil	Soil samples collected from the 0-6" bgs interval to investigate potential discharges associated with former PCB containing electrical equipment. Two samples are located on each side of the substation yard and one sample at the outfall of the yard drain. Sample data will indicate whether contaminant releases, if any, have occurred from the previous activities associated with the use of PCB-containing equipment.	PCBs

4 Sample Management and Analysis

4.1 Sample Containers, Preservation, and Holding Times

The general requirements for sampling containers, preservation, and holding times are provided in **Table 4-1**.

Table 4-1
Sample Containers, Preservation and Holding Times

Parameter	Analytical Method	Sample Container	Preservation	Holding Time
Aqueous Samples				
TCL+30, without Pesticides/PCBs	624 625	2 x 40 mL VOA vials 1 x 1L amber	4°C, HCl to pH <2 4°C	14 days 7 days extract/40 days analysis
VO+10	624	2 x 40 mL VOA vials	4°C, HCl to pH <2	14 days
B/N+15	625	1 x 1L amber	4°C	7 days extract/40 days analysis
TAL Metals	200.7	1 x 500 mL HDPE	4°C, HNO ₃ to pH<2	6 months
Mercury	7470	1 x 500 mL HDPE	4°C, HNO ₃ to pH<2	28 days
Cyanide	335.1 or 335.2	NA	NA	NA
Soil/Sediment Samples				
TCL+30, without Pesticides	8260 8082	1 x 2 ounce wide mouth glass 1 x 4 ounce wide mouth glass	Methanol NA	14 days 7 days extract/40 days analysis
VO+10	8260	1 x 2 ounce wide mouth glass	Methanol	14 days
PCBs	8082	1 x 4 ounce wide mouth glass	NA	7 days extract/40 days analysis
TPHC	NJDEP OQA-QAM-025	1 x 4 ounce wide mouth glass	NA	7 days extract/40 days analysis
TAL Metals	6010	1 x 4 ounce wide mouth glass	NA	6 months
Mercury	7471	1 x 4 ounce wide mouth glass	NA	28 days
Cyanide	9012	NA	NA	NA
Moisture	SW-846	1 x 4 ounce wide mouth glass	4°C	7 days

B/N	Base Neutrals	HNO ₃	Nitric Acid	PCB	Polychlorinated Biphenyls
°C	degrees Celsius	H ₂ SO ₄	Sulfuric Acid	TAL	Target Analyte List
g	gram	L	Liter	TCL	Target Compound List
HDPE	High Density Polyethylene	mL	milliliter	TPHC	Total Petroleum Hydrocarbon Content
HCl	Hydrochloric Acid	NA	Not Applicable	VOA	Volatile Organic Analysis

4.1.1 Containers

Before sample collection can begin, consideration must be given as to what type of container will be used to transport and store samples. The analytical laboratory provides sample containers based upon the sample matrix, potential contaminants, analytical methods, and the laboratory's internal QA/QC requirements. They should be selected upon review of the following:

- Reactivity of container material with sample. Glass is recommended for hazardous material samples since it is chemically inert to most substances. Plastics may be used when analytes of interest or sample characteristics dictate use instead of glass.
- Volume of the container. The analytical method and the matrix of the sample dictate the volume of sample needed. The lab will supply bottles that allow for sufficient volumes of sample matrix to be collected.
- Color of container. Whenever possible, amber glass is used to prevent photo-degradation. If not available, samples should be kept protected from light. One exception are the 40 ml clear glass VOA vials used for VOA aqueous analyses.
- Container closures. All containers utilized have a leak-proof seal and are constructed out of material inert with respect to sampled materials. The closure may also be separated by a closure liner that is inert to sample material.

Sample containers will be laboratory cleaned or purchased as laboratory-cleaned. Bottles being shipped are accompanied by a chain-of-custody (COC) in a cooler with a custody seal. Custody documentation must accompany containers to the field, during collection, during shipment to lab, and during analysis. This helps to assure no tampering or contamination from outside sources occurs.

Care should be taken to avoid contamination of the containers. Clean transport and storage environments should be maintained. Samples and empty bottles should never be stored near solvents, gasoline, or other equipment that is a potential source of contamination. The sample containers to be used for the various analyses at FTMM are provided in **Table 4-1**.

4.1.2 Sample Preservation and Holding Times

Preservatives will be utilized to retard hydrolysis of chemical compounds and complexes, to reduce volatility of constituents, and to retard biological action during transit and storage prior to the laboratory analysis. With the exception of aqueous samples for VOC analysis, samples will be placed in pre-preserved containers provided by the analytical laboratory. For VOC analysis of aqueous samples, the amount of hydrochloric acid required for preservation will be determined using an acid blank with well purge water prior to sampling each well. The pH of preserved samples will be determined using pH paper. Additional preservative will be added to the sample if

necessary to attain the proper pH. The pH paper will not be placed directly into the sample container in order to avoid contamination from entering or leaving the sample.

Sample preservatives and holding times for methods required for this project are presented in **Table 4-1**. *Note that all holding times expressed as 'days' refer to the number of elapsed 24-hour periods from the time of collection, not to calendar days.*

In addition to chemical preservatives, all samples for chemical analyses will be transported to the laboratory in temperature-controlled coolers maintained at $4^{\circ}\text{C} \pm 2^{\circ}\text{C}$. Wet ice will be used to maintain the internal cooler temperature required for preservation. A temperature blank (a VOC sampling vial or similar-sized container filled with tap water) will be included in every cooler and used to determine the internal temperature of the cooler upon receipt of the cooler at the laboratory.

4.2 Sample Documentation

Proper documentation of all site activities is crucial. Documentation must be maintained to trace the possession and handling of the samples from the time of collection, through analysis and disposal. Documentation will be conducted in accordance with FTMM SOP SAM-0202, which is presented in **Appendix B**.

Documents used or generated during the course of the project will be accounted for and become a part of the project files upon completion of the task. Project records included in the file may include, but are not limited to the following:

- Sample identification documents and field logbooks.
- COC records.
- Inventory of investigation-derived wastes.
- Project deliverables (such as test plans, operations manuals, design drawings, and specifications).
- Analytical logbooks, laboratory data, calculations, graphs, control charts, field logs (to include instrument identification numbers, calibration, and measurements), and software.
- Reports and correspondence material.
- Records of deviation from the Work Plan.
- Photographs.

4.2.1 Field Logbook

Every field team will be required to maintain a bound field-sampling logbook with permanent consecutively numbered pages. All entries must be recorded in waterproof

ink. The logbook must contain sufficient information to distinguish samples from each other and permit the sampling team to locate the samples in the future. All field activities and notes will be documented in the logbooks. Notations shall be made in logbook fashion, noting the time and date of all entries. Information recorded in the logbook will include:

- Name and location of the SI.
- Date and time of arrival and departure.
- Persons contacted.
- Weather conditions.
- Samples taken, method used, time of collection and the depths if required.

Documentation of field instrument calibrations and sampling equipment decontamination procedures will be kept in separate books.

4.2.2 Sample Labeling

All samples collected for laboratory analysis will be placed in the proper sample container(s), identified through labeling, and packaged for shipment to the laboratory. The sample identification information, as well as collection details, will be clearly recorded on the label and attached to the sample container. All labels are to include the following information:

- Field sample identification code (unique for each location, depth, and sampling event).
- Date and time of sample collection.
- Site name and/or location.
- Laboratory analysis requested.
- Preservation method (e.g., temperature, chemical pH adjustment).
- Initials of the individual(s) who collected the sample.
- Analytical laboratory.

4.3 Sample Chain-of-Custody

Verifiable sample COC will be an integral part of all field and laboratory operations. Traceable steps will be taken in the field and laboratory to document that all samples have been properly acquired, preserved, and identified. Evidence of sample custody will be traceable from the time the analytical containers leave the laboratory until the filled sample containers are transmitted back to the laboratory for analysis.

4.3.1 Chain-of-Custody

A COC form will be created at the time of sample collection.

The COC is intended as a legal record of possession of the sample. The COC will accompany the sample bottles during sample collection and transportation back to the laboratory, during analysis and to final disposal of the sample container. During each event, the COC bears the name of the person assuming responsibility for the samples.

When completed, there should be no lapses in sample accountability. The COC form, completed by the sampling team leader, will be placed in a plastic zip-lock bag secured to the inside lid of the sample cooler by packing tape. A copy of a COC to be used for the Phase II investigation at FTMM is provided in the FTMM SOP SAM-0202, which is presented in **Appendix B**.

4.4 Sample Packaging and Shipment

4.4.1 Sample Packaging

Following sample collection, each sample cooler will be packed with cushioning packing material and sufficient double-bagged wet ice to make sure that an internal ambient temperature of $4^{\circ}\text{C} \pm 2^{\circ}\text{C}$ is maintained from the field to the laboratory. If the sample coolers are transferred by any means other than hand carrying to an on-site laboratory or a laboratory courier, the sample coolers must be prepared for overnight shipment in accordance with the requirements of the overnight delivery service.

Each sample cooler will contain an associated COC form. After sample coolers have been sealed with packing tape, signed and dated custody seals will be placed across the front and back cooler openings and secured with clear tape. A broken seal upon arrival at the laboratory will indicate that the cooler was compromised during shipment.

4.5 Sample Receipt

Once a shipment of samples reaches the laboratory, each sample container will be checked against information on the COC form for anomalies. For the safety of laboratory personnel, sample coolers will be opened in a fume hood to prevent exposure in case there has been any breakage of containers or leakage of sample material during shipment. The condition, temperature, and appropriate preservation of samples will be checked and documented on the COC form or a sample receipt (log-in) form. Checking an aliquot of the sample using pH paper is an acceptable procedure except for VOCs, for which an additional sample is required to check preservation. The occurrence of any anomalies in the received samples and their resolution will be documented in laboratory records.

All sample information will then be entered into a tracking system and unique analytical sample identifiers will be assigned. A copy of this information will be reviewed by the laboratory for accuracy. Sample hold-time tracking begins with the collection of samples and continues until the analysis is complete. SOPs describing sample control and custody will be maintained by the laboratory. Procedures for tracking the internal laboratory COC will also be implemented and documented by the laboratory. Specific instructions concerning the analysis specified for each sample will be communicated to the analysts; analytical batches will be created; and laboratory QC samples will be introduced into each batch. Any subcontracted analyses will be repackaged by the primary laboratory and shipped to the secondary laboratory using inter-laboratory COC forms.

4.6 Analytical Program

4.6.1 Off-Site Analytical

All soil, sediment, and groundwater analyses will be performed by the FTMM analytical laboratory. The laboratory is certified by NJDEP for all the proposed analyses. **Tables 4-2 through 4-8** provide the project reporting limits (RLs) for all project analytes in comparison to their respective NJDEP soil and groundwater criteria.

Table 4-2 presents the TCL+30 list of organic compounds designated for analysis as contained in the version of the EPA "Contract Laboratory Program Statement of Work for Organics Analysis, Multi-Media, Multi-Concentration" in effect as of the date on which the laboratory is performing the analysis, and up to 30 non-targeted organic compounds (plus 30) as detected by gas chromatography/mass spectroscopy (GC/MS) analysis. A TCL+30 scan means the analysis of a sample for TCL compounds and up to 10 non-targeted VOCs and up to 20 non-targeted semivolatile organic compounds using GC/MS analytical methods. Non-targeted compound criteria shall be pursuant to the version of the EPA "Contract Laboratory Program Statement of Work for Organics Analysis, Multi-Media, Multi-Concentration" in effect as of the date on which the laboratory is performing the analysis.

Table 4-3 presents the VO+10 list of compounds amenable to analysis by the purge and trap technique. VO+10 analysis means the analysis of a sample for those TCL compounds identified as volatiles and up to 10 non-targeted VOCs pursuant to the version of the EPA "Contract Laboratory Program Statement of Work for Organics Analysis, Multi-Media, Multi-Concentration" in effect as of the date on which the laboratory is performing the analysis.

Table 4-4 presents the BN+15 list of semivolatile compounds amenable to analysis by extraction of the sample with a pH neutral and a pH basic organic solvent. BN+15 analysis means the analysis of a sample for those TCL compounds identified as semivolatiles plus up to 15 non-targeted semivolatile organic compounds, except phenol and phenolic compounds, in the version of the EPA "Contract Laboratory program Statement of Work for Organic Analysis, Multi-Media, Multi-Concentration in effect as of the date on which the laboratory is performing the analysis. **Tables 4-5 and 4-6** present the comparison criteria by media for PCB and TPHC analysis.

Table 4-7 presents the TAL of inorganic compounds/elements designated for analysis as contained in the version of the EPA Contract Laboratory Program Statement of Work for Inorganics Analysis, Multi-Media, Multi-Concentration in effect as of the date on which the laboratory is performing the analysis. A TAL scan means the analysis of a sample for TAL compounds/elements.

Table 4-8 presents the comparison criteria by media for cyanide analysis.

Soil-gas and indoor air samples will be analyzed by an offsite laboratory certified by the New Jersey Environmental Laboratory Certification Program in the method entitled

NJDEP-SRWM Low Level USEPA Method TO-15, March 2007. This method was recently developed by NJDEP to provide a lower RL and additional QC requirements as compared to those found in USEPA Method TO-15 – The Determination of VOCs in Air Collected in Specifically-Prepared Canisters and Analyzed by Gas Chromatography/Mass Spectrometry, January 1999. **Table 4-9** presents the required compounds and their associated RLs for the 1-Liter and 6-Liter canisters that will be used for this project. The information in this table will be used for the reporting of the air data to NJDEP.

Table 4-2
TCL+30

Analyte	Project Aqueous RL (µg/L)	NJDEP GW Criteria ¹ (µg/L)	Project Soil RL (mg/kg)	NJDEP RDCSCC ² (mg/kg)	NJDEP NRDCSCC ³ (mg/kg)	NJDEP IGWSCC ⁴ (mg/kg)	NJDEP Freshwater Sediment Screening Values - LEL ⁵ (mg/kg)
Volatile Organics							
Acrolein	5	5	1.2	NLE	NLE	NLE	NLE
Acrylonitrile	5 (1.23)	2	1.2	1	5	1	NLE
tert-Butyl alcohol	10	100	1.2	NLE	NLE	NLE	NLE
Methyl-tert-butyl ether	2	70	0.25	NLE	NLE	NLE	NLE
Di-isopropyl ether	2	20000	0.25	NLE	NLE	NLE	NLE
Dichlorodifluoromethane	2	1000	0.25	NLE	NLE	NLE	NLE
Chloromethane	2	NLE	0.25	520	1000	10	NLE
Vinyl chloride	2 (0.23)	1	0.25	2	7	10	NLE
Bromomethane	2	10	0.25	79	1000	1	NLE
Chloroethane	2	NLE	0.25	NLE	NLE	NLE	NLE
Trichlorofluoromethane	2	2000	0.25	NLE	NLE	NLE	NLE
1,1-Dichloroethene	2 (0.19)	1	0.25	8	150	10	NLE
Acetone	2	6000	0.25	1000	1000	100	NLE
Carbon disulfide	2	700	0.25	NLE	NLE	NLE	NLE
Methylene chloride	2	3	0.25	49	210	1	NLE
trans-1,2-Dichloroethene	2	100	0.25	1000	1000	50	NLE
1,1-Dichloroethane	2	50	0.25	570	1000	10	NLE
Vinyl acetate	2	7000	0.25	NLE	NLE	NLE	NLE
2-Butanone	2	300	0.25	1000	1000	50	NLE
cis-1,2-Dichloroethene	2	70	0.25	79	1000	1	NLE
Chloroform	2	70	0.25	19	28	1	NLE
1,1,1-Trichloroethane	2	30	0.25	210	1000	50	NLE
Carbon tetrachloride	2 (0.24)	1	0.25	2	4	1	NLE
Benzene	2 (0.24)	1	0.25	3	13	1	0.34
1,2-Dichloroethane	2	2	0.25	6	24	1	NLE
Trichloroethene	2 (0.26)	1	0.25	23	54	1	1.6

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Analyte	Project Aqueous RL (µg/L)	NJDEP GW Criteria ¹ (µg/L)	Project Soil RL (mg/kg)	NJDEP RDCSCC ² (mg/kg)	NJDEP NRDCSCC ³ (mg/kg)	NJDEP IGWSCC ⁴ (mg/kg)	NJDEP Freshwater Sediment Screening Values - LEL ⁵ (mg/kg)
1,2-Dichloropropane	2 (0.24)	1	0.25	10	43	NLE	NLE
Bromodichloromethane	2 (0.22)	1	0.25	11	46	1	NLE
2-Chloroethyl vinyl ether	2	NLE	0.25	NLE	NLE	NLE	NLE
cis-1,3-Dichloropropene	2 (0.22)	1	0.25	4	5	1	NLE
4-Methyl-2-pentanone	2	NLE	0.25	1000	1000	50	NLE
Toluene	2	1000	0.25	1000	1000	500	2.5
trans-1,3-Dichloropropene	2 (0.25)	1	0.25	4	5	1	NLE
1,1,2-Trichloroethane	2	3	0.25	22	420	1	NLE
Tetrachloroethene	2 (0.20)	1	0.25	4	6	1	0.45
2-Hexanone	2	NLE	0.25	NLE	NLE	NLE	NLE
Dibromochloromethane	2 (0.22)	1	0.25	110	1000	1	NLE
Chlorobenzene	2	50	0.25	37	680	1	NLE
Ethylbenzene	2	700	0.25	1000	1000	100	1.4
m+p Xylene	4	1000	0.5	410	1000	67	0.12
o Xylene	2	1000	0.25	410	1000	67	0.12
Styrene	2	100	0.25	23	97	100	NLE
Bromoform	2	4	0.25	86	370	1	NLE
1,1,2,2-Tetrachloroethane	2 (0.45)	1	0.25	34	70	1	NLE
1,3-Dichlorobenzene	2	600	0.25	5100	10000	100	NLE
1,4-Dichlorobenzene	2	75	0.25	570	10000	100	NLE
1,2-Dichlorobenzene	2	600	0.25	5100	10000	50	NLE
1,1,1,2-Tetrachloroethane	2	1	0.25	170	310	1	NLE
Base/Neutrals							
Pyridine	10	NLE	1	NLE	NLE	NLE	NLE
n-Nitroso-dimethylamine	10 (0.60)	0.8	1	NLE	NLE	NLE	NLE
Aniline	10 (2.38)	6	1	NLE	NLE	NLE	NLE
Phenol	10	2000	1	10000	10000	50	NLE
bis(2-Chloroethyl)ether	10 (0.71)	7	1	0.66	3	10	NLE
2-Chlorophenol	10	40	1	280	5200	10	NLE
1,3-Dichlorobenzene	10	600	1	5100	10000	100	NLE

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Analyte	Project Aqueous RL (µg/L)	NJDEP GW Criteria ¹ (µg/L)	Project Soil RL (mg/kg)	NJDEP RDCSCC ² (mg/kg)	NJDEP NRDCSCC ³ (mg/kg)	NJDEP IGWSCC ⁴ (mg/kg)	NJDEP Freshwater Sediment Screening Values - LEL ⁵ (mg/kg)
1,4-Dichlorobenzene	10	75	1	570	10000	100	NLE
Benzyl alcohol	10	2000	1	10000	10000	50	NLE
1,2-Dichlorobenzene	10	600	1	5100	10000	50	NLE
2-Methylphenol	10	NLE	1	2800	10000	NLE	NLE
bis(2-Chloroisopropyl)ether	10	300	1	2300	10000	10	NLE
4-Methylphenol	10	NLE	1	2800	10000	NLE	NLE
n-Nitroso-di-n-propylamine	10	10	1	0.66	0.66	10	NLE
Hexachloroethane	10 (0.96)	7	1	6	100	100	NLE
Nitrobenzene	10 (0.86)	6	1	28	520	10	NLE
Isophorone	10	40	1	1100	10000	50	NLE
2-Nitrophenol	10	NLE	1	NLE	NLE	NLE	NLE
2,4-Dimethylphenol	10	100	1	1100	10000	10	NLE
bis(2-Chloroethoxy)methane	10	NLE	1	NLE	NLE	NLE	NLE
2,4-Dichlorophenol	10	20	1	170	3100	10	NLE
Benzoic acid	10	30000	1	NLE	NLE	NLE	NLE
1,2,4-Trichlorobenzene	10 (0.89)	9	1	68	1200	100	NLE
Naphthalene	10	300	1	230	4200	100	0.16
4-Chloroaniline	10	30	1	230	4200	NLE	NLE
Hexachlorobutadiene	10 (0.99)	1	1	1	21	100	NLE
4-Chloro-3-methylphenol	10	NLE	1	10000	10000	100	NLE
2-Methylnaphthalene	10	NLE	1	NLE	NLE	NLE	0.070
Hexachlorocyclopentadiene	10	40	1	400	7300	100	NLE
2,4,5-Trichlorophenol	10	700	1	5600	10000	50	NLE
2,4,6-Trichlorophenol	10	20	1	62	270	10	NLE
2-Chloronaphthalene	10	600	1	NLE	NLE	NLE	NLE
2-Nitroaniline	10	NLE	1	NLE	NLE	NLE	NLE
Dimethylphthalate	10	NLE	1	10000	10000	50	NLE
Acenaphthylene	10	NLE	1	NLE	NLE	NLE	0.044
2,6-Dinitrotoluene	10	10	1	1	4	10	NLE
3-Nitroaniline	10	NLE	1	NLE	NLE	NLE	NLE

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Analyte	Project Aqueous RL (µg/L)	NJDEP GW Criteria ¹ (µg/L)	Project Soil RL (mg/kg)	NJDEP RDCSCC ² (mg/kg)	NJDEP NRDCSCC ³ (mg/kg)	NJDEP IGWSCC ⁴ (mg/kg)	NJDEP Freshwater Sediment Screening Values - LEL ⁵ (mg/kg)
Acenaphthene	10	400	1	3400	10000	100	0.016
2,4-Dinitrophenol	10	40	1	110	2100	10	NLE
Dibenzofuran	10	NLE	1	NLE	NLE	NLE	NLE
4-Nitrophenol	10	NLE	1	NLE	NLE	NLE	NLE
2,4-Dinitrotoluene	10	10	1	1	4	10	NLE
Diethylphthalate	10	6000	1	10000	10000	50	NLE
Fluorene	10	300	1	2300	10000	100	0.190
4-Chlorophenyl-phenylether	10	NLE	1	NLE	NLE	NLE	NLE
4-Nitroaniline	10	NLE	1	NLE	NLE	NLE	NLE
n-Nitrosodiphenylamine	10	10	1	140	600	100	NLE
Azobenzene	10	NLE	1	NLE	NLE	NLE	NLE
4-Bromophenyl-phenylether	10	NLE	1	NLE	NLE	NLE	NLE
Hexachlorobenzene	10 (0.95)	0.02	1	0.66	2	100	NLE
Pentachlorophenol	10 (1.01)	0.3	1	6	24	100	NLE
Phenanthrene	10	NLE	1	NLE	NLE	NLE	0.560
Anthracene	10	2000	1	10000	10000	100	0.220
Di-n-butylphthalate	10	700	1	5700	10000	100	NLE
Fluoranthene	10	300	1	2300	10000	100	0.750
Benzidine	10	20	1	NLE	NLE	NLE	NLE
Pyrene	10	200	1	1700	10000	100	0.490
Butylbenzylphthalate	10	100	1	1100	10000	100	NLE
Benzo(a)anthracene	10 (0.82)	0.1	1	0.9	4	500	0.320
3,3'-Dichlorobenzidine	10	30	1	2	6	100	NLE
Chrysene	10 (0.77)	5	1	9	40	500	0.340
bis(2-Ethylhexyl)phthalate	10 (1.28)	3	1	49	210	100	NLE
Di-n-octylphthalate	10	100	1	100	10000	100	NLE
Benzo(b)fluoranthene	10 (0.98)	0.2	1	0.9	4	50	NLE
Benzo(k)fluoranthene	10 ((0.92)	0.5	1	0.9	4	500	0.240
Benzo(a)pyrene	10 (0.71)	0.1	1	0.66	0.66	100	0.370
Indeno(1,2,3-cd)pyrene	10 (0.76)	0.2	1	0.9	4	500	0.200

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Analyte	Project Aqueous RL (µg/L)	NJDEP GW Criteria ¹ (µg/L)	Project Soil RL (mg/kg)	NJDEP RDCSCC ² (mg/kg)	NJDEP NRDCSCC ³ (mg/kg)	NJDEP IGWSCC ⁴ (mg/kg)	NJDEP Freshwater Sediment Screening Values - LEL ⁵ (mg/kg)
Dibenz(a,h)anthracene	10 (0.76)	0.3	1	0.66	0.66	100	0.060
Benzo(g,h,i)perylene	10	NLE	1	NLE	NLE	NLE	0.170
Pesticides							
alpha-BHC	0.02	0.02	0.01	NLE	NLE	NLE	0.006
beta-BHC	0.02	0.04	0.01	NLE	NLE	NLE	0.005
gamma-BHC	0.02	0.03	0.01	0.52	2.2	50	0.003
delta-BHC	0.02	NLE	0.01	NLE	NLE	NLE	0.003
Heptachlor	0.02	0.05	0.01	0.15	0.65	50	NLE
Aldrin	0.02	0.04	0.01	0.040	0.17	50	0.002
Heptachlor epoxide	0.02	0.2	0.01	NLE	NLE	NLE	0.005
gamma-Chlordane	0.02	0.5	0.01	NLE	NLE	NLE	0.007
alpha-Chlordane	0.02	0.5	0.01	NLE	NLE	NLE	0.007
Endosulfan I	0.02	40	0.01	340	6200	50	NLE
4,4'-DDE	0.02	0.1	0.01	2	9	50	0.005
Dieldrin	0.02	0.03	0.01	0.042	0.18	50	0.002
Endrin	0.02	2	0.01	17	310	50	0.003
Endosulfan II	0.02	40	0.01	340	6200	50	NLE
4,4'-DDD	0.02	0.1	0.01	3	12	50	0.008
Endrin aldehyde	0.02	NLE	0.01	NLE	NLE	NLE	NLE
4,4'-DDT	0.02	0.1	0.01	2	9	500	0.008
Endosulfan sulfate	0.02	40	0.01	NLE	NLE	NLE	NLE
Endrin ketone	0.02	NLE	0.01	NLE	NLE	NLE	NLE
Methoxychlor	0.02	40	0.01	280	5200	50	NLE
Toxaphene	0.5	2	0.05	0.10	0.2	50	NLE
PCBs							
Aroclor 1016	0.5	0.5	0.05	0.49	2	50	0.007
Aroclor 1221	0.5	0.5	0.05	0.49	2	50	0.070
Aroclor 1232	0.5	0.5	0.05	0.49	2	50	0.070
Aroclor 1242	0.5	0.5	0.05	0.49	2	50	0.070
Aroclor 1248	0.5	0.5	0.05	0.49	2	50	0.030

Analyte	Project Aqueous RL (µg/L)	NJDEP GW Criteria ¹ (µg/L)	Project Soil RL (mg/kg)	NJDEP RDCSCC ² (mg/kg)	NJDEP NRDCSCC ³ (mg/kg)	NJDEP IGWSCC ⁴ (mg/kg)	NJDEP Freshwater Sediment Screening Values - LEL ⁵ (mg/kg)
Aroclor 1254	0.5	0.5	0.05	0.49	2	50	0.060
Aroclor 1260	0.5	0.5	0.05	0.49	2	50	0.005

¹ Higher of Practical Quantitation Limits (PQLs) & Groundwater Quality Criterion (GWQC) per NJAC 7:9-6.

² NJDEP Residential Direct Contact Soil Cleanup Criteria (NRDCSCC) per NJAC 7:26D.

³ NJDEP Non-Residential Direct Contact Soil Cleanup Criteria (NRDCSCC) per NJAC 7:26D.

⁴ NJDEP Impact to Groundwater Soil Cleanup Criteria (IGWSCC) per NJAC 7:26D.

⁵ Lowest Effects Level

µg/L micrograms per liter

mg/kg milligrams per kilogram

RL Reporting Limit

GW Groundwater

NLE No Limit Established

Note: Method Detection Limits (MDLs) are listed in parenthesis.

Table 4-3
VO+10

Analyte	Project Aqueous RL (µg/L)	NJDEP GW Criteria ¹ (µg/L)	Project Soil RL (mg/kg)	NJDEP RDCSCC ² (mg/kg)	NJDEP NRDCSCC ³ (mg/kg)	NJDEP IGWSCC ³ (mg/kg)	NJDEP Freshwater Sediment Screening Values - LEL ⁵ (mg/kg)
Acrolein	5	5	1.2	NLE	NLE	NLE	
Acrylonitrile	5 (1.23)	2	1.2	1	5	1	NLE
tert-Butyl alcohol	10	100	1.2	NLE	NLE	NLE	NLE
Methyl-tert-butyl ether	2	70	0.25	NLE	NLE	NLE	NLE
Di-isopropyl ether	2	20000	0.25	NLE	NLE	NLE	NLE
Dichlorodifluoromethane	2	1000	0.25	NLE	NLE	NLE	NLE
Chloromethane	2	NLE	0.25	520	1000	10	NLE
Vinyl chloride	2 (0.23)	1	0.25	2	7	10	NLE
Bromomethane	2	10	0.25	79	1000	1	NLE
Chloroethane	2	NLE	0.25	NLE	NLE	NLE	NLE
Trichlorofluoromethane	2	2000	0.25	NLE	NLE	NLE	NLE
1,1-Dichloroethene	2 (0.19)	1	0.25	8	150	10	NLE
Acetone	2	6000	0.25	1000	1000	100	NLE
Carbon disulfide	2	700	0.25	NLE	NLE	NLE	NLE
Methylene chloride	2	3	0.25	49	210	1	NLE
trans-1,2-Dichloroethene	2	100	0.25	1000	1000	50	NLE
1,1-Dichloroethane	2	50	0.25	570	1000	10	NLE
Vinyl acetate	2	7000	0.25	NLE	NLE	NLE	NLE
2-Butanone	2	300	0.25	1000	1000	50	NLE
cis-1,2-Dichloroethene	2	70	0.25	79	1000	1	NLE
Chloroform	2	70	0.25	19	28	1	NLE
1,1,1-Trichloroethane	2	30	0.25	210	1000	50	NLE
Carbon tetrachloride	2 (0.24)	1	0.25	2	4	1	NLE
Benzene	2 (0.24)	1	0.25	3	13	1	NLE
1,2-Dichloroethane	2	2	0.25	6	24	1	0.34
Trichloroethene	2 (0.26)	1	0.25	23	54	1	NLE
1,2-Dichloropropane	2 (0.24)	1	0.25	10	43	NLE	1.6

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Analyte	Project Aqueous RL (µg/L)	NJDEP GW Criteria ¹ (µg/L)	Project Soil RL (mg/kg)	NJDEP RDCSCC ² (mg/kg)	NJDEP NRDCSCC ³ (mg/kg)	NJDEP IGWSCC ³ (mg/kg)	NJDEP Freshwater Sediment Screening Values - LEL ⁵ (mg/kg)
Bromodichloromethane	2 (0.22)	1	0.25	11	46	1	NLE
2-Chloroethyl vinyl ether	2	NLE	0.25	NLE	NLE	NLE	NLE
cis-1,3-Dichloropropene	2 (0.22)	1	0.25	4	5	1	NLE
4-Methyl-2-pentanone	2	NLE	0.25	1000	1000	50	NLE
Toluene	2	1000	0.25	1000	1000	500	NLE
trans-1,3-Dichloropropene	2 (0.25)	1	0.25	4	5	1	2.5
1,1,2-Trichloroethane	2	3	0.25	22	420	1	NLE
Tetrachloroethene	2 (0.20)	1	0.25	4	6	1	NLE
2-Hexanone	2	NLE	0.25	NLE	NLE	NLE	0.45
Dibromochloromethane	2 (0.22)	1	0.25	110	1000	1	NLE
Chlorobenzene	2	50	0.25	37	680	1	NLE
Ethylbenzene	2	700	0.25	1000	1000	100	NLE
m+p Xylene	4	1000	0.5	410	1000	67	1.4
o Xylene	2	1000	0.25	410	1000	67	0.12
Styrene	2	100	0.25	23	97	100	0.12
Bromoform	2	4	0.25	86	370	1	NLE
1,1,2,2-Tetrachloroethane	2 (0.45)	1	0.25	34	70	1	NLE
1,3-Dichlorobenzene	2	600	0.25	5100	10000	100	NLE
1,4-Dichlorobenzene	2	75	0.25	570	10000	100	NLE
1,2-Dichlorobenzene	2	600	0.25	5100	10000	50	NLE
1,1,1,2-Tetrachloroethane	2	1	0.25	170	310	1	NLE

¹ Higher of Practical Quantitation Limits (PQLs) & Groundwater Quality Criterion (GWQC) per NJAC 7:9-6.

² NJDEP Residential Direct Contact Soil Cleanup Criteria (NRDCSCC) per NJAC 7:26D.

³ NJDEP Non-Residential Direct Contact Soil Cleanup Criteria (NRDCSCC) per NJAC 7:26D.

⁴ NJDEP Impact to Groundwater Soil Cleanup Criteria (IGWSCC) per NJAC 7:26D.

⁵ Lowest Effects Level

µg/L micrograms per liter

mg/kg milligrams per kilogram

RL Reporting Limit

GW Groundwater

NLE No Limit Established

Note: Method Detection Limits (MDLs) are listed in parenthesis.

Table 4-4
BN+15

Analyte	Project Aqueous RL (µg/L)	NJDEP GW Criteria ¹ (µg/L)	Project Soil RL (mg/kg)	NJDEP RDCSCC ² (mg/kg)	NJDEP NRDCSCC ³ (mg/kg)	NJDEP IGWSCC ⁴ (mg/kg)	NJDEP Freshwater Sediment Screening Values - LEL ⁵ (mg/kg)
Pyridine	10	NLE	1	NLE	NLE	NLE	NLE
n-Nitroso-dimethylamine	10 (0.60)	0.8	1	NLE	NLE	NLE	NLE
Aniline	10 (2.38)	6	1	NLE	NLE	NLE	NLE
Phenol	10	2000	1	10000	10000	50	NLE
bis(2-Chloroethyl)ether	10 (0.71)	7	1	0.66	3	10	NLE
2-Chlorophenol	10	40	1	280	5200	10	NLE
1,3-Dichlorobenzene	10	600	1	5100	10000	100	NLE
1,4-Dichlorobenzene	10	75	1	570	10000	100	NLE
Benzyl alcohol	10	2000	1	10000	10000	50	NLE
1,2-Dichlorobenzene	10	600	1	5100	10000	50	NLE
2-Methylphenol	10	NLE	1	2800	10000	NLE	NLE
bis(2-Chloroisopropyl)ether	10	300	1	2300	10000	10	NLE
4-Methylphenol	10	NLE	1	2800	10000	NLE	NLE
n-Nitroso-di-n-propylamine	10	10	1	0.66	0.66	10	NLE
Hexachloroethane	10 (0.96)	7	1	6	100	100	NLE
Nitrobenzene	10 (0.86)	6	1	28	520	10	NLE
Isophorone	10	40	1	1100	10000	50	NLE
2-Nitrophenol	10	NLE	1	NLE	NLE	NLE	NLE
2,4-Dimethylphenol	10	100	1	1100	1000	10	NLE
bis(2-Chloroethoxy)methane	10	NLE	1	NLE	NLE	NLE	NLE
2,4-Dichlorophenol	10	20	1	170	3100	10	NLE
Benzoic acid	10	30000	1	NLE	NLE	NLE	NLE
1,2,4-Trichlorobenzene	10 (0.89)	9	1	68	1200	100	NLE
Naphthalene	10	300	1	230	4200	100	0.16
4-Chloroaniline	10	30	1	230	4200	NLE	NLE
Hexachlorobutadiene	10 (0.99)	1	1	1	21	100	NLE
4-Chloro-3-methylphenol	10	NLE	1	10000	10000	100	NLE

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Analyte	Project Aqueous RL (µg/L)	NJDEP GW Criteria ¹ (µg/L)	Project Soil RL (mg/kg)	NJDEP RDCSCC ² (mg/kg)	NJDEP NRDCSCC ³ (mg/kg)	NJDEP IGWSCC ⁴ (mg/kg)	NJDEP Freshwater Sediment Screening Values - LEL ⁵ (mg/kg)
2-Methylnaphthalene	10	NLE	1	NLE	NLE	NLE	0.070
Hexachlorocyclopentadiene	10	40	1	400	7300	100	NLE
2,4,5-Trichlorophenol	10	700	1	5600	10000	50	NLE
2,4,6-Trichlorophenol	10	20	1	62	270	10	NLE
2-Chloronaphthalene	10	600	1	NLE	NLE	NLE	NLE
2-Nitroaniline	10	NLE	1	NLE	NLE	NLE	NLE
Dimethylphthalate	10	NLE	1	10000	10000	50	NLE
Acenaphthylene	10	NLE	1	NLE	NLE	NLE	0.044
2,6-Dinitrotoluene	10	10	1	1	4	10	NLE
3-Nitroaniline	10	NLE	1	NLE	NLE	NLE	NLE
Acenaphthene	10	400	1	3400	10000	100	0.016
2,4-Dinitrophenol	10	40	1	110	2100	10	NLE
Dibenzofuran	10	NLE	1	NLE	NLE	NLE	NLE
4-Nitrophenol	10	NLE	1	NLE	NLE	NLE	NLE
2,4-Dinitrotoluene	10	10	1	1	4	10	NLE
Diethylphthalate	10	6000	1	10000	10000	50	NLE
Fluorene	10	300	1	2300	10000	100	0.190
4-Chlorophenyl-phenylether	10	NLE	1	NLE	NLE	NLE	NLE
4-Nitroaniline	10	NLE	1	NLE	NLE	NLE	NLE
n-Nitrosodiphenylamine	10	10	1	140	600	100	NLE
Azobenzene	10	NLE	1	NLE	NLE	NLE	NLE
4-Bromophenyl-phenylether	10	NLE	1	NLE	NLE	NLE	NLE
Hexachlorobenzene	10 (0.95)	0.02	1	0.66	2	100	NLE
Pentachlorophenol	10 (1.01)	0.3	1	6	24	100	NLE
Phenanthrene	10	NLE	1	NLE	NLE	NLE	0.560
Anthracene	10	2000	1	10000	10000	100	0.220
Di-n-butylphthalate	10	700	1	5700	10000	100	NLE
Fluoranthene	10	300	1	2300	10000	100	0.750
Benzidine	10	20	1	NLE	NLE	NLE	NLE
Pyrene	10	200	1	1700	10000	100	0.490

Analyte	Project Aqueous RL (µg/L)	NJDEP GW Criteria ¹ (µg/L)	Project Soil RL (mg/kg)	NJDEP RDCSCC ² (mg/kg)	NJDEP NRDCSCC ³ (mg/kg)	NJDEP IGWSCC ⁴ (mg/kg)	NJDEP Freshwater Sediment Screening Values - LEL ⁵ (mg/kg)
Butylbenzylphthalate	10	100	1	1100	10000	100	NLE
Benzo(a)anthracene	10 (0.82)	0.1	1	0.9	4	500	0.320
3,3'-Dichlorobenzidine	10	30	1	2	6	100	NLE
Chrysene	10 (0.77)	5	1	9	40	500	0.340
bis(2-Ethylhexyl)phthalate	10 (1.28)	3	1	49	210	100	NLE
Di-n-octylphthalate	10	100	1	100	10000	100	NLE
Benzo(b)fluoranthene	10 (0.98)	0.2	1	0.9	4	50	NLE
Benzo(k)fluoranthene	10 ((0.92)	0.5	1	0.9	4	500	0.240
Benzo(a)pyrene	10 (0.71)	0.1	1	0.66	0.66	100	0.370
Indeno(1,2,3-cd)pyrene	10 (0.76)	0.2	1	0.9	4	500	0.200
Dibenz(a,h)anthracene	10 (0.76)	0.3	1	0.66	0.66	100	0.060
Benzo(g,h,i)perylene	10	NLE	1	NLE	NLE	NLE	0.170

¹ Higher of Practical Quantitation Limits (PQLs) & Groundwater Quality Criterion (GWQC) per NJAC 7:9-6.

² NJDEP Residential Direct Contact Soil Cleanup Criteria (NRDCSCC) per NJAC 7:26D.

³ NJDEP Non-Residential Direct Contact Soil Cleanup Criteria (NRDCSCC) per NJAC 7:26D.

⁴ NJDEP Impact to Groundwater Soil Cleanup Criteria (IGWSCC) per NJAC 7:26D.

⁵ Lowest Effects Level

µg/L micrograms per liter

mg/kg milligrams per kilogram

RL Reporting Limit

GW Groundwater

NLE No Limit Established

Note: Method Detection Limits (MDLs) are listed in parenthesis.

**Table 4-5
PCBs**

Analyte	Project Aqueous RL (µg/L)	NJDEP GW Criteria ¹ (µg/L)	Project Soil RL (mg/kg)	NJDEP RDCSCC ² (mg/kg)	NJDEP NRDCSCC ³ (mg/kg)	NJDEP IGWSCC ⁴ (mg/kg)	NJDEP Freshwater Sediment Screening Values - LEL ⁵ (mg/kg)
Aroclor 1016	0.5	0.5	0.05	0.49	2	50	
Aroclor 1221	0.5	0.5	0.05	0.49	2	50	
Aroclor 1232	0.5	0.5	0.05	0.49	2	50	
Aroclor 1242	0.5	0.5	0.05	0.49	2	50	
Aroclor 1248	0.5	0.5	0.05	0.49	2	50	
Aroclor 1254	0.5	0.5	0.05	0.49	2	50	
Aroclor 1260	0.5	0.5	0.05	0.49	2	50	

¹ Higher of Practical Quantitation Limits (PQLs) & Groundwater Quality Criterion (GWQC) per NJAC 7:9-6.

² NJDEP Residential Direct Contact Soil Cleanup Criteria (NRDCSCC) per NJAC 7:26D.

³ NJDEP Non-Residential Direct Contact Soil Cleanup Criteria (NRDCSCC) per NJAC 7:26D.

⁴ NJDEP Impact to Groundwater Soil Cleanup Criteria (IGWSCC) per NJAC 7:26D.

⁵ Lowest Effects Level

µg/L micrograms per liter

mg/kg milligrams per kilogram

RL Reporting Limit

GW Groundwater

NLE No Limit Established

Note: Method Detection Limits (MDLs) are listed in parenthesis.

**Table 4-6
TPHC**

Analyte	Project Aqueous RL (µg/L)	NJDEP GW Criteria ¹ (µg/L)	Project Soil RL (mg/kg)	NJDEP RDCSCC ² (mg/kg)	NJDEP NRDCSCC ³ (mg/kg)	NJDEP IGWSCC ⁴ (mg/kg)	NJDEP Freshwater Sediment Screening Values - LEL ⁵ (mg/kg)
TPHC	5.0	NLE	300 (30)	10000	10000	10000	NLE

¹ Higher of Practical Quantitation Limits (PQLs) & Groundwater Quality Criterion (GWQC) per NJAC 7:9-6.

² NJDEP Residential Direct Contact Soil Cleanup Criteria (NRDCSCC) per NJAC 7:26D.

³ NJDEP Non-Residential Direct Contact Soil Cleanup Criteria (NRDCSCC) per NJAC 7:26D.

⁴ NJDEP Impact to Groundwater Soil Cleanup Criteria (IGWSCC) per NJAC 7:26D.

⁵ Lowest Effects Level

µg/L micrograms per liter

mg/kg milligrams per kilogram

RL Reporting Limit

GW Groundwater

NLE No Limit Established

TPHC Total Petroleum Hydrocarbons

Note: Method Detection Limits (MDLs) are listed in parenthesis.

**Table 4-7
TAL Metals**

Analyte	Project Aqueous RL (µg/L)	NJDEP GW Criteria ¹ (µg/L)	Project Soil RL (mg/kg)	NJDEP RDCSCC ² (mg/kg)	NJDEP NRDCSCC ² (mg/kg)	NJDEP IGWSCC ³ (mg/kg)	NJDEP Freshwater Sediment Screening Values - LEL ⁵ (mg/kg)
Aluminum	100	200	20	NLE	NLE	NLE	NLE
Antimony	10 (0.7)	6	2	14	340	NLE	NLE
Arsenic	5 (2)	3	1	20	20	NLE	6
Barium	5	2000	1	700	47000	NLE	NLE
Beryllium	0.5	1	0.1	2	2	NLE	NLE
Cadmium	2	4	0.4	39	100	NLE	0.6
Calcium	1000	NLE	200	NLE	NLE	NLE	NLE
Chromium	5	70	1	NLE	NLE	NLE	26
Cobalt	2	NLE	0.4	NLE	NLE	NLE	NLE
Copper	5	1300	1	600	600	NLE	16
Iron	500 (68)	300	100	NLE	NLE	NLE	NLE
Lead	5	5	1	400	600	NLE	31
Magnesium	1000	NLE	200	NLE	NLE	NLE	NLE
Manganese	5	50	1	NLE	NLE	NLE	NLE
Mercury	0.5	2	0.1	14	270	NLE	0.2
Nickel	5	100	1	250	2400	NLE	16
Potassium	1000	NLE	200	NLE	NLE	NLE	NLE
Selenium	20	40	2	63	3100	NLE	NLE
Silver	5	40	1	110	4100	NLE	1.0
Sodium	5000	50000	1000	NLE	NLE	NLE	NLE
Thallium	10 (1.4)	2	2	2	2	NLE	NLE
Vanadium	5	NLE	1	370	7100	NLE	NLE
Zinc	50	2000	5	1500	1500	NLE	120

¹ Higher of Practical Quantitation Limits (PQLs) & Groundwater Quality Criterion (GWQC) per NJAC 7:9-6.

² NJDEP Residential Direct Contact Soil Cleanup Criteria (NRDCSCC) per NJAC 7:26D.

³ NJDEP Non-Residential Direct Contact Soil Cleanup Criteria (NRDCSCC) per NJAC 7:26D.

⁴ NJDEP Impact to Groundwater Soil Cleanup Criteria (IGWSCC) per NJAC 7:26D.

⁵ Lowest Effects Level

µg/L micrograms per liter
mg/kg milligrams per kilogram
RL Reporting Limit
GW Groundwater
NLE No Limit Established

Note: Method Detection Limits (MDLs) are listed in parenthesis.

**Table 4-8
Cyanide**

Analyte	Project Aqueous RL (µg/L)	NJDEP GW Criteria ¹ (µg/L)	Project Soil RL (mg/kg)	NJDEP RDCSCC ² (mg/kg)	NJDEP NRDCSCC ³ (mg/kg)	NJDEP IGWSCC ⁴ (mg/kg)	NJDEP Freshwater Sediment Screening Values - LEL ⁵ (mg/kg)
Cyanide	0.05	100	1.0	1100	21000	NLE	NLE

¹ Higher of Practical Quantitation Limits (PQLs) & Groundwater Quality Criterion (GWQC) per NJAC 7:9-6.

² NJDEP Residential Direct Contact Soil Cleanup Criteria (NRDCSCC) per NJAC 7:26D.

³ NJDEP Non-Residential Direct Contact Soil Cleanup Criteria (NRDCSCC) per NJAC 7:26D.

⁴ NJDEP Impact to Groundwater Soil Cleanup Criteria (IGWSCC) per NJAC 7:26D.

⁵ Lowest Effects Level

µg/L micrograms per liter

mg/kg milligrams per kilogram

RL Reporting Limit

GW Groundwater

NLE No Limit Established

Note: Method Detection Limits (MDLs) are listed in parenthesis.

Table 4-9
List of Required Compounds, Molecular Weights and NJDEP
Required Reporting Limits - NJDEP-SRWM Low Level USEPA Method TO-15

Required Compound Name	CAS Number	Molecular Weight	6- Liter Canister Reporting Limits (ppbv)	1, 2.7 & 3.2- Liter Canister Reporting Limits (ppbv)
Acetone	67-64-1	58.08	5.0	50.0
Allyl chloride	107-05-1	76.53	0.20	2.0
Benzene	71-43-2	78.11	0.20	2.0
Bromodichloromethane	75-27-4	163.8	0.20	2.0
Bromoform	75-25-2	252.8	0.20	2.0
Bromomethane	74-83-9	94.94	0.20	2.0
1,3-Butadiene	106-99-0	54.09	0.20	2.0
Chlorobenzene	108-90-7	112.6	0.20	2.0
Chloroethane	75-00-3	64.52	0.50	50.0
Chloroform	67-66-3	119.4	0.20	2.0
Chloromethane	74-87-3	50.49	0.50	50.0
Carbon disulfide	75-15-0	76.14	0.50	5.0
Carbon tetrachloride	56-23-5	153.8	0.20	2.0
2-Chlorotoluene	95-49-8	126.6	0.20	2.0
Cyclohexane	110-82-7	84.16	0.20	2.0
Dibromochloromethane	124-48-1	208.3	0.20	2.0
1,2-Dibromoethane	106-93-4	187.9	0.20	2.0
1,2-Dichlorobenzene	95-50-1	147.0	0.20	2.0
1,3-Dichlorobenzene	541-73-1	147.0	0.20	2.0
1,4-Dichlorobenzene	106-46-7	147.0	0.20	2.0
Dichlorodifluoromethane	75-71-8	120.9	0.50	5.0
1,1-Dichloroethane	75-34-3	98.96	0.20	2.0
1,2-Dichloroethane	107-06-2	98.96	0.20	2.0
1,1-Dichloroethene	75-35-4	96.94	0.20	2.0
1,2-Dichloroethene (cis)	156-59-2	96.94	0.20	2.0
1,2-Dichloroethene (trans)	156-60-5	96.94	0.20	2.0
1,2-Dichloropropane	78-87-5	113.0	0.20	2.0
1,3-Dichloropropene (cis)	10061-01-5	111.0	0.20	2.0
1,3-Dichloropropene (trans)	10061-02-6	111.0	0.20	2.0
1,2-Dichlorotetrafluoroethane	76-14-2	170.9	0.20	2.0
1,4-Dioxane	123-91-1	88.12	5.0	50.0

Required Compound Name	CAS Number	Molecular Weight	6- Liter Canister Reporting Limits (ppbv)	1, 2.7 & 3.2- Liter Canister Reporting Limits (ppbv)
Ethanol*	64-17-5	46.07	0.20	2.0
Ethylbenzene	100-41-4	106.2	0.20	2.0
4-Ethyltoluene	622-96-8	120.2	0.20	2.0
n-Heptane	142-82-5	100.2	0.20	2.0
1,3-Hexachlorobutadiene	87-68-3	260.8	0.20	2.0
n-Hexane	110-54-3	86.17	0.20	2.0
Isopropanol*	67-63-0	60.10	0.20	2.0
Methylene chloride	75-09-2	84.94	0.50	5.0
Methyl ethyl ketone	78-93-3	72.11	0.50	5.0
Methyl isobutyl ketone	108-10-1	100.2	0.50	5.0
Methyl methacrylate	80-62-6	100.12	0.50	5.0
Methyl tert-butyl ether	1634-04-4	88.15	0.20	2.0
Styrene	100-42-5	104.1	0.20	2.0
Tert-butyl alcohol	75-65-0	74.12	5.0	50.0
1,1,2,2-Tetrachloroethane	79-34-5	167.9	0.20	2.0
Tetrachloroethene	127-18-4	165.8	0.20	2.0
Tetrahydrofuran	109-99-9	72.11	5.0	50.0
Toluene	108-88-3	92.14	0.20	2.0
1,2,4-Trichlorobenzene	120-82-1	181.5	0.50	5.0
1,1,1-Trichloroethane	71-55-6	133.4	0.20	2.0
1,1,2-Trichloroethane	79-00-5	133.4	0.20	2.0
Trichloroethene	79-01-6	131.4	0.20	2.0
Trichlorofluoromethane	75-69-4	137.4	0.20	2.0
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	187.4	0.20	2.0
1,2,4-Trimethylbenzene	95-63-6	120.2	0.20	2.0
1,3,5-Trimethylbenzene	108-67-8	120.2	0.20	2.0
2,2,4-Trimethylpentane	540-84-1	114.2	0.20	2.0
Vinyl bromide	593-60-2	106.9	0.20	2.0
Vinyl chloride	75-01-4	62.50	0.20	2.0
Xylenes (m&p)	1330-20-7	106.2	0.50	5.0
Xylenes (o)	95-47-6	106.2	0.20	2.0

5 Reporting

5.1 Reporting Goals and Objectives

The SI report will be a tool that the Army will use to begin the assessment of potential contaminants of concern. The report will enable the Army to determine whether or not there is a need to conduct further study or remediation. It will provide formal documentation of the field activities and analytical results of the SI. The report will include a summary of the applicable Phase I ECP findings, a description of each site sampled, a discussion of the work performed and methods used, a presentation of the analytical data, a determination of whether a release or disposal of hazardous substance or petroleum products has occurred, and an assessment of the general nature and extent of contamination. The report will contain all of the fundamental components of a Phase II report and a strong justification and supporting information for the conclusions and recommendations will be presented. The report will also detail any deviations from the Work Plan and the rationale for the deviation. Sample data collected under this work plan, which conforms to NJDEP regulatory standards, will be utilized to seek NFA status from the NJDEP.

5.2 Reporting Approach

The sampling approach at FTMM may include a second sampling round. The site-specific approaches in Section 3 include the samples that will be collected for Round 1. It is anticipated that in the majority of the cases, Round 1 will be sufficient for meeting the goals of the SI. However, in some cases a second round may be necessary to perform an “order of magnitude” delineation. Prior to implementing Round 2, Shaw will reconvene with Army stakeholders and present the Round 1 results. The goal of this meeting will be to agree upon the completeness of the first sampling round and/or plan the second sampling round. Further discussion of the SI report will also take place. The SI report will be written to achieve all of the goals discussed in Section 5.1. The goals for the report will be met in large part through the use of tables summarizing detections above maximum contaminant levels and figures summarizing constituents detected above applicable NJDEP comparison criteria. Descriptive text will be kept to a minimum. The text will be limited to explaining the conclusions of the investigation, recommendations for further investigation, and recommendations for NFA determinations where appropriate.

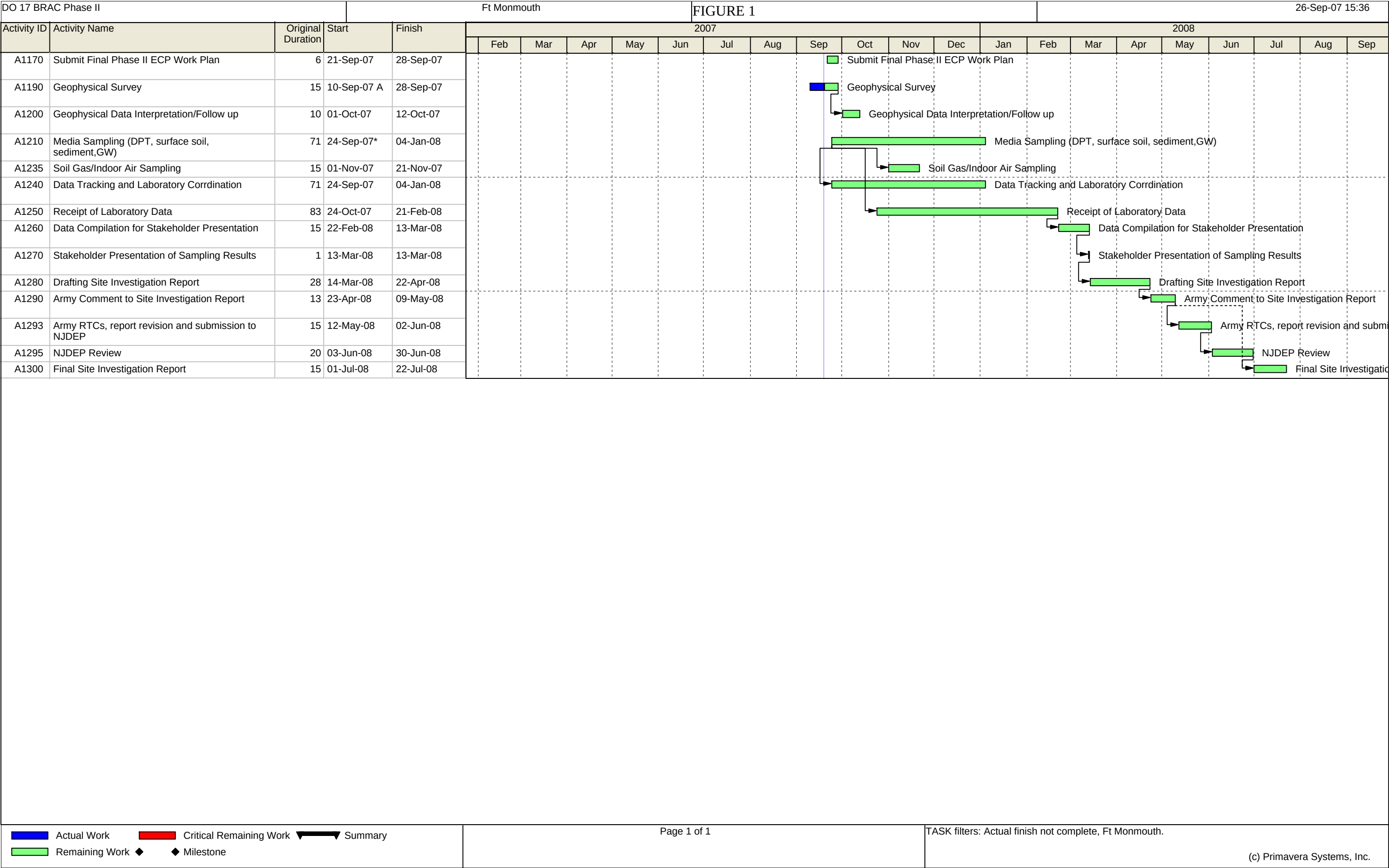
6 References

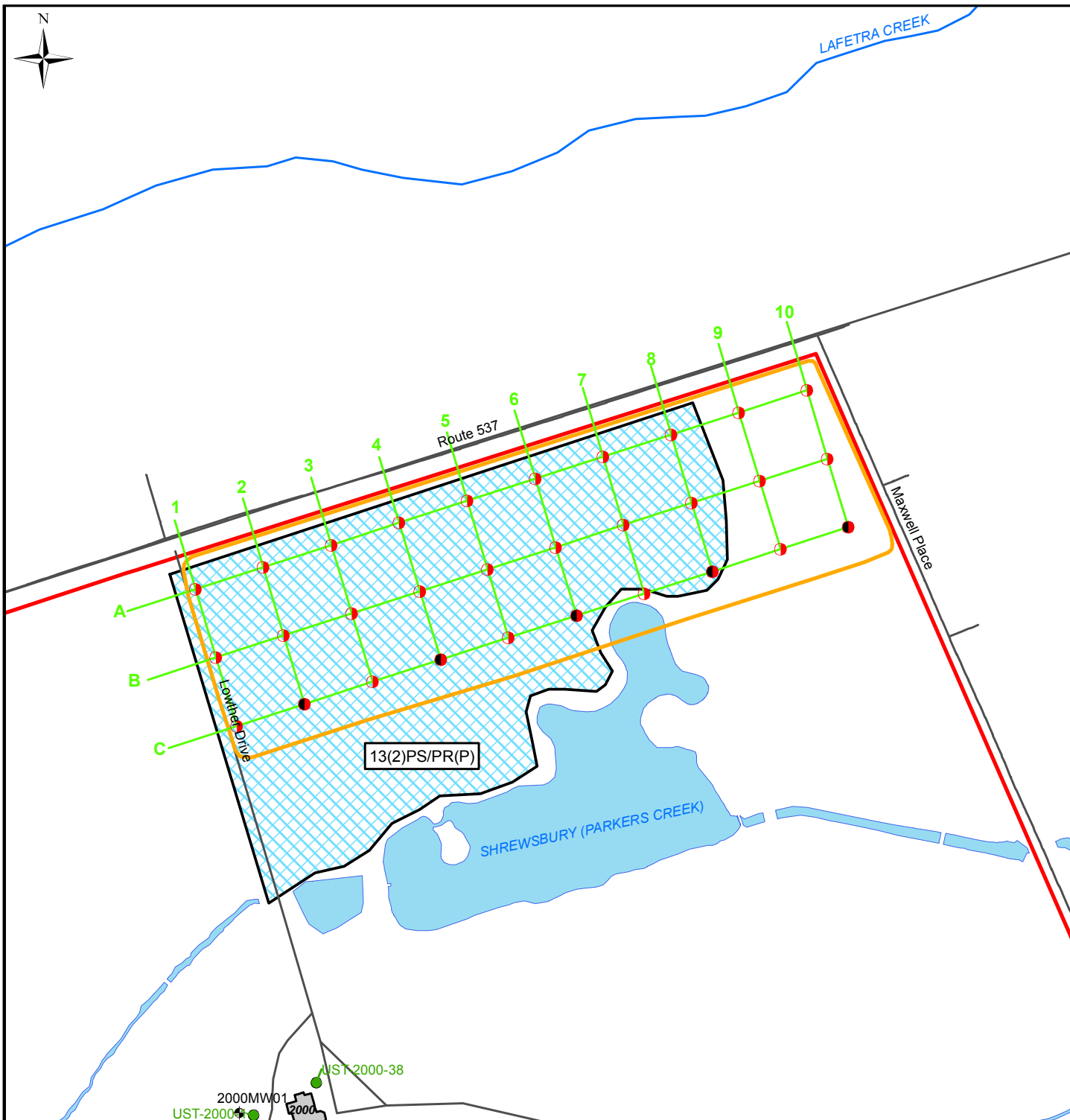
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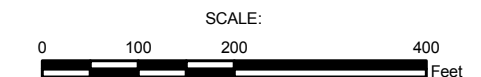
- Proposed Geoprobe Soil Sample Location - Samples to be collected at 0-6" BGS and the 6-inch interval directly above the water table.
- Proposed Geoprobe Soil Sample Location as Described Above, Plus Geoprobe Groundwater sampling.
- Monitoring Well
- Current AST Location
- Current UST Location
- Former UST Location
- Proposed Sampling Grid
- Road Centerline
- Water Feature
- Former Barracks to be Targeted By Geophysical Survey (Electromagnetic followed by Ground Penetrating Radar of Anomalies)
- Building
- Water Body
- Installation Boundary

ECP PARCEL CATEGORY DEFINITIONS

- 2 Areas where only release or disposal of petroleum products has occurred.

BRAC PARCEL LABEL DEFINITIONS

- 8(2)PS
 - CONTAMINATION DESCRIPTION
 - HS - Hazardous Substance Storage
 - HR - Hazardous Substance Release
 - PS - Petroleum Storage
 - PR - Petroleum Release
 - (P) - Possible Release or Disposal
 - CATEGORY NUMBER
 - PARCEL NUMBER



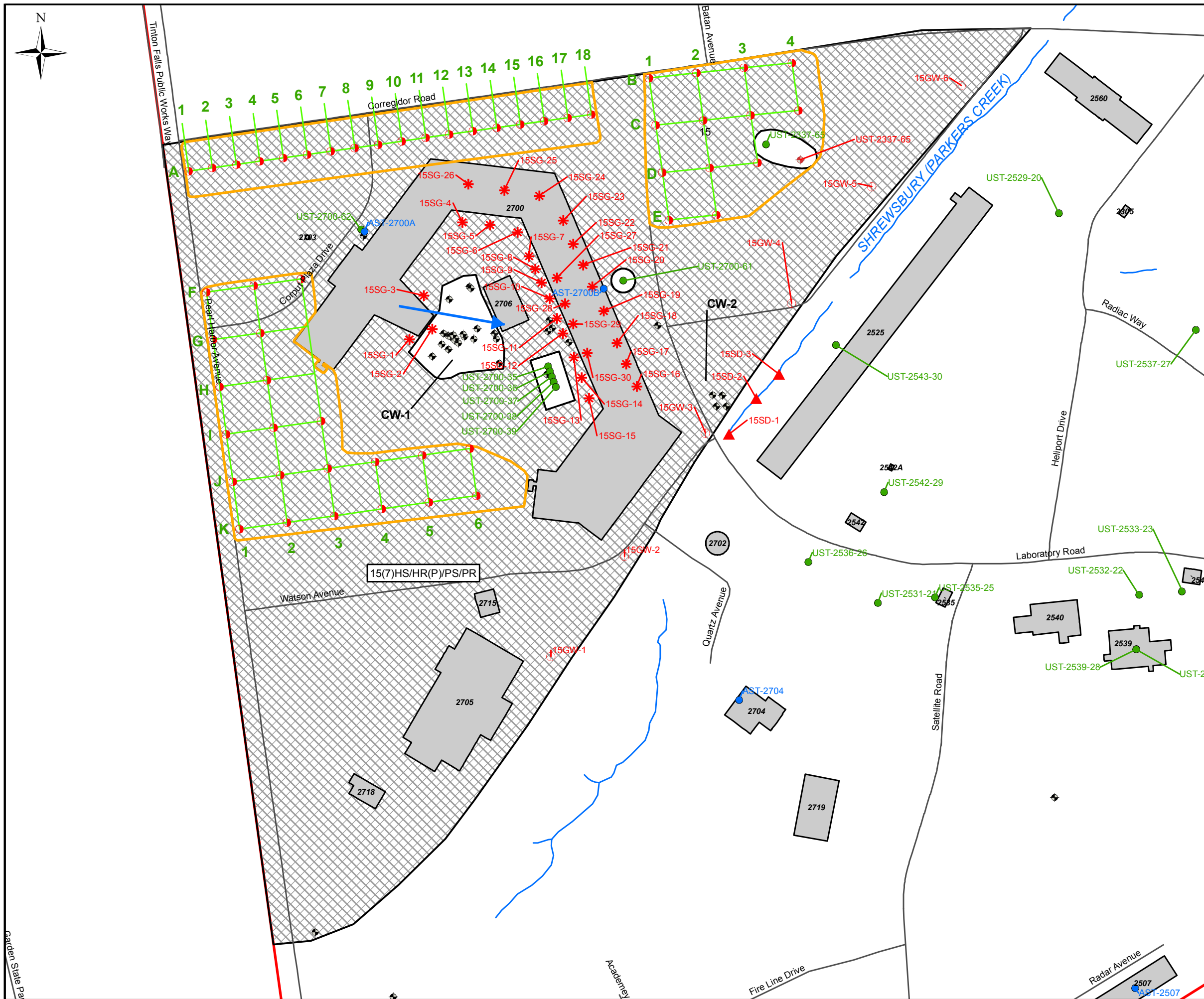
Base Realignment and Closure 2005



Shaw Environmental, Inc.



FIGURE 3-1
ECP PARCEL 13
CHARLES WOOD AREA
FORT MONMOUTH
NEW JERSEY



LEGEND

- Proposed Geoprobe Groundwater Sample Location
- Proposed Geoprobe Soil Sample Location - Samples to be collected at 0-6" BGS and the 6-inch interval directly above the water table.
- Proposed Sediment Sample Location - Samples to be collected from the 0-1 Ft BGS and 1-2 Ft BGS intervals. The deeper sample intervals may be adjusted based on sediment thickness.
- Proposed Groundwater Sample Location at Existing Monitoring Well
- Monitoring Well
- Proposed Soil-Gas Sample Location
- Current AST Location
- Current UST Location
- Former UST Location
- Road Centerline
- Water Feature
- General Groundwater Flow Direction
- Proposed Sampling Grid
- Former Barracks to be Targeted By Geophysical Survey (Electromagnetic followed by Ground Penetrating Radar of Anomalies)
- Building
- Installation Boundary

ECP PARCEL CATEGORY DEFINITIONS

- 7 Areas that are not evaluated or require additional evaluation.

BRAC PARCEL LABEL DEFINITIONS

- 8(2)PS
- CONTAMINATION DESCRIPTION
 - HS - Hazardous Substance Storage
 - HR - Hazardous Substance Release
 - PS - Petroleum Storage
 - PR - Petroleum Release
 - (P) - Possible Release or Disposal
- CATEGORY NUMBER
- PARCEL NUMBER

SCALE:

0 100 200 400 Feet



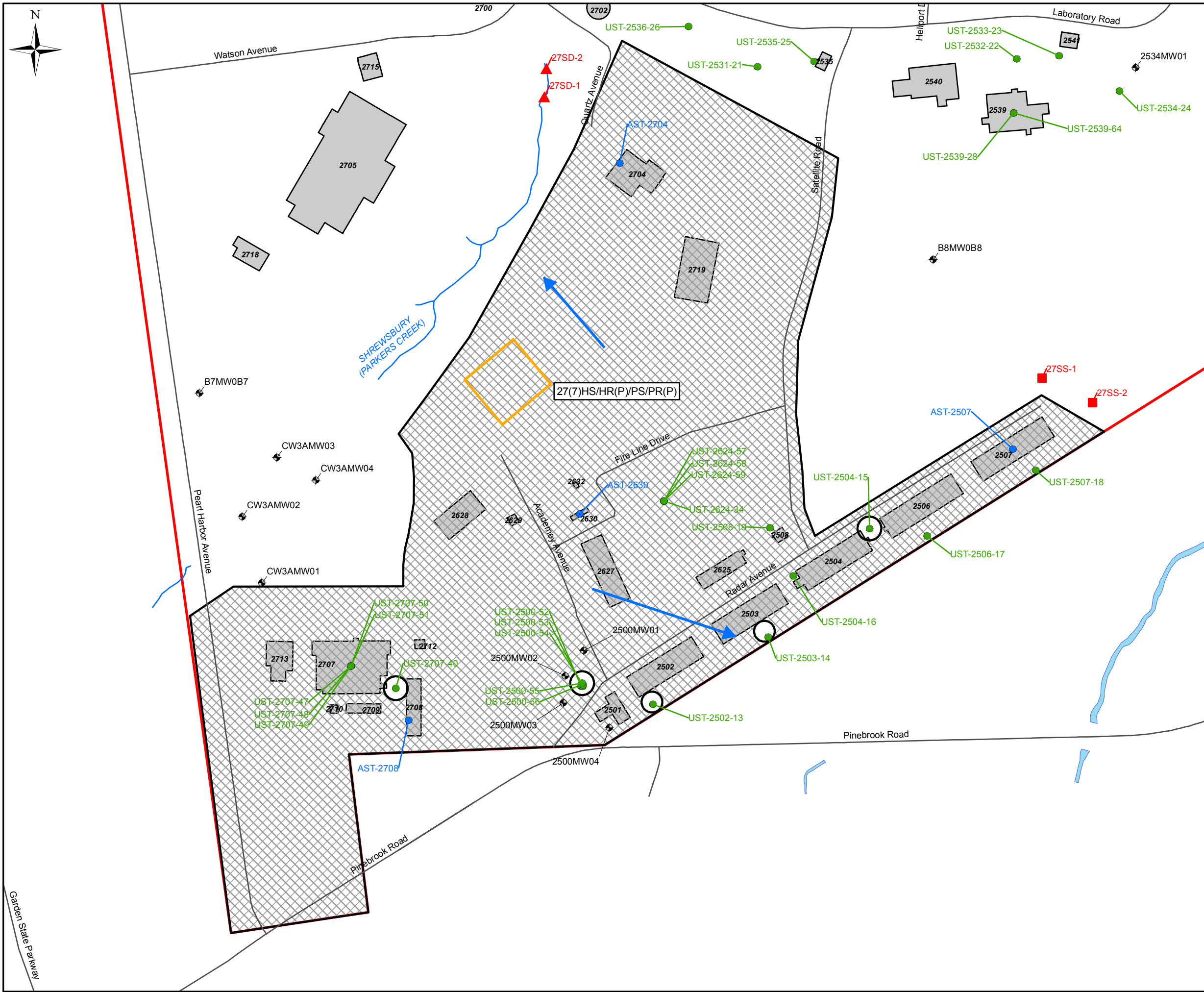
Base Realignment and Closure 2005



Shaw Environmental, Inc.



FIGURE 3-3
ECP PARCEL 15
CHARLES WOOD AREA
FORT MONMOUTH
NEW JERSEY



LEGEND

- Proposed Surface Soil Sample Location - Samples to be collected at 0-6" BGS.
- Proposed Sediment Sample Location - Samples to be collected from the 0-1 Ft BGS and 1-2 Ft BGS intervals. The deeper sample intervals may be adjusted based on sediment thickness.
- Monitoring Well
- Current AST Location
- Current UST Location
- Former UST Location
- Road Centerline
- Water Feature
- General Groundwater Flow Direction
- Water Body
- Building
- Geophysical Investigation Area (Electromagnetic Survey Followed by Targeted Ground Penetrating Radar of Anomalies)
- Installation Boundary

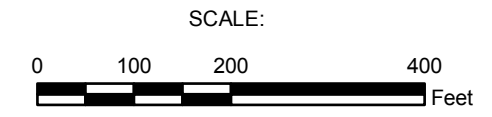
ECP PARCEL CATEGORY DEFINITIONS

- Areas that are not evaluated or require additional evaluation.

BRAC PARCEL LABEL DEFINITIONS

8(2)PS
CONTAMINATION DESCRIPTION
CATEGORY NUMBER
PARCEL NUMBER

HS - Hazardous Substance Storage
HR - Hazardous Substance Release
PS - Petroleum Storage
PR - Petroleum Release
(P) - Possible Release or Disposal

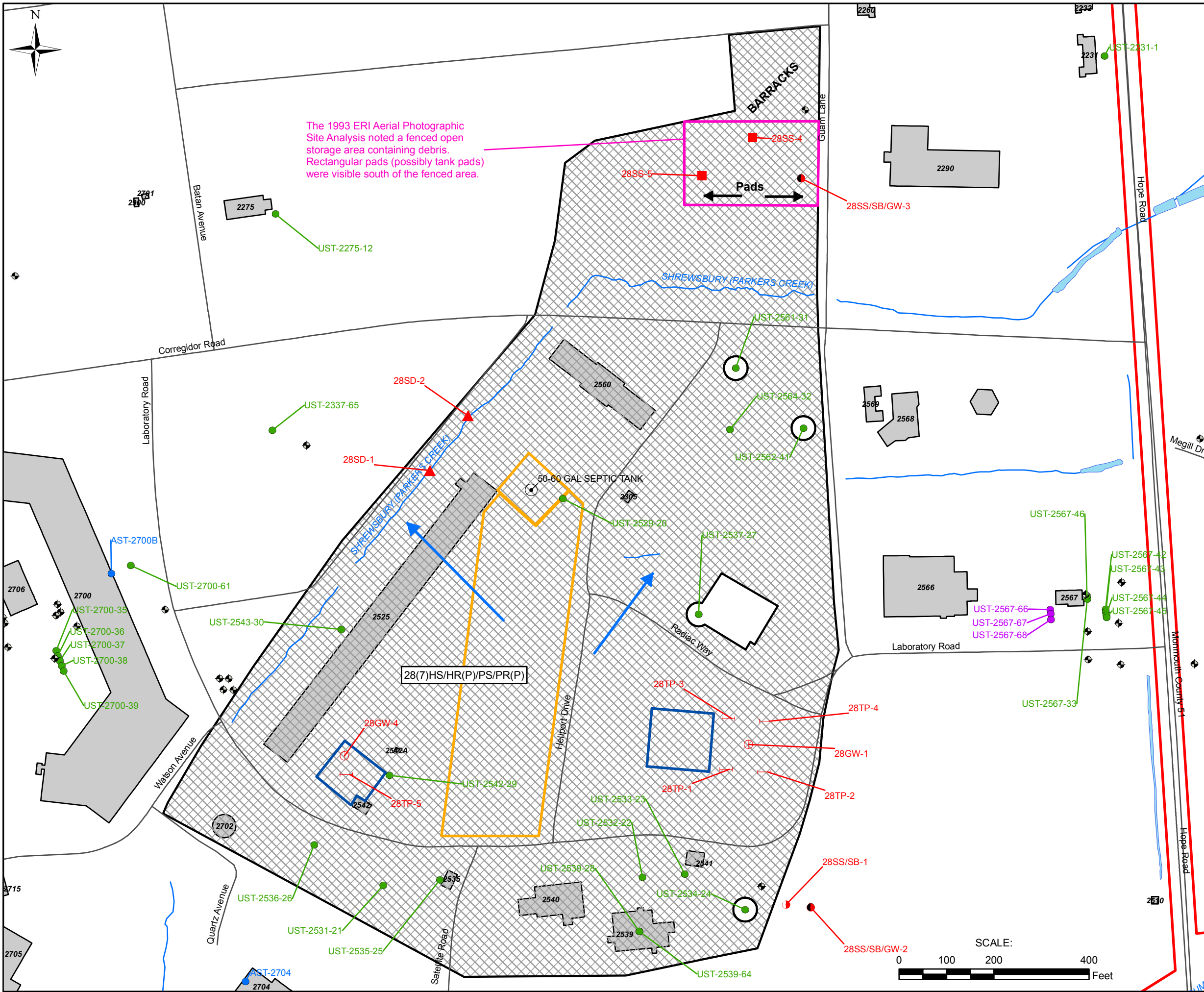


Base Realignment and Closure 2005

U.S. Army Corps of Engineers

Shaw Shaw Environmental, Inc.

FIGURE 3-4
ECP PARCEL 27
CHARLES WOOD AREA
FORT MONMOUTH
NEW JERSEY



LEGEND

- Proposed Geoprobe Soil Sample Location - Samples to be collected at 0-6" BGS and the 6-inch interval directly above the water table.
- Proposed Geoprobe Soil Sample Location as Described Above, Plus Geoprobe Groundwater sampling.
- Proposed Geoprobe Groundwater Sample Location
- Proposed Test Pit Location - Location may be modified based on results of geophysical investigation to locate septic tank/drywell. Two soil samples to be collected from each test pit based on field observation.
- Proposed Surface Soil Sample Location - Samples to be collected at 0-6" BGS.
- Proposed Sediment Sample Location - Samples to be collected from the 0-1 Ft BGS and 1-2 Ft BGS intervals. The deeper sample intervals may be adjusted based on sediment thickness.
- Monitoring Well
- Current AST Location
- Current UST Location
- Former UST Location
- Road Centerline
- Water Feature
- General Groundwater Flow Direction
- Geophysical Investigation Area (Electromagnetic Survey Followed by Targeted Ground Penetrating Radar of Anomalies)
- Geophysical Investigation Area - Ground Penetrating Radar (GPR)
- Water Body
- Building
- Installation Boundary

ECP PARCEL CATEGORY DEFINITIONS

7 Areas that are not evaluated or require additional evaluation.

BRAC PARCEL LABEL DEFINITIONS

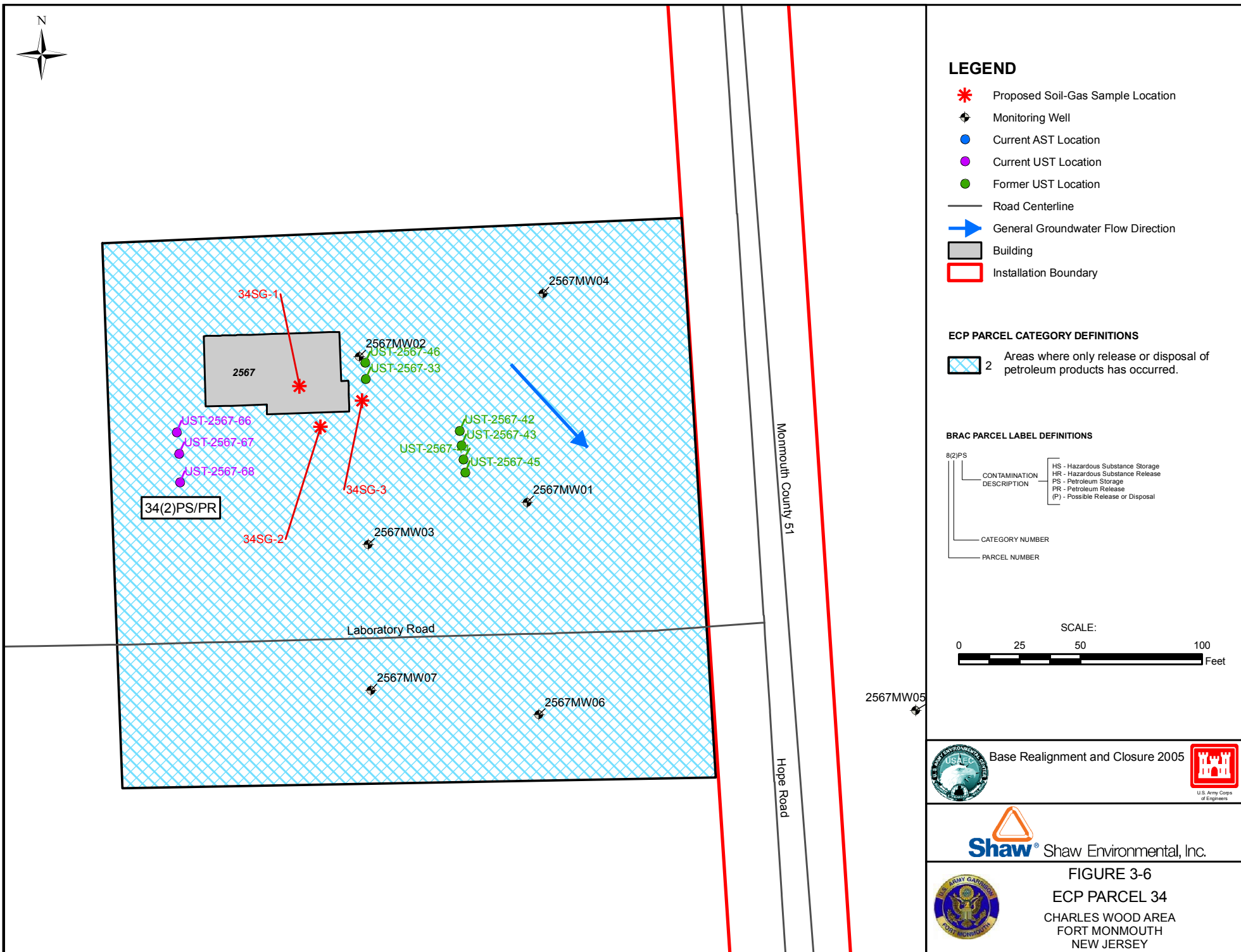
8(2)PS
CONTAMINATION DESCRIPTION
CATEGORY NUMBER
PARCEL NUMBER

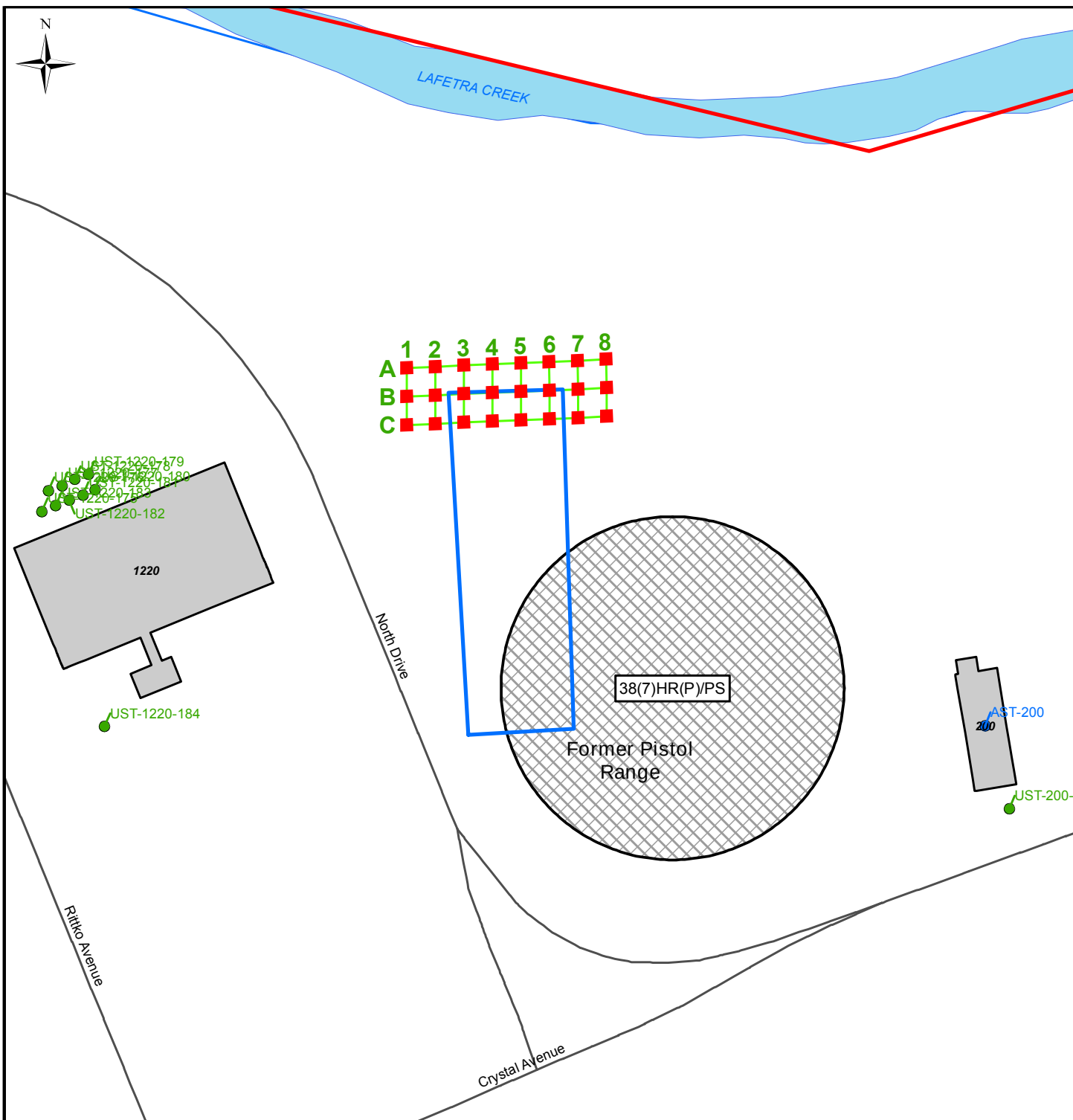
HS - Hazardous Substance Storage
HR - Hazardous Substance Release
PS - Petroleum Storage
PR - Petroleum Release
(P) - Possible Release or Disposal

Base Realignment and Closure 2005

Shaw Environmental, Inc.

FIGURE 3-5
ECP PARCEL 28
CHARLES WOOD AREA
FORT MONMOUTH
NEW JERSEY





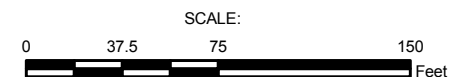
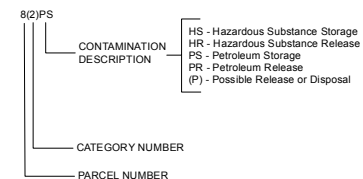
LEGEND

- Surface Soil Sampling Location
- ◆ Monitoring Well
- Current AST Location
- Current UST Location
- Former UST Location
- Proposed Sampling Grid
- Road Centerline
- Former Pistol Range
- Water Body
- Building
- Installation Boundary

ECP PARCEL CATEGORY DEFINITIONS

- 7 Areas that are not evaluated or require additional evaluation.

BRAC PARCEL LABEL DEFINITIONS



Base Realignment and Closure 2005

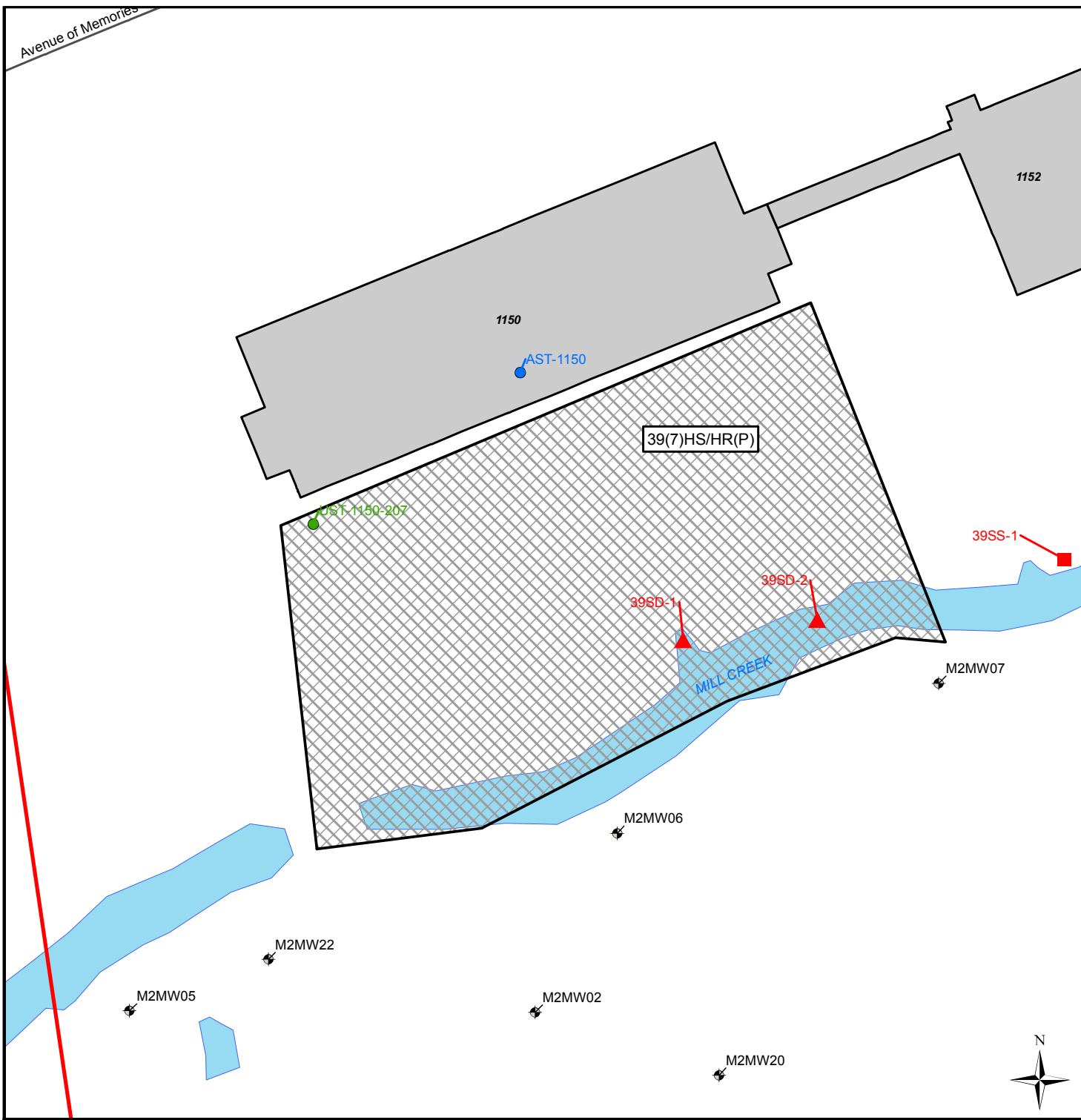


Shaw Environmental, Inc.



FIGURE 3-7
ECP PARCEL 38
MAIN POST
FORT MONMOUTH
NEW JERSEY

Avenue of Memories



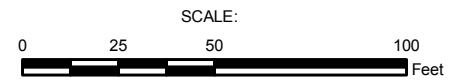
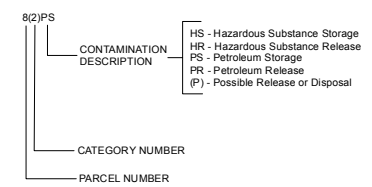
LEGEND

- Proposed Surface Soil Sample Location - Samples to be collected at 0-6" BGS.
- Proposed Sediment Sample Location - Samples to be collected from the 0-1 Ft BGS and 1-2 Ft BGS intervals. The deeper sample intervals may be adjusted based on sediment thickness.
- Monitoring Well
- Current AST Location
- Current UST Location
- Former UST Location
- Road Centerline
- Water Body
- Building
- Installation Boundary

ECP PARCEL CATEGORY DEFINITIONS

- 7 Areas that are not evaluated or require additional evaluation.

BRAC PARCEL LABEL DEFINITIONS



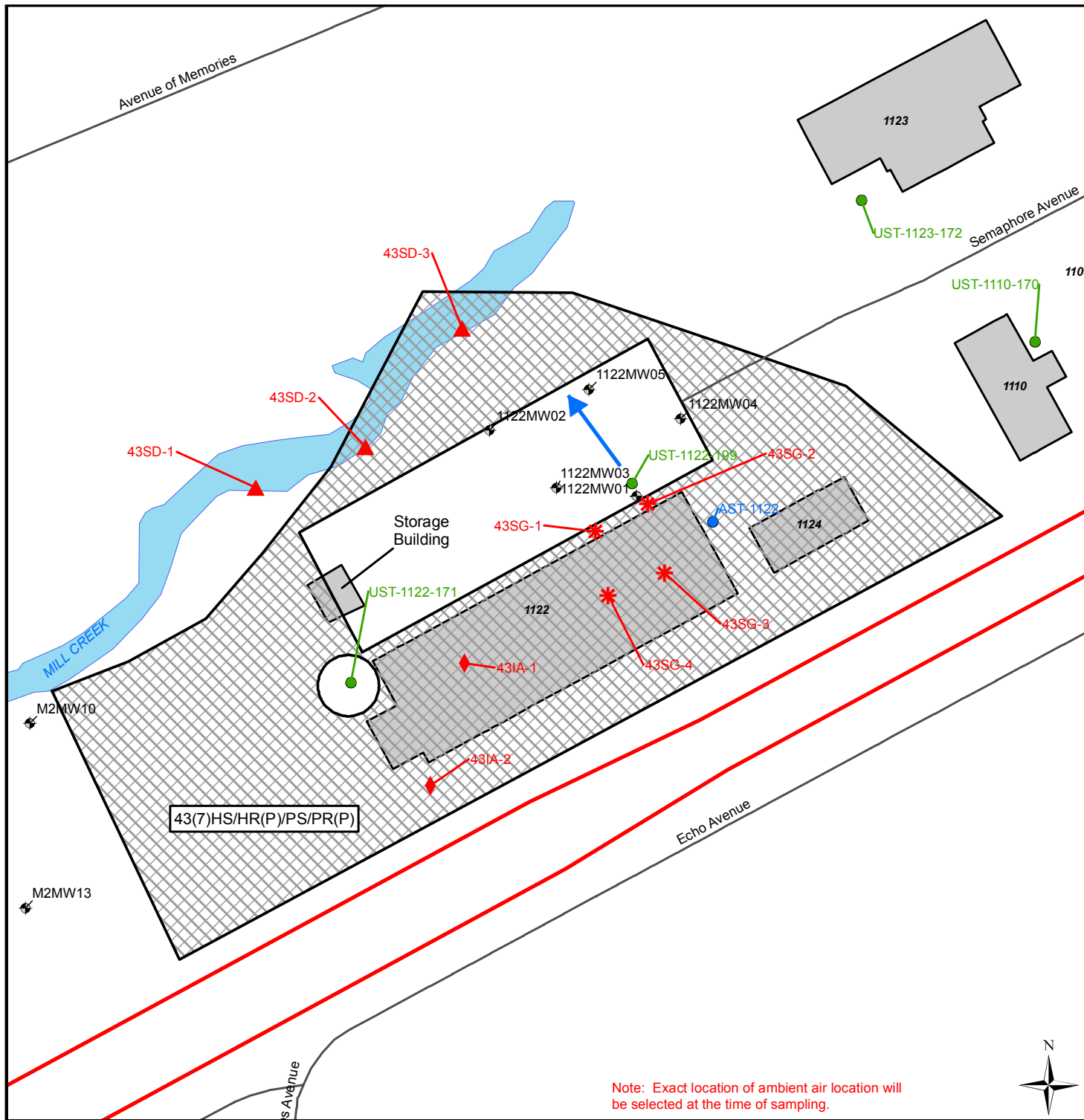
Base Realignment and Closure 2005



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FIGURE 3-8
ECP PARCEL 39
MAIN POST
FORT MONMOUTH
NEW JERSEY



LEGEND

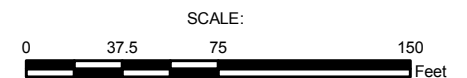
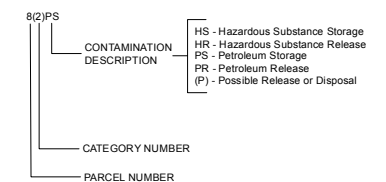
- Proposed Sediment Sample Location - Samples to be collected from the 0-1 Ft BGS and 1-2 Ft BGS depth intervals. The deeper sample interval may be adjusted based on sediment thickness.
- Proposed Indoor Air Sample Location
- Proposed Soil-Gas Sample Location
- Monitoring Well
- Current AST Location
- Current UST Location
- Former UST Location
- Road Centerline
- General Groundwater Flow Direction
- Building
- Water Body
- Installation Boundary

ECP PARCEL CATEGORY DEFINITIONS

Parcel Boundary

- 7 Areas that are not evaluated or require additional evaluation.

BRAC PARCEL LABEL DEFINITIONS



Base Realignment and Closure 2005



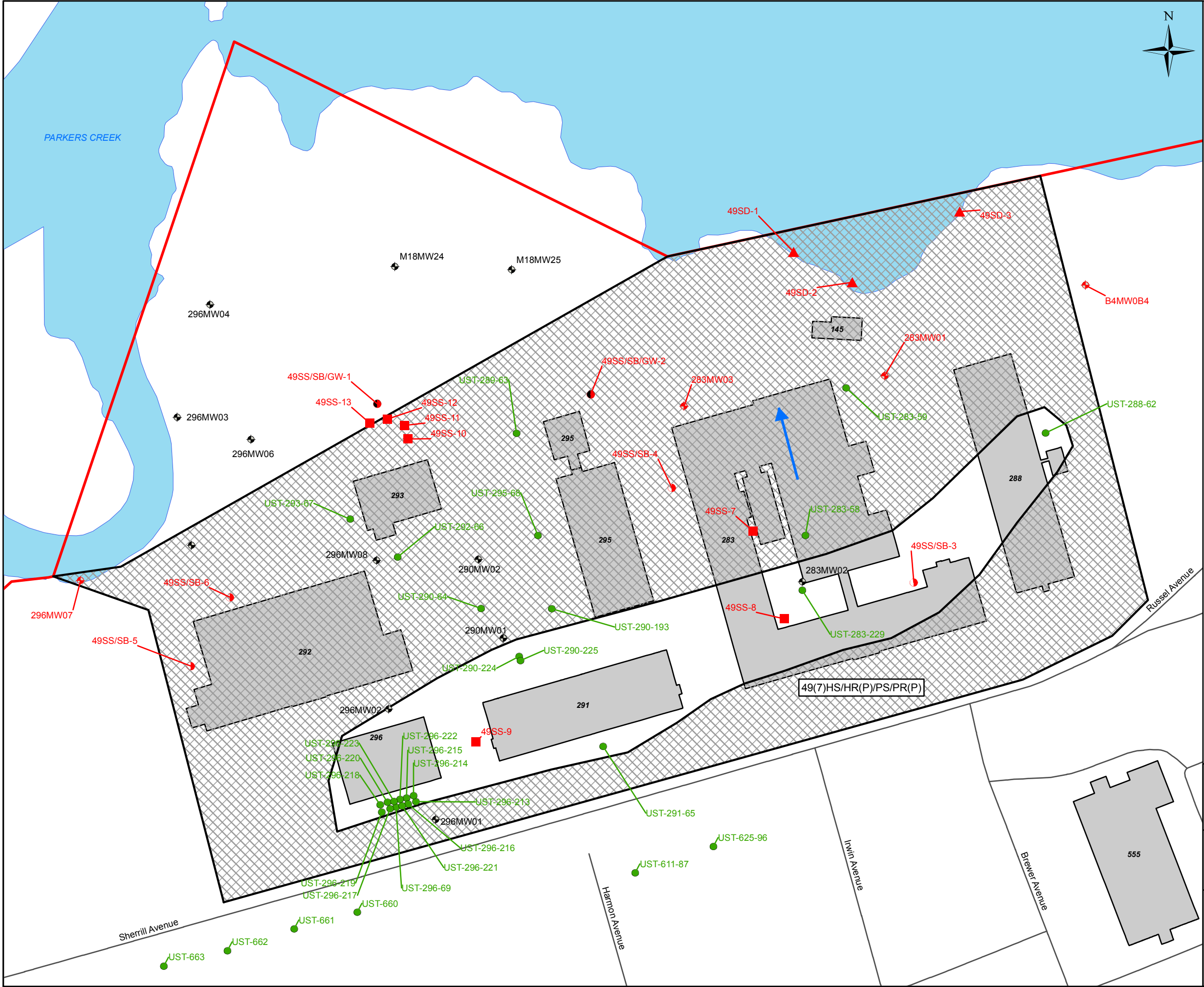
Shaw Environmental, Inc.



FIGURE 3-9
ECP PARCEL 43
MAIN POST
FORT MONMOUTH
NEW JERSEY



Note: Exact location of ambient air location will be selected at the time of sampling.



LEGEND

- Proposed Geoprobe Soil Sample Location - Samples to be collected at 0-6" BGS and the 6-inch interval directly above the water table.
- Proposed Geoprobe Soil Sample Location as Described Above, Plus Geoprobe Groundwater sampling.
- Proposed Surface Soil Sample Location - Samples to be collected at 0-6" BGS.
- Proposed Sediment Sample Location - Samples to be collected from the 0-1 Ft BGS and 1-2 Ft BGS depth intervals. The deeper sample interval may be adjusted based on sediment thickness.
- Proposed Groundwater Sample Location at Existing Monitoring Well
- Monitoring Well
- Current AST Location
- Current UST Location
- Former UST Location
- Road Centerline
- General Groundwater Flow Direction
- Water Body
- Building
- Installation Boundary

ECP PARCEL CATEGORY DEFINITIONS

- 7 Areas that are not evaluated or require additional evaluation.

BRAC PARCEL LABEL DEFINITIONS

- CONTAMINATION DESCRIPTION
 - HS - Hazardous Substance Storage
 - HR - Hazardous Substance Release
 - PS - Petroleum Storage
 - PR - Petroleum Release
 - (P) - Possible Release or Disposal
- CATEGORY NUMBER
- PARCEL NUMBER



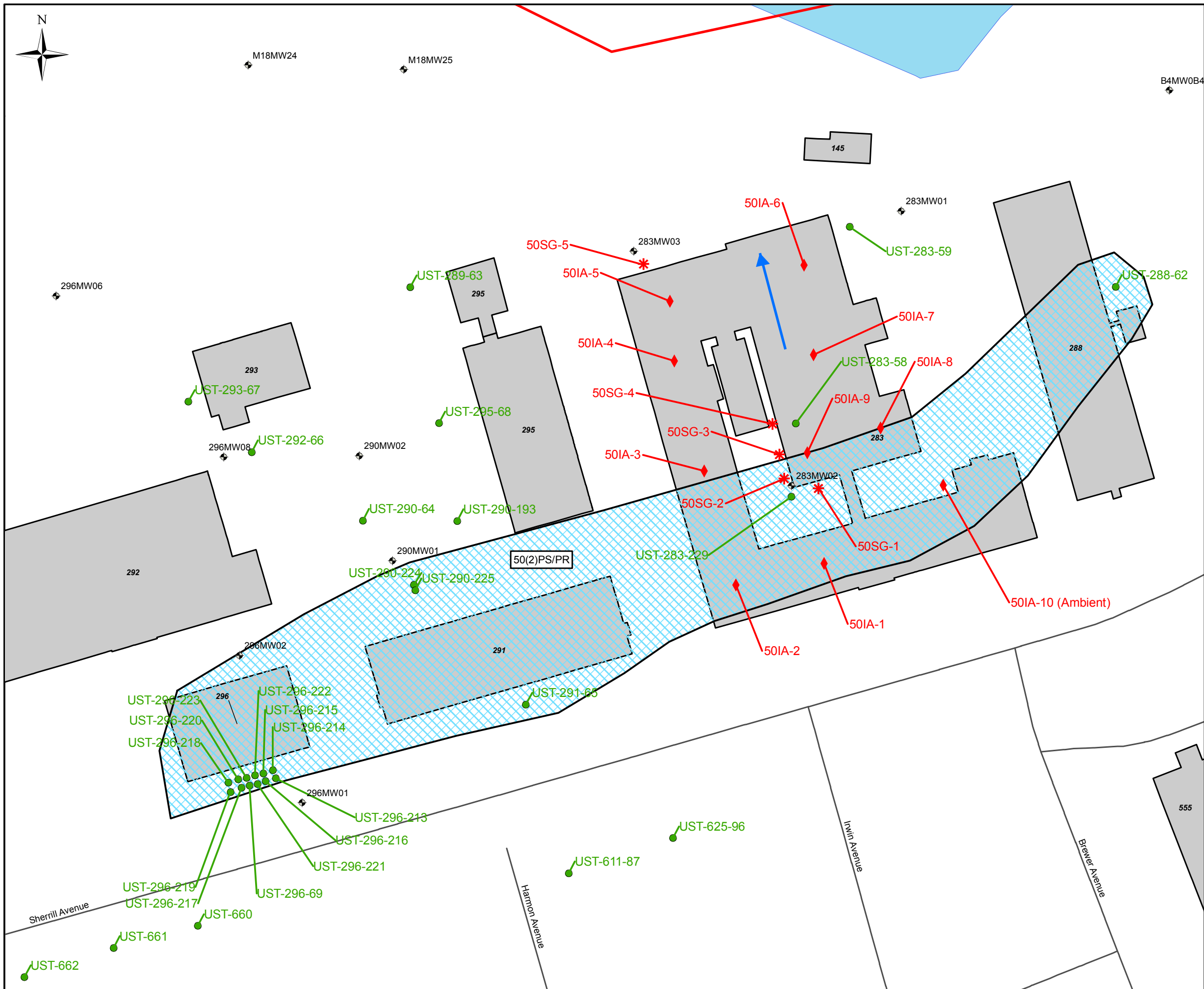
Base Realignment and Closure 2005



Shaw Environmental, Inc.



FIGURE 3-10
ECP PARCEL 49
MAIN POST
FORT MONMOUTH
NEW JERSEY



- LEGEND**
- Proposed Indoor Air Sample Location
 - Proposed Soil-Gas Sample Location
 - Monitoring Well
 - Current AST Location
 - Current UST Location
 - Former UST Location
 - Road Centerline
 - General Groundwater Flow Direction
 - Building
 - Installation Boundary
 - Water Body

ECP PARCEL CATEGORY DEFINITIONS

2 Areas where only release or disposal of petroleum products has occurred.

BRAC PARCEL LABEL DEFINITIONS

8(2)PS
CONTAMINATION DESCRIPTION
CATEGORY NUMBER
PARCEL NUMBER

HS - Hazardous Substance Storage
HR - Hazardous Substance Release
PS - Petroleum Storage
PR - Petroleum Release
(P) - Possible Release or Disposal

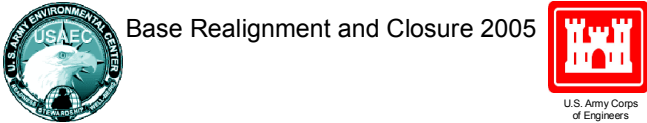
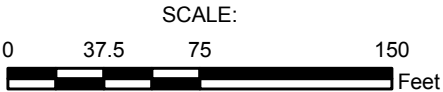
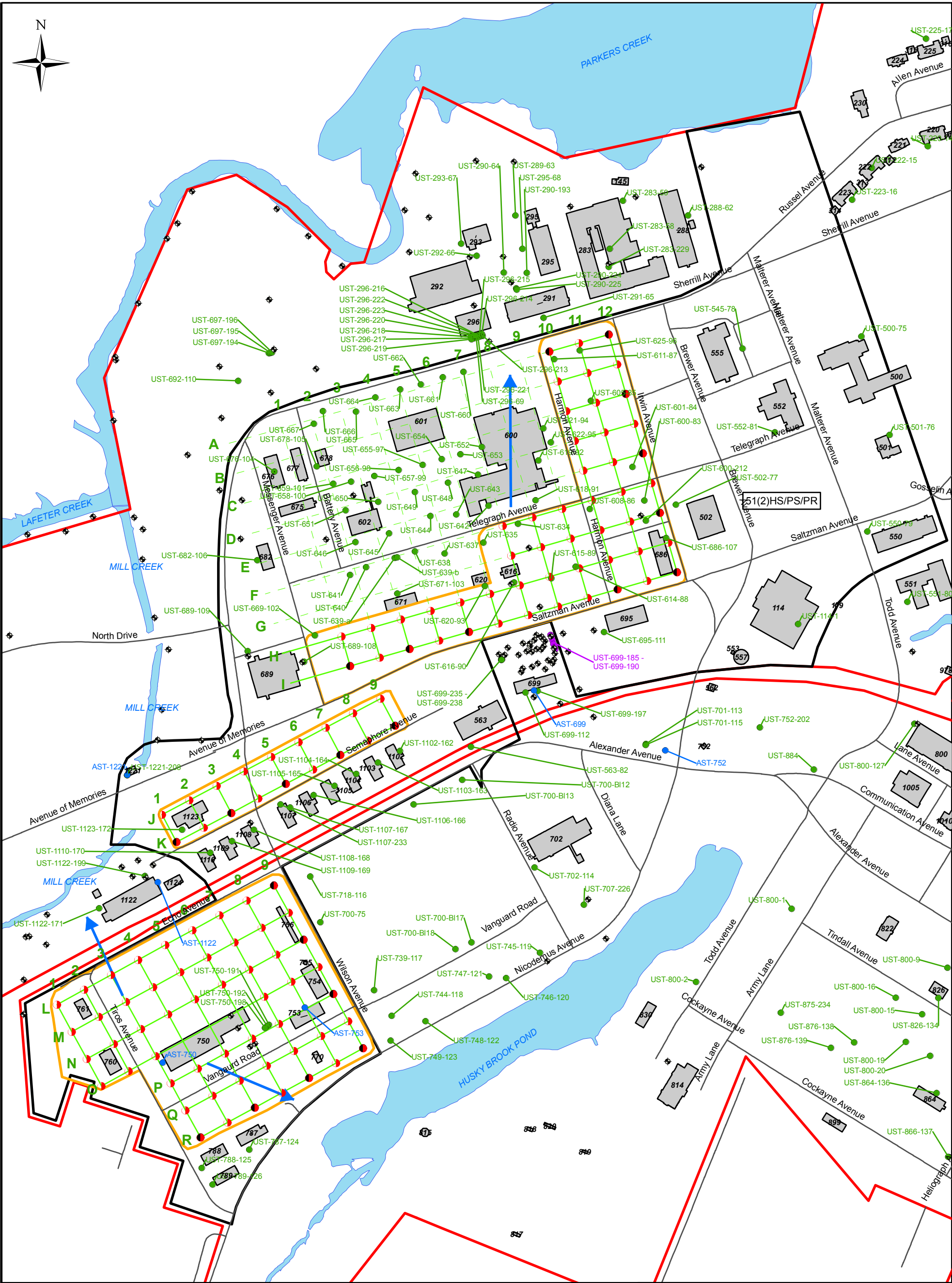


FIGURE 3-11
ECP PARCEL 50
MAIN POST
FORT MONMOUTH
NEW JERSEY



- LEGEND**
- Proposed Geoprobe Soil Sample Location - Samples to be collected at 0-6" BGS and the 6-inch interval directly above the water table.
 - Proposed Geoprobe Soil Sample Location as Described Above, Plus Geoprobe Groundwater sampling.
 - Monitoring Well
 - Current AST Location
 - Current UST Location
 - Former UST Location

- Road Centerline
- Proposed Sampling Grid
- General Groundwater Flow Direction
- Geophysical Investigation Area - Electromagnetic (EM) and Ground Penetrating Radar (GPR)
- Building
- Water Body
- Installation Boundary

- ECP PARCEL CATEGORY DEFINITIONS**
- Areas where only release or disposal of petroleum products has occurred.

Note: Groundwater will be sampled from geoprobe locations along the downgradient perimeter of the 600 area grid. Locations to be selected following verification of groundwater flow direction.

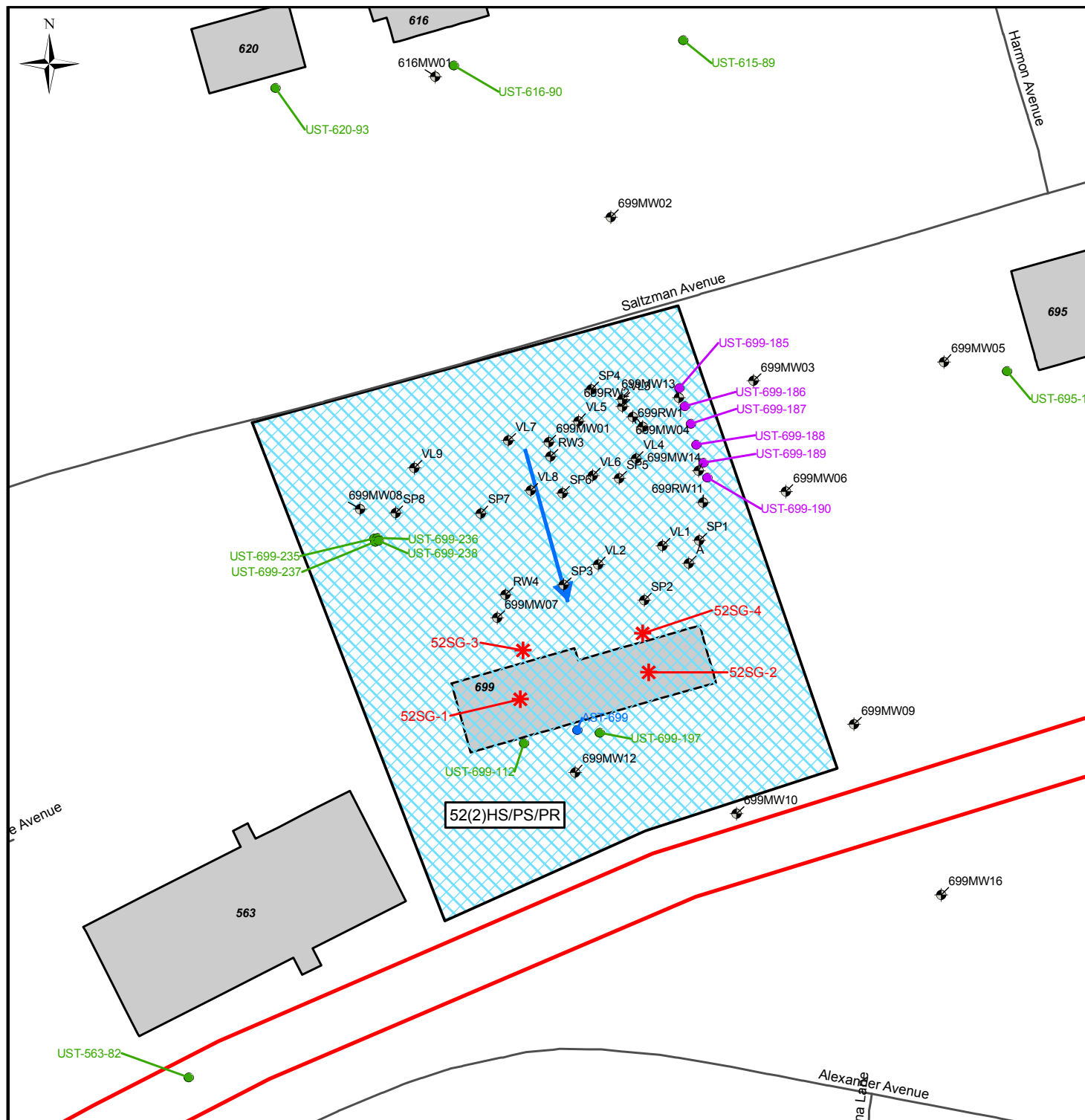
BRAC PARCEL LABEL DEFINITIONS

CONTAMINATION DESCRIPTION	CATEGORY NUMBER	PARCEL NUMBER
HS - Hazardous Substance Storage		
HR - Hazardous Substance Release		
PS - Petroleum Storage		
PR - Petroleum Release		
(P) - Possible Release or Disposal		

Base Realignment and Closure 2005

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FIGURE 3-12
ECP PARCEL 51
MAIN POST
FORT MONMOUTH
NEW JERSEY



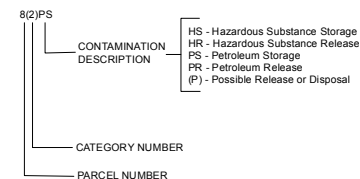
LEGEND

- Proposed Soil-Gas Sample Location
- Monitoring Well
- Current AST Location
- Current UST Location
- Former UST Location
- Road Centerline
- General Groundwater Flow Direction
- Building
- Installation Boundary

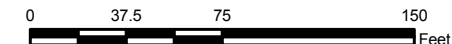
ECP PARCEL CATEGORY DEFINITIONS

- 2 Areas where only release or disposal of petroleum products has occurred.

BRAC PARCEL LABEL DEFINITIONS



SCALE:



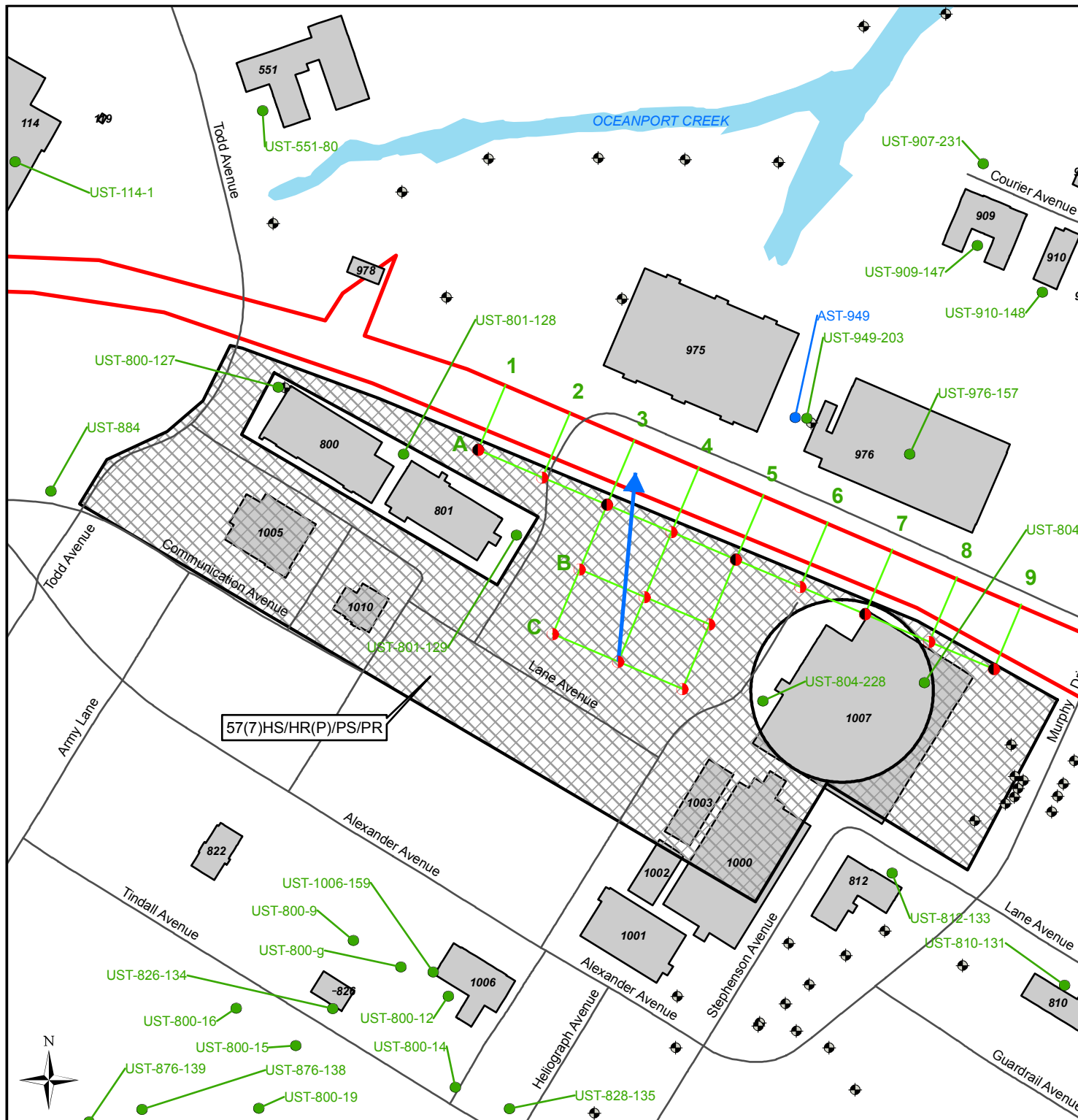
Base Realignment and Closure 2005



Shaw Environmental, Inc.



FIGURE 3-13
ECP PARCEL 52
MAIN POST
FORT MONMOUTH
NEW JERSEY



LEGEND

- Proposed Geoprobe Soil Sample Location - Samples to be collected at 0-6" BGS and the 6-inch interval directly above the water table.
- Proposed Geoprobe Soil Sample Location as Described Above, Plus Geoprobe Groundwater sampling.
- Monitoring Well
- Current AST Location
- Current UST Location
- Former UST Location
- Proposed Sampling Grid
- Road Centerline
- General Groundwater Flow Direction
- Building
- Water Body
- Installation Boundary

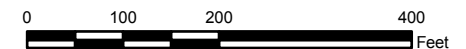
ECP PARCEL CATEGORY DEFINITIONS

- 7 Areas that are not evaluated or require additional evaluation.

BRAC PARCEL LABEL DEFINITIONS

- 8(2)PS
- | | |
|---------------------------|------------------------------------|
| CONTAMINATION DESCRIPTION | HS - Hazardous Substance Storage |
| | HR - Hazardous Substance Release |
| | PS - Petroleum Storage |
| | PR - Petroleum Release |
| | (P) - Possible Release or Disposal |
- CATEGORY NUMBER
- PARCEL NUMBER

SCALE:



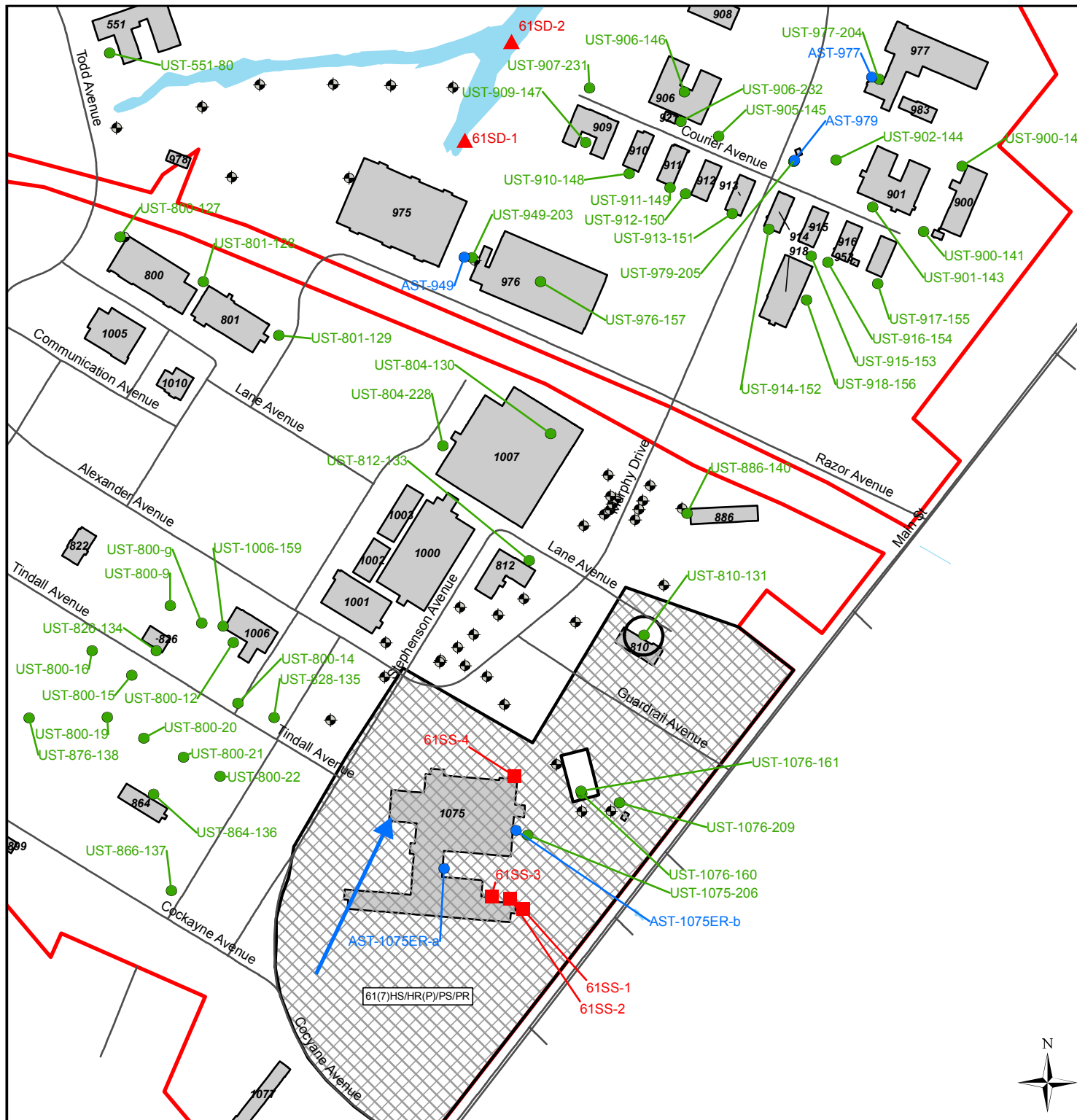
Base Realignment and Closure 2005



Shaw Environmental, Inc.



FIGURE 3-14
ECP PARCEL 57
MAIN POST
FORT MONMOUTH
NEW JERSEY



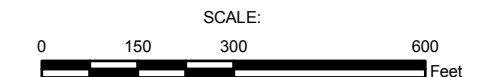
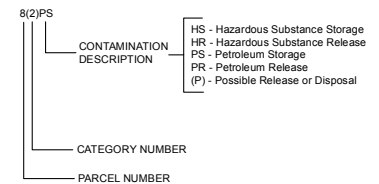
LEGEND

- Proposed Surface Soil Sample Location - Samples to be collected at 0-6" BGS.
- ▲ Proposed Sediment Sample Location - Samples to be collected from the 0-1 Ft BGS and 1-2 Ft BGS intervals. The deeper sample intervals may be adjusted based on sediment thickness.
- Monitoring Well
- Current AST Location
- Current UST Location
- Former UST Location
- ➔ General Groundwater Flow Direction
- Road Centerline
- Building
- Water Body
- Installation Boundary

ECP PARCEL CATEGORY DEFINITIONS

- Areas that are not evaluated or require additional evaluation.

BRAC PARCEL LABEL DEFINITIONS



Base Realignment and Closure 2005

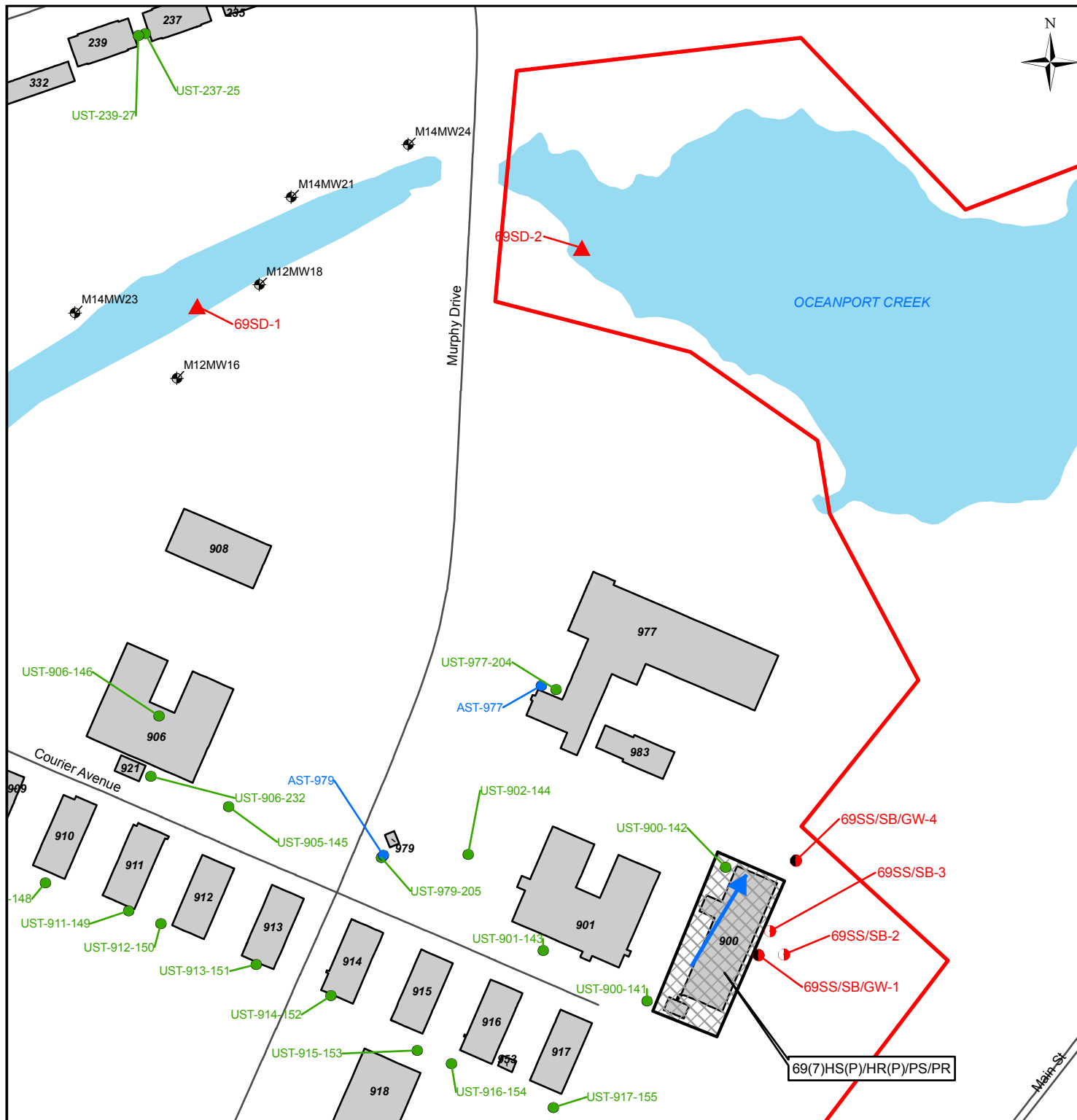


Shaw Environmental, Inc.



FIGURE 3-15
ECP PARCEL 61
MAIN POST
FORT MONMOUTH
NEW JERSEY





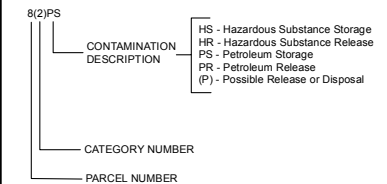
LEGEND

- Proposed Geoprobe Soil Sample Location - Samples to be collected at 0-6" BGS and the 6-inch interval directly above the water table.
- Proposed Geoprobe Soil Sample Location as Described Above, Plus Geoprobe Groundwater sampling.
- ▲ Proposed Sediment Sample Location - Samples to be collected from the 0-1 Ft BGS and 1-2 Ft BGS intervals. The deeper sample intervals may be adjusted based on sediment thickness.
- ⊕ Monitoring Well
- Current AST Location
- Current UST Location
- Former UST Location
- ➔ General Groundwater Flow Direction
- Road Centerline
- Building
- Water Body
- Installation Boundary

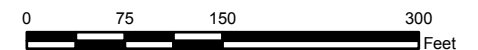
ECP PARCEL CATEGORY DEFINITIONS

- 7 Areas that are not evaluated or require additional evaluation.

BRAC PARCEL LABEL DEFINITIONS



SCALE:



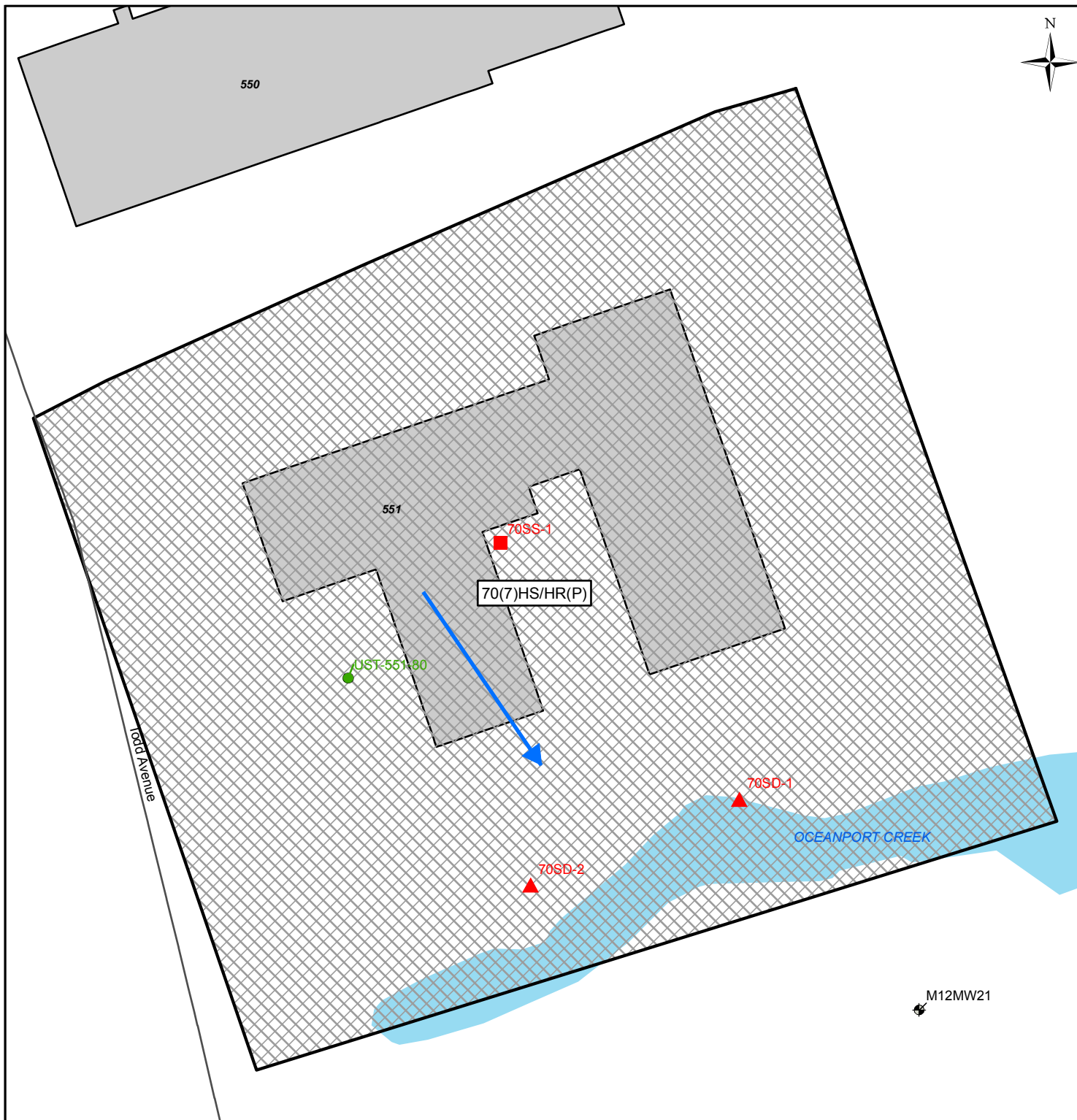
Base Realignment and Closure 2005



Shaw Shaw Environmental, Inc.



FIGURE 3-16
ECP PARCEL 69
 MAIN POST
 FORT MONMOUTH
 NEW JERSEY



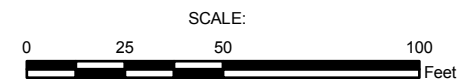
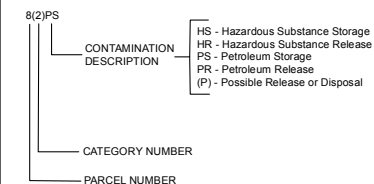
LEGEND

- Proposed Surface Soil Sample Location - Samples to be collected at 0-6" BGS.
- ▲ Proposed Sediment Sample Location - Samples to be collected from the 0-1 Ft BGS and 1-2 Ft BGS intervals. The deeper sample intervals may be adjusted based on sediment thickness.
- Monitoring Well
- Current AST Location
- Current UST Location
- Former UST Location
- ➔ General Groundwater Flow Direction
- Road Centerline
- Water Body
- Building
- Installation Boundary

ECP PARCEL CATEGORY DEFINITIONS

- 7 Areas that are not evaluated or require additional evaluation.

BRAC PARCEL LABEL DEFINITIONS



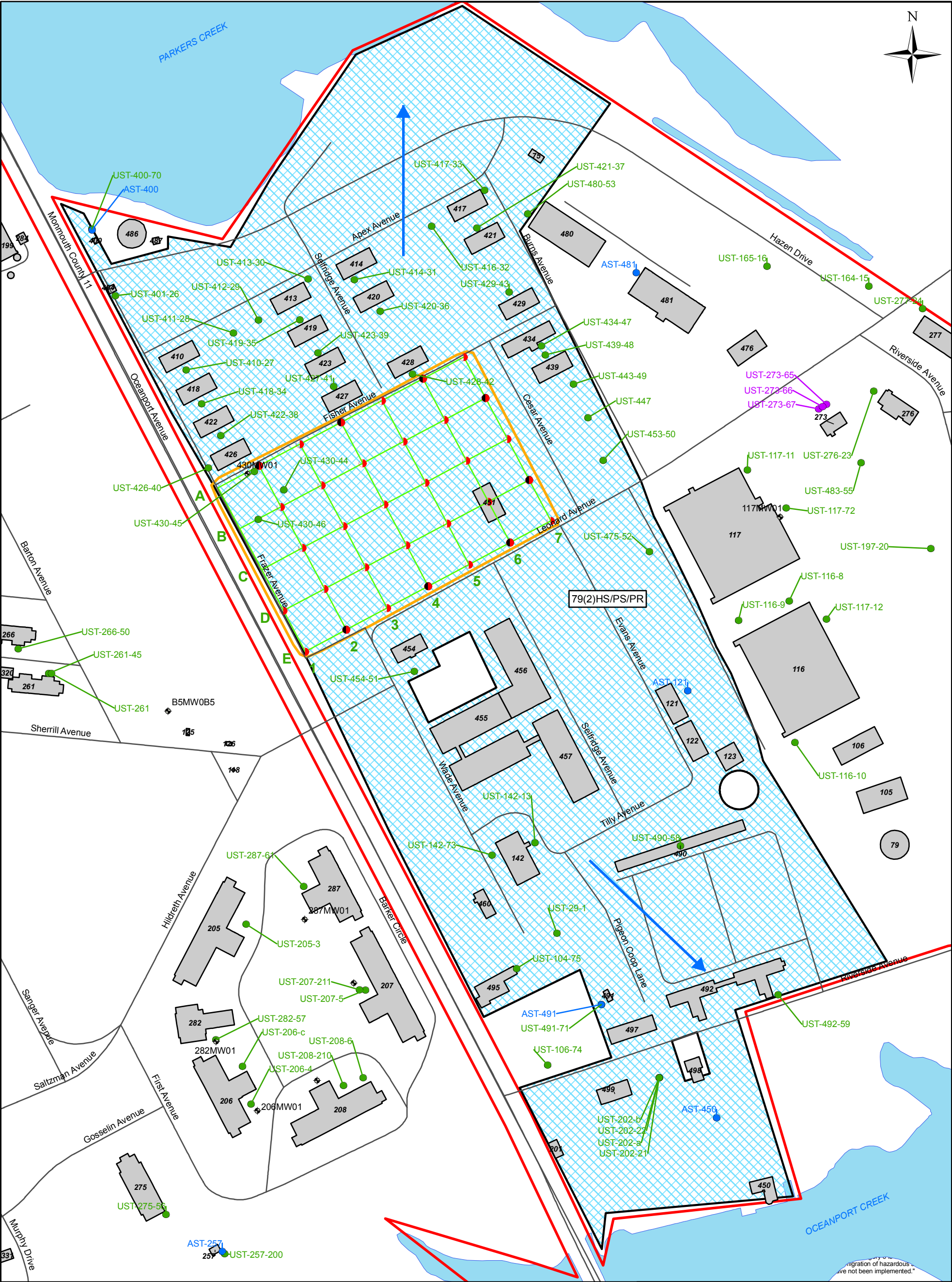
Base Realignment and Closure 2005



Shaw Environmental, Inc.



FIGURE 3-17
ECP PARCEL 70
MAIN POST
FORT MONMOUTH
NEW JERSEY



LEGEND

- Proposed Geoprobe Soil Sample Location - Samples to be collected at 0-6" BGS and the 6-inch interval directly above the water table.
- Proposed Geoprobe Soil Sample Location as Described Above, Plus Geoprobe Groundwater sampling.
- Monitoring Well
- Current AST Location
- Current UST Location
- Former UST Location
- General Groundwater Flow Direction
- Proposed Sampling Grid
- Road Centerline
- Water Feature
- Building

ECP PARCEL CATEGORY DEFINITIONS

- Geophysical Investigation Area (Electromagnetic Survey Followed by Targeted Ground Penetrating Radar of Anomalies)
- Installation Boundary

BRAC PARCEL LABEL DEFINITIONS

8(2)PS

CONTAMINATION DESCRIPTION	PARCEL NUMBER
HS - Hazardous Substance Storage	
HR - Hazardous Substance Release	
PS - Petroleum Storage	
PR - Petroleum Release	
IP - Possible Release or Disposal	

SCALE: 0 100 200 400 Feet

Base Realignment and Closure 2005

U.S. Army Corps of Engineers

Shaw Shaw Environmental, Inc.

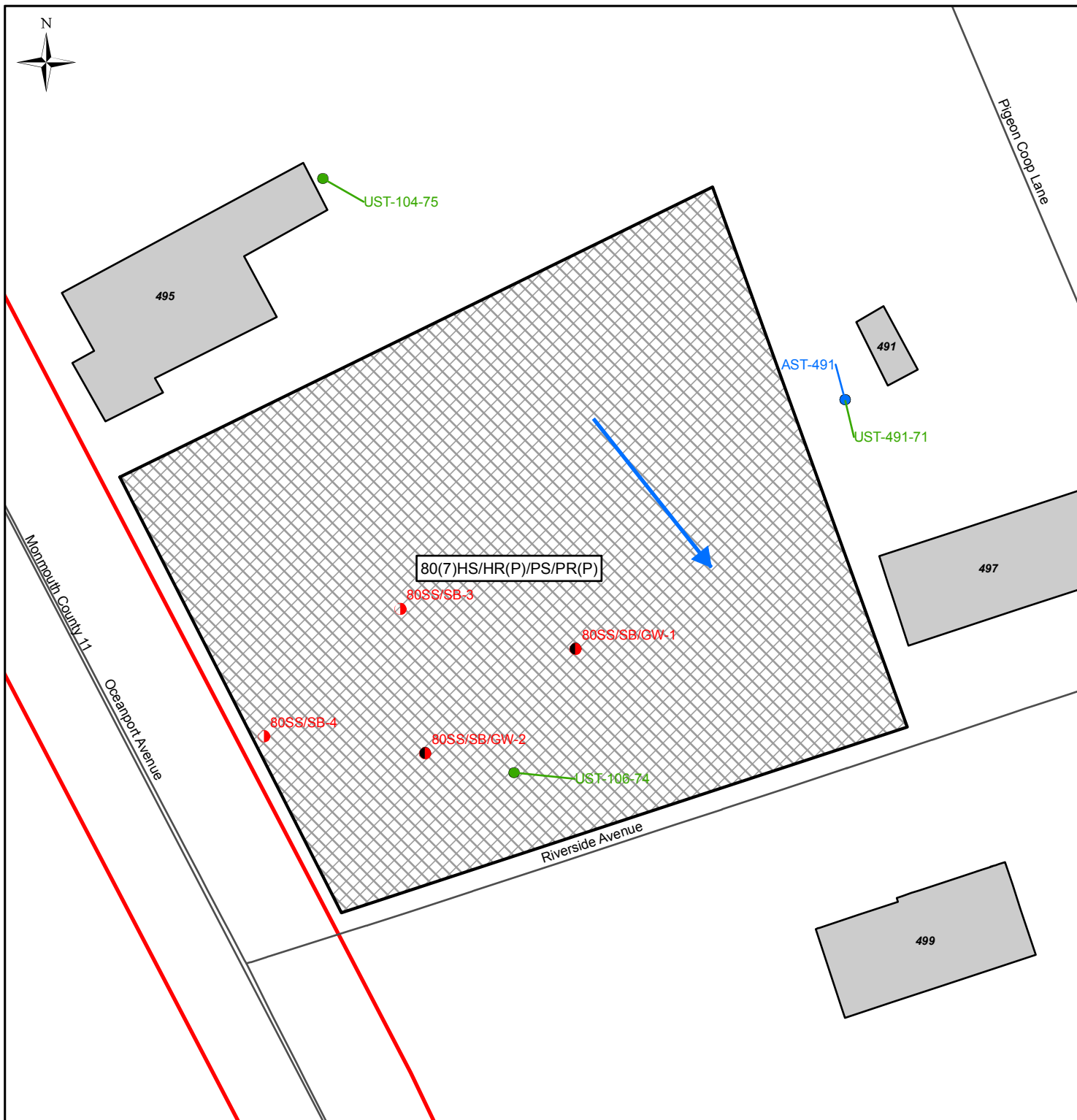
FIGURE 3-19

ECP PARCEL 79

MAIN POST

FORT MONMOUTH

NEW JERSEY



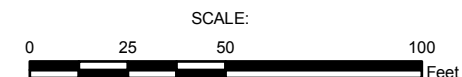
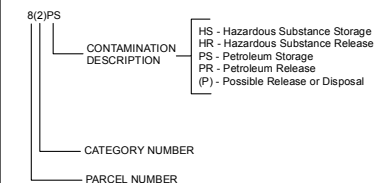
LEGEND

- Proposed Geoprobe Soil Sample Location - Samples to be collected at 0-6" BGS and the 6-inch interval directly above the water table.
- Proposed Geoprobe Soil Sample Location as Described Above, Plus Geoprobe Groundwater sampling.
- Current AST Location
- Current UST Location
- Former UST Location
- Monitoring Well
- Road Centerline
- General Groundwater Flow Direction
- Building
- Installation Boundary

ECP PARCEL CATEGORY DEFINITIONS

- 7 Areas that are not evaluated or require additional evaluation.

BRAC PARCEL LABEL DEFINITIONS

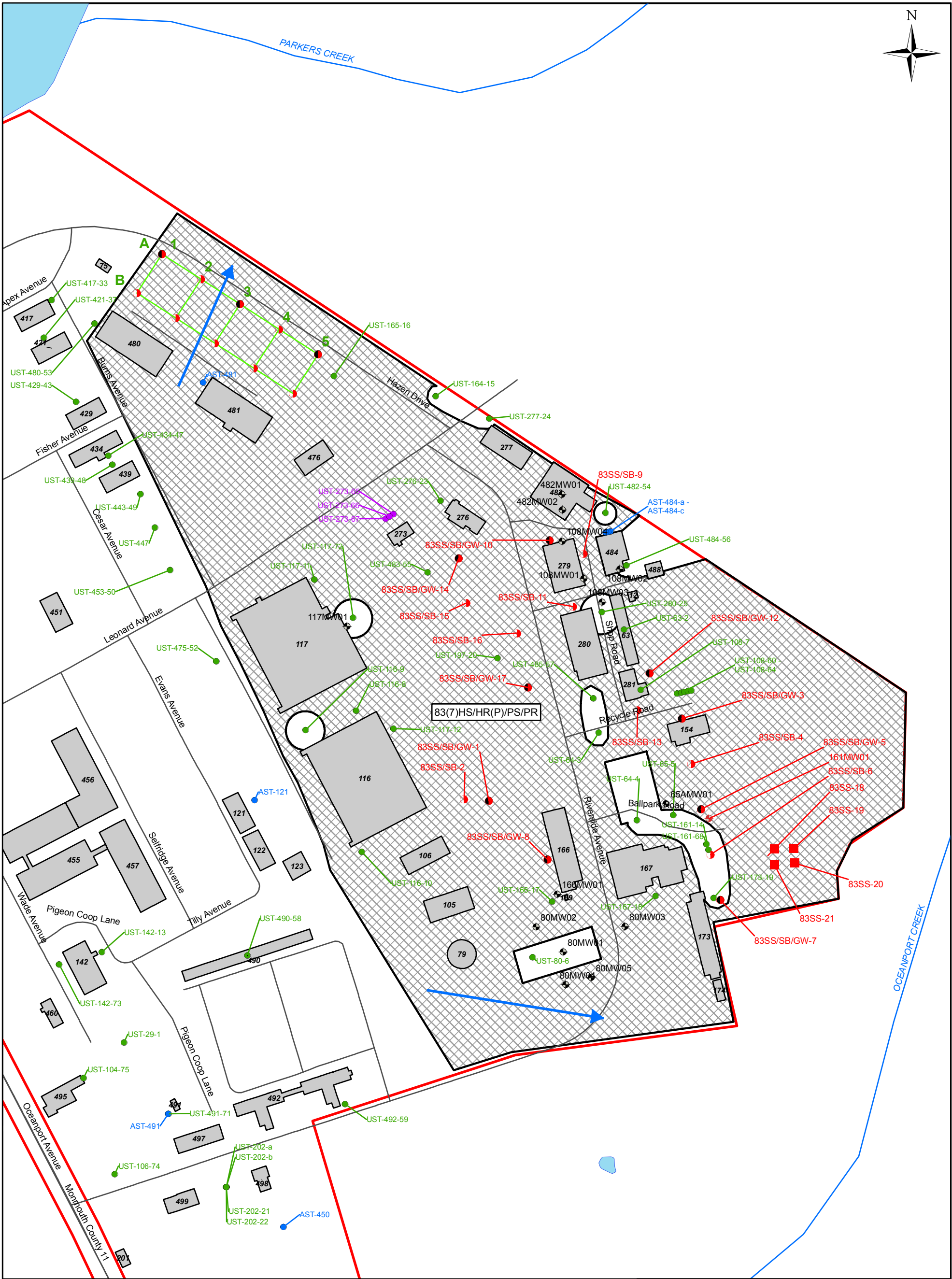


Base Realignment and Closure 2005



FIGURE 3-20
ECP PARCEL 80
MAIN POST
FORT MONMOUTH
NEW JERSEY





LEGEND

- Proposed Surface Soil Sample Location - Samples to be collected at 0-6" BGS.
- Proposed Geoprobe Soil Sample Location - Samples to be collected at 0-6" BGS and the 6-inch interval directly above the water table.
- Proposed Geoprobe Soil Sample Location as Described Above, Plus Geoprobe Groundwater sampling.
- Proposed Groundwater Sample Location at Existing Monitoring Well
- Monitoring Well
- Current AST Location
- Current UST Location
- Former UST Location

- Proposed Sampling Grid
- Road Centerline
- Water Feature
- General Groundwater Flow Direction
- Building
- Installation Boundary

ECP PARCEL CATEGORY DEFINITIONS

7 Areas that are not evaluated or require additional evaluation.

BRAC PARCEL LABEL DEFINITIONS

8(2)PS

CONTAMINATION DESCRIPTION

CATEGORY NUMBER

PARCEL NUMBER

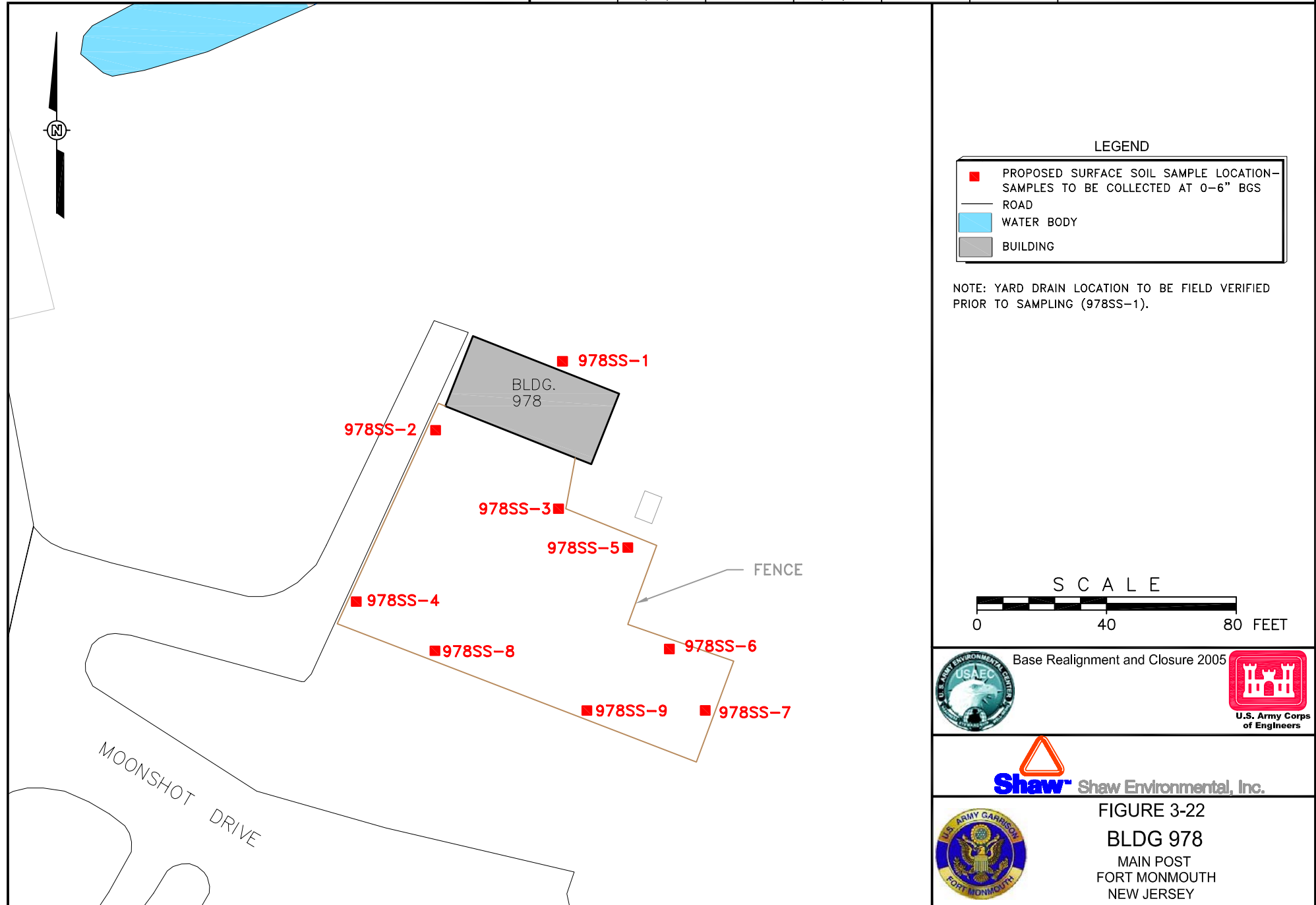
HS - Hazardous Substance Storage
HR - Hazardous Substance Release
PS - Petroleum Storage
PR - Petroleum Release
(P) - Possible Release or Disposal

Base Realignment and Closure 2005

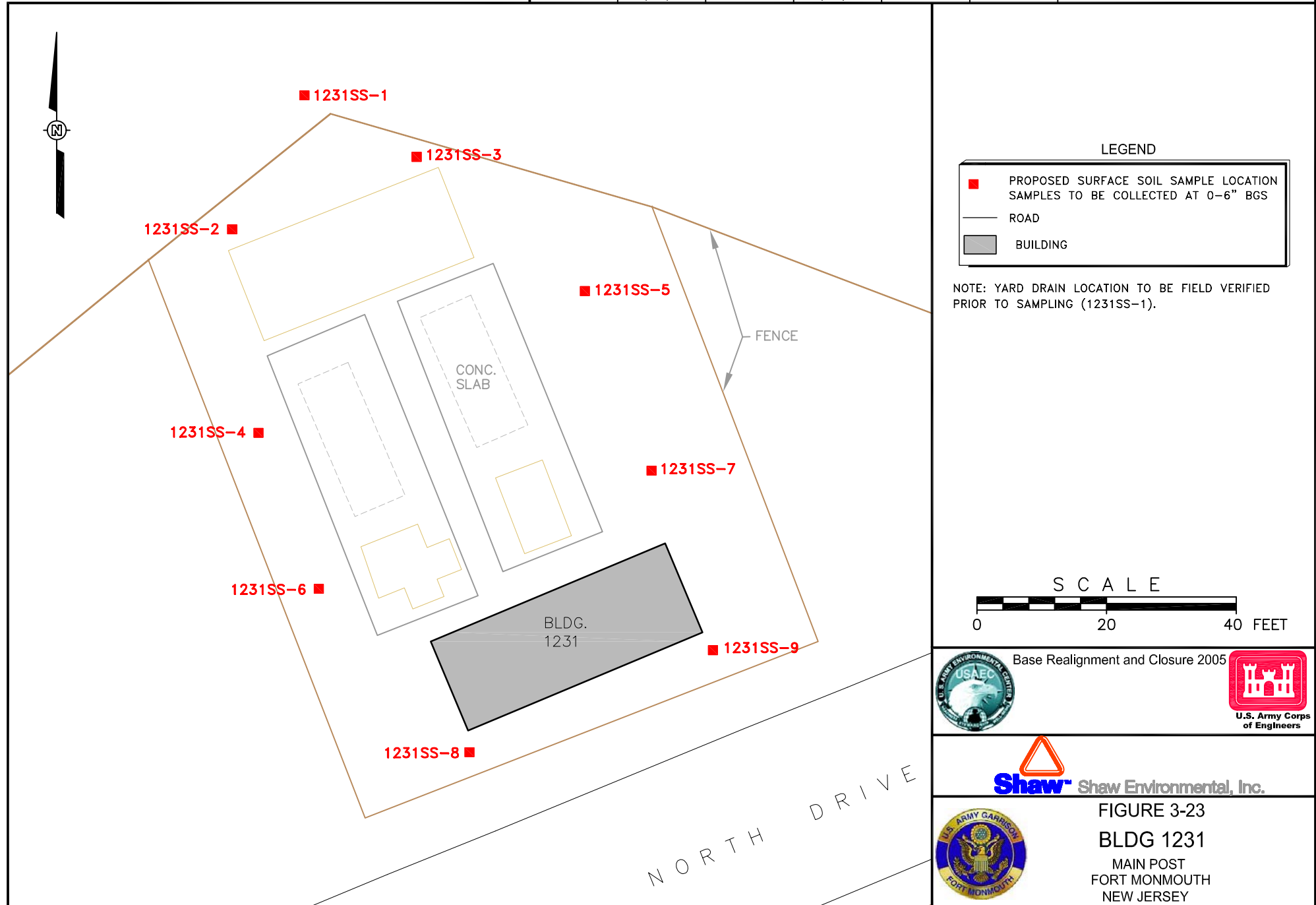
Shaw Shaw Environmental, Inc.

FIGURE 3-21
ECP PARCEL 83
MAIN POST
FORT MONMOUTH
NEW JERSEY

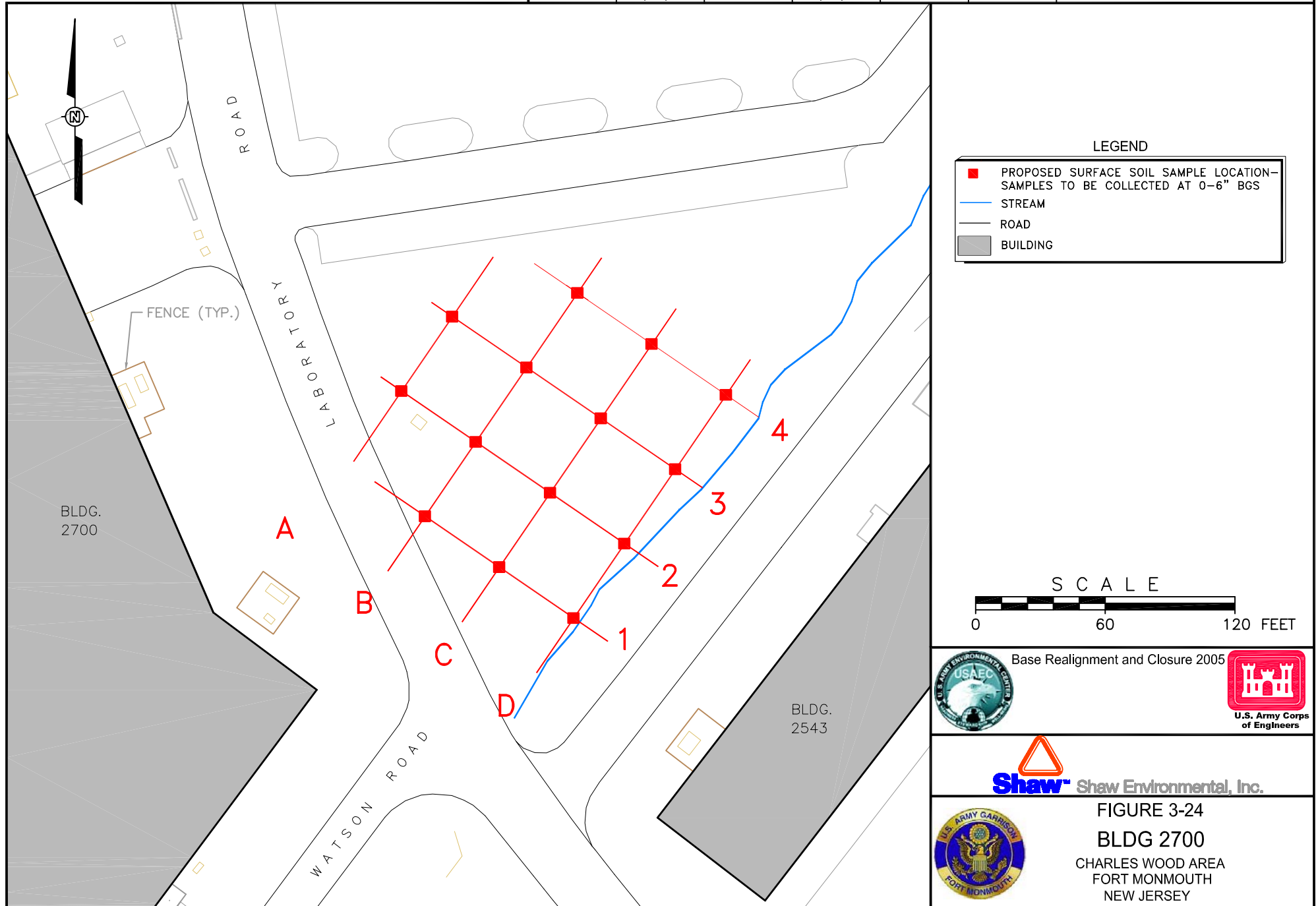
DRAWN BY		CHECKED BY		APPROVED BY		DRAWING NUMBER
S. Wiafe		kK. Gerdes		--		Soil-Sample-1.dwg
04/12/07		04/12/07				



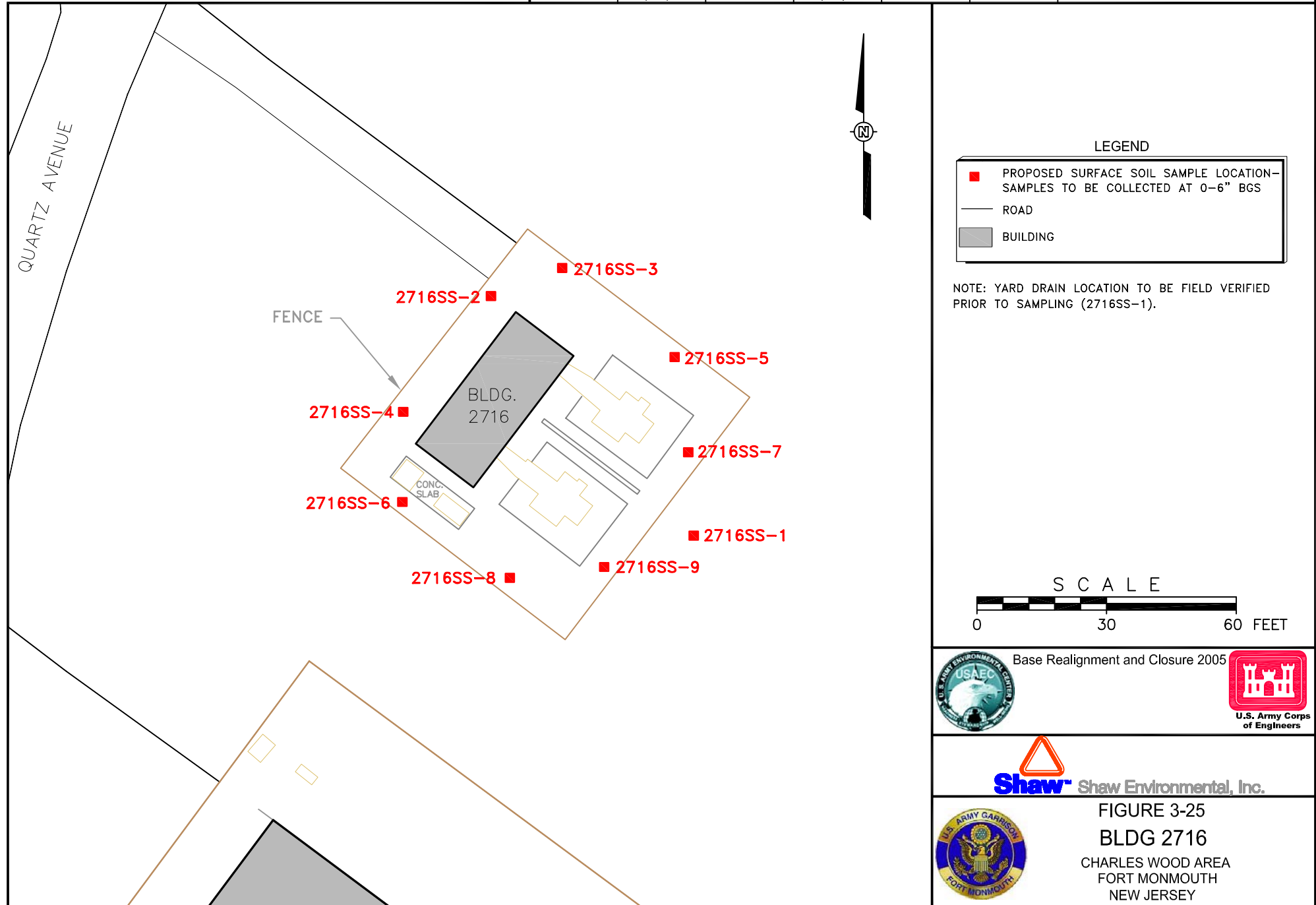
DRAWN BY		CHECKED BY		APPROVED BY		DRAWING NUMBER
S. Wiafe		kK. Gerdes		--		Soil-Sample-1.dwg
04/12/07		04/12/07				



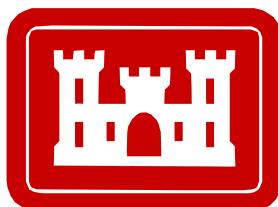
DRAWN BY		CHECKED BY		APPROVED BY		DRAWING NUMBER	Soil-Sample-1.dwg
S. Wiafe	04/12/07	KK. Gerdas	04/12/07	--	--		



DRAWN BY		CHECKED BY		APPROVED BY		DRAWING NUMBER
S. Wiafe		kK. Gerdes		--		Soil-Sample-1.dwg
04/12/07		04/12/07				



**SITE-SPECIFIC HEALTH AND SAFETY PLAN FOR
FORT MONMOUTH SITE INVESTIGATION**



Prepared for:

**U.S. Army Corps of Engineers
Baltimore District**

**Contract No.
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Prepared by:

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SHAW PROJECT NUMBER 124976

Site-Specific Safety and Health Plan Approval

I have read and approve this site-specific safety and health plan for the Fort Monmouth Phase II ECP with respect to project hazards, regulatory requirements, and Shaw procedures.



Robert A. Brooks, CSP
Health and Safety Manager

Date



Douglas L. Schicho, PE
Project Manager

12 Sept 2007
Date

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LIST OF ACRONYMS AND ABBREVIATIONS

°C	degrees Celsius
°F	degrees Fahrenheit
AHA	Activity Hazard Analysis
BTEX	Benzene, Toluene, Ethylbenzene, and Xylene
CFR	Code of Federal Regulations
CIH	Certified Industrial Hygienist
CPR	Cardio-Pulmonary Resuscitation
CRZ	Contamination Reduction Zone
CSP	Certified Safety Professional
DBA	A-Weighted Decibel
DCE	Dichloroethene
DEET	N, N-diethyl-meta-toluamide
ECP	Environmental Condition of Property
EMS	Emergency Medical Services
EPA	Environmental Protection Agency
ERCP	Emergency Response Contingency Plan
EZ	Exclusion Zone
f/b	flash/bang
FID	Flame Ionization Detector
FTMM	Fort Monmouth
HSM	Health and Safety Manager
LEMA	Local Emergency Management Agency
MHR	Maximum Heart Rate
mph	miles per hour
MSDS	Material Safety Data Sheet
MTBE	Methyl tert-butyl ether
NIOSH	National Institute for Occupational Safety and Health
NRR	Noise Reduction Rating
OSHA	Occupational Safety and Health Administration
PCB	Polychlorinated Biphenyl
PCE	Tetrachloroethene
PE	Professional Engineer
PEL	Permissible Exposure Limit
PID	Photoionization Detector
PM	Project Manager
PPE	Personal Protective Equipment
ppm	parts per million
PVC	Polyvinyl Chloride
Shaw	Shaw Environmental, Inc.
SI	Site Investigation
SS	Site Supervisor
SSHSP	Site-Specific Health and Safety Plan
SSO	Site Safety Officer
SZ	Support Zone

LIST OF ACRONYMS AND ABBREVIATIONS

TCE	Trichloroethene
TLV	Threshold Limit Value
TWA	Time-Weighted Average
USACE	U.S. Army Corps of Engineers
VOC	Volatile Organic Compound

1.0 INTRODUCTION

1.1 OBJECTIVE

The objective of this plan is to provide a mechanism for establishing safe working conditions at the site. The safety organization, procedures, and protective equipment have been established based upon an analysis of potential hazards. Specific hazard control methodologies have been evaluated and selected to minimize the potential of accident or injury.

1.2 POLICY STATEMENT

The policy of Shaw Environmental, Inc. (Shaw) is to provide a safe and healthful work environment for all employees. Shaw considers no phase of operations or administration to be of greater importance than injury and illness prevention. Safety takes precedence over expediency and shortcuts. At Shaw, it is believed all accidents and injuries are preventable. Shaw will take every reasonable step to reduce the possibility of injury, illness, or accident.

This Site-Specific Health and Safety Plan (SSHSP) prescribes the procedures that must be followed during referenced site activities. Operational changes that could affect the health and safety of personnel or the community will not be made without the prior approval of the Project Manager (PM) and the Health and Safety Manager (HSM).

The provisions of this plan are mandatory for all personnel and subcontractors assigned to the project. All visitors to the work site must abide by the requirements of the plan.

1.3 REFERENCES

This SSHSP complies with applicable Occupational Safety and Health Administration (OSHA), U.S. Environmental Protection Agency (EPA), and Shaw Health and Safety policies and procedures. This plan follows the guidelines established in the following:

- Standard Operating Safety Guides, EPA (Publication 9285.1-03, June 1992).
- Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, National Institute for Occupational Safety and Health (NIOSH), OSHA, U.S. Coast Guard, EPA (86-116, November 1985).
- Title 29 of the Code of Federal Regulations (CFR), Part 1910.
- Title 29 CFR, Part 1926.
- U.S. Army Corps of Engineers (USACE) Safety and Health Requirements Manual EM 385-1-1 (current).
- USACE Safety and Health Requirements for Hazardous, Toxic, and Reactive Waste Activities, ER 385-1-2 (2003).
- Shaw Health and Safety Procedures HS001 through HS999 (current).

1.4 DISCLAIMER

The enclosed SSHSP has been designed for the methods presently contemplated by Shaw for execution of the proposed work. Therefore, the SSHSP may not be appropriate if the work is not performed by or using the methods presently contemplated by Shaw, or if the scope of work is modified. Each company or contractor is responsible for the safety and health of their personnel, for their actions, and for the work they perform. It is highly recommended that each company or contractor working at the Fort Monmouth (FTMM) Phase II Environmental Condition of Property (ECP) site perform their work under the guidance of their internal health and safety professionals.

2.0 SITE HISTORY/SCOPE OF WORK

2.1 BACKGROUND

The work outlined in this SSHSP pertains to the conduct of the FTMM Site Investigation (SI) in the identified areas of concern in the corresponding scope of work listed below. **Figure 2-1** depicts the location of FTMM. The purpose of the SI is to move forward with the Phase II ECP recommendations developed as part of the Phase I ECP, to determine whether hazardous substances, petroleum products, or radiological substances have been disposed or released on the property, and to obtain defensible evidence that confirms that releases have or have not occurred. In addition, the goal of the Phase II ECP is to further assess the level of environmental liability of the area of concern.

As part of the overall Phase II ECP, this SSHSP will also address a radioactive survey. The Radiation Protection Plan is included in **Appendix L** of this SSHSP.

An example of some radioactive items used and stored at Army Installations are listed below. The Army Technical Bulletin 43-0116 contains a listing of radioactive items that may be used and stored at Army installations.

Often radioactive items were designed and developed specifically for military use and to accomplish specific assigned missions. As such, most radioactive commodities were subjected to use and environmental test factors during their development to establish and prove the military usefulness and safety of the items. For instance, drop, shock, vibration, temperature extreme, altitude, and accelerated weathering tests such as those established in 10 CFR, Part 32.101 were included as part of the testing plan.

Some radioactive items used in the Army are:

<u>NOMENCLATURE</u>	<u>ISOTOPE</u>
M4 Front Sight Post Assembly	Hydrogen-3 (H-3) (tritium)
Radioluminous Fire Control Device	H-3
Compasses	H-3
M1 Muzzle Reference Sensor	H-3
M1A1 Collimator, Infinity Aiming Ref	H-3
L4A1 Quadrant Fire Control Device	H-3
M58 and M59 Light Aiming Post	H-3
Wrist Watches	H-3
Chemical Agent Monitor	Nickel-63 (Ni-63)
MX-7338 Radiac Check Source	Krypton-85 (Kr-85)
UDM/2 Radiac Calibration Set	Strontium-90 (Sr-90)

NOMENCLATURE

M72 Light Antitank Weapon
M16A1 Front Sight Post Assembly
Radium Dial/Compass/Check Source
T-55 Aircraft Engine Components
Night Vision Devices
UDM/6 Radiac Calibration Set
MC-1 Moisture Density Tester
Chemical Agent Alarm

ISOTOPE

Promethium-147 (Pm-147)
Pm-147
Radium-226 (Ra-226)
Thorium-232 (Th-232)
Th-232
Plutonium-239 (Pu-239)
Am-241/Cesium-137 (Cs-137)
Americium-241 (Am-241)

Therefore, as part of the ECP and the complete determination of environmental conditions, the Radiation Survey and SI process will be used to address radiological issues.

2.2 SCOPE OF WORK

This SSHSP focuses on the SI including a radiological survey.

The principal tasks to be conducted are listed below:

- Mobilization and site preparation.
- Radiological survey (covered in specific detail in **Appendix L**).
- Soil gas sampling.
- Indoor air sampling – Summa Canister.
- Geophysical surveys.
- Soil sampling.
- Surface water/sediment sampling.
- Monitoring well groundwater sampling.
- Geoprobe soil and groundwater sampling.
- Exploratory test pit excavation.
- Site restoration/demobilization.

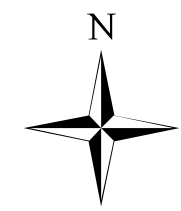
All site activities have been analyzed for potential hazards for which control measures are provided in **Appendix C**, Activity Hazard Analyses (AHAs).

N:\GIS\FtMonmouth\GIS_Documents\Project_Maps\Phase1_Sampling_Workplan\FTMON_Fig2-1_Facility.mxd (4/19/2007 10:14:02 AM)



LEGEND

 Installation Boundary



Scale:
0 2 4 8
Miles



Base Realignment and Closure 2005



Shaw Environmental, Inc.



FIGURE 2-1
FACILITY LOCATION MAP
FORT MONMOUTH
NEW JERSEY

3.0 KEY PERSONNEL AND MANAGEMENT

The PM, Site Supervisor/Site Safety Officer (SS/SSO), and HSM are responsible for formulating and enforcing health and safety requirements, and for implementing this SSHSP. The following summarizes the health and safety responsibilities of the site management.

3.1 PROJECT SAFETY RESPONSIBILITIES

The PM has the overall responsibility for the project and to assure that the requirements of the contract are attained in a manner consistent with the SSHSP requirements. The PM will coordinate with the SS/SSO to assure that the work is completed in a manner consistent with the SSHSP. The SS/SSO is responsible for field implementation of the SSHSP. The SS/SSO will be the main contact in any on-site emergency situation and will insure off-site emergency agencies have been contacted prior to the start of work. The PM, HSM, and SS/SSO are authorized to administer this SSHSP. All site personnel are authorized to stop work when an imminent health or safety risk exists. The PM and HSM are responsible for reviewing the SSHSP and ensuring that the SSHSP is complete and accurate. Each employee is responsible for personal safety as well as the safety of others in the work area.

3.2 KEY SAFETY PERSONNEL

The following individuals share responsibility for health and safety at the site:

Project Manager	Douglas L. Schicho (973) 770-5306 (office) Redacted - Privacy Act (cellular)
Site Supervisor/Site Safety Officer	Mark C. Magness (973) 770-5302 (office) Redacted - Privacy Act (cellular)
Health and Safety Manager	Winston (Doug) Russell (865) 692-3584 (office) Redacted - Privacy Act (cellular)
Client Reps	Timothy Peck, USACE Baltimore District (410) 962-3416 (office) Redacted - Privacy Act (cellular)
	Wanda Green, Fort Monmouth DPW (732) 532-8341 (office)

4.0 ACTIVITY HAZARDS

It is not anticipated that site personnel will be in direct contact with site contaminants. The primary concern will be potential airborne exposure. For discussions of activities and site locations that the SSHP addresses, see **Sections 2.0 and 3.0** of the Work Plan, respectively.

4.1 CHEMICAL HAZARDS

Potential chemical hazards include those substances identified as contaminants of concern at each of the sites as well as materials and substances brought on-site and used during the project.

Based on site history and previous investigations, the primary contaminants that may be encountered during this project include those in the contaminated soil, groundwater, soil gas, and sediment at FTMM. The chemical compounds identified as contaminants of concern for FTMM are as follows:

Groundwater – Volatile organic compounds (VOCs), primarily benzene and other fuel-related compounds; the chlorinated ethenes – tetrachloroethene (PCE), trichloroethene (TCE), and dichloroethene (DCE); vinyl chloride due to former use of solvents in electronics labs and vehicle maintenance areas; metals (primarily lead, mercury, silver); and cyanide.

Soil and sediment – Total petroleum hydrocarbons, VOCs, polychlorinated biphenyls (PCBs), metals (primarily lead, copper, mercury, silver), cyanide, and semivolatile organic compounds.

Soil gas and indoor air – VOCs.

A brief summary of the contaminants of concern is provided in **Table 4-1**.

The following general symptoms may indicate exposure to a hazardous chemical. Personnel will be removed from the work site and provided immediate medical attention if the following symptoms occur:

- Loss of appetite.
- Weakness in wrists or ankles.
- Dizziness or stupor.
- Nausea, headaches, or cramps.
- Irritation of the eyes, nose, or throat.
- Chest pains and coughing.
- Rashes or burns.

4.2 HAZARD COMMUNICATION

The purpose of hazard communication (Employee Right-to-Know) is to ensure that the hazards of all chemicals located at this field project site are transmitted (communicated) according to 29 CFR 1926.59 to all personnel and subcontractors. Hazard communication will include:

Table 4-1
Physical and Chemical Properties and Potential Health Hazards of Hazardous Materials

Contaminant (Synonym)	Exposure Limits (TWA unless noted otherwise)	Physical Description	Chemical & Physical Properties	Incompatibilities	Target Organs	Symptoms of Exposure
Benzene	NIOSH REL: (carcinogen) • TWA 0.1 ppm • STEL 1 ppm OSHA PEL: • TWA 1 ppm • STEL 5 ppm	Colorless to light-yellow liquid with an aromatic odor.	BP: 176°F VP: 75 Sol: 0.07% FP: 12°F LEL: 1.2% UEL: 7.8% IP: 9.24 eV	Strong oxidizers, many fluorides & perchlorates, nitric acid	Eyes, skin, respiratory system, blood, central nervous system, bone marrow	Irritation eyes, skin, nose, respiratory system; dizziness; headache, nausea, staggered gait; anorexia, lassitude (weakness, exhaustion); dermatitis; bone marrow depression; potential occupational carcinogen.
Benzo[a]pyrene (properties are for coal tar pitch volatiles since properties are not listed for this specific compound)	NIOSH REL: (carcinogen) • TWA 0.1 mg/m ³ OSHA PEL: • TWA 0.2 mg/m ³	Black or dark-brown amorphous residue	BP: NA VP: NA Sol: NA FP: NA LEL: NA UEL: NA IP: NA	Strong oxidizers	Respiratory system, skin, bladder, kidneys	Dermatitis, bronchitis, potential occupational carcinogen
1,2-Dichloroethane	NIOSH REL: • TWA 1 ppm (4 mg/m ³) • STEL 2 ppm (8 mg/m ³) OSHA PEL: • TWA 50 ppm • Ceiling 100 ppm • 200 ppm 5-minute maximum peak in any 3 hours	Colorless liquid with a pleasant, chloroform-like odor. [Note: Decomposes slowly, becomes acidic & darkens in color.].	BP: 182°F VP: 64 mmHg Sol: 0.9% FP: 56°F LEL: 6.2% UEL: 16% IP: 11.05 eV	Strong oxidizers & caustics; chemically-active metals such as magnesium or aluminum powder, sodium & potassium; liquid ammonia [Note: Decomposes to VC & HCl above 1112°F.]	Eyes, skin, kidneys, liver, central nervous system, cardiovascular system [in animals: forestomach, mammary gland & circulatory system cancer]	Irritation eyes, corneal opacity; central nervous system depression; nausea, vomiting; dermatitis; liver, kidney, cardiovascular system damage; [potential occupational carcinogen]

Table 4-1 (Continued)
Physical and Chemical Properties and Potential Health Hazards of Hazardous Materials

Contaminant (Synonym)	Exposure Limits (TWA unless noted otherwise)	Physical Description	Chemical & Physical Properties	Incompatibilities	Target Organs	Symptoms of Exposure
1,1-Dichloroethene	NIOSH REL: (carcinogen) OSHA PEL: • None	Colorless liquid or gas (above 89°F) with a mild, sweet, chloroform-like odor.	BP: 89°F VP: 500 mmHg Sol: 0.04% FP: -2°F LEL: 6.5% UEL: 15.5% IP: 10.00 eV	Aluminum, sunlight, air, copper, heat [Note: Polymerization may occur if exposed to oxidizers, chlorosulfonic acid, nitric acid, or oleum. Inhibitors such as the monomethyl ether of hydroquinone are added to prevent polymerization.]	Eyes, skin, respiratory system, central nervous system, liver, kidneys [in animals: liver & kidney tumors]	Irritation eyes, skin, throat; dizziness, headache, nausea, dyspnea (breathing difficulty); liver, kidney disturbance; pneumonitis; [potential occupational carcinogen]
Carbon Tetrachloride	NIOSH REL: (carcinogen) • STEL 2 ppm (12.6 mg/m ³) [60 minute] OSHA PEL: • TWA 10 ppm • Ceiling 25 ppm • 200 ppm 5-minute maximum peak in any 4 hours	Colorless liquid with a characteristic ether-like odor.	BP: 170°F VP: 91 mmHg Sol: 0.05% FP: NA LEL: NA UEL: NA IP: 11.47 eV	Chemically-active metals such as sodium, potassium & magnesium; fluorine; aluminum [Note: Forms highly toxic phosgene gas when exposed to flames or welding arcs.]	Central nervous system, eyes, lungs, liver, kidneys, skin	Irritation eyes, skin; central nervous system depression; nausea, vomiting; liver, kidney injury; drowsiness, dizziness, incoordination; potential occupational carcinogen.
1,2-DCE (properties are for 1,2-DCE since the properties are not listed for the isomers)	NIOSH REL: • TWA 200 ppm (790 mg/m ³) OSHA PEL • TWA 200 ppm (790 mg/m ³)	Colorless liquid (usually a mixture of the <i>cis</i> and <i>trans</i> isomers) with a slightly acrid, chloroform-like odor.	BP: 118-140°F VP: 182 mmHg Sol: 0.4% FP: 36-39°F LEL: 5.6% UEL: 12.8% IP: 9.65 eV	Strong oxidizers, strong alkalis, potassium hydroxide, copper.	Eyes, respiratory system, central nervous system.	Irritation to eyes, respiratory system; central nervous system depressant.

Table 4-1 (Continued)
Physical and Chemical Properties and Potential Health Hazards of Hazardous Materials

Contaminant (Synonym)	Exposure Limits (TWA unless noted otherwise)	Physical Description	Chemical & Physical Properties	Incompatibilities	Target Organs	Symptoms of Exposure
Copper (properties are for dusts and mists – does not apply to copper fumes)	NIOSH REL: • TWA 1 mg/m ³ OSHA PEL • TWA 1 mg/m ³	A reddish, lustrous, malleable, odorless solid	BP: 4703°F VP: 0 mmHg Sol: insoluble FP: NA LEL: NA UEL: NA IP: NA	Oxidizers, alkalis, sodium azide, acetylene	Eyes, respiratory system, skin, liver, kidneys, increased risk with Wilson's disease	Irritation of the nasal mucus membrane, pharynx; nasal perforation; eye irritation; metallic taste; dermatitis
Lead	NIOSH REL: • TWA 0.050 mg/m ³ OSHA PEL • TWA 0.050 mg/m ³	A heavy, ductile, soft, gray solid.	BP: 3164°F VP: 0 mmHg Sol: insoluble FP: NA LEL: NA UEL: NA IP: NA	Strong oxidizers, hydrogen peroxide, acids	Eyes, gastrointestinal tract, central nervous system, kidneys, blood, gingival tissue	Lassitude (weakness, exhaustion), insomnia; facial pallor; anorexia, weight loss, malnutrition; constipation, abdominal pain, colic; anemia; gingival lead line; tremor; paralysis wrist, ankles; encephalopathy; kidney disease; irritation eyes; hypotension
Mercury	NIOSH REL: • TWA 0.01 mg/m ³ • STEL 0.03 mg/m ³ OSHA PEL • TWA 0.01 mg/m ³ • Ceiling 0.04 mg/m ³	Silver-white, heavy, odorless liquid	BP: 674°F VP: 0.0012 mmHg Sol: insoluble FP: NA LEL: NA UEL: NA IP: ?	Acetylene, ammonia, chlorine dioxide, azides, calcium (amalgam formation), sodium carbide, lithium, rubidium, copper	Skin, respiratory system, central nervous system, kidneys, eyes	Cough, chest pain, dyspnea, bronchitis, pneumonitis; tremor, insomnia; irritability, indecision; headache, fatigue, weakness; stomatitis, salivation; gastrointestinal disturbance, anorexia, weight loss; proteinuria; irritation of the eyes, skin

Table 4-1 (Continued)
Physical and Chemical Properties and Potential Health Hazards of Hazardous Materials

Contaminant (Synonym)	Exposure Limits (TWA unless noted otherwise)	Physical Description	Chemical & Physical Properties	Incompatibilities	Target Organs	Symptoms of Exposure
Silver (metal dust and soluble compounds as Ag)	NIOSH REL: • TWA 0.01 mg/m ³ OSHA PEL • TWA 0.01 mg/m ³	White, lustrous solid	BP: 3632°F VP: 0 mmHg Sol: insoluble FP: NA LEL: NA UEL: NA IP: NA	Acetylene, ammonia, hydrogen peroxide, bromoazide, chlorine trifluoride, ethyleneimine, oxalic acid, tartaric acid	Nasal septum, skin, eyes	Blue-gray eyes, nasal septum, throat, skin; skin irritation, ulceration; gastrointestinal disturbance
Cyanide	NIOSH REL: • Ceiling 5 mg/m ³ (4.7 ppm) [10 minute] OSHA PEL • TWA 5 mg/m ³ Note: Exposure limits apply to other cyanides (as CN) except hydrogen cyanide	White granular or crystalline solids with a faint almond- like odor (KCN, NaCN)	BP: 2957°F VP: 0/0 mmHg Sol: 72/58% (77°F) FP: NA/NA LEL: NA/NA UEL: NA/NA IP: NA/NA	Strong oxidizers, such as acids, acid salts, chlorates and nitrates	Cardiovascular system, central nervous system, liver, kidneys, skin	Asphyxiation and death can occur; weakness, headache, confusion; nausea, vomiting; increased respiratory rate; slow gasping respiration, irritation of eyes, skin
PCB	NIOSH REL: (carcinogen) • TWA 0.001 mg/m ³ OSHA PEL (Aroclor 1254) • TWA 0.5 mg/m ³ (skin)	Colorless to pale- yellow, viscous liquid or solid (below 50°F) with a mild, hydrocarbon odor.	BP: 689-734°F VP: 0.00006 Sol: mmHg FP: insoluble LEL: NA UEL: NA IP: NA	Strong oxidizers	Skin, eyes, liver, reproductive system [in animals: tumors of the pituitary gland & liver, leukemia]	Irritation eyes, chloracne; liver damage; reproductive effects; [potential occupational carcinogen]

Table 4-1 (Continued)
Physical and Chemical Properties and Potential Health Hazards of Hazardous Materials

Contaminant (Synonym)	Exposure Limits (TWA unless noted otherwise)	Physical Description	Chemical & Physical Properties	Incompatibilities	Target Organs	Symptoms of Exposure
PCE	NIOSH REL: (carcinogen) Minimize workplace exposure concentrations OSHA PEL • TWA 100 ppm • Ceiling 200 ppm • 300 ppm 5-minute maximum peak in any 3-hours	Colorless liquid with a mild, chloroform- like odor.	BP: 250°F VP: 14 mmHg Sol: 0.02% FP: NA LEL: NA UEL: NA IP: 9.32 eV	Strong oxidizers; chemically-active metals such as lithium, beryllium & barium; caustic soda; sodium hydroxide; potash	Eyes, skin, respiratory system, liver, kidneys, central nervous system	Irritation eyes, skin, nose, throat, respiratory system; nausea; flush face, neck; dizziness, incoordination; headache, drowsiness; skin erythema (skin redness); liver damage; [potential occupational carcinogen]
TCE	NIOSH REL: (carcinogen) • 2 ppm (as a 60- minute ceiling) for use as anesthetic agent • 25 ppm (10-hour TWA) for all other exposures OSHA PEL • TWA 100 ppm • Ceiling 200 ppm 300 ppm 5-minute maximum peak in any 2-hours	Colorless liquid (unless dyed blue) with a chloroform- like odor.	BP: 189 VP: 58 mmHg Sol: 0.1% FP: Unknown LEL: (77°F): 8% UEL: (77°F): 10.5% IP: 9.45 eV	Strong caustics & alkalis; chemically- active metals (such as barium, lithium, sodium, magnesium, titanium & beryllium)	Eyes, skin, respiratory system, heart, liver, kidneys, central nervous system	Irritation eyes, skin; headache, visual disturbance, lassitude (weakness, exhaustion), dizziness, tremor, drowsiness, nausea, vomiting; dermatitis; cardiac arrhythmias, paresthesia; liver injury; potential occupational carcinogen.

Table 4-1 (Continued)
Physical and Chemical Properties and Potential Health Hazards of Hazardous Materials

Contaminant (Synonym)	Exposure Limits (TWA unless noted otherwise)	Physical Description	Chemical & Physical Properties	Incompatibilities	Target Organs	Symptoms of Exposure
VC	NIOSH REL: (carcinogen) OSH PEL: • TWA 1 ppm • Ceiling 5 ppm [15- minute]	Colorless gas or liquid (below 7°F) with a pleasant odor at high concentrations.	BP: 7°F VP: 3.3 Sol: atmospheres FP: At 77°F: 0/1% LEL: NA UEL: 3.6% IP: 33.0% 9.99eV	Copper, oxidizers, aluminum, peroxides, iron, steel (Polymerizes in air, sunlight, or heat unless stabilized by inhibitors such as phenol. Attacks iron and steel in presence of moisture).	Liver, central nervous system, blood, repertory system, lymphatic system (liver cancer).	Weak; abdominal pain, gastrointestinal bleeding; enlarged liver; pallor or cyanosis of extremities; liquid: frostbite; it is a carcinogen.

Notes:

BP – Boiling Point
 °C – Centigrade
 eV – Electrovolt
 °F – Degrees Fahrenheit
 FP – Flash Point
 IP – Ionization Potential
 KOH – potassium chloride
 LEL – Lower Explosive Limit

mmHg – millimeters of mercury
 NA – Not Applicable
 % – Percent
 Sol – Solubility
 UEL – Upper Explosive Limit
 VP – Vapor Pressure

OSHA – Occupational Safety and Health Administration
 PEL – Permissible Exposure Limit
 REL – Recommended Exposure Limits
 STEL – Short-Term Exposure Limit (15-minute)
 TWA – Time Weighted Average (10-hour day, 40-hour work week)

Reference: National Institute for Occupational Safety and Health (NIOSH) Pocket Guide to Chemical Hazards, U.S. Department of Health and Human Services, June 1997.

4.2.1 Container Labeling

Shaw personnel will ensure that all containers are labeled according to contents. These drums and containers will include those from manufacturers and those produced on site by operations, such as gasoline and diesel safety cans. All incoming and outgoing labels shall be checked for identity, hazard warning, and name and address of responsible party.

4.2.2 Material Safety Data Sheets

There will be a Material Safety Data Sheet (MSDS) located on site for all site contaminants and each hazardous chemical known to be used on site. MSDSs are located in **Appendix A** of the SSHSP.

4.2.3 Employee Information and Training

Training employees on chemical hazards is accomplished through an ongoing corporate training program. All site employees shall maintain their HAZWOPER training, in accordance with 29 CFR 1910.120. Additionally, chemical hazards are communicated to employees through daily safety meetings held at Shaw field projects and by an initial site orientation program.

At a minimum, Shaw and related subcontractor employees will be instructed on the following:

- An in-depth review of the soil and surface contaminants of concern identified and listed in Section 4.1.
- OSHA-regulated chemicals and their hazards in the work area.
- How to prevent exposure to these hazardous chemicals.
- What the company has done to prevent workers' exposure to these chemicals.
- Procedures to follow if they are exposed to these chemicals.
- How to read and interpret labels and MSDSs for hazardous substances found on site.
- Emergency spill procedures.
- Proper storage and labeling.

Before any new hazardous chemical is introduced on site, each Shaw and related subcontractor employee will be given information in the same manner as during the safety class. The SS/SSO will be responsible for seeing that the MSDS on the new chemical is available for review by on site personnel. The information pertinent to the chemical hazards will be communicated to project personnel.

Morning safety meetings will be held and the hazardous materials used on site will be discussed. Attendance is mandatory for all on-site employees.

4.3 PHYSICAL HAZARDS

To minimize physical hazards, Shaw has developed standard safety protocols that will be followed at all times. AHAs, located in **Appendix C**, have been developed for each principal activity and identify all major hazards to which employees may be exposed.

The SS/SSO will observe the general work practices of each crewmember and equipment operator, and enforce safe procedures. The crew leaders and SS/SSO will inspect the work areas. All hazards will be corrected in a timely manner. A variety of physical hazards may be encountered during work activities at this site. Hard hats, safety glasses and steel-toe safety boots are required in all areas of the site. Site-specific hazards and all necessary precautions will be discussed at the daily safety meetings. Failure to follow safety protocols will result in removal of an employee from the site and appropriate disciplinary actions.

4.4 ENVIRONMENTAL HAZARDS

Environmental factors such as weather, wild animals, insects, and irritant plants may pose a hazard when performing outdoor tasks. The SS/SSO will take necessary actions to alleviate these hazards should they arise.

4.4.1 Heat Stress

The combination of warm ambient temperature and protective clothing increases the potential for heat stress. Heat stress disorders include:

- Heat rash.
- Heat cramps.
- Heat exhaustion.
- Heat stroke.

Heat stress prevention is outlined in Shaw Health and Safety procedure HS400, Working in Hot Environments. This information will be reviewed during safety meetings. Workers are encouraged to increase consumption of water and electrolyte-containing beverages (e.g., Gatorade®). Heat stress can be prevented by assuring an adequate work/rest schedule. Guidelines are presented below and will be used in conjunction with HS400.

In addition, workers are encouraged to take rests and report symptoms whenever they feel any adverse effects that may be heat-related. The frequency of breaks may need to be increased based on worker recommendation to the SS/SSO. Heat stress can be prevented by assuring an adequate work/rest schedule and adequate fluid consumption. A guide for work/rest schedules for various protection levels are given below in **Table 4-2**. The number of hours before a work/rest period is based on experience with similar work. The time periods should be considered maximum. It must also be remembered that individual physical variability's and differences in physical work activities may require revisions to site plans. This table should be used as a guide. Professional judgment of the SS/SSO is necessary to assure a fully protective plan to prevent heat stress disorders.

Table 4-2
Guidelines for Work-Rest Periods
Protection Level
Number of Hours Before Rest Period

Temperature	Level D	Level C	Level B	Level A
90+ F*	2.0	1.5	1.0	0.5
87.5 F	2.5	2.0	1.5	1.0
82.5 F	3.0	2.5	2.0	1.5
77.5 F	3.5	3.0	2.5	1.5
72.5	4.0	3.5	2.5	1.5

**Work above 100°F will be reviewed with the Project HSM to determine specific requirements.*

Alternately, the work/rest schedule can be calculated based on heat stress monitoring results. Each individual will count his/her radial (wrist) pulse as early as possible during each rest period. If the heart rate exceeds 75 percent of their calculated maximum heart rate (MHR = 200 – age) at the beginning of the rest period, then the work cycle will be decreased by one-third. The rest period will remain the same. An individual is not permitted to return to work until his/her sustained heart rate is below 75 percent of their calculated maximum heart rate.

Body temperature, measured orally or through the ear canal, may also be monitored to assess heat stress. Workers should not be permitted to continue work when their body temperature exceeds 100.4°F (degrees Fahrenheit) or 38°C (degrees Celsius). Monitoring should be conducted at the beginning of each break period as noted above.

Monitoring for heat stress will begin when the ambient temperature reaches or exceeds 70°F when wearing chemical protective clothing (Levels C, B, A), or 80°F for site activities performed with no chemical protective clothing (Level D). Monitoring will include pulse rate, weight loss, oral or ear canal temperature, signs and symptoms of heat stress and fluid intake.

4.4.2 Noise

Hearing protection is required for workers operating or working near heavy equipment, where the noise level is greater than 85 A-weighted decibel (dBA) (Time-Weighted Average [TWA]) as well as personnel working around heavy equipment. The SS/SSO will determine the need and appropriate testing procedures (i.e., sound level meter and/or dosimeter) for noise measurement in accordance with Shaw Health and Safety Procedure HS402 Hearing Conservation Program.

Noise monitoring should be conducted during the beginning of each activity, as well as any time modifications lead to increased noise levels (e.g., adding additional equipment). A sound level meter will be used to measure noise levels at selected locations in the work area and on the site perimeter when treatment equipment is operating normally. When used, noise-monitoring equipment must be calibrated before and after each shift.

If continuous noise levels are found to exceed 85 dBA at any location within the work area, warning signs will be posted. Workers and visitors will be notified that hearing protection is required. Appropriate hearing protection (e.g., ear plugs) will be worn whenever personnel are working or visitors are present in that location. A supply of earplugs will be maintained on site.

Action levels in the following table will trigger the use of appropriate hearing protection (plugs or muffs). Hearing protection must be able to attenuate noise below 90 dBA (8-hour TWA). Each hearing protection or device has a Noise Reduction Rating (NRR) assigned by the EPA. The calculation for a hearing protection device's effectiveness is: noise reading dBA – (NRR – 7dB) < 90 dBA.

Instrument	Measurement	Action
Type I or Type II Sound Level Meter or dosimeter	>80 dBA → 85 dBA	Hearing protection recommended. Limit work duration to 8-hour shifts.
	>85 dBA → 90 dBA	Hearing protection required. Limit work duration to 8-hour shifts.
	>90 dBA → 115 dBA	Hearing protection required. Investigate use of engineering controls. Limit work duration to 8 hour shifts.
	>115 dBA	Stop work. Consult Project HSM.

4.4.3 Biological Hazards

4.4.3.1 Poison Ivy (Rhus Radicans)

Poison Ivy may be found at the site. It is highly recommended that all personnel entering into an area with poison ivy wear a minimum of a Tyvek® coverall, to avoid skin contact.

The majority of skin reactions following contact with offending plants are allergic in nature and characterized by:

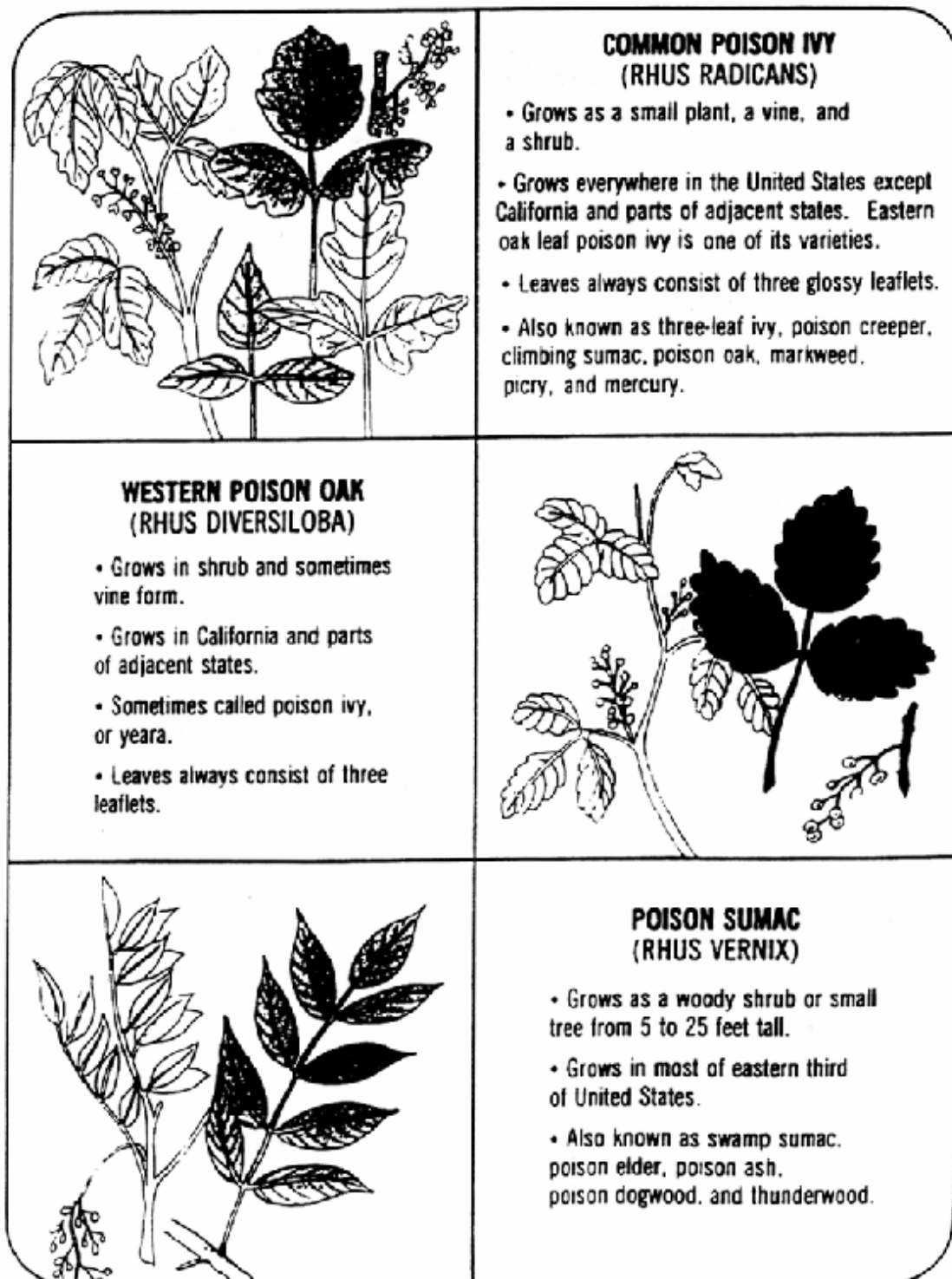
- General symptoms of headache and fever.
- Itching.
- Redness.
- A rash.

Some of the most common and most severe allergic reactions result from contact with plants of the poison ivy group, including poison oak and poison sumac. Such plants produce severe rash characterized by redness, blisters, swelling, and intense burning and itching. The victim may develop a high fever and feel very ill. Ordinarily, the rash begins within a few hours after exposure, but may be delayed 24-48 hours.

A barrier cream (e.g., IvyBlock, Stockhausen, Inc., 1-800-334-0242) should be applied to the exposed skin before entering and working in areas with possible poisonous plants.

Distinguishing Features of Poison Ivy Group Plants. The most distinctive features of poison ivy and poison oak are their leaves, which are composed of three leaflets each (see **Figure 4-1**). Both plants have greenish-white flowers and berries that grow in clusters.

Figure 4-1. Poisonous Plants



First Aid

- Remove contaminated clothing; wash all exposed areas thoroughly with soap and water, followed by rubbing alcohol. A one percent hydrocortisone cream (over-the-counter) will aid in healing and reducing itch.
- Apply calamine or other soothing lotion if rash is mild.
- Seek medical advice if a severe reaction occurs, or if there is a known history of previous sensitivity.

Contaminated Clothing. The irritating substances emitted by poison ivy group plants will remain on clothing for prolonged periods of time (up to weeks or months) if not washed thoroughly. It may be necessary to wash contaminated clothing separately and more than once before reusing.

4.4.3.2 Ticks

Heavily vegetated areas of a site may have ticks. It is highly recommended that all personnel walking through such areas wear a minimum of a Tyvek® and latex boot covers. The ticks will stand out against the light colors. A tick repellent or insect containing DEET (N, N-diethyl-meta-toluamide) is also recommended.

Ticks can transmit several diseases, including Rocky Mountain spotted fever, a disease that occurs in the eastern portion of the United States as well as the western portion, and Lyme disease. Ticks adhere tenaciously to the skin or scalp. There is some evidence that the longer an infected tick remains attached, the greater is the chance that it will transmit disease.

If you have been bitten, place the tick in a jar labeled with the date, location of the bite, and the location acquired. If any symptom appears, such as an expanding red rash, contact a physician immediately.

First Aid

- Carefully (slowly and gently) remove the tick with tweezers, taking care that all parts are removed.
- With soap and water, thoroughly, but gently, scrub the area from which the tick has been removed, because disease germs may be present on the skin; also wipe the bite area with an antiseptic.

Lyme Disease. Lyme disease may cause a number of medical conditions, including arthritis that can be treated if you recognize the symptoms early and see your doctor. Early signs may include a flu-like illness, an expanding skin rash, and joint pain. If left untreated, Lyme disease can cause serious nerve and heart problems as well as a disabling type of arthritis.

You are more likely to spot early signs of Lyme disease rather than see the tick or its bite. This is because the tick is so small (about the size of the head of a common pin or a period on this

page and a little larger after they fill with blood), you may miss it or signs of a bite. However, it is also easy to miss the early symptoms of Lyme disease.

In its early stage, Lyme disease may be a mild illness with symptoms like the flu. It can include a stiff neck, chills, fever, sore throat, headache, fatigue, and joint pain. But this flu-like illness is usually out of season, commonly happening between May and November when ticks bite.

Most people develop a large, expanding skin rash around the area of the bite. Some people may get more than one rash. The rash may feel hot to the touch and may be painful. Rashes vary in size, shape, and color, but often look like a red ring with a clear center. The outer edges expand in size. It's easy to miss the rash and the connection between the rash and the tick bite. The rash develops from three days to as long as a month after the tick bite. Almost one third of those with Lyme disease never get the rash.

Joint or muscle pain may be another early sign of Lyme disease. These aches and pains may be easy to confuse with the pain that comes from other types of arthritis. However, unlike many other types of arthritis, this pain seems to move or travel from joint to joint. In later stages, Lyme disease may be confused with other medical problems. These problems can develop months to years after the first tick bite.

Early treatment of Lyme disease symptoms with antibiotics can prevent the more serious medical problems of later stages. If you suspect that you have symptoms of Lyme disease, report it to your supervisor and seek medical attention.

Lyme disease can cause problems with the nervous system that look like other diseases. These include symptoms of stiff neck, severe headache, and fatigue usually linked to meningitis. They may also include pain and drooping of the muscles on the face, called Bell's Palsy. Lyme disease can also mimic symptoms of multiple sclerosis or other types of paralysis.

Lyme disease can also cause serious but reversible heart problems such as irregular heartbeat. Finally, Lyme disease can result in a disabling, chronic type of arthritis that most often affects the knees. Treatment is more difficult and less successful in later stages. Researchers think these more serious problems may be linked to how the body's defense or immune system responds to the infection.

4.4.3.3 West Nile Virus and West Nile Encephalitis

West Nile Virus/West Nile Encephalitis is rapidly becoming a health concern in the United States. West Nile Virus was first identified in the U.S. in the New York area in 1999 and is closely related to the St. Louis Encephalitis Virus, which is routinely found in the United States.

"Encephalitis" means an inflammation of the brain and it can be caused by viral and bacterial infections. West Nile Encephalitis can be a serious or even fatal illness although this is rare in humans. This illness develops in approximately one of every 150 infections and is generally confined to older and physically compromised individuals.

West Nile Encephalitis is a viral infection of the brain transmitted through the bite of a mosquito, which has previously fed on birds and/or horses that were infected with West Nile Virus. Dead birds in an area may mean that West Nile Virus is circulating between the birds and the mosquitoes in that area. West Nile Virus is not transmitted from one person to another. Human illness from West Nile Virus is rare, even in areas where the virus has been reported.

Symptoms of Exposure. Most people who become infected with West Nile Virus will have either no symptoms or only mild ones. Symptoms of West Nile Encephalitis include high fever, headache, confusion, muscle aches and weakness, seizures, or paralysis. At its most serious, the infection can result in coma, permanent neurological damage, and death. Symptoms usually occur five to 15 days following the bite of an infected mosquito. Because West Nile Encephalitis is a viral infection, antibiotics are not effective and there is no specific treatment available other than general support therapy.

Protective Measures at Projects. There is no vaccine to protect humans against West Nile Virus. Individuals at project sites can reduce their risk from being infected with West Nile Virus by taking the following actions to protect against mosquito bites:

- Review the hazards of West Nile Virus periodically in morning safety meetings.
- Increase protective measures when working at dawn, dusk, and in the early evening.
- Reduce the area of exposed skin when working outdoors. Long-sleeved shirts with sleeves rolled down are recommended. Understand that mosquitoes may bite through thin clothing, so personnel should evaluate the actual Level D clothing worn, e.g., heavy long sleeve work shirts and heavy jeans may be indicated. Also, the risk or threat of mosquito bites is reduced for those activities that require the use of disposable coveralls.
- For activities where only Level D Personal Protective Equipment (PPE) is specified, consider using disposable coveralls when working in wooded, highly vegetated, or swampy areas.
- Use an insect repellent containing approximately 25% DEET. DEET in concentrations greater than 25% provides no additional protection but repel insects longer. However, at some point there is no direct correlation between concentration and repellency. For example, 50% DEET provides about four hours of protection against mosquitoes, but increasing the concentration to 100% provides only one additional hour of protection. Use the repellent according to the manufacturer's directions provided on the container. Use just enough repellent to cover exposed skin and clothing. Do not treat unexposed skin. Frequent re-application is unnecessary for effectiveness. Avoid prolonged and excessive use of DEET.
- After returning from outdoor field activities, wash treated skin with soap and water.
- Personnel should report flu-like symptoms to the SSO.

DEET is safe for pregnant and lactating women and is generally safe for children. You should avoid applying it to open wounds and irritated skin as it may further irritate the skin or cause discomfort.

Sweating, perspiration and getting wet may wash away the repellent and may require that DEET containing repellent be re-applied.

To remove mosquito breeding places and prevent mosquito bites (or prevent exposure to mosquitoes) on this project, the following precautions will be followed as practical:

- Cut tall grass and weeds.
- Drain accumulated water in such items as drums, buckets, pools and plastic containers.
- Repair holes in door and window screens.
- Eliminate stagnate water puddles as practical.
- Limit outdoor activities at dawn, dusk and early evening, when mosquitoes are most active, as practical.

4.4.4 Lightning

The procedures provided below will be used to protect site personnel from lightning related injuries.

Training. A tailgate safety meeting will be conducted to increase awareness to the hazards and prevention of lightning related incidents.

Detection of Lightning. The SS/SSO will be proactive in monitoring conditions that may produce thunderstorms and lightning. A daily and weekly weather forecast will be tracked and communicated to site personnel. When signs of impending storms, i.e., increasing wind, darkening skies, or lightning appear, local weather monitoring will be increased. The National Weather Service (www.nws.noaa.gov/) should be consulted frequently. Personnel will be notified when thunderstorms may impact the site.

The “flash/bang” (f/b) technique of measuring the distance to lightning will be reviewed with all personnel. The f/b technique is defined as: for each 5 seconds from the time of observing the lightning flash to hearing the associated thunder, the lightning is one mile away.

Suspension/Resumption of Activities. All outside activities will be suspended when a lightning flash is immediately in the area or a f/b of 20 seconds (4 miles away) is noted. Personnel may continue indoor work activities. Outdoor activities will resume when 30 minutes has passed since the last observable f/b is 20 seconds or greater.

Lightning Protection. When notification is given, all outside work activities will stop and personnel will gather in the Support Zone (SZ) for a head count and further instructions. Indoor work will continue, except for the use of electrical equipment, telephones and computers. When a safe location is not present and personnel are caught by a sudden lightning event, employees should seek the lowest possible area, away from large objects which might attract lightning or fall over, e.g., trees, utility poles. The employee should assume a crouching position with their head lowered and hands over their ears. **AVOID: WATER, HIGH GROUNDS, HEAVY EQUIPMENT AND TALL, ISOLATED OBJECTS.**

First Aid. An employee that is struck by lightning needs immediate assistance (call 911). The body will not carry an electrical charge, but receives an electrical shock and may be burned. Personnel certified in first-aid/Cardio-Pulmonary Resuscitation (CPR) should inspect for shock and burns around fingers, toes, buckles and jewelry. Stay with the injured employee until medical help arrives.

4.5 VEHICLE AND HEAVY EQUIPMENT SAFETY MANAGEMENT

4.5.1 Vehicle Safety

Motor vehicle incidents are the number one cause of occupational fatalities, accounting for one in three deaths. Fifty percent or more of vehicle safety incidents occur while backing up. Shaw employees involved in the operation and use of Shaw and/or leased or rented vehicles will comply with the Shaw Health and Safety Procedures HS800 Motor Vehicle Operation: General Requirements and HS810 Commercial Vehicle Operation and Maintenance. Shaw requires employees to use seat belts at all times when traveling in Shaw owned or leased/rented vehicles. The SS/SSO will develop a parking area plan, including backing vehicles into parking spaces, using spotters for backing vehicles and policy mandated vehicle inspections.

Shaw employees are expected to incorporate safe actions and preparations to avoid vehicle accidents and personal injury during work and off-hours. Breaks should be planned into lengthy job mobilizations and demobilizations, including rotation of drivers at regular intervals. If parking areas are busy or crowded and more than one worker is traveling in the same vehicle, one worker should remain outside the vehicle as it leaves the parking space to assist the driver with traffic observation. Vehicles traveling before dawn and at dusk in rural or wooded areas should be prepared to brake for wildlife, e.g., deer crossing roadways.

Shaw employees arriving at work areas should park vehicles away from delivery, heavy equipment and vehicle loading/unloading locations to prevent parked vehicles from damage by various deliveries. Heavy equipment operators should inspect areas and request vehicles to be moved or spotters used, if necessary, to maneuver equipment in tight areas. Employees who observe near misses or potential risks to parked or moving vehicles must report these to the SS/SSO immediately.

Shaw employees are expected to use the vehicle inspection form and check/test the safety systems on the vehicle on a daily basis. Check the following: brakes, mirrors, seat belts, tires, leakage from the undercarriage, lights, and turn signals. Vehicles with safety deficiencies must be reported immediately and not driven until properly repaired. Vehicles running errands from different project sites should have telephone numbers of the job site in the vehicle in case calls for assistance are required.

Because of the different ways alcohol can affect behavior, even in very small amounts, the best and safest course is not to drink before driving. At Shaw, a driver with blood alcohol concentration over 0.04 percent is considered to be under the influence and subject to disciplinary action. Personnel involved in motor vehicle incidents are subject to drug and alcohol testing.

Weather conditions can have a profound effect on driving. On slippery roads, drive more slowly. Stop and turn with care. Keep several car lengths from other vehicles. At speeds in excess of 35 miles per hour (mph), the chances of hydroplaning increase with speed. In general, keep back 1 car length for every 10 mph to prevent striking the car ahead.

Vehicles will be operated in accordance with the requirements listed below:

- Seatbelt use is mandatory for all passengers.
- Personnel may not ride in the back of cargo vehicles.
- The driver must make a 360 degree walk around the assigned vehicle prior to vehicle movement.
- A ground guide is used to back up any vehicle.
- Vehicle speed is limited to the posted speed limits for developed roadways, 25 mph maximum on dirt roads and 10 mph maximum off-road (based on conditions).
- Vehicle driven in four wheel low and low gear when on dirt roads or off road driving where steep grades dictate.
- All operators must possess a valid drivers license.
- Fuel or gasoline are not to be transported inside the passenger compartment.
- No vehicle is left running when unattended.
- Parking brakes are used when vehicles are parked.

In the event of a vehicle incident, notify your PM ***immediately*** and complete all required reports.

4.5.2 Heavy Equipment Safety

Forklifts, excavators, loaders other material handling equipment present various physical hazards on remediation sites. The following critical safety practices shall be followed to prevent safety incidents during heavy equipment operation.

- All equipment will be inspected prior to each use.
- All operators will have training or equivalent experience to be permitted to operate heavy equipment.
- Spotters will be used to back-up equipment and direct traffic in all “blind” areas.
- Standard hand signals will be used to communicate between operators and ground crew.
- All heavy equipment will have operable back-up alarms.
- Heavy equipment will be parked in areas where operators will not be exposed to strains or slip/trip/fall hazards during mounting and dismounting of equipment
- All heavy equipment will be equipped with operable seat belts; belts will be used by all operators.
- Written lifting plans will be developed and reviewed for all critical lifts.

4.6 MANUAL MATERIAL LIFTING

Many different types of objects may be handled manually during site operations. Care should be taken when lifting and handling heavy or bulky items because they are the cause of many back injuries. The following fundamentals address the proper lifting techniques that are essential in preventing back injuries:

- The size, shape, and weight of the object to be lifted must first be considered. No individual employee is permitted to lift any object that weighs more than 60 pounds. Multiple employees or the use of mechanical lifting devices are required for objects over the 60-pound limit.
- The anticipated path to be taken by the lifter should be inspected for the presence of slip, trip, and fall hazards.
- The feet shall be placed far enough apart for good balance and stability (typically shoulder width). THE FOOTING SHALL BE SOLID.
- The worker shall get as close to the load as possible. The legs shall be bent at the knees.
- The back shall be kept as straight as possible and abdominal muscles should be tightened.
- To lift the object, the legs are straightened from their bending position.
- A worker shall never carry a load that cannot be seen over or around.
- When placing an object down, the stance and position are identical to that for lifting. The legs are bent at the knees and the object lowered.

When two or more workers are required to handle the same object, coordination is essential to ensure that the load is lifted uniformly and that the weight is equally divided between the individuals carrying the load. When carrying the object, each worker, if possible, shall face the direction in which the object is being carried. In handling bulky or heavy items, the following guidelines shall be followed to avoid injury to the hands and fingers:

- A firm grip on the object is essential; leather gloves shall be used if necessary.
- The hands and object shall be free of oil, grease, and water that might prevent a firm grip, and the fingers shall be kept away from any points that could cause them to be pinched or crushed, especially when setting the object down.
- The item shall be inspected for metal slivers, jagged edges, burrs, and rough or slippery surfaces prior to being lifted.

4.7 ACTIVITY HAZARD ANALYSES

Appendix C contains AHAs for primary site tasks. They contain detailed information on physical and chemical hazards, and provide control measures for these hazards. The AHAs will be field checked by the SS/SSO on an ongoing basis and revised as necessary. All revisions will be communicated to the work crew. In addition to the AHAs, Job Safety Analyses will be completed daily in accordance with HS045 – Job Safety Analyses (see **Appendix B**).

5.0 WORK AND SUPPORT AREAS

Work zones will be established if site activities in the ambient work area experience air monitoring readings above the action levels as outlined in Section 8.1. When necessary, each work area will be clearly identified using signs or physical barriers.

5.1 SUPPORT ZONE

The uncontaminated SZ, or clean zone, will be located upwind, in an area outside the Exclusion Zone (EZ) and Contamination Reduction Zone (CRZ) and within the geographic perimeters of the site. The area is used for material staging, vehicle parking, office facilities, sanitation facilities, and receipt of deliveries. Personnel entering this zone may include delivery personnel, visitors, security guards, etc., who will not necessarily be permitted in the EZ. All personnel arriving in the SZ will, upon arrival, report to the SS/SSO and sign the site visitor log.

5.2 CONTAMINATION REDUCTION ZONE

Personnel and equipment decontamination will be performed in the CRZ that is adjacent to the EZ. All personnel entering or leaving the EZ will pass through this area to prevent any cross-contamination and for the purpose of accountability. Personal protective outer garments and respiratory protection will be removed in the CRZ and properly labeled. All water generated from equipment and personal decontamination will be contained on site and disposed of in an appropriate manner.

5.3 EXCLUSION ZONE

The EZ will be the area around exposed landfill material, areas with elevated air monitoring readings and proposed work areas. This area has the highest potential for exposure to contamination by contact, ingestion, or inhalation. All employees will use proper PPE when working in these areas. The location of the EZ will be identified by fencing or other appropriate means primarily around the excavation areas and the stockpiles. A daily entry log records the time of entry and exit from the EZ for each person.

A log of all personnel visiting, entering or working on the site shall be maintained by the SS/SSO. Visitors will attend a site orientation given by the SS/SSO and sign the SSHSP.

The following are standard safe work practices that apply to all site personnel and will be discussed in the safety briefing prior to initiating work on the site:

- Eating, drinking, chewing gum or tobacco, and smoking is prohibited in the EZ/CRZs.
- Hands and face must be washed upon leaving the EZ and before eating, drinking, chewing gum or tobacco and smoking.
- A buddy system will be used. Hand signals will be established to maintain communication.
- During site operations, each worker will consider himself as a safety backup to his partner. Off-site personnel provide emergency assistance.

- Visual contact will be maintained between buddies on site when performing hazardous duties.
- All personnel must comply with established safety procedures. Any staff member who does not comply with safety policy, as established by the SS/SSO, will be immediately dismissed from the site.
- Proper decontamination procedures must be followed before leaving the site.
- All employees and visitors must sign in and out of the site.

6.0 PROTECTIVE EQUIPMENT

This section specifies the level of PPE, which is required for each principal activity performed at this site. All site personnel must be trained in the use of all PPE utilized. The PPE procedures outlined in Shaw Health and Safety Procedures HS600 – Personal Protective Equipment and HS601 – Respiratory Protection Program will be applied to project activities.

6.1 ANTICIPATED PROTECTION LEVELS

The following protection levels have been established for the site work activities. Protection levels for the Radiation Survey are stipulated in the Radiation Control Plan in **Appendix L**.

Table 6-1
Anticipated Protection Levels

Task	Initial PPE Level	Upgrade PPE Level	Skin Protection	Respiratory Protection	Other PPE
All site preparation and breakdown activities (no air monitoring levels are detected above the action levels noted in Section 8.1)	Level D	Modified Level D	Leather-work gloves. Tyvek® coverall as necessary to protect against biological hazards	None	Hard-hat, steel-toe work boots, safety glasses and hearing protection >85 dBA. Goggles/face shield when in contact with liquid contamination or flying debris.
Any Phase II ECP work activities in direct contact with the suspect contaminated materials (air monitoring readings are below the action levels)	Modified Level D	Level C	Tyvek® coverall, inner latex or nitrile sample gloves, outer nitrile sample gloves and latex boot covers	<u>Initial:</u> None <u>Upgrade:</u> Air Purifying full face respirator with combination	Hard-hat, steel-toe work boots, safety glasses and hearing protection >85 dBA. Goggles/face shield when there is a potential for splash hazards.

6.2 PROTECTION LEVELS DESCRIPTIONS

This section lists the minimum requirements for each protection level. Modification to these requirements may have been noted above.

6.2.1 Level D

Level D consists of the following:

- Safety glasses with side shields.
- Hard hat.

- Steel-toed work boots.
- Work clothing as prescribed by weather.
- Leather work gloves.
- Cut resistant gloves when handling sharp objects.
- Reflective vests for ground personnel working around heavy equipment or roadways.
- Hearing protection in areas >85 dBA.

6.2.2 Modified Level D

Modified Level D consists of the following:

- Safety glasses with side shields.
- Hard hat.
- Steel-toed work boots.
- Tyvek® coverall (when handling dry materials).
- Poly-coated Tyvek® coverall or polyvinyl chloride (PVC) rain suit (when handling wet materials).
- Latex over-boots.
- Inner latex sample gloves.
- Outer nitrile gloves.
- Hearing protection in areas >85 dBA.
- Full-face shield when splash hazards are present.
- Metatarsal and shin guard for pressure sprayer operations.

6.2.3 Level C

Level C protection consists of the following:

- Full face air purifying respirator.
- Hooded Coverall (Tyvek® is typically used when handling dry materials).
- Hooded Poly-coated Tyvek® coverall or PVC rain suit (Typically used when handling wet materials).
- Hard hat.
- Steel-toed work boots.
- Inner sample gloves.
- Outer gloves.
- Chemical resistant boot covers.
- Hearing protection in areas >85 dBA.

- Metatarsal and shin guards are required for pressure washing operations.
- Cut resistant gloves when handling sharp objects or broken glass.

6.3 RESPIRATORY PROTECTION

6.3.1 Air Purifying Respirators

If air monitoring shows that Level C protection is needed, personnel will wear Survivair air purifying respirators with combination organic vapor and high efficiency particulate air cartridges.

6.3.2 Inspection and Cleaning

Respirators shall be checked periodically by a qualified individual and inspected before each use by the wearer. All respirators and associated equipment will be decontaminated and hygienically cleaned after each use.

6.3.3 Fit Testing

Annual respirator fit tests are required of all personnel wearing negative-pressure respirators. The fit test must be for the style and size of the respirator to be used. Quantitative fit-testing is required for use of respirators in chemical environments where the respirator effective use limit exceeds 10 (exposure of 1 part per million [ppm] inside the respirator for 10 ppm outside the respirator). Therefore, quantitative fit-testing is dependent on the permissible exposure limit/threshold limit value (PEL/TLV) of the chemical substance involved. Quantitative fit-testing is required for potential exposure to airborne particulate levels that exceed 10 times the established PEL/TLV.

6.3.4 Facial Hair

No personnel who have facial hair which interferes with the respirator's sealing surface will be permitted to wear a respirator and will not be permitted to work in areas requiring respirator use.

6.3.5 Corrective Lenses

Normal eyeglasses cannot be worn under full-face respirators because the temple bars interfere with the respirator's sealing surfaces. For workers requiring corrective lenses, special spectacles designed for use with respirators will be provided. Contact lenses are permitted to be used with full-face respirators based on a decision by OSHA.

6.3.6 Medical Certification

Only workers who have been certified by a physician, as being physically capable of respirator usage will be issued a respirator. Personnel unable to pass a respiratory fit test or without medical clearance for respirator use will not be permitted to enter or work in areas on site that require respiratory protection. Employees will receive a written physicians opinion that they are fit for general hazardous waste operations as per 29 CFR 1910.120(f)(7).

6.4 SITE- SPECIFIC PPE

The primary objective of the PPE program is to ensure employee protection and to prevent employee exposure to site contaminants during site operations. Engineering controls are not feasible for many tasks and, therefore, require the use of PPE.

The SS/SSO will be responsible for monitoring all aspects of the PPE program. This includes donning and doffing, temperature related stress monitoring, inspection, and decontamination. PPE selection is identified in **Table 6-1** for each specified task. The SS/SSO, in consultation with the HSM, will direct changes in PPE based on changing conditions. The site-specific SSHSP will serve as written certification that the workplace was evaluated concerning PPE requirements.

7.0 DECONTAMINATION PROCEDURES

This section describes the procedures necessary to ensure that both personnel and equipment are free from contamination when they leave the work site.

7.1 PERSONNEL DECONTAMINATION

Decontamination procedures will ensure that PPE that may have been contaminated in the EZ does not result in personal exposure and does not contaminate clean areas of the site. This sequence describes the general decontamination procedure. The specific stages will vary depending on the site, the task, the protection level, etc.

7.1.1 Modified Level D Decontamination

1. Go to end of EZ.
2. Remove and discard latex booties.
3. Remove outer gloves and discard.
4. Remove protective suit.
5. Remove inner sample gloves and discard.
6. Wash face and hands.

7.1.2 Level C Decontamination

1. Go to end of EZ.
2. Step into the 1st decontamination pool.
3. Wash outer boots and outer gloves.
4. Step into 2nd decontamination pool.
5. Wash exterior of suit with copious amounts of water until all apparent contamination is removed.
6. Step into 3rd decontamination pool.
7. Decontamination assistant will inspect suit to determine if decontamination was effective and/or assist with final decontamination.
8. Step out of the 3rd pool.
9.
 - a. Remove outer boots and stage to let dry.
 - b. Remove and discard latex booties.
10. Remove outer gloves and discard.
11. Cross into CRZ.
12. Remove outer suit.
13. Move to respirator wash area, and wash egress mask and related hose line.

- a. Soap and water solution.
 - b. First rinse.
 - c. Disinfect respirator (with solution of 1 cap full of bleach to 1 gallon of water).
 - d. Final rinse.
- 14. Hang respirator (upside down) and line to dry.
 - 15. Remove inner sample gloves and discard.
 - 16. Wash face, hands and neck.

7.1.3 Suspected Contamination

Any employee suspected of sustaining skin contact with chemical materials will first use the emergency shower. Following a thorough drenching, the worker will proceed to the decontamination facility. Here, the worker will remove clothing, shower, don clean clothing, and immediately be taken to the first-aid station. Medical attention will be provided as necessary based on the degree of injury.

7.1.4 Personal Hygiene

Before eating, smoking, or drinking, personnel will wash hands, arms, neck and face.

7.2 EQUIPMENT DECONTAMINATION

All contaminated equipment will be decontaminated before leaving the site. Decontamination procedures will vary depending upon the contaminant involved, but may include sweeping, wiping, scraping, hosing, or steaming the exterior of the equipment. Personnel performing this task will wear the proper PPE as prescribed by the SS/SSO.

7.3 DISPOSAL

All decontamination liquids and disposable clothing will be treated as contaminated waste unless determined otherwise by accepted testing methods. Wastes will be disposed of according to state and federal regulations.

8.0 AIR MONITORING

Air monitoring will be conducted in order to characterize potential personnel exposures and fugitive emissions from site contaminants. The principal contaminants of concern are VOCs, primarily BTEX, MTBE, and chlorinated ethenes.

8.1 WORK AREA AIR MONITORING

Work area air monitoring at the FTMM site will be conducted by using direct reading methods. A photoionization detector/flame ionization detector (PID/FID) will be used to monitor work activities. Air monitoring results will be used to determine the proper PPE levels as specified in **Table 8-1**.

Table 8-1
Direct Reading Air Monitoring Requirements

Monitoring Device	Monitoring Location/ Personnel	Monitoring Frequency	Action Level	ACTION
PID/FID	All sampling and intrusive activities	Periodic (Minimum 4 times per day for five minutes) during sampling and intrusive activities	< 1 ppm ≥ 1 ppm < 5 ppm > 5 ppm	Level D+ Upgrade to Level C Cease work activity. Contact HSM

8.2 INSTRUMENTATION

A Photovac MicroFID flame ionization detector or equivalent, and a Photovac 2020 PID or equivalent, equipped with a 10.6-electron volt lamp, will be used to determine the concentration of VOCs in the breathing zone of personnel during intrusive investigative activities. This monitoring will be performed:

- A minimum of once per sampling event at each location (soil or water).
- A minimum of twice per hour at each direct push, soil-boring or test pit location until intrusive activity at that location has been completed.
- At any time in any work location when personnel observe odors.

8.2.1 Real-Time Air Monitoring Action Levels

The following action levels are established for the collected air monitoring data:

- PID readings of 5 ppm above background concentrations sustained for 5 minutes in the breathing zone of personnel shall necessitate ceasing work activities and upgrading to Level B PPE. This may also trigger the implementation of time-integrated air sampling for volatile organic chemicals, such as benzene and vinyl chloride.

- FID readings of 5 ppm above background concentrations sustained for 5 minutes in the breathing zone of personnel shall necessitate ceasing work activities and upgrading to Level B PPE. This may also trigger the implementation of time-integrated air sampling for VOCs such as benzene and vinyl chloride.

Unexpected instrument readings at or above action levels generally warrant the following:

- All personnel will stop work in the area and assemble upwind.
- Additional monitoring shall be performed to substantiate previous readings, if it is safe to perform additional monitoring (contact the Shaw HSM/Certified Safety Professional [CSP] – see **Section 3.2** for contact information).

If previous readings are substantiated, controls (engineering/administrative) shall be implemented to maintain air quality within specified levels or personnel shall upgrade to the appropriate level of protection. All anomalous instrument readings shall be reported to the Shaw Certified Industrial Hygienist (CIH) to determine the appropriate course of action. Time-integrated sampling may be performed to verify upgrade decision or to downgrade level of protection, at the discretion of the Shaw CIH.

It is recommended that calibration be checked before and after using each time. The HSC and/or SS/SSO will record and log such calibration information into an air monitoring notebook.

8.3 AIR MONITORING LOG

The SS/SSO will ensure that all air-monitoring data is logged into a project notebook. Data will include instrument used, wind direction, work process, etc. The Program CIH will periodically review this data.

8.4 CALIBRATION AND MAINTENANCE REQUIREMENTS

The PID/FID will be calibrated and maintained periodically as per the manufacturer's instructions. A separate log will be kept by the SS/SSO detailing date, time, span gas, or other standard, and name of person performing the calibration.

8.5 AIR MONITORING RESULTS

Air monitoring results will be available for personnel inspection and will be discussed during morning safety meetings.

9.0 EMERGENCY RESPONSE

9.1 PRE-EMERGENCY PLANNING

Prior to engaging in remediation activities at the site, Shaw will plan for possible emergency situations and have available adequate supplies and manpower to respond. In addition, site personnel will receive training during the site orientation concerning proper emergency response procedures.

The following situations would warrant implementation of the Emergency Response Contingency Plan (ERCP):

Fire/Explosion	• The potential for human injury exists. • Toxic fumes or vapors are released. • The fire could spread on-site or off-site and possibly ignite other flammable materials or cause heat-induced explosions. • The use of water and/or chemical fire suppressants could result in contaminated run-off.
Spill or Release of Hazardous Materials	• The spill could result in the release of flammable liquids or vapors, thus causing a fire or gas explosion hazard. • The spill could cause the release of toxic liquids or fumes in sufficient quantities or in a manner that is hazardous to or could endanger human health.
Natural Disaster	• A rainstorm exceeds the flash flood level. • The facility is in a projected tornado path or a tornado has damaged facility property. • Severe wind gusts are forecasted or have occurred and have caused damage to the facility. • Hurricanes.
Medical Emergency	• Overexposure to hazardous materials. • Trauma injuries (broken bones, severe lacerations/bleeding, burns). • Eye/skin contact with hazardous materials. • Loss of consciousness. • Heat stress (heat stroke). • Heart attack. • Respiratory failure. • Allergic reaction.

Note – See **Appendix D** of this SSHSP for route maps and directions to medical facilities.

The following measures will be taken to assure the availability of adequate equipment and manpower resources:

- Sufficient equipment and materials will be kept on site and dedicated for emergencies only. The inventory will be replenished after each use.
- On-site emergency responders will be current in regards to training and medical surveillance programs. Copies of all applicable certificates will be kept on file for on-site personnel required to respond.

- It will be the responsibility of the SS to brief the on-site response team on anticipated hazards at the site. The Emergency Coordinator shall also be responsible for anticipating and requesting equipment that will be needed for response activities.
- Emergency response activities will be coordinated with the Local Emergency Management Agency (LEMA) in compliance with Superfund Amendments and Reauthorization Act Title III requirements.

Communications will be established prior to commencement of any activities at the work site. Communication will be established so that all responders on site have availability to all pertinent information to allow them to conduct their activities in a safe and healthful manner. The primary communication device will be air horns.

9.2 EMERGENCY RECOGNITION AND PREVENTION

Because unrecognized hazards may result in emergency incidents, it will be the responsibility of the SS and the SSO, through daily site inspections and employee feedback (Safety Observation Program, daily safety meetings, and AHAs) to recognize and identify all hazards that are found at the site. These may include:

Chemical Hazards	• Materials at the site • Materials brought to the site
Physical Hazards	• Fire/explosion • Slips/trips/falls • Excessive noise
Mechanical Hazards	• Pinch points • Vehicle traffic
Environmental Hazards	• Electrical storms • High winds • Heavy rain/snow • Temperature extremes (heat stress) • Poisonous plants/animals

Once a hazard has been recognized, the SS/SSO will take immediate action to prevent the hazard from becoming an emergency. This may be accomplished by the following:

- Daily safety meeting.
- Task-specific training prior to commencement of activity.
- PPE selection/use.
- Following all Shaw standard operating procedures.

9.3 PERSONNEL ROLES, LINES OF AUTHORITY AND COMMUNICATIONS

This section of the ERCP describes the various roles, responsibilities, and communication procedures that will be followed by personnel involved in emergency responses.

The primary Emergency Coordinator for this site is the SS. In the event an emergency occurs and the Emergency Coordinator is not on site, the SS/SSO or the highest-ranking employee on site will serve as the Emergency Coordinator until he arrives. The Emergency Coordinator will determine the nature of the emergency and take appropriate action as defined by this ERCP.

The Emergency Coordinator will implement the ERCP immediately as required. The decision to implement the plan will depend upon whether the actual incident threatens human health or the environment. Immediately after being notified of an emergency incident, the Emergency Coordinator or his designee will evaluate the situation to determine the appropriate action.

9.3.1 Responsibilities and Duties

This section describes the responsibilities and duties assigned to the Emergency Coordinator.

It is recognized that the structure of the “Incident Command System” will change as additional response organizations are added. Shaw will follow procedures as directed by the Fire Department, LEMA, state and federal agencies, as required. Shaw will defer to the local Fire Department Chief to assume the role of Incident Commander upon arriving on site. Additional on-site personnel may be added to the Site Emergency Response Team as required to respond effectively.

9.3.2 On-Site Emergency Coordinator Duties

The on-site Emergency Coordinator is responsible for implementing and directing the emergency procedures. All emergency personnel and their communications will be coordinated through the Emergency Coordinator. Specific duties are as follows:

- Identify the source, nature, and extent of the incident, as well as the type and quantity of any release. Assess possible hazards to human health or the environment that may result directly from the problem or its control.
- Discontinue operations in the vicinity of the incident if necessary to ensure that fires, explosions, or spills do not recur or spread to other parts of the site.
- Notify the Client Representative. The Client Representative will contact the local Emergency Response Teams if their help is necessary to control the incident. **Table 9-1** provides telephone numbers for emergency assistance.
- Direct on-site personnel to control the incident until outside help arrives.
- Ensure that the building or area where the incident occurred and the surrounding area are evacuated, and shut off possible ignition sources, if appropriate. The Emergency Response Team is responsible for directing site personnel such that they avoid the area of the incident and leave emergency control procedures unobstructed.
- If fire or explosion is involved, notify facility Fire Department.
- Notify Shaw PM.
- Notify Client Representative.
- Have protected personnel, in appropriate PPE, on standby for rescue.

Table 9-1
Emergency Telephone Numbers and Project Contacts

Fire Department: Monmouth County Fire Department	Emergency – 911
Emergency Medical Care: Riverview Medical Center 1 Riverview Plaza Red Bank, NJ 07701	Emergency – 911 (732) 741-2700
Police: Fort Monmouth Military Police	(732) 532-1112
Non Emergency Medical Care: Concerta Medical Center 135 Raritan Center Parkway Edison, NJ 08837	(732) 225-5454
New Jersey Poison Control	(800) 222-1222
National Response Center Environmental Emergencies	(800) 424-8802
Fort Monmouth Environmental Program Manager	Joe Fallon (732) 532-6223 (office) Redacted - Privacy Act (cellular)
Fort Monmouth Fire Department	(732) 532-3084
<u>Shaw Contacts</u>	
PM:	Douglas L. Schicho (973) 770-5306 Redacted - Privacy Act (cell)
SS/SSHO:	Mark C. Magness (973) 770-5302 Redacted - Privacy Act (cell)
HSM:	Winston (Doug) Russell (865) 692-3584 Redacted - Privacy Act (cell)
<u>USACE – Baltimore District</u>	
Contracting Officer Representative	Tim Peck (410) 962-3416 (office)

If the incident may threaten human health or the environment outside of the site, the Emergency Coordinator should immediately determine whether evacuation of area outside of the site maybe necessary and, if so, notify the Client Representative. The Client Representative will contact the local Police Department and the Office of Emergency Management.

If hazardous waste has been released or produced through control of the incident, ensure that:

- Waste is collected and contained.
- Containers of waste are removed or isolated from the immediate site of the emergency.
- Treatment or storage of the recovered waste, contaminated soil or surface water, or any other material that results from the incident or its control is provided.

- Ensure that no waste that is incompatible with released material is treated or stored in the facility until cleanup procedures are completed.
- Ensure that all emergency equipment used is decontaminated, recharged, and fit for its intended use before operations are resumed.

9.3.3 Safe Distances and Places of Refuge

The Emergency Coordinator for all activities will be the SS/SSO. No single recommendation can be made for evacuation or safe distances because of the wide variety of emergencies that could occur. Safe distances can only be determined at the time of an emergency based on a combination of site and incident-specific criteria. However, the following measures are established to serve as general guidelines.

In the event of minor hazardous material releases (small spills of low toxicity), workers in the affected area will report initially to the CRZ. Small spills or leaks (generally less than 55 gallons) will require initial evacuation of at least 50 feet in all directions to allow for cleanup and to prevent exposure. After initial assessment of the extent of the release and potential hazards, the Emergency Coordinator or his designee will determine the specific boundaries for evacuation. Appropriate steps such as caution tape, rope, traffic cones, barricades, or personal monitors will be used to secure the boundaries.

If an incident may threaten the health or safety of the surrounding community, the public will be informed and, if necessary, evacuated from the area. The Emergency Coordinator, or his designee, will inform the proper agencies in the event that this is necessary. Telephone numbers are listed in **Table 9-1**.

Places of refuge will be established prior to the commencement of activities. These areas must be identified for the following incidents:

- Chemical release.
- Fire/explosion.
- Medical emergency.
- Hazardous weather.

In general, evacuation will be made to the main entrance to the Shaw site, unless the Emergency Coordinator determines otherwise. It is the responsibility of the Emergency Coordinator to determine when it is necessary to evacuate personnel to off-site locations.

In the event of an emergency evacuation, all the employees will gather at the entrance to the site until a head count establishes that all are present and accounted for. No one is to leave the site without notifying the Emergency Coordinator.

9.3.4 Evacuation Routes and Procedures

All emergencies require prompt and deliberate action. In the event of an emergency, it will be necessary to follow an established set of procedures. Such established procedures will be followed as closely as possible. However, in specific emergency situations, the Emergency

Coordinator may deviate from the procedures to provide a more effective plan for bringing the situation under control. The Emergency Coordinator is responsible for determining which situations require site evacuation.

9.3.5 Evacuation Signals and Routes

Cellular phone communication and an air horn will be used to notify employees of the necessity to evacuate an area or building involved in a release/spill of a hazardous material. The crew supervisor will have a cellular phone. Only the Emergency Coordinator will initiate total site evacuation. However, in his absence, the decision to preserve the health and safety of employees will take precedence.

9.3.6 Evacuation Procedures

In the event evacuation is necessary, the following actions will be taken:

- The emergency signal will be activated.
- No further entry of visitors, contractors, or trucks will be permitted. Vehicle traffic within the site will cease in order to allow safe exit of personnel and movement of emergency equipment.
- Shut off all machinery if safe to do so.
- ALL on-site personnel, visitors, and contractors in the SZ will assemble at the entrance to the site for a head count and await further instruction from the Emergency Coordinator.
- ALL persons in the EZ and CRZ will be accounted for by their immediate crew leaders (e.g., foreman). Leaders will determine the safest exits for employees and will also choose an alternate exit if the first choice is inaccessible.
- During exit, the crew leader should try to keep the group together. Immediately upon exit, the crew leader will account for all employees in his crew.
- Upon completion of the head count, the crew leader will provide the information to the Emergency Coordinator.
- Contract personnel and visitors will also be accounted for.
- The names of emergency response team members involved will be reported to the emergency spill control coordinator.
- The Emergency Coordinator, or designee, will make a final tally of persons. No attempt to find persons not accounted for will involve endangering lives of Shaw or other employees by re-entry into emergency areas.

In all questions of accountability, immediate crew leaders will be held responsible for those persons reporting to them. Visitors will be the responsibility of those employees they are seeing. Contractors and truck drivers are the responsibility of the SS.

- Personnel will be assigned by the Emergency Coordinator to be available to direct and brief emergency responders.

- Re-entry into the site will be made only after the Emergency Coordinator gives clearance. At his direction, a signal or other notification will be given for re-entry into the facility.
- Drills will be held annually, at a minimum, to practice all of these procedures and will be treated with the same seriousness as an actual emergency.

9.4 EMERGENCY SPILL RESPONSE PROCEDURES AND EQUIPMENT

In the event of an emergency involving a hazardous material spill or release, the following general procedures will be used for rapid and safe response and control of the situation. Emergency contacts found in **Table 9-1** provide a quick reference guide to follow in the event of a major spill.

9.4.1 Notification Procedures

If an employee discovers a chemical spill or process upset resulting in a vapor or material release, he or she will immediately notify the on-site Emergency Coordinator.

The on-site Emergency Coordinator will obtain information pertaining to the following:

- The material spilled or released.
- Location of the release or spillage of hazardous material.
- An estimate of quantity released and the rate at which it is being released.
- The direction in which the spill, vapor or smoke release is heading.
- Any injuries involved.
- Fire and/or explosion or possibility of these events.
- The area and materials involved and the intensity of the fire or explosion.

This information will help the on-site Emergency Coordinator to assess the magnitude and potential seriousness of the spill or release.

9.4.2 Procedure for Containing/Collecting Spills

The initial response to any spill or discharge will be to protect human health and safety, and then the environment. Identification, containment, treatment and disposal assessment will be the secondary response.

The on-site Emergency Coordinator will initiate and direct containment activities such as the following after assessing a spill or discharge:

- Construction of a temporary containment berm utilizing on-site clay absorbent earth.
- Digging a sump, installing a polyethylene liner.
- Diverting the spill material into the sump placing drums under the leak to collect the spilling material before it flows over the ground.
- Transferring the material from its original container to another container.

The Emergency Coordinator will notify the Client Representative of the spill and steps taken to institute clean up. Emergency response personnel will clean up all spills following the spill clean-up plan developed by the Emergency Coordinator. Supplies necessary to clean up a spill will be immediately available on-site. Such items may include, but are not limited to:

- Shovel, rake.
- Sorbent materials.
- Personal safety equipment.
- Steel drums.
- Miscellaneous hand tools.

As called for in regulations developed under the Comprehensive Environmental Response Compensation Liability Act of 1980 (Superfund), Shaw is to report a spill of a pound or more of any hazardous material for which a reportable quantity has not been established and which is listed under the Solid Waste Disposal Act, Clean Air Act, Clean Water Act, or Toxic Substances Control Act. Shaw also follows the same practice for any substances not listed in the Acts noted above, but which can be classified as a hazardous waste under Resource Conservation Recovery Act.

Clean-up personnel will take the following measures:

1. Make sure all unnecessary persons are removed from the hazard area.
2. Put on protective clothing and equipment.
3. If a flammable material is involved, remove all ignition sources, and use spark and explosion proof equipment for recovery of material.
4. Remove all surrounding materials that could be especially reactive with materials in the waste. Determine the major components in the waste at the time of the spill.
5. If wastes reach a storm sewer, try to dam the outfall by using sand, earth, sandbags, etc. If this is done, pump this material out into a temporary holding tank or drums as soon as possible.
6. Place all small quantities of recovered liquid wastes (55 gallons or less) and contaminated soil into drums for incineration or removal to an approved disposal site.
7. Spray the spill area with foam, if available, to help prevent possible volatile emissions.
8. Apply appropriate spill control media (e.g., clay, sand, lime, etc.) to absorb discharged liquids.
9. For large spills, establish diking around leading edge of spill using booms, sand, clay or other appropriate material. If possible, use a diaphragm pump to transfer discharged liquid to drums or holding tank.

9.4.3 Emergency Response Equipment

The following equipment will be staged in the SZ and throughout the site, as needed, to provide for safety and first aid during emergency responses.

- ABC-type fire extinguisher.
- First-aid kit, industrial size.
- Eyewash.
- Emergency signal horn.

9.4.4 Emergency Spill Response Clean-Up Materials and Equipment

A sufficient supply of appropriate emergency response clean-up and PPE will be maintained on site, inventoried, and inspected visually on a weekly basis.

The materials listed below may be kept on site for spill control, depending on the types of hazardous materials present on site. The majority of this material will be located in the SZ. Small amounts will be placed on pallets and located in the active work areas.

- Appropriate solvents (e.g., CITRIKLEEN, for decontamination of structures or equipment).
- Sand or clay to solidify/absorb liquid spills.

9.5 MEDICAL EMERGENCY CONTINGENCY MEASURES

The procedures listed below will be used to respond to medical emergencies. The SS/SSO will contact the local hospital and inform them of the site hazards and potential emergency situations. A minimum of two first-aid/CPR trained personnel will be maintained on site.

9.5.1 Response

The nearest workers will immediately assist a person who shows signs of medical distress or who is involved in an accident. The work crew supervisor will be summoned.

The work crew supervisor will immediately make radio contact with the on-site Emergency Coordinator to alert him of a medical emergency situation. The supervisor will advise the following information:

- Location of the victim at the work site.
- Nature of the emergency.
- Whether the victim is conscious.
- Specific conditions contributing to the emergency, if known.

The Emergency Coordinator will notify the SSO. The following actions will then be taken depending on the severity of the incident:

Life-Threatening Incident. If an apparent life-threatening condition exists, the crew supervisor will inform the Emergency Coordinator by radio, and the local Emergency Medical Services (EMS) will be immediately called. An on-site person will be appointed who will meet the EMS

and have him/her quickly taken to the victim. Any injury within the EZ will be evacuated by Shaw personnel to a clean area for treatment by EMS personnel. No one will be able to enter the EZ without showing proof of training, medical surveillance and site orientation.

An accident/injury/illness report will be completely and properly filled out and submitted to the Program Health and Safety /Project CIH, in accordance with Shaw reporting procedures.

A list of emergency telephone numbers is given in **Table 9-1**.

Non Life-Threatening Incident. All injuries, no matter how small, will be reported to the SS/SSO. If it is determined that no threat to life is present, the SS/SSO will direct the injured person through decontamination procedures appropriate to the nature of the illness or accident. Appropriate first-aid or medical attention will then be administered.

*NOTE: The area surrounding an accident site must not be disturbed until the scene has been cleared by the SS.

9.5.2 Notification

The following personnel/agencies will be notified in the event of a medical emergency:

- Local Fire Department or EMS.
- On-site Emergency Coordinator.
- Workers in the affected areas.
- Shaw PM.
- Client Representative.

9.6 FIRE CONTINGENCY MEASURES

Shaw personnel and subcontractors are not trained professional firefighters. Therefore, if there is any doubt that a fire can be quickly contained and extinguished, personnel will notify the Emergency Coordinator by radio and vacate the structure or area. The Emergency Coordinator will immediately notify the local Fire Department.

The following procedures will be used to prevent the possibility of fires and resulting injuries:

- Sources of ignition will be kept away from where flammable materials are handled or stored.
- “No smoking” signs will be conspicuously posted in areas where flammable materials are present and throughout the EZ and CRZ.
- Fire extinguishers will be located in all Shaw site dedicated vehicles and placed in all areas where a fire hazard may exist.
- Before workers begin operations in an area, the foreman will give instruction on egress procedures and assembly points. Egress routes will be posted in work areas and exit points clearly marked.

The following procedures will be used in the event of a fire:

- Anyone who sees a fire will notify his or her supervisor who will then contact the Emergency Coordinator by radio. The Emergency Coordinator will activate the emergency air horns and contact the local Fire Department.
- When the emergency siren sounds, workers will disconnect electrical equipment in use (if possible) and proceed to the nearest fire exit.
- Work crews will be comprised of pairs of workers (buddy system) who join each other immediately after hearing the fire alarm and remain together throughout the emergency. Workers will assemble at a predetermined rally point for a head count.
- When a worker has extinguished a small fire, the Emergency Coordinator will be notified.

9.7 HAZARDOUS WEATHER CONTINGENCY MEASURES

Operations will not be started or continued when the following hazardous weather conditions are present:

- Lightning.
- Heavy Rains.
- High Winds.

9.7.1 Response

- All equipment will be shut down and secured to prevent damage.
- Personnel will be moved to safe refuge. The Emergency Coordinator will determine when it is necessary to evacuate personnel to off-site locations and will coordinate efforts with fire, police, and other agencies.

9.7.2 Notification

The Emergency Coordinator will be responsible for assessing hazardous weather conditions and notifying personnel of specific contingency measures. Notifications will include:

- Shaw employees and subcontractors.
- Shaw PM.
- Client Representative.

10.0 TRAINING REQUIRMENTS

All personnel entering the work areas will be trained in the provisions of this site safety plan and be required to sign the Site Safety Plan Acknowledgment in **Appendix H**.

Site-specific training for activities at the FTMM SI sites will include training on potential site contaminants; Hazard Communication, as per 29 CFR 1926.59; site physical and environmental hazards; and emergency response and evacuation procedures. Emergency telephone numbers will be placed and made available on site by the SS/SSO before any site work activities begin. Additional training requirements specific to Radiological Control personnel are listed in **Appendix L**.

Outlines of the orientation for Shaw personnel and subcontract personnel and visitors are presented below:

Shaw/SUBCONTRACTORS	VISITOR ORIENTATION
• SSHSP sign off • Sign in/out procedures • Site background • Chain of command • Rules and regulations • Hours of work • Absences • Equipment • Emergency Information • Emergency signal • Gathering point • Responsibilities/roles • Emergency phone numbers • Work Zones • Contaminants, MSDSs [Hazard Communication Program] • AHAs (Activity Hazard Analyses) • Forms, site-specific Incident Reporting	• SSHSP signoff • Review of Site map • Work Zones in progress • Hazard Communication • Emergency plan/signals • Training/medical requirements • Zones/areas open to visitors

11.0 MEDICAL SURVEILLANCE PROGRAM

All Shaw personnel participate in a medical and health monitoring program. This program is initiated when the employee starts work with a complete physical and medical history and is continued on a regular basis. A listing of Shaw's worker medical profile is shown below. This program was developed in conjunction with a consultant toxicologist and Shaw's occupational health physician. Other medical consultants are retained when additional expertise is required.

All field personnel performing activities in a designated EZ or CRZ shall within the past 12 months, or as otherwise determined by Shaw's Medical Director, have completed a comprehensive medical examination. The medical examination includes the following elements:

- Medical and occupational history questionnaire.
- Physical examination.
- Complete blood count, with differential.
- Liver enzyme profile.
- Chest x-ray, once every 3 years, for non-asbestos workers.
- Pulmonary function test.
- Audiogram.
- Electrocardiogram for persons older than 35 years of age, or if indicated during the physical examination.
- Visual acuity.
- Follow-up examinations, at the discretion of the examining physician or the corporate medical director.

The medical surveillance program meets the requirements of the OSHA Standard 29 CFR 1910.120/1926.65(f).

The following information is provided in the event that medical attention is necessary.

The Shaw Medical Director is:

Dr. Jerry H. Berke
MD, MPH
Health Resources
600 West Cumming Park
Suite 3400
Woburn, Mass 01801-6350
781-935-8581 (direct dial)
800-350-4511 (toll free)

The Health Resource clinic to be used for all non-life threatening injuries is:

Concerta Medical Center
135 Raritan Center Parkway
Edison, NJ 08837
(732) 225-5454

The Shaw Medical Director and the HSM will be immediately notified of any suspected exposures to hazardous materials/wastes.

APPENDIX A
MATERIAL SAFETY DATA SHEETS

1. Alconox
2. Diesel
3. Gasoline
4. Engine Oil
5. Liquinox
6. Methane
7. Hydrochloric Acid
8. Hydrogen Gas
9. Isobutylene
10. Nitric Acid

ALCONOX
ALCONOX **Revised: 02/25/2005****MSDS Contents**

SECTION 1: PRODUCT AND COMPANY IDENTIFICATION
SECTION 2: INGREDIENT INFORMATION
SECTION 2A: ADDITIONAL INGREDIENT INFORMATION
SECTION 3: HAZARD IDENTIFICATION
SECTION 4: FIRST AID MEASURES
SECTION 5: FIRE FIGHTING MEASURES
SECTION 6: ACCIDENTAL RELEASE MEASURES
SECTION 7: HANDLING AND STORAGE
SECTION 8: EXPOSURE CONTROLS / PERSONAL PROTECTION
SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES
SECTION 10: STABILITY AND REACTIVITY
SECTION 11: TOXICOLOGICAL INFORMATION
SECTION 12: ECOLOGICAL INFORMATION
SECTION 13: DISPOSAL CONSIDERATIONS
SECTION 14: TRANSPORT INFORMATION
SECTION 15: REGULATORY INFORMATION
SECTION 16: OTHER INFORMATION

TRADE: ALCONOX

VENDOR CODE: 36.1
3M ID: 28-9025-3219-2
GROUP_NUM: 22-3540-6

VENDOR CODE: 36.1
3M ID: 26-1016-0697-3
GROUP_NUM: 18-3119-7

START_MSDS

MSDS_ALCONOX_ENGLISH_ANSI

ALCONOX

MSDS

SECTION 1: PRODUCT AND COMPANY IDENTIFICATION

CHEMICAL FAMILY: DETERGENT.

PRODUCT NAME: ALCONOX

MANUFACTURER:
ALCONOX, INC.
30 GLENN ST.
SUITE 309
WHITE PLAINS, NY 10603.

MANUFACTURER EMERGENCY: 800-255-3924.

PHONE NUMBER: 813-248-0585 (OUTSIDE OF THE UNITED STATES).

SUPPLIER: SAME AS MANUFACTURER.

SECTION 2: INGREDIENT INFORMATION

C.A.S.	CONCENTRATION %	INGREDIENT NAME
25155-30-0	10-30	SODIUM DODECYLBENZENESULFONATE
497-19-8	7-13	SODIUM CARBONATE
7722-88-5	10-30	TETRASODIUM PYROPHOSPHATE
7758-29-4	10-30	SODIUM PHOSPHATE

INGREDIENT NAME	T.L.V.	LD/50	LC/50
SODIUM DODECYLBENZENESULFONATE	NOT AVAILABLE	438 MG/KG RAT ORAL 1330 MG/KG MOUSE ORAL	NOT AVAILABLE
SODIUM CARBONATE	NOT AVAILABLE	4090 MG/KG RAT ORAL 6600 MG/KG MOUSE ORAL	2300 MG/M3/2H RAT INHALATION: 1200 MG/M3/2H MOUSE INHALATION
TETRASODIUM PYROPHOSPHATE	5 MG/M3	4000 MG/KG RAT ORAL 2980 MG/KG MOUSE ORAL	NOT AVAILABLE
SODIUM PHOSPHATE	NOT AVAILABLE	3120 MG/KG RAT ORAL 3100 MG/KG MOUSE ORAL >4640 MG/KG RABBIT DERMAL	NOT AVAILABLE

SECTION 2A: ADDITIONAL INGREDIENT INFORMATION

NOTE: (SUPPLIER).

CAS# 497-19-8:
LD50: 4020 MG/KG - RAT ORAL.

CAS# 7758-29-4:
LD50: 3100 MG/KG - RAT ORAL.

SECTION 3: HAZARD IDENTIFICATION

ROUTE OF ENTRY: SKIN CONTACT, EYE CONTACT, INHALATION AND INGESTION.

EFFECTS OF ACUTE EXPOSURE:

EYE CONTACT: MAY CAUSE IRRITATION.

SKIN CONTACT: PROLONGED CONTACT MAY CAUSE IRRITATION.

INHALATION: AIRBORNE PARTICLES MAY CAUSE IRRITATION.

INGESTION:

MAY CAUSE VOMITING AND DIARRHEA.

MAY CAUSE ABDOMINAL PAIN.

MAY CAUSE GASTRIC DISTRESS.

EFFECTS OF CHRONIC EXPOSURE: CONTAINS AN INGREDIENT WHICH MAY BE CORROSIVE.

SECTION 4: FIRST AID MEASURES

SKIN CONTACT:

REMOVE CONTAMINATED CLOTHING.

WASH THOROUGHLY WITH SOAP AND WATER.

SEEK MEDICAL ATTENTION IF IRRITATION PERSISTS.

EYE CONTACT:

CHECK FOR AND REMOVE CONTACT LENSES.

FLUSH EYES WITH CLEAR, RUNNING WATER FOR 15 MINUTES WHILE HOLDING

EYELIDS OPEN: IF IRRITATION PERSISTS, CONSULT A PHYSICIAN.

INHALATION:

REMOVE VICTIM TO FRESH AIR.

SEEK MEDICAL ATTENTION IF SYMPTOMS PERSIST.

INGESTION:

DILUTE WITH TWO GLASSES OF WATER.

NEVER GIVE ANYTHING BY MOUTH TO AN UNCONSCIOUS PERSON.

DO NOT INDUCE VOMITING, SEEK IMMEDIATE MEDICAL ATTENTION.

ADDITIONAL INFORMATION:

THE ABOVE INFORMATION IS BELIEVED TO BE CORRECT BUT DOES NOT PURPORT TO BE ALL INCLUSIVE AND SHALL BE USED ONLY AS A GUIDE. THIS COMPANY SHALL NOT BE HELD LIABLE FOR ANY INACCURACIES.

SECTION 5: FIRE FIGHTING MEASURES

FLAMMABILITY: NOT FLAMMABLE.

CONDITIONS OF FLAMMABILITY: SURROUNDING FIRE.

EXTINGUISHING MEDIA:

CARBON DIOXIDE, DRY CHEMICAL, FOAM. WATER. WATER FOG.

SPECIAL PROCEDURES:
SELF-CONTAINED BREATHING APPARATUS REQUIRED.
FIREFIGHTERS SHOULD WEAR THE USUAL PROTECTIVE GEAR.

AUTO-IGNITION TEMPERATURE: NOT AVAILABLE.

FLASH POINT (DEG. C), METHOD: NONE

LOWER FLAMMABILITY LIMIT (% VOL): NOT APPLICABLE.
UPPER FLAMMABILITY LIMIT (% VOL): NOT APPLICABLE.

EXPLOSION DATA:
SENSITIVITY TO STATIC DISCHARGE: NOT AVAILABLE.
SENSITIVITY TO MECHANICAL IMPACT: NOT APPLICABLE.

HAZARDOUS COMBUSTION PRODUCTS:
OXIDES OF CARBON (CO_x).
HYDROCARBONS.

RATE OF BURNING: NOT AVAILABLE.

EXPLOSIVE POWER: NONE

SECTION 6: ACCIDENTAL RELEASE MEASURES

LEAK/SPILL:
CONTAIN THE SPILL.

RECOVER UNCONTAMINATED MATERIAL FOR RE-USE.

WEAR APPROPRIATE PROTECTIVE EQUIPMENT.

CONTAMINATED MATERIAL SHOULD BE SWEEPED OR SHOVELED INTO APPROPRIATE WASTE CONTAINER FOR DISPOSAL.

SECTION 7: HANDLING AND STORAGE

HANDLING PROCEDURES AND EQUIPMENT:
PROTECT AGAINST PHYSICAL DAMAGE.
AVOID BREATHING DUST.
WASH THOROUGHLY AFTER HANDLING.
KEEP OUT OF REACH OF CHILDREN.
AVOID CONTACT WITH SKIN, EYES AND CLOTHING.
LAUNDER CONTAMINATED CLOTHING PRIOR TO REUSE.

STORAGE REQUIREMENTS:
KEEP CONTAINERS CLOSED WHEN NOT IN USE.
STORE AWAY FROM STRONG ACIDS OR OXIDIZERS.
STORE IN A COOL, DRY AND WELL VENTILATED AREA.

SECTION 8: EXPOSURE CONTROLS / PERSONAL PROTECTION

PRECAUTIONARY MEASURES:

GLOVES/TYPE: NEOPRENE OR RUBBER GLOVES.

RESPIRATORY/TYPE:

IF EXPOSURE LIMIT IS EXCEEDED, WEAR A NIOSH APPROVED RESPIRATOR.

EYE/TYPE: SAFETY GLASSES WITH SIDE-SHIELDS.

FOOTWEAR/TYPE: SAFETY SHOES PER LOCAL REGULATIONS.

CLOTHING/TYPE: AS REQUIRED TO PREVENT SKIN CONTACT.

OTHER/TYPE:

EYE WASH FACILITY SHOULD BE IN CLOSE PROXIMITY.

EMERGENCY SHOWER SHOULD BE IN CLOSE PROXIMITY.

VENTILATION REQUIREMENTS: LOCAL EXHAUST AT POINTS OF EMISSION.

EXPOSURE LIMIT OF MATERIAL:

NOT AVAILABLE FOR MIXTURE, SEE THE INGREDIENTS SECTION.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE: SOLID

APPEARANCE & ODOR:

ALMOST ODORLESS.

WHITE GRANULAR POWDER.

ODOR THRESHOLD (PPM): NOT AVAILABLE.

VAPOR PRESSURE (MMHg): NOT APPLICABLE.

VAPOR DENSITY (AIR=1): NOT APPLICABLE.

BY WEIGHT: NOT AVAILABLE.

EVAPORATION RATE (BUTYL ACETATE = 1): NOT APPLICABLE.

BOILING POINT (DEG. C): NOT APPLICABLE.

FREEZING POINT (DEG. C): NOT APPLICABLE.

Ph:

(1% AQUEOUS SOLUTION).

9.5

SPECIFIC GRAVITY @ 20 DEG. C (WATER = 1): 0.85 - 1.10

SOLUBILITY IN WATER (%): 100 - >10% W/W

COEFFICIENT OF WATER\OIL DIST.: NOT AVAILABLE.

VOC: NONE

CHEMICAL FAMILY: DETERGENT.

SECTION 10: STABILITY AND REACTIVITY

CHEMICAL STABILITY: STABLE UNDER NORMAL CONDITIONS.

CONDITIONS OF INSTABILITY: NONE KNOWN.

HAZARDOUS POLYMERIZATION: WILL NOT OCCUR.

INCOMPATIBLE SUBSTANCES:

STRONG ACIDS.

STRONG OXIDIZERS.

HAZARDOUS DECOMPOSITION PRODUCTS: SEE HAZARDOUS COMBUSTION PRODUCTS.

SECTION 11: TOXICOLOGICAL INFORMATION

LD50 OF PRODUCT, SPECIES & ROUTE: >5000 MG/KG RAT ORAL.

LC50 OF PRODUCT, SPECIES & ROUTE:

NOT AVAILABLE FOR MIXTURE, SEE THE INGREDIENTS SECTION.

SENSITIZATION TO PRODUCT: NOT AVAILABLE.

CARCINOGENIC EFFECTS: NOT LISTED AS A CARCINOGEN.

REPRODUCTIVE EFFECTS: NOT AVAILABLE.

TERATOGENICITY: NOT AVAILABLE.

MUTAGENICITY: NOT AVAILABLE.

SYNERGISTIC MATERIALS: NOT AVAILABLE.

SECTION 12: ECOLOGICAL INFORMATION

ENVIRONMENTAL TOXICITY: NO DATA AT THIS TIME.

ENVIRONMENTAL FATE: NO DATA AT THIS TIME.

SECTION 13: DISPOSAL CONSIDERATIONS

WASTE DISPOSAL:

IN ACCORDANCE WITH MUNICIPAL, PROVINCIAL AND FEDERAL REGULATIONS.

SECTION 14: TRANSPORT INFORMATION

D.O.T. CLASSIFICATION: NOT REGULATED.

SPECIAL SHIPPING INFORMATION: NOT REGULATED.

SECTION 15: REGULATORY INFORMATION

CANADIAN REGULATORY INFORMATION:

WHMIS CLASSIFICATION: D2B

D2 - MATERIALS CAUSING OTHER TOXIC EFFECTS

DSL STATUS:

THE SUPPLIER HAS CERTIFIED THAT ALL SUBSTANCES IN THIS PRODUCT APPEAR ON THE DOMESTIC SUBSTANCES LIST.

USA REGULATORY INFORMATION:

SARA HAZARD CATEGORIES SECTIONS 311/312:

IMMEDIATE (ACUTE) HEALTH HAZARD: YES.

DELAYED (CHRONIC) HEALTH HAZARD: NO.

FIRE HAZARD: NO.

SUDDEN RELEASE OF PRESSURE: NO.

REACTIVE: NO.

SARA SECTION 313: NONE

TSCA INVENTORY:

ALL COMPONENTS OF THIS PRODUCT ARE LISTED ON THE TSCA INVENTORY.

NFPA:

HEALTH HAZARD 1

FLAMMABILITY 0

PHYSICAL HAZARD 0

HMIS:

HEALTH HAZARD 1

FLAMMABILITY 0

PHYSICAL HAZARD 0

PPE B

SECTION 16: OTHER INFORMATION

SUPPLIER MSDS DATE: 2005/02/25

DATA PREPARED BY:

GLOBAL SAFETY MANAGEMENT

3340 PEACHTREE ROAD, #1800

ATLANTA, GA 30326

PHONE: 877-683-7460

FAX: (877) 683-7462

WEB: WWW.GLOBALSAFETYNET.COM

EMAIL: INFO@GLOBALSAFETYNET.COM.

GENERAL NOTE:

THIS MATERIAL SAFETY DATA SHEET WAS PREPARED FROM INFORMATION OBTAINED FROM VARIOUS SOURCES, INCLUDING PRODUCT SUPPLIERS AND THE CANADIAN CENTER FOR OCCUPATIONAL HEALTH AND SAFETY.

MS 01.10.01.01.06.1

AGWAY
DIESEL FUEL **Revised: 10/09/2002****MSDS Contents**

I. IDENTIFICATION AND EMERGENCY INFORMATION
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III. EMERGENCY FIRST AID PROCEDURES
IV. FIRE AND EXPLOSION
V. HEALTH HAZARDS
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VIII. TRANSPORTATION AND OSHA RELATED LABEL INFORMATION
IX. ENVIRONMENTAL INFORMATION

AGWAY ENERGY PRODUCTS (R*)

MATERIAL SAFETY DATA SHEET

AGWAY ENERGY PRODUCTS,
PO BOX 4852,
SYRACUSE, NY 13221

DATE ISSUED: 10/09/02

I. IDENTIFICATION AND EMERGENCY INFORMATION

PRODUCT NAME: DIESEL FUEL

CAS NUMBER: 68476-34-6

OTHER NAMES: #2 FUEL OIL, LOW SULFUR DIESEL, PREMIUM GOLD DIESEL

FORMULA: #2 FUEL OIL (PETROLEUM DISTILLATE) - 100%

PRODUCT APPEARANCE AND ODOR:

AMBER COLORED LIQUID WITH PETROLEUM ODOR. MAY BE DYED RED FOR IDENTIFICATION
OF TAX STATUS.

CLASSIFICATION:

FLAMMABLE OR COMBUSTIBLE LIQUID: NA 1993

DOT HAZARD CLASS: 3

PACKING GROUP: III

DISTRIBUTOR:

AGWAY ENERGY PRODUCTS
PO BOX 4852
SYRACUSE, NY 13221

PRODUCT INFORMATION: 315-449-7427

EMERGENCY PHONE NUMBER:

CHEMTREC: 800-424-9300

II. SUMMARY OF HAZARDS

COMPONENTS CAS NUMBER CONCENTRATION

#2 FUEL OIL 68476-34-6 100%

HAZARDOUS MATERIALS IDENTIFICATION SYSTEM (HMIS):

HEALTH 1

FLAMMABILITY 2

REACTIVITY 0

0 - MINIMAL

1 - SLIGHT

2 - MODERATE

3 - SERIOUS

4 - SEVERE

OCCUPATIONAL EXPOSURE LIMIT: TWA 400 PPM 8 HOURS

III. EMERGENCY FIRST AID PROCEDURES

INHALATION:

REMOVE FROM FURTHER EXPOSURE. IF RESPIRATORY IRRITATION, DIZZINESS, NAUSEA, OR UNCONSCIOUSNESS OCCURS, SEEK IMMEDIATE MEDICAL ASSISTANCE AND CALL A PHYSICIAN. IF BREATHING HAS STOPPED, USE MOUTH TO MOUTH RESUSCITATION.

EYE CONTACT:

FLUSH THOROUGHLY WITH WATER. IF IRRITATION OCCURS, CALL A PHYSICIAN.

SKIN CONTACT:

DRY-WIPE THE SKIN. CLEANSE THE AREA WITH WATERLESS HAND CLEANER, AND FOLLOW BY WASHING THOROUGHLY WITH SOAP AND WATER. REMOVE CONTAMINATED CLOTHING. LAUNDER CLOTHING BEFORE REUSE. DISCARD SHOES IF MATERIAL HAS PENETRATED TO INSIDE SURFACE.

INGESTION:

DO NOT INDUCE VOMITING. GIVE 1 TO 2 GLASSES OF WATER. GET MEDICAL ATTENTION.

NOTE TO PHYSICIAN:

MATERIAL IF ASPIRATED INTO THE LUNGS MAY CAUSE CHEMICAL PNEUMONITIS. TREAT APPROPRIATELY.

IV. FIRE AND EXPLOSION

FLASH POINT: 125 DEG. F

AUTOIGNITION TEMPERATURE: 500 DEG. F

FLAMMABLE LIMITS (% AT NORMAL ATMOS. TEMP. AND PRESSURE):

LOWER: 0.6

UPPER: 7.4

EXTINGUISHING MEDIA: WATER FOG, DRY CHEMICAL, CO2 OR CHEMICAL FOAM

FIRE AND EXPLOSION HAZARDS:

FLOWING OIL CAN BE IGNITED BY SELF-GENERATED STATIC ELECTRICITY; CHECK FOR COMBUSTIBLE VAPORS PRIOR TO AND DURING WELDING AND TORCH CUTTING ON TANKS AND VESSELS.

SPECIAL FIREFIGHTING PROCEDURES:

USE A WATER SPRAY TO COOL FIRE-EXPOSED CONTAINERS. USE A SMOTHERING TECHNIQUE FOR EXTINGUISHING FIRE OF THIS COMBUSTIBLE LIQUID. DO NOT USE A FORCED WATER STREAM DIRECTLY ON OIL FIRES AS THIS WILL SCATTER THE FIRE. FIREFIGHTERS SHOULD WEAR SELF-CONTAINED BREATHING APPARATUS AND FULL PROTECTIVE CLOTHING.

V. HEALTH HAZARDS

PRIMARY ROUTE

INHALATION:

YES

VAPORS OR MIST MAY CAUSE IRRITATION OF THE NOSE AND THROAT, HEADACHE, NAUSEA, VOMITING, DIZZINESS, DROWSINESS, EUPHORIA, LOSS OF COORDINATION, AND DISORIENTATION. IN POORLY VENTILATED AREAS OR CONFINED SPACES, UNCONSCIOUSNESS AND ASPHYXIATION MAY RESULT.

EYE CONTACT:

YES

MAY CAUSE IRRITATION, EXPERIENCED AS MILD DISCOMFORT AND SEEN AS SLIGHT EXCESS REDNESS OF THE EYE.

SKIN IRRITATION:

YES

PROLONGED OR WIDESPREAD SKIN CONTACT MAY RESULT IN THE ABSORPTION OF POTENTIALLY HARMFUL AMOUNTS OF MATERIAL.

INGESTION:

N/A

IF MORE THAN SEVERAL MOUTHFULS ARE SWALLOWED, ABDOMINAL DISCOMFORT, NAUSEA, AND DIARRHEA MAY OCCUR. ASPIRATION MAY OCCUR DURING SWALLOWING OR VOMITING RESULTING IN LUNG DAMAGE.

CHRONIC:

NIOSH HAS RECOMMENDED THAT WHOLE DIESEL EXHAUST BE REGARDED AS A POTENTIAL OCCUPATIONAL CARCINOGEN BASED ON FINDINGS OF CARCINOGENIC RESPONSES IN LABORATORY ANIMALS EXPOSED TO WHOLE DIESEL EXHAUST. THE EXCESS CANCER RISK FOR WORKERS EXPOSED TO DIESEL EXHAUST HAS NOT BEEN CALCULATED; THE PROBABILITY OF DEVELOPING CANCER SHOULD BE DECREASED BY MINIMIZING EXPOSURE TO THE LOWEST FEASIBLE LIMITS.

REPEATED SKIN CONTACT MAY CAUSE A PERSISTENT IRRITATION OR DERMATITIS.

OTHER REMARKS:

THIS PRODUCT MAY CONTAIN BENZENE. PROLONGED AND REPEATED EXPOSURE TO BENZENE HAS BEEN ASSOCIATED WITH ANEMIA AND LEUKEMIA IN HUMANS.

VI. PHYSICAL AND CHEMICAL DATA

THE FOLLOWING DATA ARE APPROXIMATE OR TYPICAL VALUES AND SHOULD NOT BE USED FOR PRECISE DESIGN PURPOSES.

BOILING RANGE: 340-700 DEG. F

SPECIFIC GRAVITY: 0.85

VAPOR PRESSURE (MM HG @ 20 DEG. C): <0.5

VAPOR DENSITY: >4

SOLUBILITY IN WATER: INSOLUBLE

pH: N/A

VOLATILE CHARACTERISTICS: N/A

STABILITY: STABLE

HAZARDOUS POLYMERIZATION: NOT EXPECTED TO OCCUR

APPEARANCE AND ODOR:

AMBER COLORED LIQUID. MAY BE DYED RED FOR IDENTIFICATION OF TAX STATUS.

CONDITIONS TO AVOID:

STRONG OXIDIZING AGENTS, HEAT, SPARK, FLAME AND BUILD-UP OF STATIC ELECTRICITY.

HAZARDOUS DECOMPOSITION PRODUCTS: CO, CO₂, SO₂, REACTIVE HYDROCARBONS

VII. PROTECTION AND PRECAUTIONS

HANDLING:

EYE PROTECTION:

REMOVE CONTACT LENSES AND WEAR CHEMICAL SAFETY GLASSES, GOGGLES OR FACESHIELD WHERE CONTACT WITH LIQUID OR MIST MAY OCCUR.

SKIN PROTECTION:

WEAR IMPERVIOUS GLOVES, CLOTHING AND BOOTS WHEN CONTACT WITH SKIN MAY OCCUR. WASH WITH SOAP AND WATER BEFORE EATING, DRINKING AND SMOKING. LAUNDER CONTAMINATED CLOTHING BEFORE REUSE.

INHALATION:

USE APPROVED RESPIRATORY PROTECTIVE EQUIPMENT FOR CLEANING LARGE SPILLS OR ENTRY INTO LARGE TANKS, VESSELS AND OTHER CONFINED SPACES, OR IN ANY SITUATION WHERE AIRBORNE CONCENTRATIONS MAY EXCEED OCCUPATIONAL EXPOSURE LIMITS.

VENTILATION:

PROVIDE ADEQUATE GENERAL AND LOCAL EXHAUST VENTILATION:

- (1) TO MEET OCCUPATIONAL EXPOSURE LIMITS
- (2) TO PREVENT THE FORMATION OF EXPLOSIVE ATMOSPHERES AND
- (3) TO PREVENT OXYGEN DEFICIENT ATMOSPHERES, ESPECIALLY IN CONFINED SPACES.

SPECIAL PRECAUTIONS AND COMMENTS:

STORAGE REQUIREMENTS:

STORE IN TIGHTLY CLOSED CONTAINERS IN A DRY, COOL PLACE, AWAY FROM SOURCES OF HEAT OR IGNITION AND INCOMPATIBLE SUBSTANCES. GROUND AND BOND ALL TRANSFER AND STORAGE EQUIPMENT TO PREVENT STATIC SPARKS AND EQUIP WITH SELF CLOSING VALVES, PRESSURE VACUUM BUNGS AND FLAME ARRESTERS. EMPTY CONTAINERS MAY CONTAIN RESIDUE (LIQUID AND/OR VAPOR) AND CAN BE DANGEROUS. DO NOT PRESSURIZE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS OR OTHER SOURCES OF IGNITION; THEY MAY EXPLODE AND CAUSE INJURY OR DEATH.

VIII. TRANSPORTATION AND OSHA RELATED LABEL INFORMATION

TRANSPORTATION INCIDENT INFORMATION:

FOR FURTHER INFORMATION RELATIVE TO SPILLS RESULTING FROM TRANSPORTATION INCIDENTS, REFER TO LATEST DEPARTMENT OF TRANSPORTATION EMERGENCY RESPONSE GUIDEBOOK FOR HAZARDOUS MATERIALS INCIDENTS, DOT P 5800.3.

DOT IDENTIFICATION NUMBER:

#2 DIESEL FUEL (A/K/A FUEL OIL) FLAMMABLE OR COMBUSTIBLE LIQUID/NA
1993/HAZARD CLASS 3

OSHA REQUIRED LABEL INFORMATION:

THE FOLLOWING HAZARD WARNING SHOULD BE FOUND ON A LABEL, BILL OF LADING OR INVOICE ACCOMPANYING THIS SHIPMENT:

DANGER!

HARMFUL IF INHALED

MAY BE HARMFUL IF ABSORBED THROUGH SKIN

MAY CAUSE DIZZINESS AND DROWSINESS

ASPIRATION HAZARD IF SWALLOWED-CAN ENTER LUNGS AND CAUSE DAMAGE

COMBUSTIBLE LIQUID AND VAPOR

USE ONLY AS FUEL

ATTENTION!

POSSIBLE CANCER HAZARD

CONTAINS MIDDLE DISTILLATES WHICH MAY CAUSE CANCER BASED ON ANIMAL DATA

IX. ENVIRONMENTAL INFORMATION

EPA INFORMATION FOR HAZARDOUS CHEMICAL REPORTING:

EPA HAZARD CLASSIFICATION CODE:

ACUTE HAZARD (XXX)

CHRONIC HAZARD (XXX)

FIRE HAZARD (XXX)

PRESSURE HAZARD ()

REACTIVE HAZARD ()

REPORTABLE QUANTITY (RQ), EPA REGULATION 40 CFR 302 (CERCLA SECTION 102):

NONE

THRESHOLD PLANNING QUANTITY (TPQ), EPA REGULATION 40 CFR 355 (SARA SECTIONS 301-304): NONE

TOXIC CHEMICAL RELEASE REPORTING, EPA REGULATION 40 CFR 372 (SARA SECTION 313): NONE

PRECAUTIONS IF MATERIAL IS SPILLED OR RELEASED:

REMOVE SOURCES OF HEAT OR IGNITION INCLUDING INTERNAL COMBUSTION ENGINES AND POWER TOOLS. REMOVE SPILL WITH VACUUM TRUCKS OR PUMP AND SOAK UP RESIDUE WITH AN INERT ABSORBENT. DO NOT FLUSH TO SEWER OR SURFACE WATER. VENTILATE AREA AND AVOID BREATHING VAPORS OR MISTS.

WASTE DISPOSAL METHODS:

PRODUCT IS SUITABLE FOR BURNING FOR FUEL VALUE IN COMPLIANCE WITH APPLICABLE LAWS AND REGULATIONS.

RCRA INFORMATION:

DISPOSAL OF UNUSED PRODUCT MAY BE SUBJECT TO RCRA REGULATIONS (40 CFR 261) DUE TO THE CHARACTERISTIC(S)/CHEMICAL(S) LISTED BELOW. DISPOSAL OF THE USED PRODUCT MAY ALSO BE REGULATED DUE TO IGNITABILITY OR TOXICITY AS DETERMINED BY THE TOXICITY CHARACTERISTIC LEACHING PROCEDURE (TCLP).

FLASH: 125 DEG. F

A EMPTY@ CONTAINER WARNING:

DO NOT PRESSURIZE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND, OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS, STATIC ELECTRICITY OR OTHER SOURCES OF IGNITION.

THE INFORMATION AND RECOMMENDATIONS CONTAINED HEREIN ARE A COMPLLATION OF DATA PROVIDED BY VARIOUS SUPPLIERS AND, TO THE BEST OF AGWAY ENERGY PRODUCTS (AEP) KNOWLEDGE AND BELIEF, ACCURATE AND RELIABLE AS OF THE DATE ISSUED. AEP DOES NOT WARRANT OR GUARANTEE THEIR ACCURACY OR RELIABILITY, AND AEP SHALL NOT BE LIABLE FOR ANY LOSS OR DAMAGE ARISING OUT OF THE USE THEREOF. THE INFORMATION AND RECOMMENDATIONS ARE OFFERED FOR THE USER=S CONSIDERATION AND EXAMINATION, AND IT IS THE USER=S RESPONSIBILITY TO SATISFY ITSELF THAT THEY ARE SUITABLE AND COMPLETE FOR ITS PARTICULAR USE. IF BUYER REPACKAGES THIS PRODUCT, LEGAL COUNSEL SHOULD BE CONSULTED TO INSURE PROPER HEALTH, SAFETY, AND OTHER NECESSARY INFORMATION IS INCLUDED ON THE CONTAINER.

THE ENVIRONMENTAL INFORMATION INCLUDED UNDER SECTION IX HEREOF AS WELL AS THE HAZARDOUS MATERIALS IDENTIFICATION SYSTEM (HMIS) AND NATIONAL FIRE PROTECTION ASSOCIATION (NFPA) RATINGS HAVE BEEN INCLUDED BY AEP IN ORDER TO PROVIDE ADDITIONAL HELP AND HAZARD CLASSIFICATION INFORMATION. THE RATINGS RECOMMENDED ARE BASED UPON THE CRITERIA SUPPLIED BY THE DEVELOPERS OF THESE RATING SYSTEMS, TOGETHER WITH AEP=S INTERPRETATION OF THE AVAILABLE DATA.

DIESEL

AMOCO
UNLEADED GASOLINES **Revised: 07/18/1983**

MSDS Contents

SECTION I
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SECTION III - HEALTH EFFECTS OF EXPOSURE
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AMOCO

INDUSTRIAL HYGIENE AND TOXICOLOGY DATA SHEET

INDUSTRIAL HYGIENE AND TOXICOLOGY DIVISION

ENVIRONMENTAL CONSERVATION AND TOXICOLOGY DEPARTMENT

UNLEADED GASOLINES

AMOCO

AMOCO PREMIUM LEAD-FREE GASOLINE

AMOCO SUPER LEAD-FREE GASOLINE

INDOLENE MOTOR FUEL

INDOLENE H.O. MOTOR FUEL III

AMOCO 940 GASOLINE

FORM U-1967-A (8-78)

SECTION I

TRADE NAME AND SYNONYMS

SEE TRADE NAMES LISTED ABOVE

MANUFACTURER'S NAME: AMOCO OIL COMPANY

ADDRESS

200 EAST RANDOLPH DRIVE, CHICAGO, ILLINOIS 60601

PRODUCT IDENTIFICATION

GASOLINE

CAS NUMBER 8006-61-9

FORMULA: - - -

EPA NUMBER: - - -

EMERGENCY PHONE NUMBER: (312) 856-5371

WARNING STATEMENT

DANGER! EXTREMELY FLAMMABLE

USE AS A MOTOR FUEL ONLY.

VAPOR HARMFUL.

HARMFUL IF SWALLOWED AND/OR ASPIRATED INTO LUNGS.

CAN PRODUCE SKIN IRRITATION UPON PROLONGED OR REPEATED CONTACT.

DOT CLASSIFICATION: FLAMMABLE LIQUID

SECTION II - IMPORTANT COMPONENTS

GASOLINE

PERMISSIBLE EXPOSURE CONCENTRATION

ACGIH TWA TLV 300 PPM (900 MG/M3)

SECTION III - HEALTH EFFECTS OF EXPOSURE

EYE

PRIMARY EYE IRRITATION SCORE OF 0.0/110.0 (RABBITS). ACUTE EXPOSURE TO HUMANS IS EXPECTED TO PRODUCE MINIMAL IRRITATION.

SKIN

SLIGHTLY IRRITATING FOR ACUTE EXPOSURES.

PRIMARY DERMAL IRRITATION SCORE 1.1/8.0 (RABBITS).

PROLONGED OR REPEATED CONTACT IS LIKELY TO CAUSE SKIN IRRITATION THROUGH DEFATTING.

ACUTE DERMAL LD50 GREATER THAN 5 ML/KG (RABBITS); PRACTICALLY NON-TOXIC FOR ACUTE EXPOSURES BY THIS ROUTE.

INHALATION:

ACUTE LC50 20.7 MG/L (RATS). MODERATELY TOXIC FOR ACUTE EXPOSURES BY THIS ROUTE. EXCESSIVE EXPOSURE TO VAPORS WILL PRODUCE SYMPTOMS OF INTOXICATION.

SEE SECTION XI FOR ADDITIONAL INFORMATION.

INGESTION

LOW VISCOSITY PRODUCT - HARMFUL OR FATAL IF SWALLOWED AND/OR ASPIRATED INTO LUNGS. ACUTE ORAL LD50 18.8 ML/KG (RATS). PRACTICALLY NON-TOXIC FOR ACUTE EXPOSURES BY THIS ROUTE.

SECTION IV - EMERGENCY AND FIRST AID PROCEDURES

EYE CONTACT

FLUSH WITH PLENTY OF WATER.

SKIN CONTACT

WASH EXPOSED SKIN WITH SOAP AND WATER. REMOVE CONTAMINATED CLOTHING, INCLUDING SHOES, AND THOROUGHLY CLEAN AND DRY BEFORE REUSE.

INHALATION

IF ADVERSE EFFECTS OCCUR, REMOVE TO UNCONTAMINATED AREA. GIVE ARTIFICIAL RESPIRATION IF NOT BREATHING. GET MEDICAL ATTENTION.

INGESTION

DO NOT INDUCE VOMITING. GET IMMEDIATE MEDICAL ATTENTION.

SECTION V - PERSONAL PROTECTION INFORMATION

EYE

NOT REQUIRED.

SKIN

IF CONTACT IS LIKELY, WEAR PROTECTIVE CLOTHING AND GLOVES.

RESPIRATORY

AVOID BREATHING VAPORS.

VENTILATION (TYPE REQUIRED) GENERAL AREA.

SECTION VI - FIRE PROTECTION INFORMATION

FLASH POINT (METHOD): -45 DEG. F

AUTO IGNITION TEMPERATURE: 495 DEG. F

FLAMMABLE LIMITS (BY VOLUME IN AIR): UPPER: 7.6% LOWER: 1.3%

EXTINGUISHING MEDIA: DRY CHEMICAL (B-C), CARBON DIOXIDE, WATER FOG, FOAM
(WATER MAY BE INEFFECTIVE).

UNUSUAL FIRE AND EXPLOSION HAZARDS:

EXTREMELY FLAMMABLE VAPOR/AIR MIXTURES FORM AND MAY FLASH BACK TO SOURCE OF IGNITION.

SECTION VII - PHYSICAL PROPERTIES AND REACTIVITY DATA

BOILING POINT (DEG. F): RANGE APPROX. 80-430

VAPOR PRESSURE: 9-15 LB. RVP (ASTM D-323.)

MELTING POINT (DEG. F): - - -

VAPOR DENSITY (AIR=1): 3.0-4.0

PH: NOT APPLICABLE

SPECIFIC GRAVITY (WATER = 1): 0.75

SOLUBILITY IN WATER: NEGLIGIBLE

VISCOSITY: N/A

APPEARANCE AND ODOR: CLEAR, BRIGHT LIQUID

HAZARDOUS POLYMERIZATION: OCCURS DOES NOT OCCUR X

PRODUCTS FORMED WHEN SUBJECTED TO HIGH TEMPERATURE OR COMBUSTION:
COMBUSTION - CARBON, CARBON MONOXIDE, CARBON DIOXIDE, VARIOUS HYDROCARBONS
AND HYDROCARBON DERIVATIVES.

MATERIALS TO AVOID: STRONG OXIDIZERS.

SECTION VIII - STORAGE AND ENVIRONMENTAL PROTECTION

STORAGE REQUIREMENTS

STORE IN A FLAMMABLE LIQUIDS STORAGE AREA.

PROCEDURES IN CASE OF BREAKAGE OR LEAKAGE

SHUT OFF ALL SOURCES OF IGNITION; USE WATER SPRAY TO DISPERSE VAPORS;
INCREASE VENTILATION IF POSSIBLE.

WASTE DISPOSAL:

CONTROLLED INCINERATION; CONSULT LOCAL ORDINANCES FOR COMPLIANCE.

BIODEGRADABILITY (X) YES () NO () UNKNOWN

BIOACCUMULATION () () NO () UNKNOWN

SECTION IX - MARKETING AND USE REGULATED BY

(SPECIFIC REGULATIONS)

() FDA - - - () USDA - - - () OTHER (SPECIFY)

SECTION X - COMMENTS

LABEL COPY:

DANGER! EXTREMELY FLAMMABLE! USE AS A MOTOR FUEL ONLY! VAPOR HARMFUL!
HARMFUL OR FATAL IF SWALLOWED AND/OR ASPIRATED INTO LUNGS! CAN PRODUCE
SKIN IRRITATION UPON PROLONGED OR REPEATED CONTACT! LONG-TERM EXPOSURE TO
VAPORS HAS CAUSED CANCER IN LABORATORY ANIMALS.

KEEP AWAY FROM HEAT, SPARKS AND FLAME. AVOID BREATHING VAPORS. USE WITH
ADEQUATE VENTILATION. AVOID PROLONGED OR REPEATED SKIN CONTACT. IF
CONTACT IS LIKELY, WEAR PROTECTIVE CLOTHING AND GLOVES. REMOVE
CONTAMINATED CLOTHING, INCLUDING SHOES & THOROUGHLY CLEAN & DRY BEFORE
REUSE. NEVER SIPHON BY MOUTH.

FOR INHALATION: IF ADVERSE EFFECTS OCCUR, REMOVE TO UNCONTAMINATED AREA.
GIVE ARTIFICIAL RESPIRATION IF NOT BREATHING. GET MEDICAL ATTENTION.

FOR SKIN: IN CASE OF CONTACT, WASH EXPOSED SKIN WITH SOAP AND WATER.

FOR INGESTION: IF SWALLOWED, DO NOT INDUCE VOMITING. GET IMMEDIATE MEDICAL ATTENTION.

N/A - DATA NOT AVAILABLE

SEE SECTION XI FOR ADDITIONAL INFORMATION

INFORMATION SUPPLIED BY
STEPHEN A. ELBERT

SIGNATURE

TITLE
DIRECTOR, PRODUCT SAFETY (USA)

DATE REVISED
JULY 18, 1983

ALCONOX
LIQUINOX **Revised: 07/14/2006****MSDS Contents**

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SECTION 14: TRANSPORT INFORMATION
SECTION 15: REGULATORY INFORMATION
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TRADE: LIQUINOX

VENDOR CODE: 36.1
3M ID: 31-0000-9490-9
GROUP_NUM: 08-8662-2

VENDOR CODE: 36.2
3M ID: 11-0025-2472-3
GROUP_NUM: 21-9373-8

VENDOR CODE: 36.2
3M ID: 28-9003-4537-3
GROUP_NUM: 21-9203-7

START_MSDS

MSDS_LIQUINOX_ENGLISH_ANSI

LIQUINOX

MSDS

SECTION 1: PRODUCT AND COMPANY IDENTIFICATION

CHEMICAL FAMILY: DETERGENT.

MANUFACTURER:
ALCONOX, INC.
30 GLENN ST.
SUITE 309
WHITE PLAINS, NY 10603.

MANUFACTURER EMERGENCY: 800-255-3924.

PHONE NUMBER: 813-248-0585 (OUTSIDE OF THE UNITED STATES).

SUPPLIER: SAME AS MANUFACTURER.

PRODUCT NAME: LIQUINOX

SECTION 2: INGREDIENT INFORMATION

C.A.S.	CONCENTRATION %	INGREDIENT NAME	T.L.V.	LD/50	LC/50
25155-30-0	10-30	SODIUM DODECYLBENZENE- SULFONATE	NOT AVAILABLE	438 MG/KG RAT ORAL	NOT AVAILABLE
				1330 MG/KG MOUSE ORAL	

SECTION 3: HAZARD IDENTIFICATION

ROUTE OF ENTRY: SKIN CONTACT, EYE CONTACT, INHALATION AND INGESTION.

EFFECTS OF ACUTE EXPOSURE:

EYE CONTACT: MAY CAUSE IRRITATION.

SKIN CONTACT: PROLONGED AND REPEATED CONTACT MAY CAUSE IRRITATION.

INHALATION: MAY CAUSE HEADACHE AND NAUSEA.

INGESTION:

MAY CAUSE VOMITING AND DIARRHEA.

MAY CAUSE GASTRIC DISTRESS.

EFFECTS OF CHRONIC EXPOSURE: SEE EFFECTS OF ACUTE EXPOSURE

SECTION 4: FIRST AID MEASURES

SKIN CONTACT:

REMOVE CONTAMINATED CLOTHING.

WASH THOROUGHLY WITH SOAP AND WATER.

SEEK MEDICAL ATTENTION IF IRRITATION PERSISTS.

EYE CONTACT:

CHECK FOR AND REMOVE CONTACT LENSES.

FLUSH EYES WITH CLEAR, RUNNING WATER FOR 15 MINUTES WHILE HOLDING EYELIDS OPEN: IF IRRITATION PERSISTS, CONSULT A PHYSICIAN.

INHALATION:

REMOVE VICTIM TO FRESH AIR.

IF IRRITATION PERSISTS, SEEK MEDICAL ATTENTION.

INGESTION:

DO NOT INDUCE VOMITING, SEEK MEDICAL ATTENTION.

DILUTE WITH TWO GLASSES OF WATER.

NEVER GIVE ANYTHING BY MOUTH TO AN UNCONSCIOUS PERSON.

SECTION 5: FIRE FIGHTING MEASURES

FLAMMABILITY: NOT FLAMMABLE.

CONDITIONS OF FLAMMABILITY: SURROUNDING FIRE.

EXTINGUISHING MEDIA:

CARBON DIOXIDE, DRY CHEMICAL, FOAM.

WATER

WATER FOG.

SPECIAL PROCEDURES:

SELF-CONTAINED BREATHING APPARATUS REQUIRED.

FIREFIGHTERS SHOULD WEAR THE USUAL PROTECTIVE GEAR.

USE WATER SPRAY TO COOL FIRE EXPOSED CONTAINERS.

AUTO-IGNITION TEMPERATURE: NOT AVAILABLE.

FLASH POINT (DEG. C), METHOD: NONE

LOWER FLAMMABILITY LIMIT (% VOL): NOT APPLICABLE.

UPPER FLAMMABILITY LIMIT (% VOL): NOT APPLICABLE.

EXPLOSION DATA:

SENSITIVITY TO STATIC DISCHARGE: NOT AVAILABLE.

SENSITIVITY TO MECHANICAL IMPACT: NOT AVAILABLE.

HAZARDOUS COMBUSTION PRODUCTS:

OXIDES OF CARBON (CO_x).

HYDROCARBONS.

RATE OF BURNING: NOT AVAILABLE.

EXPLOSIVE POWER: CONTAINERS MAY RUPTURE IF EXPOSED TO HEAT OR FIRE.

SECTION 6: ACCIDENTAL RELEASE MEASURES

LEAK/SPILL:

CONTAIN THE SPILL.

PREVENT ENTRY INTO DRAINS, SEWERS, AND OTHER WATERWAYS.

WEAR APPROPRIATE PROTECTIVE EQUIPMENT.

SMALL AMOUNTS MAY BE FLUSHED TO SEWER WITH WATER.

SOAK UP WITH AN ABSORBENT MATERIAL.

PLACE IN APPROPRIATE CONTAINER FOR DISPOSAL.

NOTIFY THE APPROPRIATE AUTHORITIES AS REQUIRED.

SECTION 7: HANDLING AND STORAGE**HANDLING PROCEDURES AND EQUIPMENT:**

PROTECT AGAINST PHYSICAL DAMAGE.

AVOID BREATHING VAPORS/MISTS.

WEAR PERSONAL PROTECTIVE EQUIPMENT APPROPRIATE TO TASK.

WASH THOROUGHLY AFTER HANDLING.

KEEP OUT OF REACH OF CHILDREN.

AVOID CONTACT WITH SKIN, EYES AND CLOTHING.

AVOID EXTREME TEMPERATURES.

LAUNDER CONTAMINATED CLOTHING PRIOR TO REUSE.

STORAGE REQUIREMENTS:

STORE AWAY FROM INCOMPATIBLE MATERIALS.

KEEP CONTAINERS CLOSED WHEN NOT IN USE.

SECTION 8: EXPOSURE CONTROLS / PERSONAL PROTECTION**PRECAUTIONARY MEASURES:**

GLOVES/TYPE: WEAR APPROPRIATE GLOVES.

RESPIRATORY/TYPE: NONE REQUIRED UNDER NORMAL USE.

EYE/TYPE: SAFETY GLASSES RECOMMENDED.

FOOTWEAR/TYPE: SAFETY SHOES PER LOCAL REGULATIONS.

CLOTHING/TYPE: AS REQUIRED TO PREVENT SKIN CONTACT.

OTHER/TYPE:

EYE WASH FACILITY SHOULD BE IN CLOSE PROXIMITY.

EMERGENCY SHOWER SHOULD BE IN CLOSE PROXIMITY.

VENTILATION REQUIREMENTS: LOCAL EXHAUST AT POINTS OF EMISSION.

EXPOSURE LIMIT OF MATERIAL: NOT AVAILABLE.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE: LIQUID.

APPEARANCE & ODOR:

ODORLESS.

PALE YELLOW.

ODOR THRESHOLD (PPM): NOT AVAILABLE.

VAPOR PRESSURE (MMHg): @ 20 DEG. C (68 DEG. F). 17

VAPOR DENSITY (AIR=1): >1

VOLATILES (%) BY VOLUME: NOT AVAILABLE.

EVAPORATION RATE (BUTYL ACETATE = 1): <1.

BOILING POINT (DEG. C): 100 (212F)

FREEZING POINT (DEG. C): NOT AVAILABLE.

pH: 8.5

SPECIFIC GRAVITY @ 20 DEG. C (WATER = 1): 1.083

SOLUBILITY IN WATER (%): COMPLETE.

COEFFICIENT OF WATER\OIL DIST.: NOT AVAILABLE

VOC: NONE

CHEMICAL FAMILY: DETERGENT.

SECTION 10: STABILITY AND REACTIVITY

CHEMICAL STABILITY:

PRODUCT IS STABLE UNDER NORMAL HANDLING AND STORAGE CONDITIONS.

CONDITIONS OF INSTABILITY: EXTREME TEMPERATURES.

HAZARDOUS POLYMERIZATION: WILL NOT OCCUR.

INCOMPATIBLE SUBSTANCES:

STRONG ACIDS.

STRONG OXIDIZING AGENTS.

HAZARDOUS DECOMPOSITION PRODUCTS: SEE HAZARDOUS COMBUSTION PRODUCTS.

SECTION 11: TOXICOLOGICAL INFORMATION

LD50 OF PRODUCT, SPECIES & ROUTE: >5000 MG/KG RAT ORAL.

LC50 OF PRODUCT, SPECIES & ROUTE: NOT AVAILABLE.

SENSITIZATION TO PRODUCT: NOT AVAILABLE.

CARCINOGENIC EFFECTS: NOT LISTED AS A CARCINOGEN.

REPRODUCTIVE EFFECTS: NOT AVAILABLE.

TERATOGENICITY: NOT AVAILABLE.

MUTAGENICITY: NOT AVAILABLE.

SYNERGISTIC MATERIALS: NOT AVAILABLE.

SECTION 12: ECOLOGICAL INFORMATION

ENVIRONMENTAL TOXICITY: NO DATA AT THIS TIME.

ENVIRONMENTAL FATE: NO DATA AT THIS TIME.

SECTION 13: DISPOSAL CONSIDERATIONS

WASTE DISPOSAL: IN ACCORDANCE WITH LOCAL AND FEDERAL REGULATIONS.

SECTION 14: TRANSPORT INFORMATION

D.O.T. CLASSIFICATION: NOT REGULATED.

SPECIAL SHIPPING INFORMATION: NOT REGULATED.

SECTION 15: REGULATORY INFORMATION

CANADIAN REGULATORY INFORMATION:

WHMIS CLASSIFICATION: NOT CONTROLLED.

DSL STATUS: NOT AVAILABLE.

USA REGULATORY INFORMATION:

SARA HAZARD CATEGORIES SECTIONS 311/312:

IMMEDIATE (ACUTE) HEALTH HAZARD: NO.

DELAYED (CHRONIC) HEALTH HAZARD: NO.

FIRE HAZARD: NO.

SUDDEN RELEASE OF PRESSURE: NO.

REACTIVE: NO.

SARA SECTION 313: NONE

TSCA INVENTORY:

ALL COMPONENTS OF THIS PRODUCT ARE LISTED ON THE TSCA INVENTORY.

NFPA:

HEALTH HAZARD 1

FLAMMABILITY 0

REACTIVITY 0

HMIS:

HEALTH HAZARD 1

FLAMMABILITY 0

PHYSICAL HAZARD 0

PPE A

SECTION 16: OTHER INFORMATION

SUPPLIER MSDS DATE: 2006/07/14

DATA PREPARED BY:
GLOBAL SAFETY MANAGEMENT
3340 PEACHTREE ROAD, #1800
ATLANTA, GA 30326

PHONE: 877-683-7460

FAX: (877) 683-7462

WEB: WWW.GLOBALSAFETYNET.COM

EMAIL: INFO@GLOBALSAFETYNET.COM.

GENERAL NOTE:
THIS MATERIAL SAFETY DATA SHEET WAS PREPARED FROM INFORMATION OBTAINED FROM
VARIOUS SOURCES, INCLUDING PRODUCT SUPPLIERS AND THE CANADIAN CENTER FOR
OCCUPATIONAL HEALTH AND SAFETY.

MS 01.40.01.01.06.1

ACCURATE GAS
METHANE **Revised:****MSDS Contents**

HEALTH HAZARD DATA
PHYSICAL DATA
FIRE AND EXPLOSION HAZARD DATA
REACTIVITY DATA
SPILL OR LEAK PROCEDURES
SPECIAL PROTECTION INFORMATION
SPECIAL PRECAUTIONS*

ACCURATE GAS, INC.

A SUBSIDIARY OF SHELTON INDUSTRIAL EQUIPMENT, INC
P.O. BOX 800
JACKSONVILLE, AL 36265

SPECIALTY GAS

MATERIAL SAFETY DATA SHEET

PRODUCT NAME: METHANE

TELEPHONE (205) 435-4680
EMERGENCY RESPONSE INFORMATION AT END OF DOCUMENT

ACCURATE GAS, INC.
110 NORTH CHINABEE STREET
P.O. BOX 800
JACKSONVILLE, AL 36265
ISSUE DATE AND REVISIONS:

TRADE NAME AND SYNONYMS: METHANE
CHEMICAL NAME AND SYNONYMS: METHANE, METHYL HYDRIDE, MARSH GAS
FORMULA: CH₄
MOLECULAR WEIGHT: 16.01

CAS NUMBER 74-82-8
CHEMICAL FAMILY: ALIPHATIC HYDROCARBON

HEALTH HAZARD DATA

TIME WEIGHTED AVERAGE EXPOSURE LIMIT:
METHANE IS DEFINED AS A SIMPLE ASPHYXIAN. OXYGEN LEVELS SHOULD BE MAINTAINED AT GREATER THAN 18 MOLAR PERCENT AT NORMAL ATMOSPHERIC PRESSURE WHICH IS EQUIVALENT TO A PARTIAL PRESSURE OF 135 MM HG. (ACGIH 1984-1985).

SYMPTOMS OF EXPOSURE**INHALATION:**

HIGH CONCENTRATIONS OF METHANE SO AS TO EXCLUDE AN ADEQUATE SUPPLY OF OXYGEN TO THE LUNGS CAUSES DIZZINESS, DEEPER BREATHING DUE TO AIR HUNGER, POSSIBLE NAUSEA AND EVENTUAL UNCONSCIOUSNESS.

SKIN CONTACT:

CONTACT WITH CRYOGENIC LIQUID METHANE CAUSES CRYOGENIC "BURNS" OR FROSTBITE OF DERMAL TISSUE.

TOXICOLOGICAL PROPERTIES

METHANE IS INACTIVE BIOLOGICALLY AND ESSENTIALLY NONTOXIC; THEREFORE, THE MAJOR PROPERTY IS THE EXCLUSION OF AN ADEQUATE SUPPLY OF OXYGEN TO THE LUNGS.

FROSTBITE EFFECTS ARE A CHANGE IN COLOR OF THE SKIN TO GRAY OR WHITE POSSIBLY FOLLOWED BY BLISTERING.

LISTED AS CARCINOGEN OR POTENTIAL CARCINOGEN

NATIONAL TOXICOLOGY PROGRAM: YES ()
NO (X)

I.A.R.C. MONOGRAPHS: YES ()
NO (X)

OSHA: YES ()
NO (X)

RECOMMENDED FIRST AID TREATMENT

PROMPT MEDICAL ATTENTION IS MANDATORY IN ALL CASES OF OVEREXPOSURE TO METHANE. RESCUE PERSONNEL SHOULD BE EQUIPPED WITH SELF-CONTAINED BREATHING APPARATUS AND BE COGNIZANT OF EXTREME FIRE AND EXPLOSION HAZARD.

INHALATION:

CONSCIOUS PERSONS SHOULD BE ASSISTED TO AN UNCONTAMINATED AREA AND INHALE FRESH AIR. QUICK REMOVAL FROM THE CONTAMINATED AREA IS MOST IMPORTANT. UNCONSCIOUS PERSONS SHOULD BE MOVED TO AN UNCONTAMINATED AREA, GIVEN MOUTH-TO-MOUTH RESUSCITATION AND SUPPLEMENTAL OXYGEN. MEDICAL ASSISTANCE SHOULD BE SOUGHT IMMEDIATELY.

DERMAL CONTACT OR FROSTBITE:

REMOVE CONTAMINATED CLOTHING AND FLUSH AFFECTED AREAS WITH LUKEWARM WATER. DO NOT USE HOT WATER. A PHYSICIAN SHOULD SEE THE PATIENT PROMPTLY IF THE CRYOGENIC "BURN" HAS RESULTED IN BLISTERING OF THE DERMAL SURFACE OR DEEP TISSUE FREEZING.

HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES
FORMS EXPLOSIVE OR FLAMMABLE MIXTURES WITH MOST OXIDIZERS (OXYGEN, CHLORINE, FLUORIDE, ETC).

IS FLAMMABLE OVER A WIDE RANGE IN AIR.

PHYSICAL DATA

BOILING POINT

-258.74 DEG. F (-161.52 DEG. C)

LIQUID DENSITY AT BOILING POINT

26.383 LB/FT³ (422.62 KG/M³)

VAPOR PRESSURE

@ 70 DEG F (21.1 DEG C) ABOVE THE CRITICAL TEMPERATURE
OF -116.6 DEG. F (-82.6 DEG. C)

GAS DENSITY AT 70 DEG. F, 1 ATM
.041 LB/FT3 (.657 KG/M3)

SOLUBILITY IN WATER @ 68 DEG. F (20 DEG. C): BUNSEN COEFFICIENT = .035

FREEZING POINT: -296.45 DEG. F (-182.47 DEG. C)

APPEARANCE AND ODOR: COLORLESS, ODORLESS GAS, LIQUID IS WATER WHITE.

SPECIFIC GRAVITY @ 70 DEG. F (AIR = 1.0) IS .55.

FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (METHOD USED): -306 DEG. F (-188 DEG. C) CLOSED CUP

AUTO IGNITION TEMPERATURE: 1076 DEG. F (580 DEG. C)

FLAMMABLE LIMITS % BY VOLUME: LEL = 5 UEL = 15

EXTINGUISHING MEDIA: WATER, CARBON DIOXIDE, DRY CHEMICAL

ELECTRICAL CLASSIFICATION: CLASS 1, GROUP D

SPECIAL FIRE FIGHTING PROCEDURES: IF POSSIBLE, STOP THE FLOW OF METHANE. USE WATER SPRAY TO COOL SURROUNDING CONTAINERS.

UNUSUAL FIRE AND EXPLOSION HAZARDS: SHOULD FLAME BE EXTINGUISHED AND FLOW OF GAS CONTINUE, INCREASE VENTILATION TO PREVENT FLAMMABLE OR EXPLOSIVE MIXTURE FORMATION.

REACTIVITY DATA

STABILITY CONDITIONS TO AVOID:
UNSTABLE
STABLE X

INCOMPATIBILITY (MATERIALS TO AVOID): OXIDIZERS

HAZARDOUS DECOMPOSITION PRODUCTS: NONE

HAZARDOUS POLYMERIZATION CONDITIONS TO AVOID
MAY OCCUR
WILL NOT OCCUR X

SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED:
EVACUATE ALL PERSONNEL FROM AFFECTED AREA. USE APPROPRIATE PROTECTIVE EQUIPMENT.
IF LEAK IS IN USER'S EQUIPMENT, BE CERTAIN TO PURGE PIPING WITH AN INERT GAS
PRIOR TO ATTEMPTING REPAIRS. IF LEAK IN THE CONTAINER OR VALVE, CONTACT ACCURATE
GAS, INC.

WASTE DISPOSAL METHOD:

DO NOT ATTEMPT TO DISPOSE OF WASTE OR UNUSED QUANTITIES. FOR EMERGENCY DISPOSAL, CONTACT ACCURATE GAS, INC.

SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (SPECIFY TYPE):

POSITIVE PRESSURE AIR LINE WITH MASK OR SELF-CONTAINED BREATHING APPARATUS SHOULD BE AVAILABLE FOR EMERGENCY USE.

VENTILATION

HOOD WITH FORCED VENTILATION

LOCAL EXHAUST

TO PREVENT ACCUMULATION ABOVE THE LEL

SPECIAL

MECHANICAL (GEN.)

IN ACCORDANCE WITH ELECTRICAL CODES

OTHER

PROTECTIVE GLOVES

PLASTIC OR RUBBER

EYE PROTECTION

SAFETY GOGGLES OR GLASSES

OTHER PROTECTIVE EQUIPMENT

SAFETY SHOES, SAFETY SHOWER, EYEWASH "FOUNTAIN"

SPECIAL PRECAUTIONS*

SPECIAL LABELING INFORMATION

DOT SHIPPING NAME: METHANE DOT HAZARD CLASS: FLAMMABLE GAS

DOT SHIPPING LABEL: FLAMMABLE GAS ID NO.: UN 1971

FOR CRYOGENIC LIQUID METHANE:

DOT SHIPPING NAME: METHANE, REFRIGERATED LIQUID

DOT SHIPPING LABEL: FLAMMABLE GAS

DOT HAZARD CLASS: FLAMMABLE GAS

I.D. NO.: UN1972

SPECIAL HANDLING RECOMMENDATIONS:

USE ONLY IN WELL-VENTILATED AREAS. VALVE PROTECTION CAPS MUST REMAIN IN PLACE UNLESS CONTAINER IS SECURED WITH VALVE OUTLET PIPED TO USE POINT. DO NOT DRAG, SLIDE OR ROLL CYLINDERS. USE A SUITABLE HAND TRUCK FOR CYLINDER MOVEMENT. USE A PRESSURE REDUCING REGULATOR WHEN CONNECTING CYLINDER TO LOWER PRESSURE (<3,000 PSIG) PIPING OR SYSTEMS. DO NOT HEAT CYLINDER BY ANY MEANS TO INCREASE THE DISCHARGE RATE OF PRODUCT FROM THE CYLINDER. USE A CHECK VALVE OR TRAP IN THE

DISCHARGE LINE TO PREVENT HAZARDOUS BACK FLOW INTO THE CYLINDER.

FOR ADDITIONAL HANDLING RECOMMENDATIONS, CONSULT L'AIR LIQUIDE'S ENCYCLOPEDIA DE GAZ OR COMPRESSED GAS ASSOCIATION PAMPHLET P-1

SPECIAL STORAGE RECOMMENDATIONS:

PROTECT CYLINDERS FROM PHYSICAL DAMAGE. STORE IN COOL, DRY, WELL-VENTILATED AREA OF NON-COMBUSTIBLE CONSTRUCTION AWAY FROM HEAVILY TRAFFICKED AREAS AND EMERGENCY EXITS. DO NOT ALLOW THE TEMPERATURE WHERE CYLINDERS ARE STORED TO EXCEED 130F (54C). CYLINDERS SHOULD BE STORED UPRIGHT AND FIRMLY SECURED TO PREVENT FALLING OR BEING KNOCKED OVER. FULL AND EMPTY CYLINDERS SHOULD BE SEGREGATED. USE A "FIRST IN-FIRST OUT" INVENTORY SYSTEM TO PREVENT FULL CYLINDERS BEING STORED FOR EXCESSIVE PERIODS OF TIME. POST "NO SMOKING OR OPEN FLAMES" SIGNS IN THE STORAGE OR USE AREA. THERE SHOULD BE NO SOURCES OF IGNITION IN THE STORAGE OR USE AREA.

FOR ADDITIONAL STORAGE RECOMMENDATIONS CONSULT L'AIR LIQUIDE'S ENCYCLOPEDIA DE GAZ OR COMPRESSED GAS ASSOCIATION'S PAMPHLETS P-1.

SPECIAL PACKAGING RECOMMENDATIONS

METHANE IS NONCORROSIVE AND MAY BE USED WITH ANY COMMON STRUCTURAL MATERIAL.

OTHER RECOMMENDATIONS OR PRECAUTIONS

EARTH-GROUND AND BOND ALL LINES AND EQUIPMENT ASSOCIATED WITH THE METHANE SYSTEM. ELECTRICAL EQUIPMENT SHOULD BE NON-SPARKING OR EXPLOSION PROOF. COMPRESSED GAS CYLINDERS SHOULD NOT BE REFILLED EXCEPT BY QUALIFIED PRODUCERS OF COMPRESSED GASES. SHIPMENT OF A COMPRESSED GAS CYLINDER WHICH HAS NOT BEEN FILLED BY THE OWNER OR WITH HIS (WRITTEN) CONSENT IS A VIOLATION OF FEDERAL LAW (49 CFR).

*VARIOUS GOVERNMENT AGENCIES (I.E., DEPARTMENT OF TRANSPORTATION, OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION, FOOD AND DRUG ADMINISTRATION AND OTHERS) MAY HAVE SPECIFIC REGULATIONS CONCERNING THE TRANSPORTATION, HANDLING, STORAGE OR USE OF THIS PRODUCT WHICH MAY NOT BE CONTAINED HEREIN. THE CUSTOMER OR USER OF THIS PRODUCT SHOULD BE FAMILIAR WITH THESE REGULATIONS.

EMERGENCY RESPONSE INFORMATION

IN CASE OF EMERGENCY INVOLVING THIS MATERIAL, CALL DAY OR NIGHT (205) 435-4680

JUDGEMENTS AS TO THE SUITABILITY OF INFORMATION HEREIN FOR PURCHASER'S PURPOSES ARE NECESSARILY PURCHASER'S RESPONSIBILITY. THEREFORE, ALTHOUGH REASONABLE CARE HAS BEEN TAKEN IN THE PREPARATION OF SUCH INFORMATION, ACCURATE GAS, INC. EXTENDS NO WARRANTIES, MAKES NO REPRESENTATIONS, AND ASSUMES NO RESPONSIBILITY AS TO THE ACCURACY OR SUITABILITY OF SUCH INFORMATION FOR APPLICATION TO PURCHASER'S INTENDED PURPOSES OR CONSEQUENCES OF ITS USE. SINCE ACCURATE GAS, INC. HAS NO CONTROL OVER THE USE OF THIS PRODUCT, IT ASSUMES NO LIABILITY FOR DAMAGE OR LOSS OF PRODUCT RESULTING FROM PROPER (OR IMPROPER) USE OR APPLICATION OF THE PRODUCT. DATA SHEETS MAY BE CHANGED FROM TIME TO TIME. BE SURE TO CONSULT THE LATEST EDITION.

**ALL PURE CHEMICAL
HYDROCHLORIC ACID****Revised: 12/01/1992****MSDS Contents**

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MATERIAL SAFETY DATA SHEET

ALL PURE CHEMICAL COMPANY
1660 W. LINNE ROAD
TRACY, CALIFORNIA 95376

HYDROCHLORIC ACID

THIS INFORMATION IS REQUIRED TO BE DISCLOSED FOR SAFETY IN THE WORKPLACE.
THIS MSDS HAS BEEN PREPARED WITHIN THE GUIDELINES OF THE FEDERAL OSHA
HAZARD COMMUNICATION STANDARD, 29CFR 1910.1200. HYDROCHLORIC ACID MAY BE
A HAZARDOUS CHEMICAL UNDER THESE STANDARDS.

I. PRODUCT IDENTIFICATION

REVISED: DECEMBER 1992

FORMULA: HCl

SYNONYMS/COMMON NAMES: MURIATIC ACID, HYDROGEN CHLORIDE

CAS NUMBER: 7647-01-0

DOT PROPER SHIPPING NAME: HYDROCHLORIC ACID

DOT HAZARD CLASS: CORROSIVE MATERIAL

DOT I.D. NUMBER: UN1789

DOT HAZARDOUS SUBSTANCE: RQ = 5,000 LBS.

ANSI/NSF STANDARD 60 MAXIMUM USE: 40 MG/L

II. PHYSICAL DATA

APPEARANCE AND ODOR: CLEAR, SLIGHTLY YELLOW LIQUID; SHARP PENETRATING, IRRITATING ORDER

FREEZING POINT: -49.3 DEG F 20 DEG Be 1 (-45 DEG C); -29.2 DEG F (-34 DEG C) 22 DEG Be 1

BOILING POINT: 230 DEG F (110 DEG C) (20-25%HCl)

VAPOR PRESSURE: (32% HCl) 5.7 mmHg AT 32 DEG F (0 DEG C)
25.8 MM HG AT 70 DEG. F (21.1 DEG.C); 72.6 MM HG AT 99.9 DEG. F
(37.7 DEG.C)

WATER SOLUBILITY: SOLUBLE IN ALCOHOLS & ALDEHYDES. MISCIBLE WITH WATER IN ALL PROPORTIONS.

MOLECULAR WEIGHT: 36.46 (SOLUTE)

SPECIFIC GRAVITY: (H2O = 1) 20 Be1; 1.18 22 Be1

pH : LESS THAN 1

III. FIRE AND EXPLOSION DATA

FLASH POINT: N/A

AUTOIGNITION TEMPERATURE: N/A

EXTINGUISHING MEDIA: N/A

THE ACID ITSELF IS NOT FLAMMABLE. HOWEVER, HIGHER CONCENTRATIONS MAY CAUSE NEARBY COMBUSTIBLE LIQUIDS AND SOLIDS TO IGNITE UPON CONTACT.

CONTACT WITH COMMON METALS WILL EVOLVE FLAMMABLE AND POTENTIALLY EXPLOSIVE HYDROGEN GAS. THE RATE OF HYDROGEN GENERATION INCREASES WITH DECREASING ACID CONCENTRATION.

CONCENTRATED VAPORS OF HYDROCHLORIC ACID ARE EXTREMELY IRRITATING TO THE RESPIRATORY TRACT AND MAY CAUSE BREATHING DIFFICULTY AND PULMONARY EDEMA.

PREVENT HUMAN EXPOSURE TO FIRE, SMOKE, FUMES OR PRODUCT OF COMBUSTION. EVACUATE NON-ESSENTIAL PERSONNEL FROM THE FIRE AREA. MAINTAIN A SAFE DISTANCE FROM THE FIRE AND STORAGE AREA BECAUSE EXCESSIVE HEAT MAY CAUSE TANK OR VESSEL TO RUPTURE.

WEAR FULL-FACE, SELF-CONTAINED BREATHING APPARATUS AND IMPERVIOUS CLOTHING (SUCH AS GLOVES, HOODS, SUITS, AND RUBBER BOOTS).

USE WATER SPRAY TO COOL CONTAINERS EXPOSED TO FIRE. USE WATER WITH EXTREME CAUTION. UNDER NO CIRCUMSTANCES SHOULD WATER OR OTHER LIQUID BE INTRODUCED INTO ACID TANKS. TAKE CARE NOT TO IGNITE HYDROGEN GAS WHICH CAN ACCUMULATE INSIDE METAL TANKS CONTAINING ACID.

ANY CONTAMINATED EQUIPMENT, BUILDINGS, OR AREAS MUST BE PROPERLY DECONTAMINATED BEFORE USAGE.

IV. SPILL OR LEAK HANDLING

IN CASE OF AN EMERGENCY, CALL CHEMTREC (800) 424-9300

REPORTABLE QUANTITY PER 40 CFR 302.4 IS 5,000 LBS.

ANY PERSON ENTERING EITHER A SIGNIFICANT SPILL AREA OR AN UNKNOWN CONCENTRATION OF A VAPOR OR MIST, SHOULD USE A POSITIVE-PRESSURE, SELF CONTAINED BREATHING APPARATUS OR A POSITIVE-PRESSURE, SUPPLIED-AIR RESPIRATOR WITH ESCAPE PACK.

SMALL SPILLS CAN BE HANDLED ROUTINELY. USE ADEQUATE VENTILATION AND/OR WEAR A NIOSH-APPROVED MIST FILTER, ACID GAS CARTRIDGE RESPIRATOR TO PREVENT INHALATION EXPOSURE. WEAR PROTECTIVE CLOTHING TO PREVENT SKIN AND EYE CONTACT. USE THE FOLLOWING PROCEDURES.

ANY LEAK OCCURRING IN PIPELINES OR EQUIPMENT SHOULD BE CONSIDERED AN ACID LEAK AND TREATED WITH EXTREME CAUTION UNTIL THE LEAK IS PROVEN NOT TO BE AN ACID LEAK. ALL CONTAMINATED AREAS SHOULD BE IMMEDIATELY ZONED OFF TO AVOID PERSONNEL EXPOSURE TO THE ACID SPRAY OR STREAM. ADJUST ALL APPROPRIATE VALVES TO ISOLATE THE SYSTEM AND STOP FURTHER LEAKAGE.

THE CONTAMINATED AREA SHOULD BE COVERED WITH SODIUM BICARBONATE, SODA ASH, OR LIME, TAKING CARE TO AVOID ANY FOAMING OR SPLATTERING THAT MAY OCCUR FROM THE NEUTRALIZATION REACTION OF THE ACID WITH THESE MATERIALS. DIKING MAY BE ADVISABLE TO HELP CONTAIN THE LIQUID SPILL. MAKE SURE ALL LIQUID HAS BEEN THOROUGHLY CONTACTED AND ABSORBED BY THE DRY MATERIALS. TRANSFER ABSORBED SPILL MATERIAL AND ANY CONTAMINATED UNDERLYING SOIL TO A SUITABLE CHEMICAL WASTE CONTAINER. DISPOSE OF CONTAINER AND CONTENTS IN COMPLIANCE WITH ALL FEDERAL, STATE, AND LOCAL REGULATIONS.

WASHING DOWN OF SPILLS WITH WATER IS NOT RECOMMENDED, AS THIS TENDS TO SPREAD THE CONTAMINATION AND INCREASES THE LIKELIHOOD OF PERCOLATING THE ACID DOWN THROUGH THE SOIL AND/OR OF UNCONTROLLED FLOW OF ACID INTO SEWERS, STREAMS, OR OTHER WATERS. HYDROCHLORIC ACID LEAKS, SPILLS, OR DRAININGS MUST NOT COME IN CONTACT WITH ANY ACID SOLUBLE SULFIDE WASTES (SUCH AS SEWERS) BECAUSE OF THE DANGER OF EVOLVING HYDROGEN SULFIDE GAS.

LARGE SPILLS SHOULD BE HANDLED ACCORDING TO A PREDETERMINED PLAN.

V. PROTECTIVE EQUIPMENT REQUIREMENTS

NORMALLY, RESPIRATORY PROTECTION IS NOT NEEDED SINCE THE VOLATILITY AND TOXICITY ARE LOW. HOWEVER, IF MISTS, VAPORS OR AEROSOLS ARE GENERATED, WEAR A NIOSH/MSHA RESPIRATOR APPROVED FOR DUSTS AND MISTS. PROTECTIVE CLOTHING (GLOVES, BOOTS, APRONS, AND PROTECTIVE SUIT) SHOULD BE MADE OF NEOPRENE, VINYL OR RUBBER AND A FACE SHIELD IS NECESSARY.

VENTILATION REQUIREMENTS: USE GENERAL EXHAUST VENTILATION UNLESS VAPORS, MISTS OR AEROSOLS ARE GENERATED. IF VAPORS, MISTS, OR AEROSOLS ARE PRESENT LOCAL EXHAUST VENTILATION IS RECOMMENDED.

RESPIRATORY REQUIREMENTS: IF VAPORS, MISTS, OR AEROSOLS ARE GENERATED, WEAR A NIOSH/MSHA APPROVED RESPIRATOR. RESPIRATOR PROTECTION IS NOT NORMALLY NEEDED SINCE THE VOLATILITY IS LOW.

VI. HANDLING AND STORAGE

CONTAINERS SHOULD BE STORED IN A COOL, DRY, WELL VENTILATED AREA AWAY FROM NON-COMPATIBLE, REACTIVE, AND FLAMMABLE MATERIALS AND SOURCES OF HEAT OR FLAME ABOVE 100 F. DO NOT EXPOSE TO DIRECT SUNLIGHT.

THIS PRODUCT IS STABLE AND HAS A SHELF LIFE OF ONE YEAR. IT IS HIGHLY CORROSIVE TO MOST METALS WITH EVOLUTION OF HIGHLY FLAMMABLE AND POTENTIALLY EXPLOSIVE HYDROGEN GAS. CONSIDERATION SHOULD BE GIVEN TO THE USE OF TANTALUM, ZIRCONIUM, CERTAIN OF THE HASTELLOY1 BRAND AND CHLORIMET2 BRAND ALLOYS AND GLASSED STEEL IN HANDLING THE MATERIAL. NON-METALLICS TO BE CONSIDERED INCLUDE RUBBER, POLYVINYLCHLORIDE, POLYETHYLENE, POLYPROPYLENE AND FIBERGLASS REINFORCED POLYESTERS WITHIN THEIR RESPECTIVE TEMPERATURE LIMITS.

VII. TOXICOLOGY

THIS MATERIAL MAY BE FATAL IF SWALLOWED AND IS HARMFUL IF IT IS CONTACTED BY THE SKIN OR EYES. HARMFUL IF INHALED. THE REPORTED ODOR THRESHOLD IS 1 PART PER MILLION (PPM) IN THE AIR. ITS IRRITATION THRESHOLD IS 1-5 PPM IN THE AIR.

INHALATION: REPEATED OR PROLONGED EXPOSURE TO CONCENTRATIONS GREATER THAN ACCEPTED OCCUPATIONAL LIMITS MAY CAUSE DENTAL DISCOLORATION AND EROSION OF THE TEETH. INHALATION OF THE MIST OR VAPOR OF HYDROGEN CHLORIDE GAS MAY CAUSE IRRITATION OF THE MUCUS MEMBRANES AND RESPIRATORY TRACT WITH SYMPTOMS OF BURNING, CHOKING, AND COUGHING. AT EXPOSURE CONCENTRATIONS GREATER THAN THE TLV, DAMAGE MAY OCCUR TO THE MUCOUS MEMBRANES (ULCERATION OF THE NOSE AND THROAT) AND RESPIRATORY TRACT. AT THESE HIGH CONCENTRATIONS, SEVERE BREATHING DIFFICULTIES MAY OCCUR WHICH MAY BE DELAYED IN ONSET AND MAY BE DUE TO PULMONARY EDEMA (FLUID IN THE LUNG) OR LARYNGEAL EDEMA OR SPASM.

SKIN CONTACT: DIRECT CONTACT OF THE LIQUID WILL BE CORROSIVE TO THE SKIN, WITH THE POTENTIAL FOR SCARRING AND ULCERATION OF THE CONTACTED TISSUE. HYDROCHLORIC ACID MIST MAY RAPIDLY CAUSE SKIN INFLAMMATION AND BURNS. REPEATED CONTACT WITH THE MIST HAS BEEN REPORTED TO CAUSE A CONTACT DERMATITIS (SKIN RASH).

EYE CONTACT: EYE IRRITATION AND/OR SEVERE BURNS WITH PERMANENT DAMAGE AND POSSIBLE LOSS OF SIGHT MAY RESULT IF EXPOSED TO THE MIST. DIRECT CONTACT WITH THIS LIQUID WILL RESULT IN CORROSION TO THE EYE WITH RESULTING SEVERE BURNS, POTENTIAL VISUAL IMPAIRMENT OR LOSS OF SIGHT.

INGESTION: THERE IS NO DATA AVAILABLE ON THE POTENTIAL EFFECTS FROM REPEATED EXPOSURE BY THIS ROUTE AS THE LIKELIHOOD OF THIS OCCURRING IS LOW BECAUSE OF THE CORROSIVE NATURE OF THE CHEMICAL. INGESTION MAY RESULT IN BURNS OF THE MOUTH, THROAT AND STOMACH, PAIN, NAUSEA, VOMITING, AND POSSIBLY DEATH DUE TO ESOPHAGEAL OR GASTRIC NECROSIS.

EXPOSURE LIMIT INFORMATION: THE FEDERAL OSHA PERMISSIBLE EXPOSURE LIMIT (PEL) IS A CEILING LIMIT OF 5 PPM (7 MG/M3) FOR HYDROGEN CHLORIDE (29 CFR 1910.1000).

THE AMERICAN CONFERENCE OF GOVERNMENTAL INDUSTRIAL HYGIENISTS (ACGIH, 1992) HAS RECOMMENDED A THRESHOLD LIMIT VALUE (TLV) FOR HYDROGEN CHLORIDE OF 7.5 MG/M3.

VIII. FIRST AID

SHOULD AN EXPOSURE OCCUR OR BE SUSPECTED, IMMEDIATELY START THE RECOMMENDED PROCEDURE BELOW. SIMULTANEOUSLY CONTACT A POISON CONTROL CENTER, A PHYSICIAN OR THE NEAREST HOSPITAL. INFORM THE PERSON CONTACTED OF THE TYPE AND EXTENT OF EXPOSURE, DESCRIBE THE VICTIM'S SYMPTOMS AND FOLLOW THE ADVICE GIVEN.

INGESTION: IF SWALLOWED, IMMEDIATELY GIVE SEVERAL GLASSES OF WATER BUT DO NOT INDUCE VOMITING. THIS MATERIAL IS CORROSIVE. IF VOMITING DOES OCCUR, GIVE FLUIDS AGAIN. HAVE A PHYSICIAN DETERMINE IF CONDITION OF PATIENT WILL PERMIT INDUCTION OF VOMITING OR EVACUATION OF STOMACH. DO NOT GIVE ANYTHING BY MOUTH TO AN UNCONSCIOUS OR CONVULSING PERSON.

SKIN CONTACT: USING A DRY CLOTH, IMMEDIATELY WIPE AWAY EXCESS MATERIAL FROM SKIN AND REMOVE ALL CONTAMINATED CLOTHING AND SHOES. UNDER A SAFETY SHOWER, FLUSH ALL AFFECTED AREAS THOROUGHLY WITH LARGE AMOUNTS OF RUNNING WATER FOR AT LEAST 15 MINUTES. DO NOT ATTEMPT TO NEUTRALIZE WITH CHEMICAL AGENTS. GET MEDICAL ATTENTION IMMEDIATELY. PROPERLY DISCARD CONTAMINATED CLOTHING AND SHOES.

EYE CONTACT: IMMEDIATELY FLUSH THE EYES WITH LARGE QUANTITIES OF RUNNING WATER FOR A MINIMUM OF 15 MINUTES. HOLD THE EYELIDS APART DURING THE FLUSHING TO ENSURE RINSING OF THE ENTIRE SURFACE OF THE EYE AND LIDS WITH WATER. DO NOT ATTEMPT TO NEUTRALIZE WITH CHEMICAL AGENTS. OBTAIN MEDICAL ATTENTION AS SOON AS POSSIBLE. OILS OR OINTMENTS SHOULD NOT BE USED AT THIS TIME. CONTINUE THE FLUSHING FOR AN ADDITIONAL 15 MINUTES IF A PHYSICIAN IS NOT IMMEDIATELY AVAILABLE.

INHALATION: IF INHALED, REMOVE TO FRESH AIR. IF NOT BREATHING, CLEAR VICTIM'S AIRWAY AND APPLY ARTIFICIAL RESPIRATION. IF VICTIM IS BREATHING, OXYGEN MAY BE GIVEN FROM A DEMAND-TYPE OR CONTINUOUS-FLOW INHALER, PREFERABLY WITH A PHYSICIAN'S ADVICE. GET MEDICAL ATTENTION IMMEDIATELY.

IX. REACTIVITY DATA

THIS PRODUCT IS INCOMPATIBLE WITH ALKALINE MATERIALS, ALUMINUM, AMINES, CARBONATES, IRON, SULFURIC ACID, HYDROXIDES, LEATHER AND OTHER FABRICS, METALLIC OXIDES, MAGNESIUM, OLEUM, PERCHLORIC ACID, AND ZINC. HYDROGEN GAS MAY BECOME FLAMMABLE BY REACTION WITH MANY METALS. CHLORINE GAS IS RELEASED BY REACTION WITH OXIDIZING AGENTS. DO NOT EXPOSE TO HEAT OR DIRECT SUNLIGHT.

X. TRANSPORTATION DATA

UNDER THE HAZARDOUS MATERIALS TABLE 49 CFR 172.101 HYDROCHLORIC ACID IS A CORROSIVE MATERIAL, UN 1789, AND IS REGULATED AS A DOT HAZARDOUS

MATERIAL. 49 CFR 172.101 APPENDIX, STATES THAT THE REPORTABLE QUANTITY (RQ) OF A SPILL OR LEAK OF HYDROCHLORIC ACID IS 5,000 POUNDS AND MUST BE REPORTED IMMEDIATELY AT OR ABOVE THIS LIMIT.

THE ABOVE MATERIAL IS SUBJECT UNDER 49 CFR 173.244 AND 173.263, TO THE U.S. DOT HAZARDOUS MATERIALS REGULATIONS BY THE MODES AND PACKAGING QUANTITIES STATED BELOW:

RAIL - BULK AND NON-BULK
MOTOR - BULK AND NON-BULK
WATER - BULK AND NON-BULK
AIR - BULK AND NON-BULK

XI. DISPOSAL

IF THIS PRODUCT BECOMES A HAZARDOUS WASTE, IT MEETS THE CRITERIA OF A HAZARDOUS WASTE AS DEFINED UNDER 40 CFR 261.

IF THIS PRODUCT BECOMES A HAZARDOUS WASTE, IT WILL BE HAZARDOUS WASTE WHICH IS SUBJECT TO THE LAND DISPOSAL RESTRICTIONS UNDER 40 CFR 268 AND MUST BE MANAGED ACCORDINGLY.

IF THIS MATERIAL BECOMES HAZARDOUS WASTE, IT MUST BE DISPOSED OF IN ACCORDANCE WITH LOCAL, STATE AND FEDERAL REGULATIONS IN A PERMITTED HAZARDOUS WASTE TREATMENT, STORAGE AND DISPOSAL FACILITY IN COMPLIANCE WITH 40 CFR 268.

IT IS THE RESPONSIBILITY OF THE USER TO DISPOSE OF UNUSED MATERIAL, RESIDUES AND CONTAINERS IN COMPLIANCE WITH ALL RELEVANT LOCAL, STATE, AND FEDERAL LAWS AND REGULATIONS REGARDING TREATMENT, STORAGE, AND DISPOSAL FOR HAZARDOUS AND NON-HAZARDOUS WASTES.

XII. ADDITIONAL REGULATORY STATUS INFORMATION

XIII. ADDITIONAL INFORMATION

THIS PRODUCT IS CERTIFIED BY THE NATIONAL SANITATION FOUNDATION (NSF)

ALL INFORMATION IS OFFERED IN GOOD FAITH, WITHOUT GUARANTEE OR OBLIGATION FOR THE ACCURACY OR SUFFICIENCY THEREOF, OR THE RESULTS OBTAINED, AND IS ACCEPTED AT USER'S RISK. THE USES REFERRED TO ARE FOR THE PURPOSE OF ILLUSTRATION ONLY. USER SHOULD INVESTIGATE AND ESTABLISH THE SUITABILITY OF SUCH USE(S) IN EVERY CASE. NOTHING HEREIN SHALL BE CONSTRUED AS A RECOMMENDATION FOR USES WHICH INFRINGE VALID PATENTS OR AS EXTENDING LICENSE UNDER VALID PATENTS.

XIV. SOURCE OF REFERENCES

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FOR FURTHER INFORMATION CONTACT:

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TRACY, CALIFORNIA 95376

TEL. (209) 835-5423

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ALL PURE

ALL PURE CHEMICAL COMPANY

AGA GAS**HYDROGEN, COMPRESSED; (D.O.T); WATER GAS****Revised: 01/01/1995****MSDS Contents**

HEALTH HAZARD DATA

HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS OR GASES:

PHYSICAL DATA

FIRE AND EXPLOSION HAZARD DATA

REACTIVITY DATA

SPILL OR LEAK PROCEDURES

SPECIAL PROTECTION INFORMATION

SPECIAL PRECAUTIONS*

MATERIAL SAFETY DATA SHEET

AGA

AGA GAS, INC. (216) 642-6600
6225 OAKTREE BOULEVARD
P.O. BOX 94737
CLEVELAND, OH 44101-4737

PRODUCT NAME: HYDROGEN

TRADE NAME AND SYNONYMS: HYDROGEN, COMPRESSED; (D.O.T); WATER GAS

CHEMICAL NAME AND SYNONYMS: HYDROGEN; NORMAL HYDROGEN

ISSUE DATE AND REVISIONS: REVISED JANUARY 1995

CAS# 1333-74-0

DOT I.D. NO: UN 1049

DOT HAZARD CLASS: DIVISION 2.1

FORMULA: H₂

CHEMICAL FAMILY: INORGANIC FLAMMABLE GAS

HEALTH HAZARD DATA

TIME WEIGHTED AVERAGE EXPOSURE LIMIT

HYDROGEN IS DEFINED AS A SIMPLE ASPHYXIAN (ACGIH 1994-1995); OSHA 1993 PEL (8 HR. TWA)=NO LISTING. OXYGEN LEVELS SHOULD BE MAINTAINED AT GREATER THAN 18 MOLAR PERCENT AT NORMAL ATMOSPHERIC PRESSURE (pO₂>135 TORR).

SYMPTOMS OF EXPOSURE

INHALATION: HIGH CONCENTRATIONS OF HYDROGEN SO AS TO EXCLUDE AN ADEQUATE SUPPLY OF OXYGEN TO THE LUNGS CAUSES DIZZINESS, DEEPER BREATHING DUE TO AIR HUNGER, POSSIBLE NAUSEA AND EVENTUAL UNCONSCIOUSNESS.

TOXICOLOGICAL PROPERTIES

HYDROGEN IS INACTIVE BIOLOGICALLY AND ESSENTIALLY NONTOXIC; THEREFORE, THE MAJOR PROPERTY IS THE EXCLUSION OF AN ADEQUATE SUPPLY OF OXYGEN TO THE LUNGS.

HYDROGEN IS NOT LISTED IN THE IARC, NTP OR BY OSHA AS A CARCINOGEN OR POTENTIAL CARCINOGEN.

PERSONS IN ILL HEALTH WHERE SUCH ILLNESS WOULD BE AGGRAVATED BY EXPOSURE TO HYDROGEN SHOULD NOT BE ALLOWED TO WORK WITH OR HANDLE THIS PRODUCT.

RECOMMENDED FIRST AID TREATMENT

PROMPT MEDICAL ATTENTION IS MANDATORY IN ALL CASES OF OVEREXPOSURE TO HYDROGEN. RESCUE PERSONNEL SHOULD BE EQUIPPED WITH SELF-CONTAINED BREATHING APPARATUS AND BE COGNIZANT OF EXTREME FIRE AND EXPLOSION HAZARD.

INHALATION:

CONSCIOUS PERSONS SHOULD BE ASSISTED TO AN UNCONTAMINATED AREA AND INHALE FRESH AIR. QUICK REMOVAL FROM THE CONTAMINATED AREA IS MOST IMPORTANT. UNCONSCIOUS PERSONS SHOULD BE MOVED TO AN UNCONTAMINATED AREA, GIVEN ASSISTED RESPIRATION AND SUPPLEMENTAL OXYGEN. FURTHER TREATMENT SHOULD BE SYMPTOMATIC AND SUPPORTIVE.

HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS OR GASES:

HYDROGEN IS FLAMMABLE OVER A VERY WIDE RANGE IN AIR.

PHYSICAL DATA

BOILING POINT: -423 DEG. F (-252.8 DEG. C)

LIQUID DENSITY AT BOILING POINT: 4.43 LB/FT³ (70.96 KG/M³)

VAPOR PRESSURE @ 70 DEG. F: (21.1 DEG. C) = ABOVE THE CRITICAL TEMPERATURE OF -399.8 DEG. F (-239.9 DEG. C)

GAS DENSITY AT 70 DEG. F 1 ATM: .0052

SOLUBILITY IN WATER: VERY SLIGHTLY

FREEZING POINT: -434.6 DEG. F (-259.2 DEG. C)

EVAPORATION RATE: N/A (GAS)

SPECIFIC GRAVITY (AIR=1): @ 70 DEG. F (21.1 DEG. C) = .069

APPEARANCE AND ODOR: COLORLESS, ODORLESS GAS

FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (METHOD USED): N/A (GAS)

AUTO IGNITION TEMPERATURE: 1058 DEG. F (570 DEG. C)

FLAMMABLE LIMITS % BY VOLUME: LEL 4 UEL 74.5

EXTINGUISHING MEDIA: WATER, CARBON DIOXIDE, DRY CHEMICAL

ELECTRICAL CLASSIFICATION: CLASS 1, GROUP B

SPECIAL FIRE FIGHTING PROCEDURES:

IF POSSIBLE, STOP THE FLOW OF HYDROGEN. COOL SURROUNDING CONTAINERS WITH WATER SPRAY. HYDROGEN BURNS WITH AN ALMOST INVISIBLE FLAME OR RELATIVELY LOW THERMAL RADIATION.

UNUSUAL FIRE AND EXPLOSION HAZARDS:

HYDROGEN IS VERY LIGHT AND RISES VERY RAPIDLY IN AIR. SHOULD A HYDROGEN FIRE BE EXTINGUISHED AND THE FLOW OF GAS CONTINUE, INCREASE VENTILATION TO PREVENT AN EXPLOSION HAZARD, PARTICULARLY IN THE UPPER PORTIONS OF BUILDINGS OR SHEDS WHERE THE GAS MIGHT "COLLECT".

REACTIVITY DATA

STABILITY:

UNSTABLE ()

STABLE (X)

CONDITIONS TO AVOID: NONE

INCOMPATIBILITY (MATERIALS TO AVOID): OXIDIZERS

HAZARDOUS DECOMPOSITION PRODUCTS: NONE

HAZARDOUS POLYMERIZATION:

MAY OCCUR ()

WILL NOT OCCUR (X)

CONDITIONS TO AVOID: NONE

SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED:

EVACUATE ALL PERSONNEL FROM AFFECTED AREA. USE APPROPRIATE PROTECTIVE EQUIPMENT. IF LEAK IS IN USER'S EQUIPMENT, BE CERTAIN TO PURGE PIPING WITH AN INERT GAS PRIOR TO ATTEMPTING REPAIRS. IF LEAK IS IN CONTAINER OR CONTAINER VALVE, CONTACT YOUR CLOSEST SUPPLIER LOCATION OR CALL THE EMERGENCY TELEPHONE NUMBER LISTED HEREIN.

WASTE DISPOSAL METHOD:

DO NOT ATTEMPT TO DISPOSE OF WASTE OR UNUSED QUANTITIES. RETURN IN THE SHIPPING CONTAINER PROPERLY LABELED, WITH ANY VALVE OUTLET PLUGS OR CAPS SECURED AND VALVE PROTECTION CAP IN PLACE TO YOUR SUPPLIER. FOR EMERGENCY DISPOSAL ASSISTANCE, CONTACT YOUR CLOSEST SUPPLIER LOCATION OR CALL THE EMERGENCY TELEPHONE NUMBER LISTED HEREIN.

SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (SPECIFY TYPE):

POSITIVE PRESSURE AIR LINE WITH MASK OR SELF-CONTAINED BREATHING APPARATUS
SHOULD BE AVAILABLE FOR EMERGENCY USE.

VENTILATION: HOOD WITH FORCED VENTILATION

LOCAL EXHAUST: TO PREVENT ACCUMULATION ABOVE THE LEL

MECHANICAL (GEN.): IN ACCORDANCE WITH ELECTRICAL CODES

SPECIAL: N/A

OTHER: N/A

PROTECTIVE GLOVES: PLASTIC OR RUBBER

EYE PROTECTION: SAFETY GOGGLES OR GLASSES

OTHER PROTECTION EQUIPMENT: SAFETY SHOES, SAFETY SHOWER

SPECIAL PRECAUTIONS*

SPECIAL LABELING INFORMATION

DOT SHIPPING NAME: HYDROGEN, COMPRESSED

DOT SHIPPING LABEL: FLAMMABLE GAS

DOT HAZARD CLASS: DIVISION 2.1

I.D. NO.: UN 1049

SPECIAL HANDLING RECOMMENDATIONS:

USE ONLY IN WELL-VENTILATED AREAS. VALVE PROTECTION CAPS MUST REMAIN IN PLACE
UNLESS CONTAINER IS SECURED WITH VALVE OUTLET PIPED TO USE POINT. DO NOT DRAG,
SLIDE OR ROLL CYLINDERS. USE A SUITABLE HAND TRUCK FOR CYLINDER MOVEMENT. USE A
PRESSURE REDUCING REGULATOR WHEN CONNECTING CYLINDER TO LOWER PRESSURE (<3,000
PSIG) PIPING OR SYSTEMS. DO NOT HEAT CYLINDER BY ANY MEANS TO INCREASE THE
DISCHARGE RATE OF PRODUCT FROM THE CYLINDER. USE A CHECK VALVE OR TRAP IN THE
DISCHARGE LINE TO PREVENT HAZARDOUS BACK FLOW INTO THE CYLINDER.

FOR ADDITIONAL HANDLING RECOMMENDATIONS, CONSULT COMPRESSED GAS ASSOCIATION'S
PAMPHLET G-5, P-1, P-14, AND SAFETY BULLETIN SB-2.

SPECIAL STORAGE RECOMMENDATIONS:

PROTECT CYLINDERS FROM PHYSICAL DAMAGE. STORE IN COOL, DRY, WELL-VENTILATED
AREA OF NONCOMBUSTIBLE CONSTRUCTION AWAY FROM HEAVILY TRAFFICKED AREAS AND
EMERGENCY EXITS. DO NOT ALLOW THE TEMPERATURE WHERE CYLINDERS ARE STORED TO
EXCEED 125F (52C). CYLINDERS SHOULD BE STORED UPRIGHT AND FIRMLY SECURED TO
PREVENT FALLING OR BEING KNOCKED OVER. FULL AND EMPTY CYLINDERS SHOULD BE
SEGREGATED. USE A "FIRST IN - FIRST OUT" INVENTORY SYSTEM TO PREVENT FULL
CYLINDERS BEING STORED FOR EXCESSIVE PERIODS OF TIME. POST "NO SMOKING OR OPEN
FLAMES" SIGNS IN THE STORAGE OR USE AREA. THERE SHOULD BE NO SOURCES OF
IGNITION IN THE STORAGE OR USE AREA.

FOR ADDITIONAL STORAGE RECOMMENDATIONS, CONSULT COMPRESSED GAS ASSOCIATION'S PAMPHLET G-5, P-1, P-14, AND SAFETY BULLETIN SB-2.

SPECIAL PACKAGING RECOMMENDATIONS:

HYDROGEN IS NONCORROSIVE AND MAY BE USED WITH ANY COMMON STRUCTURAL MATERIAL.

OTHER RECOMMENDATIONS OR PRECAUTIONS:

EARTH-GROUND AND BOND ALL LINES AND EQUIPMENT ASSOCIATED WITH THE HYDROGEN SYSTEM. ELECTRICAL EQUIPMENT SHOULD BE NON-SPARKING OR EXPLOSION PROOF. COMPRESSED GAS CYLINDERS SHOULD NOT BE REFILLED EXCEPT BY QUALIFIED PRODUCERS OF COMPRESSED GASES. SHIPMENT OF A COMPRESSED GAS CYLINDER WHICH HAS NOT BEEN FILLED BY THE OWNER OR WITH HIS (WRITTEN) CONSENT IS A VIOLATION OF FEDERAL LAW (49CFR).

ALWAYS SECURE CYLINDERS IN AN UPRIGHT POSITION BEFORE TRANSPORTING THEM. NEVER TRANSPORT CYLINDERS IN TRUNKS OF VEHICLES, ENCLOSED VANS, TRUCK CABS OR IN PASSENGER COMPARTMENTS. TRANSPORT CYLINDERS SECURED IN OPEN FLATBED OR IN OPEN PICK-UP TYPE VEHICLES.

*VARIOUS GOVERNMENT AGENCIES (I.E. DEPARTMENT OF TRANSPORTATION, OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION, FOOD AND DRUG ADMINISTRATION AND OTHERS) MAY HAVE SPECIFIC REGULATIONS CONCERNING THE TRANSPORTATION, HANDLING, STORAGE OR USE OF THIS PRODUCT WHICH WILL NOT BE REFLECTED IN THIS DATA SHEET. THE CUSTOMER SHOULD REVIEW THESE REGULATIONS TO ENSURE THAT HE IS IN FULL COMPLIANCE.

INFORMATION CONTAINED IN THIS MATERIAL SAFETY DATA SHEET IS OFFERED WITHOUT CHARGE FOR USE BY TECHNICALLY QUALIFIED PERSONNEL AT THEIR DISCRETION AND RISK. ALL STATEMENTS, TECHNICAL INFORMATION AND RECOMMENDATIONS CONTAINED HEREIN ARE BASED ON TESTS AND DATA WHICH WE BELIEVE TO BE RELIABLE, BUT THE ACCURACY OR COMPLETENESS THEREOF IS NOT GUARANTEED AND NO WARRANTY OF ANY KIND IS MADE WITH RESPECT THERETO. THIS INFORMATION IS NOT INTENDED AS A LICENSE TO OPERATE UNDER OR A RECOMMENDATION TO PRACTICE OR INFRINGE ANY PATENT OF THIS COMPANY OR OTHERS COVERING ANY PROCESS, COMPOSITION OF MATTER OR USE.

SINCE THE COMPANY SHALL HAVE NO CONTROL OF THE USE OF THE PRODUCT DESCRIBED HEREIN, THE COMPANY ASSUMES NO LIABILITY FOR LOSS OR DAMAGE INCURRED FROM THE PROPER OR IMPROPER USE OF SUCH PRODUCT.

REPORTING UNDER SARA, TITLE III, SECTION 313 NOT REQUIRED.

NEPA 704 NO. FOR HYDROGEN = 1 4 0 NONE

WHITE POSSIBLY FOLLOWED BY BLISTERING.

RECOMMENDED FIRST AID TREATMENT

!PROMPT MEDICAL ATTENTION IS REQUIRED IN ALL CASES OF OVEREXPOSURE TO ISOBUTYLENE. RESCUE PERSONNEL SHOULD BE EQUIPPED WITH SELF-CONTAINED BREATHING APPARATUS AND MUST BE AWARE OF EXTREME FIRE AND EXPLOSION HAZARD.!

INHALATION: MOVE EXPOSED PERSONNEL TO AN UNCONTAMINATED AREA. IF NOT BREATHING, GIVE ARTIFICIAL RESPIRATION, PREFERABLY MOUTH-TO-MOUTH. IF BREATHING IS DIFFICULT, GIVE OXYGEN. MEDICAL ASSISTANCE SHOULD BE SOUGHT IMMEDIATELY.

SKIN CONTACT OR FROSTBITE: REMOVE CONTAMINATED CLOTHING AND FLUSH AFFECTED AREAS WITH LUKEWARM WATER. !DO NOT USE HOT WATER.! A PHYSICIAN SHOULD SEE THE PATIENT PROMPTLY IF THE CRYOGENIC "BURN" HAS CAUSED BLISTERING OF THE SKIN OR DEEP TISSUE FREEZING.

INFORMATION CONTAINED IN THIS MATERIAL SAFETY DATA SHEET IS OFFERED WITHOUT CHARGE FOR USE BY TECHNICALLY QUALIFIED PERSONNEL AT THEIR DISCRETION AND RISK. ALL STATEMENTS, TECHNICAL INFORMATION AND RECOMMENDATIONS CONTAINED HEREIN ARE BASED ON TESTS AND DATA WHICH WE BELIEVE TO BE RELIABLE, BUT THE ACCURACY OR COMPLETENESS THEREOF IS NOT GUARANTEED AND NO WARRANTY OF ANY KIND IS MADE WITH RESPECT THERETO. THIS INFORMATION IS NOT INTENDED AS A LICENSE TO OPERATE UNDER OR A RECOMMENDATION TO PRACTICE OR INFRINGE ANY PATENT OF THIS COMPANY OR OTHERS COVERING ANY PROCESS, COMPOSITION OF MATTER OR USE.

SINCE THE COMPANY SHALL HAVE NO CONTROL OF THE USE OF THE PRODUCT DESCRIBED HEREIN, THE COMPANY ASSUMES NO LIABILITY FOR LOSS OR DAMAGE INCURRED FROM THE PROPER OR IMPROPER USE OF SUCH PRODUCT.

HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES
ISOBUTYLENE IS FLAMMABLE OVER A WIDE RANGE IN AIR.

PHYSICAL DATA

BOILING POINT	LIQUID DENSITY AT BOILING POINT
19.6 F (- 6.9 C)	39.1 LB/FT(3) (626 KG/M3)
VAPOR PRESSURE @ 70 F (21.1 C) =	GAS DENSITY AT 70-F, 1 ATM
39 PSIA (269 KPA)	0.148 LB/FT(3) (2.37 KG/M3)
SOLUBILITY IN WATER	FREEZING POINT
INSOLUBLE	- 220.6 F (- 140.3 C)
APPEARANCE AND ODOR	
COLORLESS GAS WITH AN UNPLEASANT ODOR SIMILAR TO THAT WHICH IS EMITTED WHEN BURNING ANTHRACITE COAL.	

FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (METHOD USED)
SEE LAST PAGE

AUTO IGNITION TEMPERATURE
869 F (465 C)

FLAMMABLE LIMITS % BY VOLUME
LEL 1.8 UEL 9.6

EXTINGUISHING MEDIA
WATER, CARBON DIOXIDE, DRY CHEMICAL

ELECTRICAL CLASSIFICATION
CLASS 1. GROUP NOT
SPECIFIED

SPECIAL FIRE FIGHTING PROCEDURES

KEEP CYLINDER(S) COOL WITH WATER SPRAY FROM A DISTANCE. IF
POSSIBLE WITHOUT RISK, MOVE CYLINDER(S) AWAY FROM FIRE AREA. IF
POSSIBLE WITHOUT RISK, STOP THE FLOW OF GAS TO A FIRE. ALLOW
GAS FIRE TO BURN ITSELF OUT. (CONTINUED ON LAST PAGE.)

UNUSUAL FIRE AND EXPLOSION HAZARDS

ISOBUTYLENE IS DENSER THAN AIR AND CAN TRAVEL CONSIDERABLE
DISTANCES TO AN IGNITION SOURCE AND FLASH BACK. CYLINDER(S) MAY
EXPLODE OR VENT WHEN EXPOSED TO FIRE.

REACTIVITY DATA

STABILITY	CONDITIONS TO AVOID
UNSTABLE ()	
STABLE (X)	

INCOMPATIBILITY (MATERIALS TO AVOID)
OXIDIZERS

HAZARDOUS DECOMPOSITION PRODUCTS
NONE

HAZARDOUS POLYMERIZATION	CONDITIONS TO AVOID
MAY OCCUR ()	
WILL NOT OCCUR (X)	

SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED
EVACUATE ALL PERSONNEL FROM AFFECTED AREA. USE APPROPRIATE
PROTECTIVE EQUIPMENT. IF LEAK IS IN USER'S EQUIPMENT, BE
CERTAIN TO PURGE PIPING WITH AN INERT GAS PRIOR TO ATTEMPTING
REPAIRS. IF LEAK IS IN CONTAINER OR CONTAINER VALVE. CALL
THE "800" EMERGENCY PHONE NUMBER LISTED HEREIN.

WASTE DISPOSAL METHOD

ALL FEDERAL, STATE AND LOCAL REGULATIONS REGARDING HEALTH AND
POLLUTION SHOULD BE FOLLOWED IN WASTE DISPOSAL. CONTACT AIR
PRODUCTS FOR SPECIFIC RECOMMENDATIONS. DO NOT DISPOSE OF UNUSED
QUANTITIES.

(CONTINUED ON LAST PAGE.)

SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (SPECIFY TYPE) POSITIVE PRESSURE AIR
LINE WITH MASK OR SELF-CONTAINED BREATHING APPARATUS
SHOULD BE AVAILABLE FOR EMERGENCY USE.

VENTILATION
HOOD WITH FORCED VENTILATION

LOCAL EXHAUST
TO PREVENT ACCUMULATION
ABOVE THE LEL

MECHANICAL (GEN.)
IN ACCORDANCE WITH
ELECTRICAL CODES

SPECIAL

OTHER

PROTECTIVE GLOVES
PLASTIC OR RUBBER

EYE PROTECTION
SAFETY GOGGLES OR GLASSES

OTHER PROTECTIVE EQUIPMENT
SAFETY SHOES, SAFETY SHOWER, EYEWASH "FOUNTAIN."

SPECIAL PRECAUTIONS***SPECIAL LABELING INFORMATION**

DOT SHIPPING NAME: LIQUIFIED PETROLEUM GAS
DOT HAZARD CLASS: FLAMMABLE GAS
DOT SHIPPING LABEL: FLAMMABLE GAS ID NO.: UN 1075

SPECIAL HANDLING RECOMMENDATIONS

USE ONLY IN WELL-VENTILATED AREAS. VALVE PROTECTION CAPS MUST
REMAIN IN PLACE UNLESS CONTAINER IS SECURED WITH VALVE OUTLET
PIPED TO USE POINT. DO NOT DRAG, SLIDE OR ROLL CYLINDERS. USE A
SUITABLE HAND TRUCK FOR CYLINDER MOVEMENT. USE A PRESSURE
REDUCING REGULATOR WHEN CONNECTING CYLINDER TO LOWER PRESSURE
(<250 PSIG) PIPING OR SYSTEMS. DO NOT HEAT CYLINDER BY ANY
MEANS TO INCREASE THE DISCHARGE RATE OF PRODUCT FROM THE
CYLINDER. USE A CHECK VALVE OR TRAP IN THE DISCHARGE LINE TO
PREVENT HAZARDOUS BACK FLOW INTO THE CYLINDER.

FOR ADDITIONAL RECOMMENDATIONS CONSULT THE AIR PRODUCTS
SPECIALTY GAS CATALOG SAFETY AND TECHNICAL INFORMATION SECTION
OR COMPRESSED GAS ASSOCIATION PAMPHLET P-1.

SPECIAL STORAGE RECOMMENDATIONS

PROTECT CYLINDERS FROM PHYSICAL DAMAGE. STORE IN COOL, DRY,
WELL-VENTILATED AREA OF NON-COMBUSTIBLE CONSTRUCTION AWAY FROM

HEAVILY TRAFFICKED AREAS AND EMERGENCY EXITS. DO NOT ALLOW THE TEMPERATURE WHERE CYLINDERS ARE STORED TO EXCEED 130 F (54 C). CYLINDERS SHOULD BE STORED UPRIGHT AND FIRMLY SECURED TO PREVENT FALLING OR BEING KNOCKED OVER. FULL AND EMPTY CYLINDERS SHOULD BE SEGREGATED. USE A "FIRST IN-FIRST OUT" INVENTORY SYSTEM TO PREVENT FULL CYLINDERS BEING STORED FOR EXCESSIVE PERIODS OF TIME. POST "NO SMOKING OR OPEN FLAMES" SIGNS IN THE STORAGE OR USE AREA. THERE SHOULD BE NO SOURCES OF IGNITION IN THE STORAGE OR USE AREA.

FOR ADDITIONAL RECOMMENDATIONS CONSULT THE AIR PRODUCTS SPECIALTY GAS CATALOG SAFETY AND TECHNICAL INFORMATION SECTION OR COMPRESSED GAS ASSOCIATION PAMPHLET P-1.

SPECIAL PACKAGING RECOMMENDATIONS
ISOBUTYLENE IS NONCORROSIVE AND MAY BE USED WITH ANY COMMON STRUCTURAL MATERIAL.

OTHER RECOMMENDATIONS OR PRECAUTIONS
EARTH-GROUND AND BOND ALL LINES AND EQUIPMENT ASSOCIATED WITH THE ISOBUTYLENE SYSTEM. ELECTRICAL EQUIPMENT SHOULD BE NON-SPARKING OR EXPLOSION PROOF. COMPRESSED GAS CYLINDERS SHOULD NOT BE REFILLED EXCEPT BY QUALIFIED PRODUCERS OF COMPRESSED GASES. SHIPMENT OF A COMPRESSED GAS CYLINDER WHICH HAS NOT BEEN FILLED BY THE OWNER OR WITH HIS (WRITTEN) CONSENT IS A VIOLATION OF FEDERAL LAW (49CFR).

*VARIOUS GOVERNMENT AGENCIES (I.E.. DEPARTMENT OF TRANSPORTATION, OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION. FOOD AND DRUG ADMINISTRATION AND OTHERS) MAY HAVE SPECIFIC REGULATIONS CONCERNING THE TRANSPORTATION, HANDLING. STORAGE OR USE OF THIS PRODUCT WHICH WILL NOT BE REFLECTED IN THIS DATA SHEET. THE CUSTOMER SHOULD REVIEW THESE REGULATIONS TO ENSURE THAT HE IS IN FULL COMPLIANCE.

SPECIALTY GAS DEPARTMENT
AIR PRODUCTS AND CHEMICALS, INC.
ALLENTOWN, PA 18195
(215) 481-8257

TIME WEIGHTED AVERAGE EXPOSURE LIMIT (CONTINUED) ISOBUTYLENE IS DEFINED AS A SIMPLE ASPHYXIAN. OXYGEN LEVELS SHOULD BE MAINTAINED AT GREATER THAN 18 MOLAR PERCENT AT NORMAL ATMOSPHERIC PRESSURE WHICH IS EQUIVALENT TO A PARTIAL PRESSURE OF 135 MM HG. (ACGIH 1984-85)

FLASH POINT (METHOD USED) (CONTINUED)
- 105 F (- 76 C) CLOSED CUP

SPECIAL FIRE FIGHTING PROCEDURES (CONTINUED)
VENTILATE LOW AREAS WHERE FLAMMABLE OR EXPLOSIVE MIXTURES MAY FORM.

WASTE DISPOSAL METHOD (CONTINUED)
RETURN THE PROPERLY LABELED SHIPPING CONTAINER TO AIR PRODUCTS FOR DISPOSAL WITH VALVE(S) TIGHTLY CLOSED, OUTLET SEAL(S) SECURED AND VALVE PROTECTION CAP IN PLACE. FOR EMERGENCY DISPOSAL ASSISTANCE, CALL THE "800" EMERGENCY PHONE NUMBER

LISTED HEREIN.

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ACROS ORGANICS
NITRIC ACID **Revised: 12/20/1994****MSDS Contents**

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NITRIC ACID
000016550

SECTION 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

MSDS NAME:NITRIC ACID

CATALOG NUMBERS:

12466-0010, 12466-0025, 12466-5000, 13362-0010,
13362-0025, 42400-0025, 42400-5000, 1146307, 1146422, 1200500,
1868819, EK 114 6307, EK 114 6422,
EK 120 0500, EK 186 8819

SYNONYMS:

AZOTIC ACID, ENGRAVERS NITRATE, HYDROGEN NITRATE.

COMPANY IDENTIFICATION: ACROS ORGANICS

JANSSEN PHARMACEUTICAL AAN 3
2440 GEEL, BELGIUM

FOR INFORMATION IN NORTH AMERICA, CALL: 800-ACROS-01
FOR INFORMATION IN EUROPE, CALL: 0032(0) 14575211
FOR EMERGENCIES IN THE US, CALL CHEMTREC: 800-424-9300
FOR EMERGENCIES OUTSIDE THE US, CALL: 0032(0) 14575299

SECTION 2 - COMPOSITION, INFORMATION ON INGREDIENTS

CAS#	CHEMICAL NAME	%	EINECS#
7697-37-2	NITRIC ACID	69-71%	UNLISTED

SECTION 3 - HAZARDS IDENTIFICATION**EMERGENCY OVERVIEW**

APPEARANCE: CLEAR, COLORLESS TO YELLOW LIQUID WITH A STRONG, ACRID ODOR.
DANGER! OXIDIZER. CONTACT WITH OTHER MATERIAL MAY CAUSE FIRE. CORROSIVE. CAUSES EYE, SKIN, AND DIGESTIVE TRACT BURNS. CAUSES SEVERE RESPIRATORY TRACT IRRITATION. MAY CAUSE PERFORATION OF THE DIGESTIVE TRACT AND EROSION OF TEETH.

TARGET ORGANS: NONE.

POTENTIAL HEALTH EFFECTS

EYE: CAUSES SEVERE EYE BURNS.
MAY CAUSE IRREVERSIBLE EYE INJURY.

SKIN: MAY CAUSE SEVERE SKIN IRRITATION.
CAUSES SKIN BURNS.
MAY CAUSE DEEP, PENETRATING ULCERS OF THE SKIN.

INGESTION:
CAUSES GASTROINTESTINAL TRACT BURNS.
MAY CAUSE PERFORATION OF THE DIGESTIVE TRACT.

INHALATION:
MAY BE FATAL IF INHALED.
EFFECTS MAY BE DELAYED.
MAY CAUSE IRRITATION OF THE RESPIRATORY TRACT WITH BURNING PAIN IN THE NOSE AND THROAT, COUGHING, WHEEZING, SHORTNESS OF BREATH AND PULMONARY EDEMA.

CHRONIC:
REPEATED INHALATION MAY CAUSE CHRONIC BRONCHITIS.
REPEATED EXPOSURE MAY CAUSE EROSION OF TEETH.

SECTION 4 - FIRST AID MEASURES

EYES: FLUSH EYES WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES, OCCASIONALLY LIFTING THE UPPER AND LOWER LIDS. GET MEDICAL AID IMMEDIATELY. DO NOT ALLOW VICTIM TO RUB OR KEEP EYES CLOSED.

SKIN: FLUSH SKIN WITH PLENTY OF SOAP AND WATER FOR AT LEAST 15 MINUTES WHILE REMOVING CONTAMINATED CLOTHING AND SHOES. GET MEDICAL AID IF IRRITATION DEVELOPS OR PERSISTS. WASH CLOTHING BEFORE REUSE.

INGESTION: DO NOT INDUCE VOMITING AND SEEK IMMEDIATE MEDICAL ADVICE.

INHALATION:
REMOVE FROM EXPOSURE TO FRESH AIR IMMEDIATELY. IF NOT BREATHING, GIVE ARTIFICIAL RESPIRATION. IF BREATHING IS DIFFICULT, GIVE OXYGEN. GET MEDICAL AID.

NOTES TO PHYSICIAN:
TREAT SYMPTOMATICALLY AND SUPPORTIVELY.
NO SPECIFIC ANTIDOTE EXISTS.

SECTION 5 - FIRE FIGHTING MEASURES

GENERAL INFORMATION:

AS IN ANY FIRE, WEAR A SELF-CONTAINED BREATHING APPARATUS IN PRESSURE-DEMAND, MSHA/NIOSH (APPROVED OR EQUIVALENT), AND FULL PROTECTIVE GEAR.
STRONG OXIDIZER. CONTACT WITH COMBUSTIBLE MATERIALS MAY CAUSE A FIRE.
USE WATER SPRAY TO KEEP FIRE-EXPOSED CONTAINERS COOL.
SUBSTANCE IS NONCOMBUSTIBLE.

EXTINGUISHING MEDIA:

SUBSTANCE IS NONCOMBUSTIBLE; USE AGENT MOST APPROPRIATE TO EXTINGUISH SURROUNDING FIRE.

AUTOIGNITION TEMPERATURE: NOT AVAILABLE.

FLASH POINT: NOT AVAILABLE.

EXPLOSION LIMITS, LOWER:NOT AVAILABLE.
UPPER:NOT AVAILABLE.

SECTION 6 - ACCIDENTAL RELEASE MEASURES

GENERAL INFORMATION:

USE PROPER PERSONAL PROTECTIVE EQUIPMENT AS INDICATED IN SECTION 8.

SPILLS/LEAKS:

ABSORB SPILL WITH INERT MATERIAL, (E.G., DRY SAND OR EARTH), THEN PLACE INTO A CHEMICAL WASTE CONTAINER. WEAR A SELF CONTAINED BREATHING APPARATUS AND APPROPRIATE PERSONAL PROTECTION. (SEE EXPOSURE CONTROLS, PERSONAL PROTECTION SECTION).

SECTION 7 - HANDLING AND STORAGE

HANDLING:

WASH THOROUGHLY AFTER HANDLING.
REMOVE CONTAMINATED CLOTHING AND WASH BEFORE REUSE.
USE WITH ADEQUATE VENTILATION.
DO NOT GET ON SKIN OR IN EYES.
DO NOT INGEST OR INHALE.

STORAGE:

STORE IN A COOL, DRY, WELL-VENTILATED AREA AWAY FROM INCOMPATIBLE SUBSTANCES.

SECTION 8 - EXPOSURE CONTROLS, PERSONAL PROTECTION

ENGINEERING CONTROLS:

USE ADEQUATE GENERAL OR LOCAL EXHAUST VENTILATION TO KEEP AIRBORNE CONCENTRATIONS BELOW THE PERMISSIBLE EXPOSURE LIMITS.

EXPOSURE LIMITS

CHEMICAL NAME	ACGIH	NIOSH	OSHA - FINAL PELS
NITRIC ACID	2 PPM : 5.2 MG/M3: 4 PPM STEL: 10 MG/M3 STEL	2 PPM TWA; 5 MG/M3 TWA: 4 PPM STEL; 10 MG/M3 STEL	2 PPM TWA; 5 MG/M 3 TWA

OSHA VACATED PELS:

NITRIC ACID:

2 PPM TWA; 5 MG/M3 TWA; 4 PPM STEL; 10 MG/M3 STEL

PERSONAL PROTECTIVE EQUIPMENT

EYES: WEAR APPROPRIATE PROTECTIVE EYEGLASSES OR CHEMICAL SAFETY GOGGLES AS DESCRIBED BY OSHA'S EYE AND FACE PROTECTION REGULATIONS IN 29 CFR 1910.133.

SKIN: WEAR APPROPRIATE PROTECTIVE GLOVES AND CLOTHING TO PREVENT SKIN EXPOSURE.

CLOTHING: WEAR APPROPRIATE PROTECTIVE CLOTHING TO PREVENT SKIN EXPOSURE.

RESPIRATORS: FOLLOW THE OSHA RESPIRATOR REGULATIONS FOUND IN 29CFR 1010.134. ALWAYS USE A NIOSH-APPROVED RESPIRATOR WHEN NECESSARY.

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE:	LIQUID
APPEARANCE:	TRANSPARENT, CLEAR OR YELLOWISH LIQUID.
ODOR:	STRONG ACRID.
PH:	1.0
VAPOR PRESSURE:	6.8 MM HG
VAPOR DENSITY:	NOT AVAILABLE.
EVAPORATION RATE:	NOT AVAILABLE.
VISCOSITY:	NOT AVAILABLE.
BOILING POINT:	186.8 F
FREEZING/MELTING POINT:	-43.6 F
DECOMPOSITION TEMPERATURE:	NOT AVAILABLE.

SOLUBILITY: SOLUBLE IN WATER.
SPECIFIC GRAVITY/DENSITY: 1.50
MOLECULAR FORMULA: HNO₃
MOLECULAR WEIGHT: 63.0119

SECTION 10 - STABILITY AND REACTIVITY

CHEMICAL STABILITY:
DECOMPOSES WHEN IN CONTACT WITH AIR, LIGHT, OR ORGANIC MATTER.

CONDITIONS TO AVOID:
HIGH TEMPERATURES, INCOMPATIBLE MATERIALS, MOISTURE, REDUCING AGENTS

INCOMPATIBILITIES WITH OTHER MATERIALS:
REACTS WITH OVER 150 CHEMICAL COMBINATIONS. REFER TO NFPA FIRE PROTECTION GUIDE FOR SPECIFICS. REACTS EXPLOSIVELY WITH ORGANIC MATERIALS AND COMBUSTIBLES.

HAZARDOUS DECOMPOSITION PRODUCTS:
NITROGEN OXIDES.

HAZARDOUS POLYMERIZATION: HAS NOT BEEN REPORTED.

SECTION 11 - TOXICOLOGICAL INFORMATION

RTECS#:
CAS# 7697-37-2 QU5775000 QU5900000

LD50/LC50:
INHALATION, RAT: LC50 = 67 PPM 4 HR

CARCINOGENICITY:
NITRIC ACID
NOT LISTED BY ACGIH, IARC, NIOSH, NTP, OR OSHA.
NO COMPONENTS ARE LISTED BY ACGIH, IARC, NIOSH, NTP, OR OSHA.

EPIDEMIOLOGY:
NO INFORMATION AVAILABLE.

TERATOGENICITY:
EFFECTS ON NEWBORN; BIOCHEMICAL AND METABOLIC, ORAL-RAT TDLo=2345 MG/KG (FEMALE 18D POST). FETOTOXICITY: STUNTED FETUS, ORAL-RAT TDLo=21150 MG/KG (FEMALE 1-21D POST).

REPRODUCTIVE EFFECTS:
NO INFORMATION AVAILABLE.

NEUROTOXICITY:
NO INFORMATION AVAILABLE.

MUTAGENICITY:

NO INFORMATION AVAILABLE.

OTHER STUDIES:
NONE.

SECTION 12 - ECOLOGICAL INFORMATION

ECOTOXICITY:

MOSQUITO FISH: TLm=72 PPM/96H (FRESH WATER)

COCKLE: LC50=330-1000 PPM/48H (SALT WATER)

ENVIRONMENTAL FATE:
NO INFORMATION AVAILABLE.

PHYSICAL/CHEMICAL:
NO INFORMATION AVAILABLE.

PHYSICAL/CHEMICAL:
NONE.

SECTION 13 - DISPOSAL CONSIDERATIONS

DISPOSE OF IN A MANNER CONSISTENT WITH FEDERAL, STATE, AND LOCAL REGULATIONS.

RCRA D-SERIES MAXIMUM CONCENTRATION OF CONTAMINANTS: NOT LISTED.

RCRA D-SERIES CHRONIC TOXICITY REFERENCE LEVELS: NOT LISTED.

RCRA F-SERIES: NOT LISTED.

RCRA P-SERIES: NOT LISTED.

RCRA U-SERIES: NOT LISTED.

NOT LISTED AS A MATERIAL BANNED FROM LAND DISPOSAL ACCORDING TO RCRA.

SECTION 14 - TRANSPORT INFORMATION

US DOT
SHIPPING NAME: NITRIC ACID
HAZARD CLASS: 8
UN NUMBER: UN 2031
PACKING GROUP: 1

IMO
SHIPPING NAME: NITRIC ACID
HAZARD CLASS: 8
UN NUMBER: 2031
PACKING GROUP: 2

IATA
SHIPPING NAME: NITRIC ACID

HAZARD CLASS: 8
UN NUMBER: 2031
PACKING GROUP: 2

RID/ADR
SHIPPING NAME: NITRIC ACID, OTHER THAN RED FUMING, WITH LESS THAN 70%
70% ACID
DANGEROUS GOODS CODE: 8(2B)
UN NUMBER: 2031

CANADIAN TDG
SHIPPING NAME: NITRIC ACID
HAZARD CLASS: 8(9.2)
UN NUMBER: UN2031

SECTION 15 - REGULATORY INFORMATION

A. FEDERAL TSCA

CAS# 7697-37-2 IS LISTED ON THE TSCA INVENTORY.
HEALTH & SAFETY REPORTING LIST
NONE OF THE CHEMICALS ARE ON THE HEALTH & SAFETY
REPORTING LIST.

CHEMICAL TEST RULES

NONE OF THE CHEMICALS IN THIS PRODUCT ARE UNDER A CHEMICAL TEST RULE.

SECTION 12B:

NONE OF THE CHEMICALS ARE LISTED UNDER TSCA SECTION
12B.

TSCA SIGNIFICANT NEW USE RULE:

NONE OF THE CHEMICALS IN THIS MATERIAL HAVE A SNUR UNDER TSCA.

CERCLA/ SARA

SECTION 302 (RQ)

NONE OF THE CHEMICALS IN THIS MATERIAL HAVE AN RQ.

SECTION 302 (TPQ)

CAS# 7697-37-2: TPQ = 1000 POUNDS

SECTION 313

SECTION 313:

THIS MATERIAL CONTAINS NITRIC ACID (CAS# 7697-37-2, 69-71%), WHICH IS
SUBJECT TO THE REPORTING REQUIREMENTS OF SECTION 313 OF SARA TITLE III AND
40 CFR PART 373.

CLEAN AIR ACT:

THIS MATERIAL DOES NOT CONTAIN ANY HAZARDOUS AIR POLLUTANTS.

THIS MATERIAL DOES NOT CONTAIN ANY CLASS 1 OZONE DEPLETORS.

THIS MATERIAL DOES NOT CONTAIN ANY CLASS 2 OZONE DEPLETORS.

CLEAN WATER ACT:

CAS# 7697-37-2 IS LISTED AS A HAZARDOUS SUBSTANCE UNDER THE CWA.

NONE OF THE CHEMICALS IN THIS PRODUCT ARE LISTED AS PRIORITY

POLLUTANTS UNDER THE CWA.

NONE OF THE CHEMICALS IN THIS PRODUCT ARE LISTED AS TOXIC POLLUTANTS
UNDER THE CWA.

OSHA:

CAS# 7697-37-2 IS CONSIDERED HIGHLY HAZARDOUS BY OSHA.

B. STATE

NITRIC ACID CAN BE FOUND ON THE FOLLOWING STATE RIGHT TO KNOW LISTS:

CALIFORNIA, NEW JERSEY, FLORIDA, PENNSYLVANIA, MINNESOTA, MASSACHUSETTS.

CALIFORNIA NO SIGNIFICANT RISK LEVEL:
NONE OF THE CHEMICALS IN THIS PRODUCT ARE LISTED.

C. INTERNATIONAL

CANADA

CAS# 7697-37-2 IS LISTED ON CANADA'S DSL/NDL LIST.

CAS# 7697-37-2 IS LISTED ON CANADA'S INGREDIENT DISCLOSURE LIST.

EUROPEAN LABELING IN ACCORDANCE WITH EC DIRECTIVES

HAZARD SYMBOLS: NOT AVAILABLE.

RISK PHRASES:

SAFETY PHRASES:

SECTION 16 - ADDITIONAL INFORMATION

ADDITIONAL INFORMATION:

NO ADDITIONAL INFORMATION AVAILABLE.

MSDS CREATION DATE:DECEMBER 20, 1994

THE INFORMATION ABOVE IS BELIEVED TO BE ACCURATE AND REPRESENTS THE BEST INFORMATION CURRENTLY AVAILABLE TO US. HOWEVER, WE MAKE NO WARRANTY OF MERCHANTABILITY OR ANY OTHER WARRANTY, EXPRESS OR IMPLIED, WITH RESPECT TO SUCH INFORMATION, AND WE ASSUME NO LIABILITY RESULTING FROM ITS USE. USERS SHOULD MAKE THEIR OWN INVESTIGATIONS TO DETERMINE THE SUITABILITY OF THE INFORMATION FOR THEIR PARTICULAR PURPOSES.

MATERIAL SAFETY DATA SHEET

APPENDIX B

SPECIFIC HEALTH AND SAFETY PROCEDURES

NOTE: **Health and safety procedures that will be utilized during the project are listed below. A copy of all the Health and Safety Procedures (HS001-999) will be available on site or via ShawNet.**

Accident Prevention Program: Management Safety Reviews

HS045 Job Safety Analysis

HS051 Tailgate Safety Meeting

HS060 Hazard Communication Program

HS308 Underground/Overhead Utility Contact Prevention

HS400 Working in Hot Environments

HS401 Cold Stress

HS402 Hearing Conservation

HS600 Personal Protection Program

HS601 Respiratory Protection

HS800 Motor Vehicle Operation: General Requirements



PROCEDURE

**Subject: ACCIDENT PREVENTION PROGRAM:
MANAGEMENT SAFETY INSPECTIONS**

1.0 PURPOSE AND SUMMARY

This procedure establishes the requirement for management safety inspections of project and office locations. These inspections are an integral part of the overall accident prevention program and help to demonstrate management's commitment to safety. Key requirements of this procedure include:

- Project managers are required to conduct one inspection per month and ensure that at least one other inspection is conducted during the month;
- Office managers are required to conduct an office safety inspection once every six months.
- Completed inspection reports are given to the project/office health and safety representative for review. A copy of the completed report will then be forwarded to the respective business line health and safety manager.

2.0 TABLE OF CONTENTS

1.0	Purpose and Summary
2.0	Table of Contents
3.0	Responsibility Matrix
3.1	Procedure Responsibility
3.2	Action/Approval Responsibilities
4.0	Text
4.1	Safety Inspections and Documentation
4.1.1	Management Site Visits
4.1.2	Project Managers
4.1.3	Office Managers
4.1.4	Project Supervisors
4.1.5	Health and Safety Representative
4.2	Workshops
5.0	Exception Provisions
6.0	Cross References
7.0	Attachments



3.0 RESPONSIBILITY MATRIX

3.1 Procedure Responsibility

The Director of Health and Safety is responsible for the issuance, revision, and maintenance of this procedure.

3.2 Action/Approval Responsibilities

The Responsibility Matrix is Attachment 1.

4.0 TEXT

Inspections of project and office locations by managers, supervisors, and the health and safety staff are critical factors in a comprehensive accident prevention program. Management safety inspections help demonstrate management's commitment to safety and verify that proper work practices are in use. These inspections are also used to verify the existence of safe work conditions and regulatory compliance. All employees are afforded the opportunity to participate in the inspection process via the safety interview process.

4.1 Safety Inspections and Documentation

Safety inspections are required by various tiers of the management structure. The objective is for operation managers to visibly demonstrate their concern for safety in the workplace by direct contact with employees while in the workplace. Each inspection is to be documented on the appropriate Safety Inspection Report (Attachment 2 or 3).

The primary responsibilities of the inspector include:

- Interviewing employees with regard to health and safety issues and how they might be corrected;
- Observing and correcting unsafe conditions and acts; and
- Verifying that corrective actions have been assigned to a responsible employee and implemented.

Positive safety observations and safety issues not specifically addressed in the Safety Inspection Report can be documented on the last page of the report. A list of all corrective action items will be maintained showing the corrective action, responsible person, and the date action is to be completed. Completed reports are to be given to the project/office health and safety representative, then forwarded to the respective business line health and safety manager.

4.1.1 Management Site Visits

Each senior manager is encouraged to make an informal safety inspection and review previously conducted inspection reports, during each site visit, to demonstrate their commitment to safety and reinforce the responsibilities of project management. Findings during this informal inspection are to be brought to the attention of the project manager so that corrective action can be initiated.



4.1.2 Project Managers

All project managers are required to complete at least one safety inspection per month and ensure that at least one other safety inspection per month is conducted. In the event that the project manager is not present at the project site during the month, this responsibility may be delegated to the project supervisor.

4.1.3 Office Managers

Office managers are required to conduct an office safety inspection once every six months. Managers are encouraged to conduct more frequent inspections if the office location is being remodeled or if new space is being occupied that was not previously inspected.

4.1.4 Project Supervisors

Project supervisors are expected to inspect their projects monthly and ensure that corrective actions are implemented. Dependent upon project manager participation, project supervisors may also be required to conduct an additional monthly inspection. The requirement to conduct these inspections cannot be delegated.

4.1.5 Health and Safety Representative

Health and safety representatives must continually observe activities and correct unsafe acts/conditions as soon as reasonably possible. They are also required to review each Safety Inspection Report completed at their location to ensure that corrective actions are implemented. Once this review is complete, they will forward the reports to the appropriate business line health and safety manager.

4.2 Workshops

Health and safety representatives will present workshops and/or conduct joint inspections to help managers and supervisors develop their inspection skills.

5.0 EXCEPTION PROVISIONS

Variances and exceptions may be requested pursuant to the provisions of Procedure HS013, Health and Safety Procedure Variances.

6.0 CROSS REFERENCES

HS013 Health and Safety Procedure Variances

7.0 ATTACHMENTS

1. Responsibility Matrix
2. Project Safety Inspection Report
3. Office Safety Inspection Report
4. Laboratory Inspection Report



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ATTACHMENT 1

ACCIDENT PREVENTION PROGRAM: MANAGEMENT SAFETY INSPECTIONS RESPONSIBILITY MATRIX

Action	Procedure Section	Responsible Party				
		Senior Managers	Project/Office Manager	Project Supervisors	Health and Safety Representative	Director of Health and Safety
Issue, Revise, and Maintain Procedure	3.1					X
Conduct Informal Safety Inspections and Review Previously Completed Reports	4.1.1	X				
Conduct Safety Inspections	4.1.2 4.1.3 4.1.4		X	X		
Give Completed Reports to Health and Safety Representative	4.1.2 4.1.3 4.1.4		X	X		
Review Reports and Forward to Health and Safety Manager	4.1.5				X	
Conduct Inspection Workshops	4.2				X	



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ATTACHMENT 2

PROJECT SAFETY INSPECTION REPORT

PROJECT _____ DATE _____

BUSINESS LINE: _____ PROJECT NAME/NUMBER: _____
PROGRAM MANAGER: _____ PROJECT MANAGER: _____
GENERAL PROJECT DESCRIPTION: _____
SITE ACTIVITIES AT TIME OF INSPECTION: _____

INTERVIEWED EMPLOYEE: _____
SAFETY ISSUE: _____
CORRECTIVE ACTION: _____

ASSIGNED TO: _____ FOLLOW-UP DATE: _____
CORRECTION VERIFIED BY: _____ DATE: _____

INTERVIEWED EMPLOYEE: _____
SAFETY ISSUE: _____
CORRECTIVE ACTION: _____

ASSIGNED TO: _____ FOLLOW-UP DATE: _____
CORRECTION VERIFIED BY: _____ DATE: _____

INSPECTION COMPLETED BY: _____ DATE: _____

HEALTH AND SAFETY REVIEW BY: _____ DATE: _____



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PROJECT SAFETY INSPECTION REPORT

PROJECT _____ DATE _____

	YES	NO	N/A
<u>FIRST AID</u>			
1. Are first aid kit locations identified and accessible?	_____	_____	_____
2. Are emergency eye wash/safety showers available and inspected monthly?	_____	_____	_____
3. Are first aid kits inspected weekly?	_____	_____	_____
4. Is a qualified first aid/CPR provider on site?	_____	_____	_____
<u>PERSONAL PROTECTIVE EQUIPMENT</u>			
1. Have levels of personnel protection been established?	_____	_____	_____
2. Are respirators decontaminated, inspected, and stored according to standard procedures?	_____	_____	_____
3. Have employees been fit-tested?	_____	_____	_____
4. Is defective personal protective equipment tagged and taken out of service?	_____	_____	_____
5. Does compressed breathing air meet CGA Grade "D" minimum?	_____	_____	_____
6. Are there sufficient sizes and quantities of protective equipment?	_____	_____	_____
7. At a minimum, are employees utilizing safety glasses, hard hats, and steel toe boots?	_____	_____	_____
<u>FIRE PREVENTION</u>			
1. Are employees smoking only in designated outdoor areas?	_____	_____	_____
2. Are fire lanes established and maintained?	_____	_____	_____
3. Are flammable liquid dispensing systems bonded?	_____	_____	_____
4. Are approved safety cans available for storage of flammable liquids?	_____	_____	_____
5. Has the local fire department been contacted?	_____	_____	_____
6. Are fire extinguishers available and inspected monthly?	_____	_____	_____
7. Are flammables and combustibles properly stored?	_____	_____	_____
8. Are flammable storage cabinets available and used when needed?	_____	_____	_____
<u>AIR MONITORING</u>			
1. Is required air monitoring being conducted?	_____	_____	_____
2. Are air monitoring instruments calibrated daily?	_____	_____	_____
3. Are air monitoring logs up to date?	_____	_____	_____
4. Are instrument user manuals available?	_____	_____	_____
5. Are instruments being maintained?	_____	_____	_____
6. Are employees notified of personal sampling results within 5 days of receipt?	_____	_____	_____
<u>WELDING AND CUTTING</u>			
1. Are fire extinguishers present at welding and cutting operations?	_____	_____	_____
2. Are confined spaces evaluated prior to and during cutting and welding operations?	_____	_____	_____
3. Have Hot Work Permits been completed?	_____	_____	_____
4. Are proper helmets, goggles, aprons, and gloves available for welding and cutting operations?	_____	_____	_____
5. Are welding machines properly grounded?	_____	_____	_____
6. Are oxygen and fuel gas cylinders stored a minimum of 20 feet apart?	_____	_____	_____
7. Are only trained personnel permitted to operate welding and cutting equipment?	_____	_____	_____
8. Are gas cylinders transported in a secured vertical position with caps in place?	_____	_____	_____
<u>HAND AND POWER TOOLS</u>			
1. Are defective hand and power tools tagged and taken out of service?	_____	_____	_____
2. Is eye protection available and used when operating power tools?	_____	_____	_____



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PROJECT _____ DATE _____

	YES	NO	N/A
3. Are guards and safety devices in place on power tools?	_____	_____	_____
4. Are power tools inspected before each use?	_____	_____	_____
5. Are nonsparking tools available when necessary?	_____	_____	_____
6. Is the correct tool being used for the job?	_____	_____	_____

MOTOR VEHICLES

1. Are vehicles regularly inspected?	_____	_____	_____
2. Are personnel licensed for the vehicles they operate?	_____	_____	_____
3. Are unsafe vehicles tagged and reported to supervision?	_____	_____	_____
4. Is vehicles safety equipment operating properly?	_____	_____	_____
5. Are loads secure?	_____	_____	_____
6. Are vehicle occupants using safety belts?	_____	_____	_____
7. Are current insurance cards and blank accident report forms located in vehicles?	_____	_____	_____

EMERGENCY PLANS

1. Are emergency telephone numbers posted?	_____	_____	_____
2. Have emergency escape routes been designated?	_____	_____	_____
3. Are employees familiar with the emergency signal?	_____	_____	_____
4. Has the emergency route to the hospital been established and posted?	_____	_____	_____
5. Is a vehicle on site that can transport injured employees to the hospital?	_____	_____	_____

MATERIALS HANDLING

1. Are materials stacked and stored to prevent sliding or collapsing?	_____	_____	_____
2. Are tripping hazards identified?	_____	_____	_____
3. Are semi-trailers chocked?	_____	_____	_____
4. Are fixed jacks used under semi-trailers?	_____	_____	_____
5. Are riders prohibited on materials handling equipment?	_____	_____	_____
6. Are approved manlifts provided for the lifting of personnel?	_____	_____	_____
7. Are personnel in manlifts wearing approved fall protection devices?	_____	_____	_____

FIRE PROTECTION

1. Has a fire alarm system been established?	_____	_____	_____
2. Do employees know the location and use of all fire extinguishers?	_____	_____	_____
3. Are fire extinguisher locations posted?	_____	_____	_____
4. Are combustible materials segregated from open flames?	_____	_____	_____
5. Have fire extinguishers been professionally inspected during the last year?	_____	_____	_____
6. Are fire extinguishers visually inspected monthly?	_____	_____	_____

ELECTRICAL

1. Is electrical equipment and wiring properly guarded and maintained in good condition?	_____	_____	_____
2. Are extension cords kept out of wet areas?	_____	_____	_____
3. Is damaged electrical equipment tagged and taken out of service?	_____	_____	_____
4. Have underground electrical lines been identified by proper authorities?	_____	_____	_____
5. Has a lockout/tagout system been established?	_____	_____	_____
6. Are GFCIs being used on all temporary electrical systems and as needed?	_____	_____	_____
7. Are extension cords being inspected daily (i.e., group pin in place, no unapproved splices)?	_____	_____	_____
8. Are warning signs exhibited on high voltage equipment (250V or greater)?	_____	_____	_____



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PROJECT _____ DATE _____

	YES	NO	N/A
9. Is adequate distance maintained from overhead electrical lines?	_____	_____	_____
10. Are switches, circuit breakers, and switchboards installed in wet locations enclosed in weatherproof enclosures?	_____	_____	_____
CRANES AND RIGGING			
1. Are cranes inspected daily prior to use?	_____	_____	_____
2. Are crane swing areas barricaded or demarked?	_____	_____	_____
3. Is all rigging equipment tagged with an identification number and rated capacity?	_____	_____	_____
4. Is rigging equipment inspection documented?	_____	_____	_____
5. Are slings, chains, and rigging inspected before each use?	_____	_____	_____
6. Are damaged slings, chains, and rigging tagged and taken out of service?	_____	_____	_____
7. Are slings padded or protected from sharp corners?	_____	_____	_____
8. Do employees keep clear of suspended loads?	_____	_____	_____
9. Are rated load capacities and special hazard warnings posted on crane?	_____	_____	_____
10. Are the records of annual crane inspection available?	_____	_____	_____
11. Has accessible areas within the swing radius of the rear of the crane been barricaded?	_____	_____	_____
12. Do crane operators have required training/certification?	_____	_____	_____
COMPRESSED GAS CYLINDERS			
1. Are breathing air cylinders charged only to prescribed pressures?	_____	_____	_____
2. Are like cylinders segregated and stored in well ventilated areas?	_____	_____	_____
3. Is smoking prohibited in cylinder storage areas?	_____	_____	_____
4. Are cylinders stored secure and upright?	_____	_____	_____
5. Are cylinders protected from snow, rain, etc.?	_____	_____	_____
6. Are cylinder caps in place before cylinders are moved?	_____	_____	_____
7. Are fuel gas and oxygen cylinders stored a minimum of 20 feet apart?	_____	_____	_____
8. Are propane cylinders stored and used only outside of buildings?	_____	_____	_____
SCAFFOLDING			
1. Is scaffolding placed on a flat, firm surface?	_____	_____	_____
2. Are scaffold planks free of mud, ice, grease, etc.?	_____	_____	_____
3. Is scaffolding inspected before each use?	_____	_____	_____
4. Are defective scaffold parts taken out of service?	_____	_____	_____
5. Have employees completed scaffold user training?	_____	_____	_____
6. On scaffolds where platforms are overlapped, is planking overlapped a minimum of 12 inches?	_____	_____	_____
7. Does scaffold planking extend over end supports between 6 to 18 inches (dependent upon platform length)?	_____	_____	_____
8. Are employees restricted from working on scaffolds during storms and high winds?	_____	_____	_____
9. Are all pins in place and wheels locked?	_____	_____	_____
10. Is required perimeter guarding (top rail, mid rail, and toe board) present?	_____	_____	_____
11. Has a competent person been designated to oversee scaffold construction?	_____	_____	_____
12. Are employees prohibited from moving mobile scaffold horizontally while employees are on them?	_____	_____	_____
13. Are all scaffold components manufactured by the same company?	_____	_____	_____
WALKING AND WORKING SURFACES			
1. Are ladders regularly inspected?	_____	_____	_____
2. Are access ways, stairways, ramps, and ladders clean of ice, mud, snow, or debris?	_____	_____	_____



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PROJECT _____ DATE _____

	YES	NO	N/A
3. Are ladders being used in a safe manner?	_____	_____	_____
4. Are ladders kept out of passageways, doors, or driveways?	_____	_____	_____
5. Are broken or damaged ladders tagged and taken out of service?	_____	_____	_____
6. Are metal ladders prohibited in electrical service?	_____	_____	_____
7. Are stairways and floor openings guarded?	_____	_____	_____
8. Are safety feet installed on straight and extension ladders?	_____	_____	_____
9. Is general housekeeping being maintained?	_____	_____	_____
10. Are ladders tied off?	_____	_____	_____
11. Are handrails and side rails installed along the unprotected sides of stairways having 4 or more risers or rising more than 30 inches?	_____	_____	_____

SITE SAFETY PLAN

1. Is a site safety plan available on site or accessible to all employees?	_____	_____	_____
2. Does the safety plan accurately reflect site conditions and tasks?	_____	_____	_____
3. Have potential hazards been described to employees on site?	_____	_____	_____
4. Is there a designated safety official on site?	_____	_____	_____
5. Have all employees signed the safety plan acknowledgment form?	_____	_____	_____

SITE POSTERS

1. Are the following posters displayed in a prominent and accessible area?			
A. Minimum Wage	_____	_____	
B. OSHA Job Protection	_____	_____	
C. Equal Employment Opportunity	_____	_____	
2. Are all required state-specific posters displayed?	_____	_____	

SITE CONTROL

1. Are work zones clearly marked?	_____	_____	_____
2. Are support trailers located to minimize exposure from a potential release?	_____	_____	_____
3. Are support trailers accessible for approach by emergency vehicles?	_____	_____	_____
4. Is the site properly secured during and after work hours?	_____	_____	_____
5. Is an exclusion zone sign-in/sign-out log maintained?	_____	_____	_____
6. Are only employees with current training and physicals permitted in exclusion zone?	_____	_____	_____

HEAVY EQUIPMENT

1. Is heavy equipment inspected as prescribed by the manufacturer?	_____	_____	_____
2. Is defective heavy equipment tagged and taken out of service?	_____	_____	_____
3. Are project roads and structures inspected for load capacities and proper clearances?	_____	_____	_____
4. Is heavy equipment shut down for fueling and maintenance?	_____	_____	_____
5. Are backup alarms installed and working on mobile equipment?	_____	_____	_____
6. Have qualified equipment operators been designated?	_____	_____	_____
7. Are riders prohibited on heavy equipment?	_____	_____	_____
8. Are guards and safety appliances in place and used?	_____	_____	_____
9. Are operators using the "three point" system when mounting/dismounting equipment?	_____	_____	_____

EXCAVATION



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PROJECT SAFETY INSPECTION REPORT

PROJECT _____ DATE _____

	YES	NO	N/A
1. Has a "competent person" been designated to oversee excavation activities?	_____	_____	_____
2. Prior to opening excavations, are utilities located and marked?	_____	_____	_____
3. Has a professional engineer evaluated all excavations greater than 20 feet deep?	_____	_____	_____
4. Is there rescue equipment on site and accessible to the excavation area?	_____	_____	_____
5. Is excavated material placed a minimum of 24 inches from the excavation?	_____	_____	_____
6. Are the sides of excavations sloped or shored to prevent cave ins?	_____	_____	_____
7. Have excavations greater than 4 feet deep been monitored for hazardous atmospheres (i.e., LEL/O ₂ deficiency)?	_____	_____	_____
8. Are ladders or ramps used in excavations over 4 feet deep?	_____	_____	_____
9. Are means of egress available so as to require no more than 25 feet of lateral travel?	_____	_____	_____
10. Are barriers, i.e., guardrails or fences, placed around excavations near pedestrian or vehicle thoroughfares?	_____	_____	_____
11. Is excavation inspected <u>daily</u> by competent persons and documented?	_____	_____	_____

CONFINED SPACES

1. Have employees been trained in the hazards of confined spaces?	_____	_____	_____
2. Are confined space permits posted at entrance to confined space?	_____	_____	_____
3. Is a copy of the confined space entry procedure available?	_____	_____	_____
4. Has a rescue plan been established?	_____	_____	_____
5. Is an entry supervisor present at each permit-required entry?	_____	_____	_____
6. Are required extraction/fall protection devices being used?	_____	_____	_____

DECONTAMINATION

1. Are decontamination stations set up on site?	_____	_____	_____
2. Is decontamination water properly contained and disposed of?	_____	_____	_____
3. Are all pieces of equipment inspected for proper decontamination before leaving the site?	_____	_____	_____
4. Are shin/metatarsal guards being used during power washing activities?	_____	_____	_____

HAZARD COMMUNICATION

1. Is there a copy of the HAZCOM procedure on site?	_____	_____	_____
2. Are there MSDSs for required materials/chemicals present on site?	_____	_____	_____
3. Are all containers properly labeled, as to content, hazard?	_____	_____	_____
4. Have employees been trained in accordance with the HAZCOM procedure?	_____	_____	_____
5. Do employees (including subcontractors) know and understand the effects of exposure from the chemicals on site?	_____	_____	_____
6. Have all personnel signed the HAZCOM acknowledgment form?	_____	_____	_____
7. Is there an updated list of chemicals maintained on site?	_____	_____	_____

TRAINING

1. Are tailgate safety meetings being conducted daily?	_____	_____	_____
2. Are current training/medical records maintained on site?	_____	_____	_____

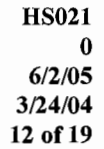
DOCUMENTATION

1. Is an OSHA 300 Log maintained on site and posted during February 1, to April 30,?	_____	_____	_____
2. Are accident report forms available?	_____	_____	_____
3. Is a copy of health and safety policy and procedures available on site?	_____	_____	_____



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ATTACHMENT 3

OFFICE SAFETY INSPECTION REPORT

OFFICE _____ DATE _____

DATE: _____ OFFICE NAME:
OFFICE MANAGER:
AREA(S) OF OFFICE INSPECTED:

INTERVIEWED EMPLOYEE:
SAFETY ISSUE:
CORRECTIVE ACTION:

ASSIGNED TO: _____ FOLLOW-UP DATE:
CORRECTION VERIFIED BY: _____ DATE:

INTERVIEWED EMPLOYEE:
SAFETY ISSUE:
CORRECTIVE ACTION:

ASSIGNED TO: _____ FOLLOW-UP DATE:
CORRECTION VERIFIED BY: _____ DATE:

INSPECTION COMPLETED BY: _____ DATE:

HEALTH AND SAFETY REVIEW BY: _____ DATE:



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OFFICE SAFETY INSPECTION REPORT

OFFICE _____ DATE _____

	YES	NO	N/A
<u>FIRST AID</u>			
1. Are first aid kits accessible and identified?	_____	_____	_____
2. Are emergency eye wash/safety showers available where needed and inspected?	_____	_____	_____
3. Are first aid kits inspected weekly?	_____	_____	_____
<u>FIRE PREVENTION</u>			
1. Are employees smoking only in designated outdoor areas?	_____	_____	_____
2. Are fire lanes/evacuation routes established and maintained?	_____	_____	_____
3. Are approved safety cans/cabinets available for storage of flammable liquids?	_____	_____	_____
4. Are fire exits clearly identified and unobstructed?	_____	_____	_____
<u>FURNITURE AND EQUIPMENT</u>			
1. Are desks, file cabinets, etc. arranged so that drawers do not open into aisles or walkways?	_____	_____	_____
2. Are desk and file drawers closed after use?	_____	_____	_____
3. Is weight distributed in file cabinets so that upper drawer contents does not create a top-heavy condition?	_____	_____	_____
4. Are cabinets, bookcases, and shelves secured to prevent their falling over?	_____	_____	_____
5. Are faulty desks, chairs, or other office equipment repaired or taken out of service?	_____	_____	_____
6. Is adequate and sufficient lighting provided in all work areas?	_____	_____	_____
7. Are paper cutter blades in fully down and locked position when not in use?	_____	_____	_____
8. Are work stations arranged to be comfortable without unnecessary strains on backs, arms, necks, etc.?	_____	_____	_____
9. Do machines with exposed moving parts have appropriate guards?	_____	_____	_____
<u> AISLES AND FLOORS</u>			
1. Is aisle clearance adequate for two-way traffic and for unobstructed access to all parts of the office and building?	_____	_____	_____
2. Does office arrangement allow easy egress under emergency conditions?	_____	_____	_____
3. Are wastebaskets, briefcases, or other objects placed where they are not a tripping hazard?	_____	_____	_____
4. Are floors clear of pencils, bottles, and other loose objects?	_____	_____	_____
5. Are tripping hazards from electrical cords, phone outlets, or other protrusions on the floor prevented by arrangement of furniture or other means?	_____	_____	_____
6. Are floors free of loose tiles and projections that can create a tripping hazard?	_____	_____	_____
7. Is carpeting in good condition and not badly worn or torn?	_____	_____	_____
<u>HAND AND POWER TOOLS</u>			
1. Are defective hand and power tools tagged and taken out of service?	_____	_____	_____
2. Is eye protection available and used when operating power tools?	_____	_____	_____
3. Are guards and safety devices in place on power tools?	_____	_____	_____
4. Are power tools inspected before each use?	_____	_____	_____
5. Is the correct tool being used for the job?	_____	_____	_____
6. Do knife blades have guards when not in use?	_____	_____	_____
<u>MOTOR VEHICLES</u>			
1. Are vehicles regularly inspected?	_____	_____	_____
2. Are personnel licensed for the vehicles they operate?	_____	_____	_____
3. Are unsafe vehicles reported to supervision?	_____	_____	_____



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OFFICE SAFETY INSPECTION REPORT

OFFICE _____

DATE _____

	YES	NO	N/A
4. Is safety equipment on vehicles?	_____	_____	_____
5. Are loads secure on vehicles?	_____	_____	_____
6. Are vehicle occupants using safety belts?	_____	_____	_____
7. Are current insurance cards and blank accident report forms located in vehicles?	_____	_____	_____

EMERGENCY PLANS

1. Are emergency telephone numbers posted?	_____	_____	_____
2. Have emergency escape routes been designated?	_____	_____	_____
3. Are employees familiar with the emergency signal?	_____	_____	_____
4. Has an emergency route to the hospital been established and posted?	_____	_____	_____

MATERIALS HANDLING

1. Are materials stacked and stored to prevent sliding or collapsing?	_____	_____	_____
2. Are flammables and combustibles stored in approved containers?	_____	_____	_____
3. Are tripping hazards identified?	_____	_____	_____
4. Are riders prohibited on material handling equipment?	_____	_____	_____

FIRE PROTECTION

1. Has a fire alarm system been established?	_____	_____	_____
2. Do employees know the location and use of all fire extinguishers?	_____	_____	_____
3. Are fire extinguisher locations marked?	_____	_____	_____
4. Have fire extinguishers been professionally inspected during the last year?	_____	_____	_____
5. Are fire extinguishers visually inspected monthly?	_____	_____	_____
6. Is there an operating fire detection system?	_____	_____	_____

ELECTRICAL

1. Are extension cords kept out of wet areas?	_____	_____	_____
2. Are certified electricians used for electrical work?	_____	_____	_____
3. Are GFCIs being used as needed?	_____	_____	_____
4. Are extension cords not being used in lieu of permanent wiring?	_____	_____	_____
5. Are warning signs exhibited on high voltage equipment (250V or greater)?	_____	_____	_____
6. Are switches, circuit breakers, and switchboards installed in wet locations enclosed in weatherproof enclosures?	_____	_____	_____
7. Are electric fans protected with guards of not over one-half inch mesh, which prevents fingers getting inside guard?	_____	_____	_____
8. Are cords, panels, receptacles, and plugs in good condition?	_____	_____	_____
9. Are multi-outlet strips not plugged into other multi-outlet strips?	_____	_____	_____
10. Are extension cords not plugged into other extension cords?	_____	_____	_____
11. Are circuit breakers or fuse panels properly labeled, kept closed, and accessible?	_____	_____	_____
12. Are extension cords arranged so that they are not placed over radiators, steam pipes, through doorways, or under carpets?	_____	_____	_____
13. Do space heaters have automatic shut-offs that will actuate if the heater tips over?	_____	_____	_____
14. Are space heaters UL listed and plugged directly into a wall receptacle?	_____	_____	_____
15. Are space heaters located at least 3 feet from combustible material?	_____	_____	_____

WALKING AND WORKING SURFACES

1. Are cords, cables, and other items not placed in walkways?	_____	_____	_____
2. Are ladders regularly inspected?	_____	_____	_____
3. Are access ways, stairways, ramps, and ladders clean of ice, mud, snow, or debris?	_____	_____	_____



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OFFICE _____

DATE _____

	YES	NO	N/A
4. Are ladders being used in a safe manner?	_____	_____	_____
5. Are ladders kept out of passageways, doors, or driveways?	_____	_____	_____
6. Are broken or damaged ladders tagged and taken out of service?	_____	_____	_____
7. Are metal ladders prohibited in electrical service?	_____	_____	_____
8. Are stairways and floor openings guarded?	_____	_____	_____
9. Are safety feet installed on straight and extension ladders?	_____	_____	_____
10. Are employees walking instead of running?	_____	_____	_____
11. Are handrails and side rails installed along the unprotected sides of stairways having 4 or more risers or rising more than 30 inches?	_____	_____	_____
12. Are there torn, loose, or curled carpets?	_____	_____	_____

HOUSEKEEPING

1. Is good housekeeping maintained?	_____	_____	_____
2. Are paper and materials stored properly?	_____	_____	_____
3. Are cleaning fluids used only in small quantities and stored in closed containers that are kept in well-ventilated areas?	_____	_____	_____
4. If cleaning fluids are flammable, are they not used near a flame or an open heating element?	_____	_____	_____
5. Are wastebaskets emptied on a daily basis?	_____	_____	_____

SITE POSTERS

1. Are the following posters displayed in a prominent and accessible area?			
A. Minimum Wage	_____	_____	_____
B. OSHA Job Protection	_____	_____	_____
C. Equal Employment Opportunity	_____	_____	_____
2. Are all required state-specific posters displayed?	_____	_____	_____

HAZARD COMMUNICATION

1. Is the written HAZCOM program available?	_____	_____	_____
2. Is there a MSDS <u>FOR EACH HAZARDOUS CHEMICAL</u> present in the office?	_____	_____	_____
3. Are all containers properly labeled, as to content, hazard?	_____	_____	_____
4. Have employees been trained on chemical hazards?	_____	_____	_____
5. Have all employees signed the HAZCOM acknowledgment form?	_____	_____	_____
6. Is there a list of chemicals maintained on site?	_____	_____	_____

DOCUMENTATION

1. Is an OSHA 300 Log maintained and posted during February1, to April 30?	_____	_____	_____
2. Are accident report forms available?	_____	_____	_____
3. Is a copy of health and safety policy and procedures available?	_____	_____	_____



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OFFICE _____

DATE _____

ALL NEGATIVE RESPONSES	CORRECTIVE ACTION	ASSIGNED TO	DATE ASSIGNED	DATE COMPLETE D	VERIFIED BY

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ATTACHMENT 4 LABORATORY SAFETY INSPECTION REPORT

LOCATION _____ DATE _____

	YES	NO	N/A
I. <u>FIRST AID</u>			
1. Are first aid kit locations identified and accessible?	_____	_____	_____
2. Are emergency eye wash/safety showers available and inspected monthly?	_____	_____	_____
3. Is access to eye wash units and safety showers unimpeded?	_____	_____	_____
II. <u>PERSONAL PROTECTIVE EQUIPMENT</u>			
1. Are employees wearing safety glasses in the laboratory?	_____	_____	_____
2. Are laboratory coats worn by all employees and visitors when working with chemicals and/or samples?	_____	_____	_____
3. Are gloves worn when chemicals and samples are handled?	_____	_____	_____
III. <u>FIRE PREVENTION/FIRE PROTECTION</u>			
1. Are employees smoking only in designated outdoor areas?	_____	_____	_____
2. Are flammable storage cabinets available and used when needed?	_____	_____	_____
3. Has a fire alarm system been established?	_____	_____	_____
4. Are fire extinguishers available and inspected monthly?	_____	_____	_____
5. Do employees know the location and use of fire extinguishers?	_____	_____	_____
6. Are fire extinguisher locations posted?	_____	_____	_____
7. Have fire extinguishers been professionally inspected during the last year?	_____	_____	_____
IV. <u>EMERGENCY PLANS</u>			
1. Are emergency telephone numbers posted?	_____	_____	_____
2. Have emergency escape routes been designated?	_____	_____	_____
3. Are employees familiar with the emergency signal?	_____	_____	_____
4. Are appropriate spill kit supplies available?	_____	_____	_____
5. Are emergency exits marked?	_____	_____	_____
6. Are sprinkler heads unobstructed?	_____	_____	_____
V. <u>ELECTRICAL</u>			
1. Are extension cords kept out of wet areas?	_____	_____	_____
2. Are extension cords arranged so that they are not placed over radiators, steam pipes, through doorways, or under carpets?	_____	_____	_____
3. Are cords, panels, receptacles, and plugs in good condition?	_____	_____	_____
4. Are extension cords not being used in lieu of permanent wiring?	_____	_____	_____
5. Are extension cords not plugged into other extension cords?	_____	_____	_____
6. Are multi-outlet strips not plugged into other multi-outlet strips?	_____	_____	_____
7. Has a lockout/tagout system been established?	_____	_____	_____
8. Are GFCIs being used on all temporary electrical systems and as needed?	_____	_____	_____
9. Are warning signs exhibited on high voltage equipment (250V or greater)?	_____	_____	_____
10. Are circuit breakers or fuse panels properly labeled, kept closed, and accessible?	_____	_____	_____
VI. <u>COMPRESSED GAS CYLINDERS</u>			
1. Are like cylinders segregated and stored in well ventilated areas?	_____	_____	_____
2. Is smoking prohibited in cylinder storage areas?	_____	_____	_____
3. Are cylinders stored secure and upright?	_____	_____	_____
4. Are cylinders protected from snow, rain, etc.?	_____	_____	_____



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ATTACHMENT 4 LABORATORY SAFETY INSPECTION REPORT

LOCATION _____ DATE _____

	YES	NO	N/A
5. Are cylinder caps in place for storage and movement?	_____	_____	_____

VIII. WALKING AND WORKING SURFACES

1. Are accessways, stairways, and ramps clean of ice, mud, snow, or debris?	_____	_____	_____
2. Are stairways and floor openings guarded?	_____	_____	_____
3. Are handrails and siderails installed along the unprotected sides of stairways having 4 or more risers or rising more than 30 inches?	_____	_____	_____
4. Are tripping hazards from electrical cords, phone outlets, or other protrusions on the floor prevented by arrangement of furniture or equipment?	_____	_____	_____
5. Are floors free of loose tiles and projections that can create a tripping hazard?	_____	_____	_____

VIII. HAZARD COMMUNICATION

1. Is there a copy of the Chemical Hygiene Plan (CHP) on site?	_____	_____	_____
2. Have employees been trained in accordance with the CHP?	_____	_____	_____
3. Are all containers properly labeled as to content, hazard, etc.?	_____	_____	_____
4. Is there an updated list of chemicals maintained at the laboratory?	_____	_____	_____
5. Are there MSDSs for the chemicals present in the laboratory?	_____	_____	_____
6. Do employees know and understand the effects of exposure from the chemicals they work with?	_____	_____	_____

IX. DOCUMENTATION

1. Is an OSHA 300A Log maintained on site and posted between February 1 and May 1?	_____	_____	_____
2. Are accident report forms available?	_____	_____	_____

X. FURNITURE AND EQUIPMENT

1. Are desks, file cabinets, etc. arranged so that drawers do not open into aisles or walkways?	_____	_____	_____
2. Are desk and file drawers closed after use?	_____	_____	_____
3. Are cabinets, bookcases, and shelves secured to prevent their falling over?	_____	_____	_____
4. Is adequate and sufficient lighting provided in all work areas?	_____	_____	_____
5. Are work stations arranged to be comfortable without unnecessary strains on backs, arms, necks, etc.?	_____	_____	_____
6. Do machines with exposed moving parts have guards?	_____	_____	_____

XI. LABORATORY FUME HOODS

1. Are face velocities posted on each hood?	_____	_____	_____
2. Is the average face velocity at least 100 ft/min.?	_____	_____	_____
3. Is the sash position marked or otherwise indicated to show the acceptable position for achieving the desired airflow rate?	_____	_____	_____
4. Has the hood face velocity been measured with a calibrated instrument in the last 6 months?	_____	_____	_____
5. Are signs posted on hoods that are not working correctly?	_____	_____	_____
6. Does the hood contain visual indicators that it is working properly (e.g., manometer, magnehelic gauge, etc.)?	_____	_____	_____



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ATTACHMENT 4
LABORATORY SAFETY INSPECTION REPORT

LOCATION _____ **DATE** _____

YES **NO** **N/A**

XII. GENERAL LABORATORY RULES

- | | | | |
|--|-------|-------|-------|
| 1. Are open-toed shoes and sandals prohibited in the laboratory? | _____ | _____ | _____ |
| 2. Are eating, drinking, chewing gum or tobacco products prohibited in the laboratory? | _____ | _____ | _____ |
| 3. Are food refrigerators labeled such as to prevent chemical storage or vice versa? | _____ | _____ | _____ |

XIII. HOUSEKEEPING

- | | | | |
|---|-------|-------|-------|
| 1. Are lab benches orderly? | _____ | _____ | _____ |
| 2. Are laboratories free of liquid spills? | _____ | _____ | _____ |
| 3. Are sinks free of accumulated glassware? | _____ | _____ | _____ |
| 4. Are waste disposal containers available and labeled? | _____ | _____ | _____ |



PROCEDURE

Subject: JOB SAFETY ANALYSIS (JSA)

1.0 PURPOSE AND SUMMARY

This procedure provides the guidelines to perform a Job Safety Analysis.

The (JSA) is an effective management technique for identifying hazardous conditions and unsafe acts in the workplace. A JSA is intended to analyze the individual steps or activities, which together create

a job or specific work duty, and to detect any actual or potential hazards that may be present. This process can identify less obvious potential hazards that may go undetected during routine management observations or audits. **A new JSA must be completed every day, before commencement of any work activity and updated in the event of changing conditions. It should be understood that changing conditions that a work crew encounters during a work period (inclement weather, another contractor began work in area, etc.) requires that the JSA be modified to address the new hazards. The JSA should be changed to reflect new conditions in the task being performed or new hazards not identified previously.**

2.0 TABLE OF CONTENTS

- 1.0 Purpose and Summary
- 2.0 Table of Contents
- 3.0 Responsibility Matrix
 - 3.1 Procedure Responsibility
 - 3.2 Action/Approval Responsibilities
- 4.0 Definitions
- 5.0 Text
 - 5.1 General Requirements
 - 5.2 Methods of Conducting JSA's
 - 5.3 Analyzing The Job
 - 5.4 Common Errors
 - 5.5 Identifying the Hazards and Potential Accidents
 - 5.6 Accident Types
 - 5.7 Writing Instructions
 - 5.8 Develop Solutions
- 6.0 Specific Requirements
 - 6.1 Sequence of Basic Job Steps
 - 6.2 Potential Hazards
 - 6.3 Recommended Action Procedure
- 7.0 References
- 8.0 Attachments



3.0 Responsibility Matrix

3.1 Procedure Responsibility

The Manager/Supervisor is responsible for implementing and enforcing this procedure.

The Safety Representative is responsible for monitoring compliance with this procedure.

Each Employee is responsible for complying with the project safety program, along with the rules and regulations as stipulated in this procedure and instructions issued by the employee's supervisor.

It is the responsibility of management and supervision to ensure that this policy is followed. Accordingly, should the project / site requirements stipulate the use of another method of job safety analysis, it is the responsibility of management and supervision to ensure that the proposed method either meets or exceeds this JSA policy and the accompanying JSA form. Any policy or JSA form that does not cover the items contained herein shall not be used.

3.2 Action/Approval Responsibilities

The Responsibility Matrix is Attachment 1

4.0 DEFINITIONS

HAZARD - A potential danger. Oil on the floor is a hazard.

ACCIDENT - An unintended happening that may result in injury, loss or damage.

EXAMPLE - Slipping on the oil is an accident.

INJURY - The result of an accident. A sprained wrist from the fall would be an injury.

5.0 TEXT

5.1 General Requirements

The first page of the JSA form is a checklist that should be used for reference purposes and serves to assist the work crew and supervisor in completing the second page of the JSA. The first page of the JSA form is used to write out the various tasks involved, potential hazards, recommended actions, etc.

Job Safety Analysis is a procedure used to review job methods and uncover hazards:

- That may have been overlooked in a Hazard Analysis, project layout or design of the



equipment, tools processes or work area.

- That may have developed after production started.
- That may have resulted from changes in work procedures or personnel

The three basic steps in performing a job safety analysis are

- (Job Task) Break the job down into successive steps or activities and observe how these actions are performed.
- (Potential Hazards) Identify the hazards and potential accidents. This is the critical step because only an identified problem can be corrected or eliminated.
- (Recommended Actions) Develop safe job procedures to eliminate the hazards and prevent potential accidents.

5.2 Methods of Conducting JSA's

There are two basic methods for conducting the Job Safety Analysis:

- Direct observation
- Group discussion

A fast and efficient method of conducting a JSA is through direct observations of job performance. In many instances, however, this method may not be practical. However, through direct observation, one can gain knowledge concerning an activity and use it on a future JSA.

For instance, new jobs and those that are done infrequently do not lend themselves to direct observation. When this is the case, the JSA can be made through discussions with persons familiar with the job. Individuals often involved in the process include, but are not limited to, first line supervisors, safety specialists, engineers, experienced employees and outside contractors.

5.3 Analyzing The Job

When analyzing the job, most people start with the worst first. You should be guided by the following factors:

- **Frequency of Accidents** (Including "near misses"):
An element of a job that repeatedly produces accidents is a candidate for starting a JSA. The greater the number of incidents associated with a job element, the greater its priority claim for a JSA.



- **New or Revised Jobs:**

Jobs created by changes in equipment or in processes obviously have no history of accidents, but their accident potential may not be fully appreciated. Analysis should not be delayed until accidents or near misses occur.

Any changes from the original task/job shall be noted on the form as a revision. Once this has occurred the new found hazards must be reviewed with the crew.

- **Multiple Employee Exposure**

Jobs that expose more than one individual to potential hazards should also be analyzed.

5.4 Common Errors

Five common errors that are often made when performing a job analysis are:

- Making the breakdown so detailed that an unnecessarily large number of steps are listed.
- Making the job so general that basic steps are not recorded.
- Failure to identify the education and experience level of the target audience.
- Failure to identify end use(s). (i.e., training, actual procedure, basis for procedure, etc.)
- Always relying on the Supervisor for completing the JSA. Supervisor should describe work scope to the crew. The crew should then assist in identifying hazards and controls at the job site with active involvement from the Supervisor. Ultimately, the supervisor is responsible, however, crew members and the Supervisor should be actively involved in each JSA.

5.5 Identifying the Hazards and Potential Accidents

The purpose is to identify all hazards, both **physical** and **environmental**. To do this, ask yourself these questions about each step:

- Is there a danger of striking against, being struck by, or otherwise making harmful contact with an object?
- Can the employee be caught in, on, by or between objects?
- Is there a potential for a slip, trip or fall? If so, will it be on the same elevation or to a different elevation?
- Can he strain himself by pushing, pulling, lifting, bending or twisting?
- Is the Environment hazardous to one's safety or health? Has the weather been considered as a factor? Has the work product of others, as it pertains to the environment, been considered???



5.7 Accident Types

- | | |
|--|---|
| <ul style="list-style-type: none">• Struck by
moving or flying object
falling material | <ul style="list-style-type: none">• Struck against
stationary or moving object
protruding object
sharp or jagged edge |
| <ul style="list-style-type: none">• Contact with
acid
electricity
heat
caustic
cold
radiation
toxic and noxious substances | <ul style="list-style-type: none">• Overexertion / repetitive
Lifting
pulling
pushing
reaching
twisting |
| <ul style="list-style-type: none">• Caught
in
on
between | <ul style="list-style-type: none">• Fall to
same level
lower level |
| <ul style="list-style-type: none">• Bodily reaction from
voluntary motion
involuntary motion | <ul style="list-style-type: none">• Rubbed or abraded by
friction
pressure
vibration |

5.8 Writing Instructions

- Put any qualifying statements first, not last.
- Start each instruction with an action word.
- Each instruction should be observable.
- Each instruction should be measurable.

When evaluating a given procedure, ask the following question.

"What should the employee do -- or not do -- to eliminate this particular hazard or prevent this potential accident?"

Answer must be specific and concrete to be beneficial. General precautions such as "be careful"; "use caution" or "be alert" are useless. Answers should state what to do and how to do it.

This recommendation, "Make certain the wrench does not slip or cause loss of balance" is incomplete. It does not tell how to prevent the wrench from slipping. Here is a more complete recommendation. "Set the wrench properly and securely. Test its grip by exerting a slight pressure on it. Brace yourself against something immovable, or take a stance with feet wide apart before exerting full pressure. This prevents loss of balance if



the wrench slips."

Job Safety Analyses can be very beneficial if they are performed correctly. They not only result in a safer job, but also increase productivity and eliminate waste. Take the time to do them correctly; **and more importantly, use them.**

5.9 Develop Solutions

The final step in conducting a JSA is to develop a recommended safe job procedure to prevent the occurrence of potential accidents. The principle solutions are:

- Find a new way to do the job.
- Change the physical conditions that create the hazard.
- Try to eliminate remaining hazards by changing work methods or procedures.
- Try to reduce the necessity of doing a job, or at least the frequency that it must be performed.

6.0 Specific Requirements

Instructions for Completing Job Safety Analysis Form

Job Safety Analysis (JSA) is an important accident prevention tool that works by finding hazards and eliminating or minimizing them before the job is performed, and before they have a chance to become accidents.

- Use your JSA for job clarification and hazard awareness
- as a guide in new employee training
- for periodic contacts and for retraining of senior employees
- as a reference tool to be used prior to commencing a job which is performed infrequently
- as an accident investigation tool
- Informing employees of specific job hazards and protective measures.

6.1 Sequence of Basic Job Steps

Break the job down into steps. Each of the steps of a job should accomplish some major task. The task will consist of a set of movements used to perform a task, and then determine the next logical set of movements.

For example, the job might be to move a box from a conveyor in the receiving area to a shelf in the storage area. How does that break down into job steps? Picking up the box from the conveyor and putting it onto a hand truck is one logical set of movements, so it is one job step.



Everything related to that one logical set of movements is part of that job step. The next logical set of movements might be pushing the loaded hand truck to the storeroom. Removing the boxes from the truck and placing them on the shelf is another logical set of movements. Finally, returning the hand truck to the receiving area might be the final step in this type of job.

Be sure to list all the steps in a job. Some steps might not be done each time -- checking the casters on a hand truck, for example. However, that task is part of the job as a whole, and should be listed and analyzed.

6.2 Potential Hazards

Identify the hazards associated with each step. Examine each step to find and identify hazards -- actions, conditions and possibilities that could lead to an accident. It is not enough to look at the obvious hazards. It is also important to look at the entire work environment and discover every conceivable hazard that might exist.

- Be sure to list health hazards as well, even though the harmful effect may not be immediate. A good example is the harmful effect of inhaling a solvent or chemical dust over a long period of time.
- Hazards contribute to accidents, injuries and occupational illnesses. In order to do part three of a JSA effectively, you must identify potential and existing hazards. That's why it's important to distinguish between a hazard, an accident and an injury. Each of these terms has a specific meaning:

Some people find it easier to identify possible accidents, illnesses, and work back from them to the hazards. If you do that, you can list the accident and illness types in parentheses following the hazard. However, be sure you focus on the hazard for developing recommended actions and safe work procedures.

6.3 Recommended Action Procedure

Decide what actions are necessary to eliminate or minimize the hazards that could lead to an accident, injury or occupational illness. Among the actions that can be taken are:

- 1) engineering the hazard out
- 2) administrative controls
 - job instruction training
 - good housekeeping



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- good ergonomics
(Positioning the person in relation to the machine or other elements in the Environmental in such a way as to eliminate stresses and strains)

3) providing personal protective equipment

- List recommended safe operating procedures on the form, and list required or recommended personal protective equipment for each step of the job.
- Be specific. Say exactly what needs to be done to correct the hazard, such as "lift, using your leg muscles." Avoid general statements like "be careful."
- Give a recommended action or procedure for every hazard.
- If the hazard is a serious one, it shall be corrected immediately.

The JSA should be changed to reflect new conditions in the task being performed or new hazards not identified previously.

7.0 REFERENCES

"Job Hazard Analysis", U.S. Dept. of Labor -- OSHA Publication No. 3071

"Job Safety Analysis" - Safety Manual No. 5, U.S. Dept. of Interior, Mining Enforcement and Safety Administration

8.0 ATTACHMENTS

1. Responsibility Matrix
2. Job Safety Analysis Form



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**ATTACHMENT 1
EMPLOYEE AND SUBCONTRACTOR TRAINING REQUIREMENTS**

Responsibility Matrix

Action	Procedure Section	Responsible Party		
		Manager/ Supervisor	H&S Representative	Employee
Responsible for implementing and enforcing procedure	3.1	X		
Monitoring for compliance with the procedure.	3.1		X	
Complying with the project JSA program, along with the rules and regulations as stipulated in this procedure	3.1			X
Review completed JSA forms for any errors and communicate to the originator of the changes.	5.5		X	



JOB SAFETY ANALYSIS

DATE:
JOB#:
PERMIT#:
ISSUED BY:

SUPERVISION/FOREMAN

Consider the following and check the items which apply to the job, then review with the work crew.

PERMITS
____ Required
____ Cold Work
____ Hot Work
____ Entry Permit
____ All Conditions Met
____ Signed Off When Complete
____ Other _____

PERSONAL PROTECTIVE EQUIP. (PPE)
____ Type of Gloves
____ Composition of Gloves
____ Special Purpose Gloves
____ Tyvek Suit
____ Acid Suit /Slicker Suit
____ Rubber Boots
____ Mono Goggles (vented/non-vented)
____ Face Shield
____ Respirator
____ Fresh Air
____ Ear Protection
____ Safety Harness
____ Burning Goggles
____ Other _____

TOOLS
____ Current Inspection
____ Proper Tools for the Job
____ Good Tool Condition
____ Qualifications
____ Other _____

EMERGENCY EQUIPMENT
____ Fire Extinguishers
____ Safety Shower
____ Evacuation Route
____ Other _____

ACCESS
____ Scaffold (properly inspected)
____ Ladder (Tied off)
____ Manlift
____ Personnel Basket (inspected & approved)
____ Operator Training
____ Special Provisions
____ Other _____

WELDING
____ Flashburns
____ Combustibles
____ Spark Containment
____ Shields
____ Grounding
____ Water Hose
____ Fire Extinguisher
____ Fire Blanket
____ Fire Watch
____ Sewer Covers
____ Other _____

OVERHEAD WORK
____ Barricades
____ Signs
____ Hole Cover
____ Handrail
____ Other _____

ELECTRICAL
____ Locked & Tagged out
____ Try Start/Stop Switch
____ GFCI Test
____ Assured Grounding
____ Extension Cord Inspection
____ Other _____

LIFTING
____ Forklift
____ Cherry Picker
____ Load Chart
____ Angle
____ Crane
____ Chainfall
____ Proper Rigging Practices
____ Manual Lifting
____ Condition of Equipment
____ Operator Certificate

HAZARDS (ENVIRONMENTAL)
____ Electrical Shock
____ Heat Stress
____ Heavy Objects
____ Hot/Cold Surf. Or Mat.
____ Inadequate Lighting
____ Line Breaking
____ Noise
____ Poor Access/Egress
____ Sharp Objects
____ Other _____

HAZARDS/CHEMICALS
____ Chemical Burn Skin/Eyes
____ Flammable
____ Ingestion
____ Inhalation
____ Skin Contamination

HAZARDS/BODY
____ Fall Potential
____ Pinch Points
____ Slip-Trip Potential
____ Other _____

OTHER WORK IN AREA
____ Others Working Overhead
____ Type Work Others Doing
____ PPE Due to Other Work
____ Other _____

Confined Space
Know the Following:

- Possible hazards within the confined space
- First signs of exposure
- How to summons help
- How to track personnel
- Entering and exiting the confined space
- Maintain contact with all entrants by voice or visual
- Do not attempt to rescue unless you are a part of a coordinated effort
- Remain at entry point assume no duties with take you from there.

SUPERVISOR/FOREMAN RECOMMENDATION: _____

Location of Job (Unit/Location on Project):					
Required PPE:		Safety Access/ Location		Supervisor of Work:	
		Safe Haven:		JSA Prepared By:	
		Wind Direction:		Are other crews in area?	
<u>Pre-Job Preparation</u>		Evacuation Route:			
1. Fill out JSA		Assembly Point:		New:	
2. Review JSA (EVERYONE)				Revised:	
3. Sign JSA (EVERYONE)					
Job Task (What are You Doing)				Audit the Job <u>Audit Time:</u>	
Potential Hazards				<u>Supervisors Comments</u>	
Recommended Action or Procedure				Supervisor's Initials:	
Crew Name Signatures:					



PROCEDURE

Subject: TAILGATE SAFETY MEETINGS

1.0 PURPOSE AND SUMMARY

This procedure establishes the requirement for the conductance of tailgate safety meetings. These meetings are to be conducted at each company project site, on a daily basis, prior to the start of any work activities.

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- 1.0 Purpose and Summary
- 2.0 Table of Contents
- 3.0 Responsibility Matrix
 - 3.1 Procedure Responsibility
 - 3.2 Action/Approval Responsibilities
- 4.0 Definitions
- 5.0 Text
- 6.0 Exception Provisions
- 7.0 Cross References
- 8.0 Attachments

3.0 RESPONSIBILITY MATRIX

3.1 Procedure Responsibility

The Director of Health and Safety is responsible for the issuance, revision, and maintenance of this procedure.

3.2 Action/Approval Responsibilities

The Responsibility Matrix is Attachment 1.

4.0 DEFINITIONS

Company - All wholly-owned subsidiaries of Shaw Environmental & Infrastructure, Inc. (Shaw E & I).

Tailgate Safety Meeting - A short training or informative session that provides safety guidelines for the planned work activities for the day or shift.



5.0 TEXT

The project supervisor or his/her designee conducts a tailgate safety meeting at the beginning of each shift or whenever new employees arrive at the work site. The topics discussed at the tailgate safety meeting should cover the work assignments for the day, the expected hazard(s) presented by the work, and an explanation on how employees will protect themselves from those hazards.

The meetings are to be documented by the completion of a Tailgate Safety Meeting Form. The project supervisor will assure that the form is properly completed and signed by all attendees. Completed forms will be maintained in the project files.

The following sections provide guidance for the completion of the form:

- **Project Name/Number** - Specific project name and number assigned to the project.
- **Date** - Date of meeting.
- **Time** - Time at which meeting is held.
- **Client** - Identification, name, etc. of entity for whom work is to be performed.
- **Work Activities** - Detailed description of the work activities to be performed that day.
- **Hospital Name/Address** - Hospital name and address designated to be used for the project.
- **Phone Number** - Designated hospital non-emergency phone number.
- **Ambulance** - Phone number for medical emergency transportation.
- **Safety Topics Presented:**
 1. **Chemical Hazards** - Specific chemical name and adverse properties of all chemicals to be encountered on the job that day. A Material Safety Data Sheet (MSDS) for each should be available and discussed in accordance with Procedure HS060.
 2. **Physical Hazards** - Address physical hazards associated with the work site, such as slipping/tripping/falling hazards, pinch points, overhead hazards, and nearby operations that could pose a hazard.
 3. **Personal Protective Equipment** - Specify levels of protective clothing and protective devices to be used by employees for each of the days activities.



4. **New Equipment** - Indicate proper work techniques and any hazards associated with new or unfamiliar equipment.

5. **Other Safety Topic(s)** - List any remaining safety topics pertinent to the potential hazards of the job for that day. This is an area where different, unique subjects can be introduced to make the tailgate safety meeting more interesting.

- **Attendees** - Printed name and signature of all persons in attendance. (Also, list affiliation if not employed by the company.)
- **Meeting Conducted By** - Printed name and signature of individual conducting the tailgate safety meeting.

6.0 **EXCEPTION PROVISIONS**

Variances and exceptions may be requested pursuant to the provisions of Procedure HS013, Health and Safety Procedure Variances

7.0 **CROSS REFERENCES**

HS013 Health and Safety Procedure Variances
HS060 Hazard Communication Program

8.0 **ATTACHMENTS**

1. Responsibility Matrix
2. Tailgate Safety Meeting Form



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ATTACHMENT 1 TAILGATE SAFETY MEETINGS

Responsibility Matrix

Action	Procedure Section	Responsible Party	
		Director of Health and Safety	Project Supervisor
Issuance, Revision, and Maintenance of Procedure	3.1	X	
Conduct Meeting	5.0		X



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ATTACHMENT 2

TAILGATE SAFETY MEETING FORM

Project Name/Number: _____ Date: _____ Time: _____

Client: _____

Work Activities: _____

Hospital Name/Address: _____

Hospital Phone No.: _____ Ambulance Phone No.: _____

Safety Topics Presented

Chemical Hazards: _____

Physical Hazards: _____

Personal Protective Equipment:

Activity: _____ PPE Level: _____

Activity: _____ PPE Level: _____

Activity: _____ PPE Level: _____

Activity: _____ PPE Level: _____

Activity: _____ PPE Level: _____

New Equipment: _____

Other Safety Topic(s): _____

Attendees

NAME PRINTED

SIGNATURE

Meeting conducted by:



PROCEDURE

Subject: HAZARD COMMUNICATION PROGRAM

1.0 PURPOSE AND SUMMARY

This procedure has been developed to ensure that all affected company employees are provided with current information on the hazardous chemicals that they may encounter during their work. The basic principle of Hazard Communication (HAZCOM) is that anyone that works with hazardous chemicals has both a need and a right to know the identities and the hazards of any chemical to which they may be occupationally exposed. This principle has been propagated by the Occupational Safety and Health Administration (OSHA) in 29 Code of Federal Regulations (CFR) 1910.1200 *Hazard Communication*.

Some company activities are likely to occur in states or localities that either have or will have requirements that differ from those contained within the federal standard. In such circumstances, the local health and safety representative will be responsible for ensuring that these requirements are included in either a site health and safety plan or a similar document and conveyed to all affected employees. If federal, state, or local regulations vary or conflict, the more protective requirements and practices will be followed.

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5.1	Hazardous Chemical Inventories
5.2	Procurement of Hazardous Chemicals
5.3	Container Labeling
5.4	Material Safety Data Sheets (MSDS)
5.5	Training
5.6	Trade Secrets
5.7	Contractors
6.0	Exception Provisions
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3.0 RESPONSIBILITY MATRIX

3.1 Procedure Responsibility

The EH&S Operations Manager is responsible for the issuance, revision, and maintenance of this procedure.

3.2 Action/Approval Responsibilities

The Responsibility Matrix is Attachment 1.

4.0 DEFINITIONS

Article - A manufactured item other than a fluid or particle which is formed to a specific shape or design during manufacture, has end use function dependent in whole or in part upon its shape or design during end use, which under normal conditions of use does not release more than trace amounts of a hazardous substance and does not pose a physical hazard or health risk to employees.

Affected Employee - Any company employee who may be exposed to hazardous chemicals under normal operating conditions or in foreseeable emergencies.

Company - All wholly-owned subsidiaries of Shaw Environmental & Infrastructure, Inc. (Shaw E & I)

Hazardous Chemical - Any chemical which poses a physical or health hazard.

Health Hazard - A chemical for which there is statistically significant evidence based on at least one study conducted in accordance with established scientific principles that acute or chronic health effects may occur in exposed employees. Health hazards include chemicals which are carcinogens, toxic or highly toxic agents, reproductive toxins, irritants, corrosives, sensitizers, hepatotoxins, nephrotoxins, neurotoxins, agents which act on the hematopoietic system, and agents which damage the lungs, skin, eyes, or mucous membranes.

Immediate Use - When hazardous chemicals will be under the control of and used only by the person who transfers it from a labeled container and only within the work shift in which it is transferred.

Label - Any written, printed, or graphic material displayed on or affixed to containers of hazardous chemicals.

Local Health and Safety Representative - The person who is responsible for the management and/or oversight of health and safety activities at a particular workplace. He/she may be assigned as a site health and safety officer or act as a home office health and safety manager who



is responsible for multiple workplaces. This person does not necessarily need to be physically located at a workplace in which they are responsible for ensuring that the requirements of this procedure are fulfilled. The local health and safety representative may designate another qualified individual to assume some or all of the responsibilities delineated in this procedure.

Physical Hazard - A chemical for which there is scientifically valid evidence that it is a combustible liquid, compressed gas, explosive, flammable, an organic peroxide, an oxidizer, pyrophoric, unstable, or reactive.

Responsible Party - The entity responsible for preparation or distribution of Material Safety Data Sheets (MSDS) that can provide additional information on the hazardous chemical and appropriate emergency procedures.

Trade Secret - Any confidential formula, pattern, process, device, information, or compilation of information that is used in an employer's business, and that gives the employer an opportunity to obtain an advantage over competitors who do not currently know or use it.

Workplace - An establishment, job site, laboratory, office, or project at one geographic location containing one or more work areas.

5.0 TEXT

In accordance with the requirements established in 29 CFR 1910.1200, employers are required to develop, implement, and maintain at each workplace a HAZCOM program. The program contained herein is intended to ensure that the hazards of all chemicals used by employees are evaluated and that information concerning the hazards of each chemical are conveyed to affected employees. The company program generally consists of five provisions, including hazardous chemical inventories, procurement of hazardous chemicals, container labeling, MSDSs, and the development and implementation of employee training programs. Since the company does not typically produce, distribute, or import hazardous chemicals, the focus of this procedure is on establishing an effective consumer/handler type HAZCOM program and the communication of information to our affected employees.

There are some types of chemicals that are specifically exempt from this procedure. These materials include:

- Any hazardous waste as defined by the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act of 1967, as amended (42 U.S.C. 6901 *et seq.*), when subject to regulations issued under that Act by the U.S. Environmental Protection Agency.
- Any hazardous chemical as defined by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) when the hazardous chemical is the focus of



remedial or removal actions being conducted under CERCLA in accordance with U.S. Environmental Protection Agency regulations.

- Tobacco or tobacco products.
- Wood or wood products, including lumber which will not be processed, where the manufacturer or importer can establish that the only hazard they pose to employees is the potential for flammability or combustibility. Wood or wood products which have been treated with a hazardous chemical are covered by this procedure, and wood which may be subsequently sawed or cut, generating dust.
- Articles.
- Food or alcoholic beverages which are sold, used, or prepared in a retail establishment, or foods intended for personal consumption by employees while in the workplace.
- Any drug, as defined by the Federal Food, Drug, and Cosmetic Act, when it is in solid, final form for direct administration to patient; drugs which are packaged by the manufacturer for sale to consumers in a retail establishment; and drugs intended for personal consumption by employees while in the workplace.
- Cosmetics which are packaged for sale to consumers in a retail establishment, and cosmetics intended for personal consumption by employees while in the workplace.
- Any consumer product or hazardous chemical, as defined by Consumer Product Safety Act and Federal Hazardous Chemicals Act, where the employer can show that it is used in the workplace for the purpose intended by the manufacturer or importer of the product, and the use results in a duration and frequency of exposure which is not greater than the range of exposures that could reasonably be experienced by consumers when used for the purpose intended.
- Nuisance particulates where the manufacturer, distributor, or importer can establish that they do not pose any physical or health hazard covered under this procedure.
- Ionizing and nonionizing radiation.
- Biological hazards.

5.1 Hazardous Chemical Inventories

A complete list of all hazardous chemicals known to be present in the workplace that may expose an employee to a physical or health hazard will be maintained at each office location and project site. This list will be placed in the front section of the MSDS binder discussed in Section 5.4. The local health and safety representative/site safety officer will be responsible for maintaining the list and revising it as new chemicals are procured



or when chemicals are no longer used and have been removed from the workplace. The identity of the hazardous chemical maintained on the list will be consistent with that which appears on the MSDS. All affected employees will be made aware of the location of the MSDS binder.

5.2 Procurement of Hazardous Chemicals

Since the company does not typically manufacture, distribute, or import hazardous chemicals, procurement is the primary method of obtaining hazardous chemicals. The person initiating the procurement of a hazardous chemical will be responsible for requesting a MSDS from the manufacturer or distributor. This MSDS is to be provided either prior to or at the time of receipt of the chemical. Hazardous chemicals are strictly forbidden to be accepted without an accompanying MSDS. Upon receipt of a hazardous chemical, the person receiving the shipment will notify the local health and safety representative so that a review of the MSDS can be conducted. Also, note that the supplier is only required to submit a MSDS with the initial shipment of a hazardous chemical to a specific location.

In the unlikely event that a hazardous chemical is either manufactured, imported, or distributed by the company, the Vice President, Health and Safety will be notified so that required actions, as dictated by OSHA, can be implemented.

5.3 Container Labeling

Labeling on hazardous chemical containers is meant to provide immediate information to affected employees about the hazards of chemicals they will be expected to handle during the course of their job duties. It is the responsibility of the manufacturer, importer, or distributor of the chemical to ensure that each hazardous chemical leaving their place of business is labeled, tagged, or marked with the following information:

- Identity of the hazardous chemical (must be common to the label, the MSDS, and the chemical inventory list);
- Appropriate warnings of the hazardous effects of a chemical (words, pictures, symbols, or any combination that appears on the label and convey the specific physical or health hazards including target organ effects); and
- Name and address of the chemical manufacturer, importer, or other responsible party.

The person receiving the shipment is responsible to ensure that each container of hazardous chemical(s) has been provided with this labeling information. Hazardous chemicals that do not contain adequate labeling will not be accepted by the receiving person. In the event that hazardous chemicals that do not contain adequate labeling are inadvertently received, they are not to be handled until the identity of the material and appropriate hazard warnings are provided. If the hazardous chemical is regulated by a



chemical-specific health standard, then it must be labeled in accordance with the requirements of that standard.

As long as the hazardous chemicals are maintained in their original, properly labeled container and their composition is not altered, there is no need for additional labeling. In the event that the chemical is transferred from a labeled container to an unlabeled portable container, the user must label this secondary container unless the container is intended for immediate use of the employee who performs the transfer. In this case, the container must be labeled with the identity of the chemical and the appropriate hazard warnings, as described above.

In locations where employees are present who only communicate in languages other than English, all labeling information must be presented in their language as well as in English.

5.4 Material Safety Data Sheets (MSDS)

MSDSs are written documents that convey specific, detailed information about the hazards associated with a specific chemical. It is the responsibility of the manufacturer, importer, or distributor to either provide MSDSs prior to shipment or with the shipped materials. The employee receiving the shipment of materials is responsible to ensure that a MSDS has been supplied. As described in Section 5.2, the employee initiating the procurement is responsible for requesting a MSDS from the manufacturer or distributor. In the event that a MSDS has not been provided, it is the responsibility of the receiving person to obtain one from the manufacturer or distributor as soon as possible. The material will not be handled prior to the receipt of a MSDS.

Each MSDS will be forwarded to the local health and safety representative/site safety officer or a designee who will then place a copy into a MSDS binder. This binder will be maintained in the workplace and updated as new materials arrive. The local health and safety representative/site safety officer will ensure that this binder is reviewed with all affected employees and is readily accessible during each work shift. A designated area for the storage of the binder will be established and all employees are to be informed of its location. Employees can request a personal copy of a MSDS by completing the Employee Request for MSDS form provided in Attachment 2. Where employees travel between workplaces during a work shift, the MSDSs may be kept at the primary workplace. Affected employees must be able to immediately obtain information from the MSDSs in the event of an emergency.

MSDSs will be in English and other languages, as necessary, for the particular employees in which the MSDSs will be used. MSDSs are to include the following information:

- Name, address, and telephone number of the responsible party;
- Identity of the chemical as it appears on the label;
- Hazardous ingredients;



- Physical and chemical characteristics;
- Physical and health hazards;
- Primary route(s) of entry;
- OSHA permissible exposure limit (PEL) or other applicable exposure limits;
- Carcinogen information;
- Safe handling and use information;
- Control measures;
- Emergency and first aid procedures; and
- Date of preparation and latest revision date.

5.5 Training

All affected employees will be provided with information and training on the hazardous chemicals in their work area at the time of their initial assignment, when new information about the hazards of a chemical is discovered, and whenever a new physical or health hazard that the employees have not previously been informed of is introduced into the workplace. The HAZCOM training record has been provided as Attachment 3.

Information provided in this training will include:

1. Requirements of the HAZCOM program.
2. Any operations in the work area where hazardous chemicals are present.
3. Location of written hazard communication program, listing of hazardous chemicals present and MSDS.
4. Methods and observations that may be used to detect the presence or release of hazardous chemicals by use of monitoring devices, visual appearance or odor.
5. The physical and health hazards of chemicals in the work area.
6. Protection measures to be utilized to prevent exposure, appropriate work practices, emergency procedures and proper PPE to be used.
7. Explanation of the labeling system and the MSDS and how employees can obtain and use the appropriate hazard information.

Training on this HAZCOM program may be satisfied by the use of two different types of training sessions. These sessions include:

- **Tailgate Safety Meetings** - These meetings will be used to convey the methods and observations that may be used to detect the presence or release of a hazardous chemical in the workplace, the physical and health hazards of the chemicals in the workplace, and the measures that can be taken to protect affected employees from these hazards. The guidelines for this meeting are described in Procedure HS051, Tailgate Safety Meetings.
- **Workplace-Specific or Annual Refresher Training** - Either of these training sessions can be used to convey the details of this HAZCOM program. These details include an explanation of labeling systems, the use of MSDSs, and how employees



can obtain and use the appropriate hazard information. These training sessions are discussed further in Procedure HS050, Training Requirements.

Workplace-specific and tailgate safety meetings will be facilitated by the local health and safety representative or another individual who is knowledgeable on the requirements of the HAZCOM program and the specific chemicals that are being discussed. Training for non-English speaking employees shall be conducted in a manner such that the employee is able to comprehend. Annual refresher training can only be conducted by personnel previously approved by the company Training Department.

5.6 Trade Secrets

Some hazardous chemical manufacturers, importers, and distributors may withhold proprietary information required to be present on a MSDS. In such instances, the name and telephone number of the manufacturer, importer, or distributor will be forwarded to the Vice President of Health and Safety for further action. It will be the responsibility of the Vice President of Health and Safety to either obtain the necessary information or to decide to reject the chemical for use in company workplaces.

5.7 Contractors

During the execution of our work, there will be situations when the company will be at locations where employees of other entities may be exposed to chemicals being used by the company. It will be the responsibility of the local health and safety representative or designee to provide the other entities= site representative(s) with copies of all MSDSs in which their employees may be exposed, as well as the labeling system in place, the protective measures to be taken, safe handling procedures to be used, and the location and availability of the MSDS binder.

Periodically, company work areas will be located on or adjacent to a facility operated by another entity. In these situations, the local health and safety representative or designee will contact the other entity to obtain applicable MSDS(s) for hazardous chemicals that company employees may be exposed to.

6.0 EXCEPTION PROVISIONS

Variances and exceptions may be requested pursuant to the provisions of Procedure HS013, Health and Safety Procedure Variances.

7.0 CROSS REFERENCES

HS013 Health and Safety Procedure Variances
HS050 Training Requirements
HS051 Tailgate Safety Meetings
HS500 OSHA Regulated Toxic and Hazardous Chemicals
OSHA 29 CFR 1910.1200



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8.0 ATTACHMENTS

1. Responsibility Matrix
2. Employee Request for MSDS
3. HAZCOM and Right-to-Know Standards Employee Training Record



ATTACHMENT 1 HAZARD COMMUNICATION PROGRAM

Responsibility Matrix

Action	Procedure Section	Responsible Party				
		Purchaser	Receiver	Affected Employee	Local Health and Safety Representative	EH&S Operations Manager
Understand and Comply With State and/or Local Regulations	1.0				X	
Issuance, Revision, and Maintenance of Procedure	3.1					X
Review and Understand This Procedure	5.0	X	X	X	X	
Establish, Update, and Revise MSDS Binder	5.1				X	
Request MSDSs for Procured Chemicals	5.2	X				
Initial Review of MSDSs	5.2				X	
Implement Requirements For Company Manufactured, Imported, or Distributed Chemicals	5.2					X
Review Incoming Shipments for Hazard Labeling/MSDS	5.3		X			
Request Missing MSDSs From Manufacturer or Distributor	5.4		X			
Provide HAZCOM Training	5.5				X	
Receive HAZCOM Training	5.5			X		
Obtain Information on Proprietary Chemicals	5.6					X
Transmit MSDSs to Contractors	5.7				X	
Obtain MSDSs From Other Entities	5.7				X	



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ATTACHMENT 2

EMPLOYEE REQUEST FOR MATERIAL SAFETY DATA SHEET (MSDS)

Employee Name: (Please print) _____

Employee Number: _____

Job Title/Location: _____

Department/Work Area: _____

I am requesting a copy of the MSDS(s) for the following chemical(s):

(Chemical name, Common name, Trade name)

1. _____

2. _____

3. _____

Signature

Date

I have received a copy of the above MSDS(s) I requested.

Signature

Date

cc: Local Health and Safety Representative



ATTACHMENT 3

HAZARD COMMUNICATION AND RIGHT-TO-KNOW STANDARDS EMPLOYEE TRAINING RECORD

INITIAL:

1. I have been informed about the Hazard Communication Program, Material Safety Data Sheets (MSDS), their use and location, and the procedures to obtain copies.
2. I have been informed that some of my work may involve exposure to toxic substances, the hazards of which will be reviewed with me in tailgate safety meetings or site-specific training.
3. I have been informed about the right of employees to have access to relevant exposure and medical records, and the procedures for requesting access.
4. I understand that the company must act upon a request in a reasonable amount of time so as to avoid interruption of normal work operations.
5. I have been provided access to the applicable regulations governing hazard communication, and access to employee exposure and medical records.

PRINT NAME: _____

SIGNATURE: _____

EMPLOYEE NUMBER: _____

DATE: _____



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ATTACHMENT 4

CHEMICAL LISTING

Chemical	MSDS Number
A12 - Car Cleaner Wax	1
A-33 Dry	2
ABC Dry Chemical	3
Acetone	4
Acid, Acetic	5
Acid Hydrochloric	6
Acid, Nitric	7
Acid, Nitric (Lightning)	8
Acid, Oxalic Dihydrate	9
Alcohol, Ethyl	10
Alcohol, Isopropyl	11
Alcohol, Methanol	12
Alconox	13
All Weather DTR Primer White Comp A	14
Aluminum Nitrate, 9-Hydrate	15
Amine Mixture	16
Ammonium Hydroxide	17
Anti-Seize Lubricant (133K)	18
Anti-Static Spray #19050	19
Antimicrobial Wipes	20
Armor All Protectant	21
Barium Nitrate	22
Bentonite Extender D20	23
Bradley Opti-Aid and Opti-Aid Plan 1181	24
Brake Cleaner (Aerosol), GUNK	25
Buffer Solution pH4	26
Buffer Solution pH7	27
Buffer Solution pH10	28
Butyl Rubber Sealant	29
Butyl Tape Glazing Compound 250 H	30
Calcium Chloride, (Flake)	31
Calcium Oxide, (Lime)	32
Canvak Coating	33
Carbon Dioxide	34
Casrn 38640-62-9	35
Casrn 92-71-7	36
Castrol Super Clean	37
Cement sp-4633	38
Certicool Instant Cold Pack	39
Chemlok AP-134	40
Closed Cell Neoprene Sponge	41



Cobalt Nitrate, 6-Hydrate	42
Contrac Rodenticide	43
CPVC Orange Cement	44
Crazy Clean Cleaner (031)	45
Dap Kwik Foam	46
Day-Chem Cure & Seal 26% (J-22)	47
Day-Chem Cure & Seal 26% 1315 (J-22)	48
Dextrose	49
Diazinon Ultra Insect Spray	50
Diesel Aid	51
Diesel Fuel	52
Dow All Purpose Cleaner	53
Dow Disinfectant Bathroom Cleaner	54
Dow Glass Plus	55
Dragon Home Pest Killer	56
Dursban Many Purpose Concentrate	57
Dye, (D11006 Chromatint Uranine HS Liquid)	58
Dyed Fuel Oil #2	59
Enforcer Wasp and Hornet Killer XT	60
Enoz Old Fashioned Moth Balls	61
Envirocide, Disinfectant Decontaminant/Cleaner	62
Enviroseal 20	63
Envirosorb	64
Eva-Pox Quick Gel #24	65
Ethyl Chloride	66
Ethylene Glycol	67
Eyesaline Concentrate	68
Eyesaline Solution	69
Fantastic All Purpose Cleaner	70
Fast Track Trim Adhesive - 3M Brand	71
Ferric Chloride, 6-Hydrate	72
Fly Ash. NO DESIGN. NO DESIGN	73
Formamide	74
Formula 409 Cleaner/Degreaser	75
Four Part Mix (H2S, CH4, CO & O2 in N2)	76
Freeze Ban	77
Freshly-Mixed, Unhardened Concrete	78
Gasoline	79
Glass, Fibrous	80
Great Stuff, Instafoam Products	81
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Hazorb	83
Home Safeguard, Smoke Detector Tester	84
Hydraulic Fluid, ATF Automatic Transmission	85
Hydrogen Peroxide	86
Hydrogen Sulfide	87
Intraplast N	88
Insta-Gel	89



Insta-Gel XF	90
Iron Powder	91
Irritant Smoke	92
Isobutylene in Air	93
Isocyanate Mixture	94
Iso-Flex Epoxy SF Primer(Part A)	95
Kerosene	96
Klean-Strip Mineral Spirits	97
Kolor Kut Water Finding Paste	98
KoolVest	99
Latex Acrylic Caulk, GE Silicones (GE91)	100
Lexel	101
Liquid Nails (LN 601)	102
Liquid Nails (LN 901)	103
Liquid Nitrogen	104
Liquid-Plumr	105
Lysol Brand Disinfectant Tub & Tile Cleaner	106
Magic American--Goo Gone Stain Remover	107
Magic Lens Cleaning Anti-Fogging Anti-Static Fluid	108
Micro Air I	109
Micro Air	110
Mop & Glo R	111
Mountain Grout "Accelerator"	112
Mountain Grout "Flexible"	113
Mountain Grout "Soil Stabilizer"	114
Mr. Jinx	115
Multi-Purpose Anti-Static Cleaner	116
Nickelous Nitrate, 6-Hydrate	117
Non-Flammable Gas Mixture (Multi-Gas)	118
Non-Flammable Gas Mixture (P-10)	119
Oil, Durafilm Air Line	120
Oil, Echo 30 Weight Bar & Chain	121
Oil & Grease - Cato - Mystic JT-6 Multipurpose	122
Oil, Husqvarna Pro Forest 30 Wt. Bar & Chain	123
Oil, Lubricating, Automatic Transmission	124
Oil, Mobile DTE, Heavy	125
Oil, Pennzoil - HD Motor Oil SAE 40	126
Oil, Pennzoil - Multi-Duty Motor Oil SAE 10W-40	127
Oil, Rigid Dark Thread Cutting Oil	128
Oil, Save-A-Chain 30 Weight	129
Oil, Shell Rotella T Oil 30	130
Oil, Unitrac Fluid 10W30	131
Paint, Color Place Spray Paint	132
Paint, Duralux Enamel	133
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Petroleum Hydrocarbon	144
Phenolic Foam	145
Pico-Fluor 40	146
Pine-Sol Brand Cleaner, Professional Strength	147
Pitt Guard All Weather DTR Gray Coating	148
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Potassium Permanganate	155
Premium Gel	156
Propane	157
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Sealed Standard, Blank (Toluene)	170
Sealtight Fibre Expansion Joint	172
Sight Savers Brand Disposable Cleaning Station	173
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Sodium Chloride	182
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PROCEDURE

Subject: UNDERGROUND/OVERHEAD UTILITY CONTACT PREVENTION

1.0 PURPOSE AND SUMMARY

This procedure prescribes the steps to be followed in order to prevent accidents involving the contact with or damage of underground/overhead utilities. The company provides the operational and training practices required to safely execute work where underground/overhead utility hazards may exist.

2.0 TABLE OF CONTENTS

- 1.0 Purpose and Summary
- 2.0 Table of Contents
- 3.0 Responsibility Matrix
 - 3.1 Procedure Responsibility
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- 4.0 Definitions
- 5.0 Text
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 - 5.2.1 Underground Utilities Requirements
 - 5.2.2 Overhead Utilities Requirements
 - 5.2.3 Other Requirements
 - 5.3 Training Requirements
 - 5.4 Incident Reporting Requirements
 - 5.5 Local Jurisdiction Requirements
- 6.0 Exception Provisions
- 7.0 Cross References
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3.0 RESPONSIBILITY MATRIX

- 3.1 **Procedure Responsibility**

The Director of Health and Safety is responsible for the issuance, revision, and maintenance of this procedure. Also, see Attachment 1 for matrix of responsibilities.
- 3.2 **Action/Approval Responsibilities**

The Responsibility Matrix is Attachment 1.



4.0 DEFINITIONS

Company

All wholly-owned subsidiaries of Shaw Environmental & Infrastructure, Inc. (Shaw E & I).

Competent Person – Drilling Oversight (CPDO) Training

When drilling activity is to take place the Shaw's Field Team Leader (FTL) must have successfully completed Shaw's in-house training pertinent to competent person drilling oversight (CPDO Training). The FTL is required not only to have successfully completed CPDO training but to have an appropriate educational background, coupled with field experience and, the authority to make changes to correct deficiencies, or to stop the job if need be.

NOTE: The CPDO training requirement will become effective September 1st 2006. This means that every FTL will have successfully completed CPDO Training prior to August 31, 2006.

Competent Person - Excavation and Trenching

A person who is capable of identifying existing and predictable hazards in the excavation/trenching work area and who has the authority to take prompt corrective measures to eliminate them. NOTE: Excavation/Trenching training is required when trenching/excavation hazards are present/anticipated (i.e. spoil piles, use of three foot (3') or larger diameter augers, or other circumstances) but only recommended when trenching/excavation hazards are not present/anticipated.

Excavation

Any manmade cut, cavity, trench or depression in an earth surface formed by earth removal.

Underground Utility

Any active or inactive subsurface or buried structure that is or was designed to service a public or private facility. These may include, but are not limited, to the following:

- Electric power lines
- Natural gas lines
- Telephone lines
- Telephone cables and fiber optic lines
- Water lines
- Steam and pneumatic lines
- Sewer lines
- Drain lines
- Underground storage tanks
- Septic tanks
- Process or product lines



Overhead Utility

Any active or inactive overhead structure that is or was designed to service a public or private facility. These may include, but are not limited, to the following:

- Overhead power lines
- Overhead telephone lines
- Overhead fiber optic lines
- Overhead cables
- Overhead supports
- Overhead piping
- Traffic lights
- Utility Bridges

One Call Center

Each state has a One Call, Dig Safe, Miss Dig, etc. dial-in number for requesting mark-out of buried public utilities, such as gas lines, electrical lines, telephone/cable lines, sewer lines, and water lines. This number is typically called a minimum of 72 hours prior to subsurface activities depending on the particular state the work will be conducted. The One Call Center will notify the local public utilities for a line location mark-out for the particular location. The individual public utilities must locate and mark-out the utilities upon request. In most cases, the markouts will not be performed on private property. A confirmation number is established and confirmation report generated and submitted to the requester.

As-Built Drawings

As-built drawings are blueprints that are usually obtained from the facility owner or client. They show original buried utilities and any modifications which have been made.

Private Utility Locating Service

A private utility locating service is a firm established to locate underground utilities using specialized locating equipment, such as ground penetrating radar location devices or radio transmitter type utility locating equipment.

Fiber Optic Service Lines

Fiber optic service lines are communication lines that are buried underground. When damaged, these lines are very expensive to replace. Fiber optic companies routinely provide on-site supervision, if requested. The company encourages this practice.

Field Team Leader (FTL)

The FTL is the person with whom the responsibility of the execution of the field work resides. This person may be the project manager, senior geologist, staff geologist, etc. This individual must have the sufficient experience, training and, field knowledge to ensure all site configuration information is collected and analyzed.



Site Survey

A site survey is an inspection of the work site to look for signs of other buried utilities that may not be indicated through as-built drawings or through utility locating services. The survey typically involves inspection of overhead electrical services, inspection of basements, utility rooms, garages, etc., for signs of old electrical conduits or fuel/water/septic lines. The FTL must contact the appropriate site representative to provide any additional information that may be marked on the as-builts.

5.0 TEXT

Underground/overhead utilities may be encountered at any job site. The guidelines established in this procedure were developed to help identify and mitigate the potential hazards associated with this type of work.

Any subsurface activity is subject to the underground utility locating regulations for the state where the work will be conducted. This procedure authorizes the use of state, local or other required practices, but requires that the practice which most limits the liability to Shaw for damaged utilities is utilized. No variance is required under these circumstances, but the project-specific Health and Safety Plan (HASP) or work plan shall fully document these more protective procedures.

5.1 Preliminary Requirements

The Project Manager or designee must visit the site to mark the boring/excavation locations so they can be clearly identified and then contact the One Call Center for the state in which the work is to be performed in to formally request a utility mark out at the particular work location(s).

Prior to assignment of work the Field Team Leader (FTL) will assure that all affected employees receive an overview of the hazards of encountering underground/overhead utilities. The FTL is responsible to review this procedure, the work practices to control these hazards, and the roles and responsibilities of each worker with the work crew. This procedure and other requirements that may be contained in the site specific HASP shall be reinforced during daily tailgate safety meetings.

5.2 Operating Requirements

5.2.1 Underground Utilities Requirements

Prior to conducting any project site activities, the FTL must ensure that all existing underground/overhead utilities in the work area are located per the state or local mark-out protocols. Documentation of utility mark-out must be completed using the Utility Mark-out Documentation form (Attachment 3). No boring/excavation work is to be performed until all utility mark-outs are verified.



While on-site, the FTL must conduct a site survey to search for signs of other buried or overhead utilities. This will include areas such as garages, basements, etc. The results of such surveys must be documented on the Utility Markout Documentation form (Attachment 3). The property owner, client, or facility operator must be consulted on the issue of underground utilities. All knowledge of past and present utilities must be evaluated prior to conducting work..

After all mark outs have been completed, and the boring locations have been accepted by the FTL prior to drilling, each borehole location must be hand dug to a minimum of five feet bgs.

If the investigation requires boreholes in an area not covered by a municipal one call system (on private property), then the FTL must utilize appropriate geophysical techniques, hand held utility locating devices, a private utility locating firm, or other approved method to determine the locations of underground utilities. The current accepted geophysical methods for the investigation and location of buried utilities include: Ground Penetrating Radar (GPR), Time Domain and/or Frequency Domain Electromagnetic methods, Magnetometer, and Inductive/Conductive Radio-Magnetic methods. The geophysical methods can be very useful for locating buried utility lines in areas where hand digging is not possible or practical. However, it must be noted that these methods do have limitations that are a function of soil conditions, depth of investigation, imaging resolution, or other factors.

If it is determined that a non-invasive geophysical investigation may be needed, assistance with selecting the appropriate method(s) can be obtained from the Shaw E & I Science and Technology Division, Geophysics & Mapping Group, and a variance request must be submitted and approved prior to the inception of intrusive field activity.

Should the local geology be prone to refusal or should there be any other reason the boring location cannot be cleared to a minimum of 5' bgs then the appropriate aforementioned alternative methods should be utilized to ensure the boring location is clear of utilities 5' bgs, and a variance request must be submitted for review.

5.2.2 Overhead Utilities Requirements

Overhead utility locations must be marked (warning tape, flags, etc.) where heavy equipment, or other equipment, has the potential for contacting overhead utilities. Conduct a site inspection on a daily basis to determine where activities will take place and the location of overhead utilities and overhead obstructions. Once they have been identified, place warning tape on poles and/or guy wires and attempt to plan the work so that no contact will be made with the overhead utilities or obstructions. Share the information with all site personnel during the tailgate safety meeting.



Maintain at least 10 feet from overhead power lines, up to 50 kV. For voltages over 50 kV, add 0.4 inches per kV to obtain the safe distance between equipment and power lines. If voltage is unknown, remain at least 20 feet from overhead power lines.

As a precaution, a spotter must be used at all times when it is possible to violate the minimum distance requirements for overhead utilities. If contact is deemed unavoidable, consult with the client and the respective health and safety representative to evaluate the area to determine if the particular overhead utility can be removed prior to engaging in the activity.

5.2.3 Other Requirements

Only hand digging is permitted within 3 feet of underground high voltage, product or gas lines. Once the line is exposed heavy equipment can be used but must remain at least 3 feet from the exposed line.

Only experienced, demonstrably proficient equipment operators will be used to operate such heavy equipment as drill rigs, backhoes, front-end loaders, cranes, etc.

Due the sensitivity and costs associated with damage to fiber optic cables the FTL must have documented verbal contact and an agreement with the fiber optic company for all work within 50' of the fiber optic cables. Subsurface investigations near fiber optic cables are more fully discussed in site specific HASP's. Contact your division Health and Safety Professional for specific information on this subject.

5.3 Training Requirements

Competent Person Drilling Oversight (CPDO) Training

The FTL (at least one onsite Shaw person will be performing the drilling oversight) will be required to have successfully completed the approved internal Competent Person Drilling Oversight (CPDO) training.

Prior to assignment of work the Field Team Leader (FTL) will assure that all affected employees receive an overview of the hazards of encountering underground/overhead utilities. The FTL is responsible to review this procedure, the work practices to control these hazards, and the roles and responsibilities of each worker with the work crew. This procedure and other requirements that may be contained in the site specific HASP shall be reinforced during daily tailgate safety meetings.

Trenching/Excavation Training

The Field Team Leader or at least one onsite Shaw employee will be required to have successfully completed Trenching/Excavation training prior to the inception of site work activity when trenching excavation hazards (i.e. spoil piles, use of 3' diameter augers, or anytime similar hazards are present) are present/anticipated. NOTE: This training is now recommended rather than required when trenching/excavation hazards are NOT anticipated/required



5.4 Incident Reporting Requirements

Employees are required to immediately report to their direct supervisor any overhead or underground utility contact incident, or near miss incidents. Any supervisor (but preferably the supervisor directly responsible for the involved employees) with first-hand knowledge of an incident is required to investigate the incident. The Project Manager and respective Health and Safety Manager or Representative shall be informed of the incident immediately.

At a minimum, the incident investigation will require completion of the incident investigation report and General Liability Property Damage and Loss Report form found in H&S Procedure HS020.

In addition, Attachment 5 provides a "Tip Sheet" to help properly assess and investigate the incident causes and recommendations or requirements.

5.5 Local Jurisdiction Requirements

Where local jurisdictions or clients have established requirements different from those in this procedure, the practice which most limits the liability to Shaw for damaged utilities shall be utilized. No variance is required under these circumstances but the project-specific Health and Safety Plan or work plan shall fully document the alternate procedures.

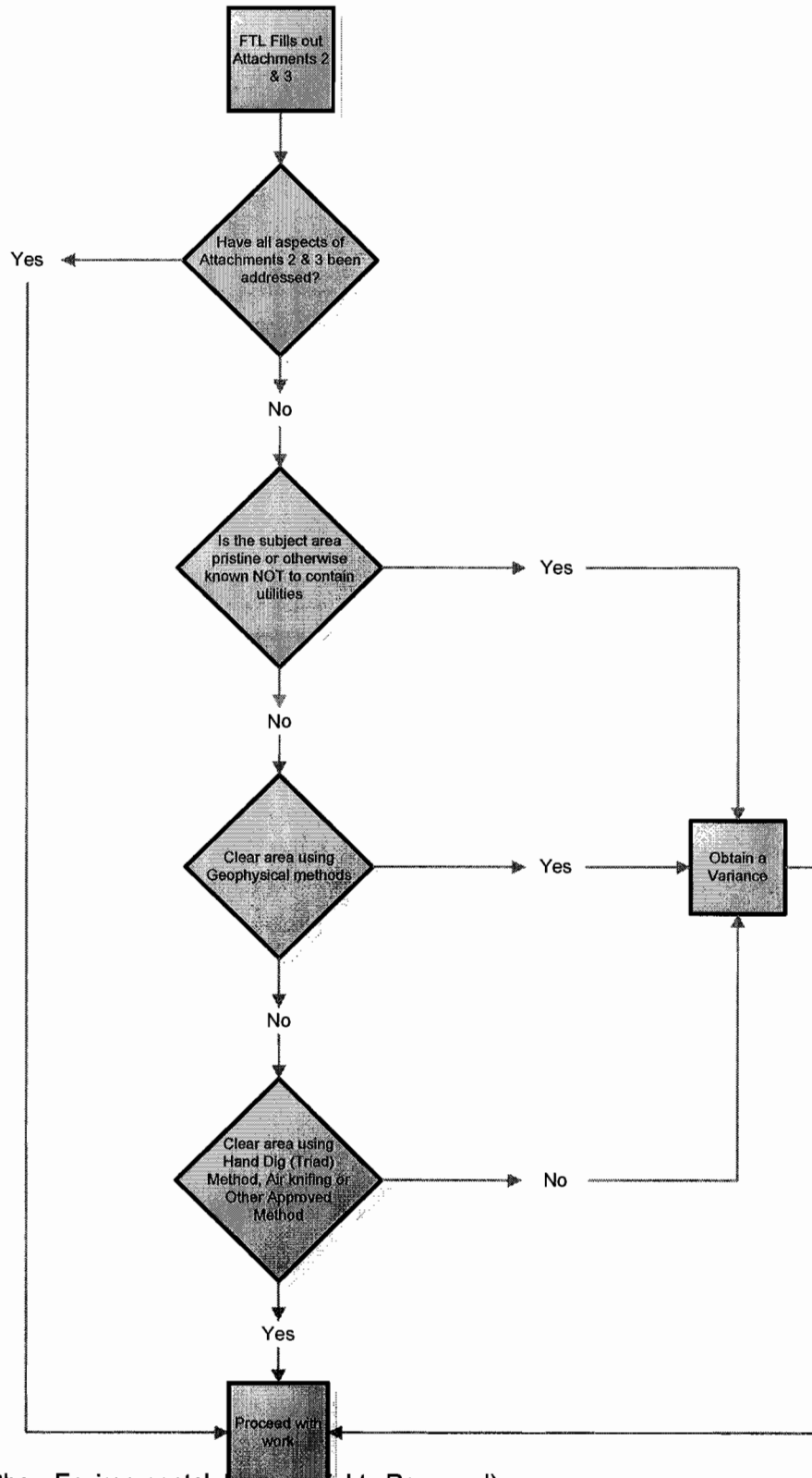
6.0 EXCEPTION PROVISIONS

Anytime a minimum of a 5' clearance cannot be obtained by either hand digging or by using geophysical means, the FTL must obtain a variance from the Regional VP (or equivalent level such as Operations Director for Federal Business Line) or designee to proceed with drilling operations in that area. This would include an initial verbal variance documented in the field log followed up by a written (email) approval from either the Regional VP (or equivalent level or title) or designee. The record of communication will be noted in the field log for the project and, a record of the approval or denial will be placed in the project file.

A variance form can be obtained in HS 013. A flowchart to assist one in determining how and when a variance should be obtained can be found immediately following this section.



HS 308 Flow Chart





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7.0 CROSS REFERENCES

HS013	Health and Safety Procedure Variances
HS020	Accident Prevention Program: Reporting, Investigation, and Review
HS050	Training Requirements
HS307	Excavation and Trenching

8.0 ATTACHMENTS

1. Responsibility Matrix
2. Pre Drilling Checklist
3. Utility Markout Documentation
4. Underground Utility Hits – Tip Sheet for Incident Investigations
5. Frequently Asked Questions



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ATTACHMENT 1 - UNDERGROUND/OVERHEAD UTILITY CONTACT PREVENTION Responsibility Matrix

Action	Procedure Section	Vice President	Project Manager	Field Team Leader	HS Representative
Project-specific HASP or Work Plan shall document the practices to be used at a particular site.	1.0		X	X	X
Contact the One Call Center for mark out of utilities at the site	5.1		X		
Complete Utility Markout Documentation Form	5.2		X	X	
As-built drawings shall be reviewed	5.2			X	
Only experienced demonstrably proficient equipment operators will be used to operate such heavy equipment as backhoes, front-end loaders, cranes, etc.	5.3			X	
Provide training*	5.3				
Incident Investigation and Reporting	5.4		X	X	X
Exceptions to Procedure	6.0	X	X	X	X

*Provided by Shaw's Training Department



ATTACHMENT 2 - PRE - DRILLING/BORING/GEOPROBE Checklist

Purpose: This form is designed to help the FTL make decisions drilling/boreholing/geoprobng around underground/overhead utilities.

DATE _____ PROJECT NAME/NUMBER _____

Field Team Leader Name: _____

DURATION/SUMMARY OF WORK TO BE PERFORMED: _____

Consideration	Check	Check	Explanation	Initial
Has the state one-call been contacted?	☐ Yes	☐ No		
Are any as-built drawings available? If so, do they show any utilities?	☐ Yes	☐ No		
Has a visual inspection of the work area(s) been completed?	☐ Yes	☐ No		
If one-call not available has a private locating service or Shaw S&T group been contacted?	☐ Yes	☐ No		
Were any utilities identified through private locating service? If so, indicate on site drawings.	☐ Yes	☐ No		
Are there any fiber optic cables within 50 feet of hole locations?	☐ Yes	☐ No		
If fiber optic cables are within 50 feet has an agreement with the fiber optic company been established?	☐ Yes	☐ No		
Can a test borehole be advanced by hand digging, probing, post hole digging, and/or air knifed to 5 feet bgs?	☐ Yes	☐ No		
If hand digging, probing, post hole digging, and or air knifing to 5 feet bgs is not possible, can a non-invasive geophysical investigation be conducted? If not, why?	☐ Yes	☐ No		
Are you comfortable with approving this authorization?	☐ Yes	☐ No		
Other considerations:				



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ATTACHMENT 3 - UTILITY MARK-OUT DOCUMENTATION

Project Name: _____
FTL Name: _____
Utility Called: _____
Subcontractor: _____
County of work: _____

Location: _____
Date: _____
Confirmation #: _____
Task/Activity: _____
Municipality of work: _____

Before work is done on any site, contact the appropriate local utility locating service (One Call, Miss Dig, Uloco, etc.) or a local utility contractor to have sub grade utilities marked. NOTE: Boring locations to be placed not in the public right of way are typically not marked out by the public utility mark out, and a private utility locate service must be engaged. Indicate to the utility locator the nearest intersecting street for the site: _____ Confirmation No: _____.

List utility firms (public and private) and the utility they will mark.

Utility Marker Emergency Telephone Numbers			
Major Utilities Marked by Color Code			
Name of Utility Company	Utility	Color Code	Emergency Telephone Number
	Water	Blue	
	Gas	Yellow	
	Electric	Red	
	Telephone/ Cable/ Communication	Orange	
	Sewer	Green	

“ALL UNDERGROUND UTILITIES MAY NOT BE LOCATED BY THE LOCAL UTILITY SERVICE”. Accordingly, you must list other known utilities in the area that the “One Call” service will not contact:

Attach photos of the area prior to placing boreholes.

Take photos of the area indicating minimum 5' hand dig, post hole dig, probe, GPR or other:

NOTE: For any borehole, should 5' minimum clearance not be obtained, you must contact Business Line VP or equivalent (Operations Director or other on the Federal Business Line) and obtain a variance.



Completed by: _____
Name

Signature

Date

ATTACHMENT 3 – UNDERGROUND UTILITY HITS TIP SHEET FOR INCIDENT INVESTIGATIONS

1. Location of the incident.
2. The time of day the incident occurred.
3. What type of utility was hit?
4. How deep was the line hit (in feet)?
5. Who called Designated Locator Service?
6. Note the "One Call" number on the Incident Investigation Follow-up report.
7. Attach the "One Call" record keeping documentation.
8. Were mark-outs completed by the utilities? If so, please identify.
9. Were mark-outs legible at the site?
10. Was the mark-out of the line that was hit accurate?
11. Was the mark-out misinterpreted?
12. Is there a utility damage sheet attached to the Incident Investigation Follow-up Report?
13. Have there been any faults or oversights by any 3rd party? If so, is it documented on the Incident Investigation Follow-up Report?
14. Did the FTL interview the property owner/manager prior to the incident?
15. Was pre-screened by hand digging 5 feet?
16. Were any supplemental utility locator devices used? If so, did we obtain them? If so, were they used on site?
17. Were there blueprints/as built plans available? If so, did we obtain them? If so, were they used on site?
18. Who is paying for the repairs?
19. Please define the total hours and cost estimate/impact to address the utility damage incident:

_____	Site time in hours (not billed to the job)
_____	PM time hours (not billed to the job)
_____	H&S time in hours (not billed to the job)
_____	BLM Time in hours (not billed to the job)
_____	Rework/non-billable time (estimate)
_____	Subcontractor rework/non-billable costs (estimate)
_____	Repair costs to company (estimate)
_____	Repair cost to customer (estimate)

20. Has the FTL completed Shaw's in-house CPDO training?
21. Has the FTL completed trenching/excavation training?
22. Is he/she current with the OSHA 40 hour and 8 hour refresher? If so, what are the dates of the training?
23. Who was the Site Safety Officer on the job site?
24. Does he/she have OSHA 8 hour supervisor training? If so, what are the dates of the training?
25. What was the name of the drilling subcontractor that was on site?
26. Have we researched the training background for this vendor?
27. Was a JSA performed at least once during the day that covered utility contacts and associated hazards?
28. Does this vendor have approved status?
29. Was there a tailgate safety meeting that took place?
30. Were utility mark-outs addressed at the tailgate safety meeting?
31. Were there any markings nearby the "hit" area?



ATTACHMENT 5 – Frequently Asked Questions (FAQs)

During the roll-out of this revision of HS 308 a variety of questions/comments/concerns arose. These concerns have been put in the form of most frequently asked questions (FAQs) and their respective responses. These FAQs will clear up misunderstanding pertaining to this procedure, and provide valuable information that will help our workforce have a better understanding of how this procedure should be implemented. Please review the FAQs below:

- 1. No other competitor of Shaw has felt the need to do anything as extreme as this procedure to ensure minimization of utility hits. Instituting this procedure will put us out of business.*

Response: After thorough review of claims and incidents involving drilling activities and underground utilities, the committee believes that our business/client needs are best served by adopting this policy. And that the likelihood of being put out of business is much greater from continuing to do business the way we currently do it than by adopting this improved policy. The committee realized that 100% adherence to this procedure at all work sites is likely not possible. For those cases where legitimate reasons exist for non-compliance, the committee realized that an effective responsive (variance) system must be in place. The committee believes that the variance procedure, as stated in the policy, should address the exceptions as they occur.

The Committee is not aware of any specific ASTM or true “industry standard”. However, the committee is aware that best practices can vary tremendously and many times are client dependent. For example one extremely large Shaw client requires that we continuously probe. On the other end of the spectrum some clients look completely to Shaw for guidance in these matters.

- 2. Our clients want us to do the work but do not wish to pay the additional fees involved with this new procedure. Could we offer them a two tiered pricing, one to do it the old way, and one to do it the new way?*

Response: The committee believes that contacting an underground utility of any type, no matter who is at fault or who ultimately pays for fixing, the outcome is a “black eye” for all involved. When these events occur, even if Shaw is not at fault, the committee believes that continued good client relations, and the potential for obtaining future business lessens as utility hits/incidents occur. This procedure is designed to minimize health and safety risks to our workers AND to mitigate liability to Shaw. Receiving the necessary compensation for the precautionary measures outlined in the procedure would be expected, and should be itemized in the initial proposal including a statement as to what will specifically be done in the field to mitigate risks relative to underground utilities and WHY Shaw believes these steps are necessary. However, if the client is willing to assume the entire



liability resulting from “hitting” an underground utility, the contract should be written to reflect this and a variance would be in order. Keep in mind that Shaw cannot allow a client’s desires to take on liability to affect the health and safety of workers. No matter what the client desires might be, Shaw would still expect the basic procedures to be followed for health and safety purposes. The training though yet to be finalized will provide project manager’s examples of wording to be used in proposals and contracts.

3. *Hand digging to 5’ is impossible during frost conditions in Minnesota, Wisconsin and many northern areas. How should this be addressed?*

Response: When conditions present themselves that do not allow for hand digging each borehole, other methods must be used for clearance and a variance must be obtained. The alternative methods include a range of non-invasive geophysical survey techniques designed specifically for locating buried utilities, pipelines, tank (UST), and other buried objects that can interfere with drilling. These non-invasive geophysical methods are suggested and mentioned in the procedure.

4. *What if the field crew runs into refusal during hand dig clearance?*

Response: If refusal occurs and moving to an alternate spot presents the same problem, hand digging may not be possible as mentioned in #2 above. When conditions present themselves that do not allow for hand digging each borehole, other methods must be used for clearance and/or a variance must be obtained. Of course, we expect that the dig safe folks to be contacted, and that a private locating service be utilized if available. Should a private locating service not be available, we can use trained internal sources.

The alternative methods include a range of non-invasive geophysical survey techniques designed specifically for locating buried utilities, pipelines, tank (UST), and other buried objects that can interfere with drilling. The current accepted geophysical methods for the investigation and location of buried utilities include: Ground Penetrating Radar (GPR), Time Domain and/or Frequency Domain Electromagnetic methods, Magnetometer, and Inductive/Conductive Radio-Magnetic methods. These non-invasive geophysical methods are suggested and discussed in the procedures. The geophysical methods can be very useful for locating buried utility lines in areas where drilling and digging are not possible or practical, but these methods do have some limitations that are a function of soil conditions, depth of investigation, and imaging resolution.

If it is determined that a non-invasive geophysical investigation may be needed, assistance with selecting the appropriate method(s) can be obtained from the Shaw E & I Science and Technology Division, Geophysics & Mapping Group. Of course, it is expected that the “dig safe” folks will be contacted, and that a private utility locating service be utilized when appropriate (utility location method is known to be feasible), and if available. Should a private locating service not be available, we can use trained internal Shaw E & I personnel resources to perform utility line location work. Finally, if the Project Manager has determined that a variance to the procedure is justified, a variance request should be submitted for review.



5. *Why is trenching/excavation training required for putting in Geoprobe® boreholes? This seems like tremendous overkill.*

Response: The committee believes that, in general, trenching/excavation training is a good educational tool that promotes overall health and safety awareness and provides important information/techniques for our field staff. Trenching/excavation training provides insights into fall hazards, spoil pile placement, and many other related safety issues. Many of our drilling jobs have involved oversized auger bits (3' in diameter) where a large deep borehole is created. The committee agrees that when the diameter of the borehole lessens (i.e. use of a Geoprobe®), the impact of trenching/excavation training decreases. Trenching excavation training is now a requirement only when large boreholes are created or other hazards as mentioned above are present, but only recommended training when Geoprobe ® or similar equipment is being used and the result is trenching excavation type hazards do NOT exist. NOTE: Specific training pertinent to drilling/ Geoprobe ®/boring (CPDO training) will be provided and will be mandatory. Additionally, CPDO and trenching / excavation training are both required on projects where 3' or larger diameter boreholes are to be drilled.

6. *Are there any training requirements besides trenching/excavation training?*

Response: The committee evaluated a need for training specific to the HS 308 policy (drilling) and solicited the assistance of the training department and certain operations employees to develop CPDO training. This CPDO training includes basic steps needed to be taken from call the dig-safe number, private utility searches, geo-physical capabilities, probing, hand augering, air knifing, water pumping/knifing, hand digging and others.

7. *Hand diggings creates heat stress, tripping hazards, back injuries, and other hazards and is unnecessary.*

Response: The committee did not envision using a spade and a strong back to dig various 5' holes at the field site. The committee does envision using an air knife, water knife, probe, or other method rather than a hand shovel. The committee understands that not all methods may be acceptable in all states, municipalities or to all clients. The committee was also aware that when all else fails one could consider using a 1" diameter stainless steel auger placing 5' bgs hand borings in a triangular pattern where the auger bit could be placed in between these small hand borings. The committee envisions this theme and methodology to be expanded within the upcoming training. Additional information on augering techniques will be provided in the specific training (CPDO) mentioned above.

8. *I need to put borings in pristine farmland next door to a contamination zone. There are no and have never been any utilities in this area. What should I do?*

Response: Once you go through the proper utility locate procedure and are confident that no utilities
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exist in the subject area, you need to obtain a variance. This would also hold true for pristine forest preserves, wildlife refuges, or other areas not affected by utilities.

9. Who needs to sign off on a variance?

Response: Variances are signed by the Area Vice President (or designee, which may be delegated to the BLM for each office) along with the Project/Program Manager/Director. When we know in advance that HS308 cannot be adhered to, one should make plans to get a formal variance approval and appropriate paperwork developed two weeks prior to field activity. Variances can also be obtained when field conditions arise that make adherence to HS308 impossible. The variance can be obtained via cell phone in the field with the PM and appropriate management with the outcome noted in the field logbook followed up by an appropriate e-mail. This e-mail should be kept in the project file as proof of variance approval. It is recommended that variances be obtained as soon as it is known that they will be required.

10. What constitutes a “probe”? I assume a Geoprobe® is not valid?

Response: A Geoprobe® is NOT a valid probe in that Geoprobe® have caused damage to sewer lines and other utilities. Probes are typically made of a fiberglass-like material that have a pointed end but will not damage subsurface utilities and allows for the field staff to sense if underground items are encountered.

11. Under 5.1, is a subcontractor a designee?

Response: Although a subcontractor can make arrangements to contact dig safe and more, Shaw must ensure that the sub has, in fact, done what they had agreed to do. It should be remembered that typically on drilling projects, from many of our customer’s perspective, the liability remains with Shaw, and they will look to Shaw, not our subs, for resolution of any events that occur. Hence, it is incumbent on Shaw to insure that our procedures are followed by Shaw and Shaw subs.

12. Does ground surface include concrete, asphalt or other man-made coverings?

Response: A simple NO. Some of our projects include drilling through airport runways or tarmacs which can be up to 15” in depth. Manmade surfaces do NOT count in the 5’ hand dig clearance specification. If we are attempting to advance boreholes below existing concrete surfaces, the geology below the concrete will be exposed by cutting the concrete and removal of the concrete. After the concrete is removed and the geology is exposed, a hand auger can then be used. Hopefully, the twelve concerns above and the responses to these comments will have helped users understand the implementation of this HS 308 policy. More importantly the committee realizes that information on this subject will be provided during the training mentioned above. It is the committee’s belief that once this program has been completely rolled out the need for variances will be minimal and the interactions of the safety department with operations management with this entire process will make ensure success.



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PROCEDURE

Subject: HEAT STRESS

1.0 PURPOSE AND SUMMARY

This procedure establishes the guidelines to protect employees from the effects of heat related illness. It describes the four major types of heat-induced illnesses, methods of prevention, types of treatment, and includes discussions on the monitoring of heat stress situations.

Some clients may have monitoring requirements that differ from those contained in this procedure. In such circumstances, the more protective monitoring requirements will be followed.

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 - 3.1 Procedure Responsibility
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- 4.0 Definitions
- 5.0 Text
 - 5.1 Signs, Symptoms, and Treatment
 - 5.1.1 Heat Rash
 - 5.1.2 Heat Cramps
 - 5.1.3 Heat Exhaustion
 - 5.1.4 Heat Stroke
 - 5.2 Prevention
 - 5.3 Monitoring
 - 5.3.1 Wet Bulb Globe Temperature
 - 5.3.2 Physiological
 - 5.4 Training
- 6.0 Exception Provisions
- 7.0 Cross References
- 8.0 Attachments

3.0 RESPONSIBILITY MATRIX

3.1 Procedure Responsibility

The Director of Health and Safety is responsible for the issuance, revision, and maintenance of this procedure.

3.2 Action/Approval Responsibilities

The Responsibility Matrix is Attachment 1.



4.0 DEFINITIONS

Acclimatization - Series of physiological and psychological adjustments that occur in an employee during initial exposures to hot environmental conditions that increase the employee's tolerance to elevated work environment temperature.

Company - All wholly-owned subsidiaries of Shaw Environmental & Infrastructure, Inc. (Shaw E & I).

Maximum Heart Rate - Amount of work (beats) per minute a healthy person's heart can be expected to safely deliver. Maximum heart rate (MHR) is calculated by subtracting an employee's age from 200.

5.0 TEXT

Adverse climatic conditions are important considerations in planning and conducting site operations. High ambient temperature can result in deleterious health effects ranging from transient heat fatigue, physical discomfort, reduced efficiency, personal illness, increased accident probability, etc., to serious illness or death. Heat stress is of particular concern when chemical protective garments are worn, since these garments prevent evaporative body cooling. Wearing personal protective equipment places employees at considerably higher risk of developing heat stress.

Heat stress is caused by a number of interacting factors, including environmental conditions, clothing, workload, and the individual characteristics of the worker. Because heat stress is probably one of the most common (and potentially serious) illnesses, regular monitoring and other preventive precautions are vital.

5.1 Signs, Symptoms, and Treatment

5.1.1 Heat Rash

Heat rash can be caused by continuous exposure to hot and humid air and skin abrasion from sweat soaked clothing.

Signs and Symptoms: The condition is characterized by a localized red skin rash and reduced sweating. Aside from being a nuisance, the ability to tolerate heat is reduced.

Treatment: Keep skin hygienically clean and allow it to dry thoroughly after using chemical protective clothing.



5.1.2 Heat Cramps

Heat cramps are caused by profuse perspiration with inadequate electrolytic fluid replacement. This often robs the larger muscle groups (stomach and quadriceps) of blood which can cause painful muscle spasms and pain.

Signs and Symptoms: Muscle spasms and pain in the extremities and abdomen.

Treatment: Remove employee to a cool place and give sips of water or an electrolytic drink. Watch for signs of heat exhaustion or stroke.

5.1.3 Heat Exhaustion

Heat exhaustion is a mild form of shock caused by increased stress on various organs to meet increased demand to cool the body. Onset is gradual and symptoms should subside within one hour.

Signs and Symptoms: Weak pulse; shallow breathing; pale, cool, moist skin; profuse sweating; dizziness; fatigue.

Treatment: Remove employee to a cool place and remove as much clothing as possible. Give sips of water or electrolytic solution and fan the person continually to remove heat by convection. CAUTION: Do not allow the affected person to become chilled; treat for shock if necessary.

5.1.4 Heat Stroke

Heat stroke is the most severe form of heat stress; the body must be cooled immediately to prevent severe injury and/or death. **THIS IS A MEDICAL EMERGENCY!**

Signs and Symptoms: Red, hot, dry skin (skin may be wet from previous perspiration particularly when evaporation-preventing clothing is worn); body temperature of 105° degrees Fahrenheit (F) or higher; no perspiration; nausea; dizziness and confusion; strong, rapid pulse.

Treatment: Heat stroke is a true medical emergency. Transportation of the victim to a medical facility must not be delayed. Prior to transport, remove as much clothing as possible and wrap the victim in a sheet soaked with water. Fan vigorously while transporting to help reduce body temperature. Apply cold packs, if available; place under the arms, around the neck, or any other place where they can cool large surface blood vessels. If transportation to a medical facility is delayed, reduce body temperature by immersing victim in a cool water bath (however, be careful not to over-chill the victim once body temperature is reduced below 102° F). If this is not possible, keep victim wrapped in a sheet and continuously douse with water and fan.



5.2 Prevention

The implementation of preventative measures is the most effective way to limit the effects of heat-related illnesses. During periods of high heat, adequate liquids must be provided to replace lost body fluids. Replacement fluids can be a 0.1% (percent) salt water solution, a commercial mix such as Gatorade, or a combination of these with fresh water. The replacement fluid temperature should be kept cool, 50°F to 60°F, and should be placed close to the work area. Employees must be encouraged to drink more than the amount required to satisfy thirst. Employees should also be encouraged to salt their foods more heavily during hot times of the year.

Cooling devices such as vortex tubes or cooling vests can be worn beneath impermeable clothing. If cooling devices are worn, only physiological monitoring will be used to determine work activity.

All workers are to rest when any symptoms of heat stress are noticed. Rest breaks are to be taken in a cool, shaded rest area. Employees shall remove chemical protective garments during rest periods and will not be assigned other tasks.

All employees shall be informed of the importance of adequate rest and proper diet in the prevention of heat stress and the harmful effects of excessive alcohol and caffeine consumption.

5.3 Monitoring

The initiation of heat stress monitoring will be required when employees are working in environments exceeding 90°F ambient air temperature. If employees are wearing impermeable clothing, this monitoring will begin at 78°F. There are two general types of monitoring that the health and safety representative can designate to be used: wet bulb globe temperature (WBGT) and physiological. Attachment 2 will be used to record the results of heat stress monitoring.

5.3.1 Wet Bulb Globe Temperature

The WBGT index is the simplest and most suitable technique to measure the environmental factors which most nearly correlate with core body temperature and other physiological responses to heat. When WBGT exceeds 25.9°C (78°F), the work regimen in Table 2 of the section, Heat Stress, in the latest edition of the American Conference of Governmental Industrial Hygiene (ACGIH) Threshold Limit Value (TLV) Booklet should be followed.

5.3.2 Physiological

Physiological monitoring can be used in lieu of or in addition to WBGT. It is anticipated that this monitoring can be self-performed once the health and safety representative demonstrates appropriate techniques to affected employees. Since individuals vary in their susceptibility to heat, this type of monitoring has its advantages. The two parameters that are to be monitored at the beginning of each rest period are:



- Heart Rate - Each individual will count his/her radial (wrist) pulse as early as possible during each rest period. If the heart rate of any individual exceeds 75% (percent) of their calculated maximum heart rate ($MHR = 200 - \text{age}$) at the beginning of the rest period, then the work cycle will be decreased by one-third. The rest period will remain the same. An individual is not permitted to return to work until his/her sustained heart rate is below 75% (percent) of their calculated maximum heart rate.
- Temperature - Each individual will measure his/her oral temperature with a disposable thermometer for one minute as early as possible in the first rest period. If the temperature exceeds 99.6°F at the beginning of the rest period, then the work cycle will be decreased by one-third. The rest period will remain the same.
- An individual is not permitted to return to work if his/her temperature exceeds 100.4°F

5.4 Training

Employees potentially exposed to heat stress conditions will be instructed on the contents of this procedure. This training can be conducted during daily tailgate safety meetings.

6.0 EXCEPTION PROVISIONS

Variances and exceptions may be requested pursuant to the provisions of Procedure HS013, Health and Safety Procedure Variances

7.0 CROSS REFERENCES

HS013 Health and Safety Procedure Variances
HS051 Tailgate Safety Meetings

8.0 ATTACHMENTS

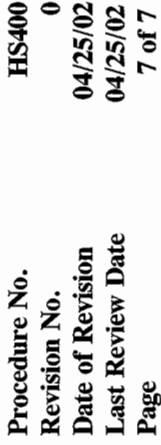
1. Responsibility Matrix
2. Heat Stress Monitoring Record



ATTACHMENT 1
HEAT STRESS

Responsibility Matrix

Action	Procedure Section	<i>Responsible Party</i>		
		Director of Health and Safety	Project Supervisor	Health and Safety Representative
Issuance, Revision, and Maintenance of Procedure	3.1	X		
Conduct Monitoring	5.3			X
Inform Employees About Procedure	5.4		X	X



Project/Location _____ Date _____

[illegible]



PROCEDURE

Subject: COLD STRESS

1.0 PURPOSE AND SUMMARY

The purpose of this procedure is to establish the guidelines necessary to protect employees from the adverse health effects caused by exposure to low temperature environments.

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 - 4.1.1 Frostbite
 - 4.1.2 Hypothermia
 - 4.2 Precautionary Measures
 - 4.3 Training
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3.0 RESPONSIBILITY MATRIX

3.1 Procedure Responsibility

The Director of Health and Safety is responsible for the issuance, revision, and maintenance of this procedure.

3.2 Action/Approval Responsibilities

The responsibility matrix is Attachment 1.

4.0 TEXT

Most cold related worker fatalities have resulted from failure to escape low air temperatures, or from immersion in low temperature water. Employees should be protected from exposure to cold so that their deep core temperature does not fall below 96.8° degrees Fahrenheit. Core body temperatures below this level will likely result in reduced mental alertness, reduction in rational decision making, or loss of consciousness with the threat of fatal consequences.



4.1 Signs and Symptoms of Cold Stress

Several factors increase the harmful effects of cold including, being very young or old, wet clothing, having wounds or fractures, smoking, drinking alcoholic beverages, fatigue, emotional stress and certain diseases and medications. The two most prominent adverse effects from exposure to cold temperatures are frostbite and hypothermia. Treatment for cold related injuries should be administered by a person qualified in first aid or a professional medical provider.

4.1.1 Frostbite. Frostbite is the most common injury caused by exposure to cold temperatures. It occurs when cells of the body freeze restricting blood flow and causing tissue damage. The first sign of frostbite is slightly flushed skin which then changes to white or grayish yellow and finally grayish blue. Pain is sometimes initially felt but is often followed by a cold numb feeling.

4.1.2 Hypothermia. Hypothermia is the most severe form of cold stress and results from a drop in the body's core temperature. The initial signs include; shivering, numbness, confusion, weakness, impaired judgement, impaired vision, and drowsiness. Hypothermia victims typically progress through five stages of the condition including; (1) shivering, (2) apathy, (3) loss of consciousness, (4) decreasing pulse and breathing rate, and (5) death.

4.2 Precautionary Measures

It is recommended that employees wear insulated clothing to maintain core temperatures above 96.8°F when working in air temperatures below 40°F. This protective clothing may include but is not limited to:

- Insulated suits, such as whole-body thermal underwear
- Wool or polypropylene socks
- Insulated gloves and boots
- Insulated head cover, such as knit caps, hard hat liners, etc.

When conducting work in air temperatures below 35°F, the following practices shall be followed:

- If the clothing of an employee is expected to become wet, the outer layers of clothing must be impermeable to water.
- If an employees underclothing becomes wet it must be changed immediately. If the clothing becomes wet from sweating, the employee may finish the task which caused the sweating before changing into dry clothing.
- Employees will be provided a warm area (65°F or above) to change from work clothing into street clothing and for breaks.



- Hot liquids, such as soups, warm drinks, etc. shall be provided in the break area. The intake of caffeine containing products shall be discouraged due to their diuretic and circulatory effects.
- If appropriate, approved space heaters may be provided in the work area to warm the hands, feet, etc.
- The buddy system shall be practiced. Any employee observed with signs of cold stress shall immediately proceed to the break area.
- Employees will be reminded to layer their clothing, i.e., wear thinner, lighter clothing next to the body with heavier clothing layered outside the inner clothing.
- Avoid overdressing when going into warm areas or when performing activities which are strenuous. This could potentially lead to heat stress situations.
- Auxiliary heated versions of handwear, footwear, etc., can be used in lieu of mittens, insulated socks, etc. if extremely cold conditions exist.
- Employees handling liquids with high evaporation rates (gasoline, hexane, alcohol, etc.) shall take special precautions to avoid soaking of clothing with the liquids because of the added danger of cold injury caused by evaporative cooling.
- Work shall be arranged in such a way that sitting still or standing for long periods is minimized.
- If the air temperature is 20°F or below the hands shall be protected by mittens or gloves prior to contact with cold surfaces such as metal, etc.

Air temperature is not the only factor to be considered while evaluating cold stress situations. Wind chill cooling rate and the cooling power of air are critical factors. The higher the wind speed the greater the risk of experiencing cold related injuries. For exposed skin, continuous exposure should not be permitted when the air speed and temperature result in an equivalent chill temperature of -25°F or less. The wind chill table provided in attachment two can be used to help assess hazardous conditions attributable to wind chill effects.

4.3 Training

Training on the contents of this procedure will be conducted during tailgate safety meetings held at project or office locations where employees are exposed to cold temperatures. Topics to be discussed during this training will include:

- Proper rewarming procedures and first aid treatment of cold related cases
- Proper clothing practices



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- Eating and drinking habits
- Recognition of signs and symptoms of cold stress
- Safe cold weather work practices.

5.0 EXCEPTION PROVISIONS

Variances may be requested as described in procedure HS013; Health and Safety Procedure Variances.

6.0 CROSS REFERENCES

Shaw Environmental & Infrastructure, Inc. (Shaw E & I) Procedure HS051-Tailgate Safety Meetings

Shaw E & I Procedure HS600-Personal Protective Equipment

Threshold Limit Values and Biological Exposure Indices, American Conference of Governmental Industrial Hygienists.

Standard First Aid Workbook, American Red Cross

7.0 ATTACHMENTS

1. Responsibility Matrix
2. Windchill Table



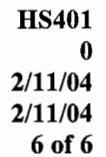
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ATTACHMENT 1 COLD STRESS

Responsibility Matrix

Action	Responsible Party			
	Procedure Section	Employee	Local HS Representative	Director of Health and Safety
Issuance, revision and maintenance of this procedure	3.1			X
Provide training	4.2		X	
Receive training	4.2	X		



	Actual Temperature Reading (°F)											
Estimated Wind Speed (mph)	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
	Equivalent Chill Temperature (°F)											
Calm	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
5	48	37	27	16	6	-5	-15	-26	-36	-47	-57	-68
10	40	28	16	4	-9	-24	-33	-46	-58	-70	-83	-95
15	36	22	9	-5	-18	-32	-45	-58	-72	-85	-99	-112
20	32	18	4	-10	-25	-39	-53	-67	-82	-96	-110	-121
25	30	16	0	-15	-29	-44	-59	-74	-88	-104	-118	-133
30	28	13	-2	-18	-33	-48	-63	-79	-94	-109	-125	-140
35	27	11	-4	-20	-35	-51	-67	-82	-98	-113	-129	-145
40	26	10	-6	-21	-37	-53	-69	-85	-100	-116	-132	-148
(Wind speeds greater than 40 mph have little additional effect.)	LITTLE DANGER In under an hour with dry skin. Maximum danger is false sense of security.				INCREASING DANGER Danger from freezing of exposed flesh within one minute.				GREAT DANGER Flesh may freeze within 30 seconds.			
	Trenchfoot and immersion foot may occur at any point on this chart.											



PROCEDURE

Subject: HEARING CONSERVATION PROGRAM

1.0 PURPOSE AND SUMMARY

The purpose of this procedure is to establish guidelines for the company hearing conservation program. Regulatory requirements mandate that the company administer a hearing conservation program whenever employee sound exposures equal or exceed an 8-hour time-weighted average (TWA) sound level of 85 decibels (dB).

Evidence is well established that worker exposure to sound of sufficient intensity and duration can result in hearing damage. This procedure prescribes the control measures required to prevent employee exposure to excessive sound levels and includes provisions for:

- Monitoring of the workplace to determine employee exposures.
- An audiometric testing program which includes baseline and annual audiograms.
- An employee training and information program.
- Description of various control measures that can be used to decrease exposures.
- Providing hearing protection to all affected employees when administrative or engineering controls fail to reduce sound levels to below the action level.
- Recordkeeping requirements.

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 - 5.3.2 Annual Audiograms
 - 5.4 Employee Training and Information



- 5.5 Control Measures
 - 5.5.1 Sound Control at the Source
 - 5.5.2 Sound Control in the Transmission Path
 - 5.5.3 Protection for the Receiver
- 5.6 Recordkeeping
- 6.0 Exception Provisions
- 7.0 Cross References
- 8.0 Attachments

3.0 RESPONSIBILITY MATRIX

3.1 Procedure Responsibility

The Director of Health and Safety is responsible for the issuance, revision, and maintenance of this procedure.

3.2 Action/Approval Responsibilities

The Responsibility Matrix is Attachment 1.

4.0 DEFINITIONS

Action Level - An 8-hour TWA of 85 dB or a dose of 50 percent.

Company - All wholly-owned subsidiaries of Shaw Environmental & Infrastructure, Inc. (Shaw E & I).

Standard Threshold Shift (STS) - Change in hearing threshold relative to the baseline audiogram of 10 dB or more at 2,000, 3,000, and 4,000 hertz (Hz) in either ear.

5.0 TEXT

5.1 General

The company hearing conservation program will be implemented and protection against the effects of sound exposure will be provided whenever sound levels exceed the action level.

5.2 Monitoring

Monitoring of employee exposures to sound will be conducted whenever it is anticipated that exposure may exceed the action level. This monitoring will be conducted by a qualified individual who, through professional credentials, training, or experience, has the necessary qualifications to specify and use the type of monitoring equipment (area or personal) that will best represent employee exposures. This monitoring will be repeated whenever changes in the work environment lead to the possibility of additional exposures or inadequacy of selected hearing protection. Employees will be provided the



opportunity to observe monitoring and will be notified when the results exceed the action level.

Sound level monitoring instrumentation will be operated on the A-weighted scale in slow response mode. Employee sound exposures will be computed in accordance with Attachment 2 and without regard to any attenuation provided by the use of hearing protection.

5.3 Audiometric Testing

Audiometric testing will be provided to all employees exposed at or above the action level. Testing will be in accordance with Procedure HS100, Medical Policies and Procedures.

5.3.1 Baseline Audiogram. Audiometric test results obtained from the pre-hire medical examination will be used as the baseline audiogram. Testing to establish a baseline audiogram shall be preceded by at least 14 hours without exposure to workplace sound. Employees will also be notified of the need to avoid high levels of non-occupational sound exposure during this 14-hour period.

5.3.2 Annual Audiograms. Annual audiograms will be conducted for all employees exposed at or above the action level during the preceding year. Each annual audiogram will be compared to that employee's baseline audiogram to determine if the audiogram is valid and if a STS has occurred.

5.4 Employee Training and Information

All employees who are exposed to sound levels above the action level are required to participate in a formal training program. This program will be presented by a health and safety representative and include, as a minimum, the following information:

- The effects of sound on hearing.
- The purpose of hearing protection; the advantages, disadvantages, and attenuation of various types; and instructions on selection, fitting, use, and care.
- The specific nature of operations which could result in exposure to excessive sound levels.
- The purpose of audiometric testing and an explanation of the test procedures.
- The engineering controls and administrative practices associated with the employee's job assignment.

This training program will be repeated annually. Participating employees are required to complete the Hearing Protection Training Completion Record (Attachment 3). This



record will be maintained by the company Training Department in Knoxville. In addition, tailgate safety meetings will be periodically used to instruct employees on the need for hearing protection in designated areas.

The project/location manager will make available to affected employees or their authorized representatives a copy of 29 Code of Federal Regulations (CFR) 1910.95 and will also post a copy in the workplace.

5.5 Control Measures

A straightforward method of controlling sound exposure is to examine the problem in terms of its three basic elements including:

- Sound arises from a source;
- Travels over a path; and
- Affects a receiver or listener.

The solution to a given sound problem might require alteration or modification of any or all of these three basic elements including:

- Modifying the source to reduce its sound output;
- Altering or controlling the transmission path to reduce the sound level reaching the listener; or
- Providing the receiver with hearing protection (but only if the sound source or path cannot be controlled).

5.5.1 Sound Control at the Source. Perhaps the best method for controlling sound at its source is the initial equipment selection process. The following summarizes those features that the buyer should look for and steps to be taken in selecting equipment:

- Low-sound certification.
- Advertisement of a quiet operation, evidence of sound control design.
- Evidence of lower and slower operating characteristics.
- Conductance of side-by-side sound tests of equipment.
- Request an on-site or in operation inspection of mechanical equipment before purchase.



Most mechanical devices are complex sound generators. Though it is impractical to discuss all possible solutions to all sound problems, some general control measures and methods have been provided below:

- Reduce impact or impulse sound by reducing the weight, size, or height of fall of impacting mass.
- Reduce speed in machines and flow velocities and pressure in fluid conveyance systems.
- Balance rotating parts to control machinery sound and vibration of fans, fly wheels, pulleys, cams, shafts, etc.
- Reduce frictional resistance between rotating, sliding, or moving parts by frequent lubrication and proper alignment; static and dynamic balancing of rotating parts; and/or correction of eccentricity or Aout-of-roundness of wheels, gears, rollers, pulleys, etc.
- Reduce resistance in air or fluid systems by use of low flow velocities, smooth surfaces of duct or pipe systems, and long-radius turns and flared sections in pipes, etc., to reduce turbulence.
- Isolate vibration elements in machinery; install motors, pumps, etc., on most massive part of machine; use belt or roller drives in place of gear trains; use flexible hoses and wiring instead of rigid piping and stiff wiring; etc.
- Apply vibration damping materials such as liquid mastics; pads of rubber, felt, foam, or fibrous blankets; or sheet metal viscoelastic laminates or composites to vibrating machine surface.
- Reduce sound leakage from the interior of machines such as compressors by sealing or covering all openings or applying acoustical materials to machine interiors.

5.5.2 Sound Control in the Transmission Path. Another effective way to limit employee exposure to sound is through the use of transmission path controls. These controls may include, but are not necessarily limited to:

- Separation of the sound source and receiver.
- Use of sound absorbing materials on ceiling, floor, or wall surfaces.
- Use of sound barriers and deflectors in the sound path.



- Use of acoustical lining on inside surfaces of passageways, ducts, pipe chases, or electrical channels.
- Use of mufflers or silencers on all gasoline or diesel engines, regardless of size, and particularly on equipment when large quantities of high-pressure, high-velocity gases, liquids, steam, or air are discharged.
- Use vibration isolators and flexible couplers where the sound transmission path is structural in character.

5.5.3 Protection for the Receiver. When engineering controls fail to reduce sound levels to below the action level, hearing protection will be provided. Hearing protection will be provided at no cost to employees and will be replaced as necessary.

Supervisors will ensure that hearing protection is worn by all employees who are exposed at or above the action level. Employees will be given the opportunity to select their hearing protection from a variety of suitable protection devices that attenuate their exposure to the action level or below. Attenuations are determined by subtracting 7 dB from the noise reduction rating (NRR) of the protector and subtracting the remainder from the TWA sound level.

5.6 Recordkeeping

The company will maintain records of all audiometric test records required by this procedure and retain them for at least the following periods:

- Sound exposure measurement records will be retained for two (2) years.
- Audiometric test records will be retained for the duration of the affected employee=s employment.

All records required by this procedure will be provided upon request to employees, former employees, representatives designated by the individual employee, and any authorized government representative.

6.0 EXCEPTION PROVISIONS

Variances and exceptions may be requested pursuant to the provisions of Procedure HS013, Health and Safety Procedure Variances.

7.0 CROSS REFERENCES

HS013 Health and Safety Procedure Variances
HS100 Medical Policies and Procedures



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8.0 ATTACHMENTS

1. Responsibility Matrix
2. Sound Exposure Computation
3. Hearing Protection Training Completion Record



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ATTACHMENT 1
HEARING CONSERVATION PROGRAM

Responsibility Matrix

Action	Procedure Section	<i>Responsible Party</i>		
		Health and Safety Representative	Project/Location Manager	Director of Health and Safety
Issue, Revise, and Maintain Procedure	3.1			X
Monitor Employee Exposures	5.2	X		
Provide Training	5.4	X		
Make Available/Post 29 CFR 1910.95	5.4		X	



ATTACHMENT 2

SOUND EXPOSURE COMPUTATION

Computation of Employee Sound Exposure

- A. Sound dose is computed using Table 1 as follows:

When the sound level is constant over the entire work shift, the sound dose (D), in percent, is given by:

$$D = 100 C/T$$

Where C is the total length of the work day, in hours, and T is given in Table 1.

- B. When the work shift sound exposure is composed of two or more periods of sound at different levels, the total sound dose over the work day is given by:

$$D = 100 (C_1/T_1 + C_2/T_2 \dots + C_n/T_n)$$

Where C_n indicates the total time of exposure at a specific sound level and T_n indicates the reference duration for that level as given by Table 1.

- C. The eight-hour TWA sound level, in decibels, may be computed from the dose, in percent, by means of the formula:

$$TWA = 16.61 \log_{10} (D/100) + 90$$

For an eight-hour work shift with the sound level constant over the entire shift, the TWA is equal to the measured sound level.

Conversion Between A Dose and an 8-Hour TWA Sound Level

Sound exposure is usually measured with an audio dosimeter which gives a readout in terms of $A_{dose} \equiv$ Dosimeter readings can be converted to an 8-hour TWA sound level.

In order to convert the reading of a dosimeter into TWA, use Table 2. This table applies to dosimeters that are set to calculate dose or percent exposure according to the relationships in Table 1. So, for example, a dose of 91 percent over an 8-hour day results in a TWA of 89.3 decibels and a dose of 50 percent corresponds to a TWA of 85 decibels.

If the dose as read on the dosimeter is less than or greater than the values found in Table 2, the TWA may be calculated by using the formula:

$$TWA = 16.61 \log_{10} (D/100) + 90$$

Where TWA equals 8-hour TWA sound level and D equals accumulated dose in percent exposure.



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Table 1
Permissible Sound Exposure

A-Weighted Sound Level (decibels)	Permitted Duration Per Workday (T) (hours)	A-Weighted Sound Level (decibels)	Permitted Duration Per Workday (T) (hours)
80	32.0	106	0.87
81	27.9	107	0.76
82	24.3	108	0.66
83	21.1	109	0.57
84	18.4	110	0.50
85	16.0	111	0.44
86	13.9	112	0.38
87	12.1	113	0.33
88	10.6	114	0.29
89	9.2	115	0.25
90	8.0	116	0.22
91	7.0	117	0.19
92	6.1	118	0.16
93	5.3	119	0.14
94	4.6	120	0.125
95	4.0	121	0.11
96	3.5	122	0.095
97	3.0	123	0.082
98	2.6	124	0.072
99	2.3	125	0.063
100	2.0	126	0.054
101	1.7	127	0.047
102	1.5	128	0.041
103	1.3	129	0.036
104	1.1	130	0.031
105	1.0		



Table 2
Conversion From APercent Sound Exposure≅ or ADose≅ To A8-Hour TWA Sound Level≅

Dose or Percent Sound Exposure (D)	TWA	Dose or Percent Sound Exposure (D)	TWA	Dose or Percent Sound Exposure (D)	TWA	Dose or Percent Sound Exposure (D)	TWA
10	73.4	104	90.3	260	96.9	640	103.4
15	76.3	105	90.4	270	97.2	650	103.5
20	78.4	106	90.4	280	97.4	660	103.6
25	80.0	107	90.5	290	97.7	670	103.7
30	81.3	108	90.6	300	97.9	680	103.8
35	82.4	109	90.6	310	98.2	690	103.9
40	83.4	110	90.7	320	98.4	700	104.0
45	84.2	111	90.8	330	98.6	710	104.1
50	85.0	112	90.8	340	98.8	720	104.2
55	85.7	113	90.9	350	99.0	730	104.3
60	86.3	114	90.9	360	99.2	740	104.4
65	86.9	115	91.1	370	99.4	750	104.5
70	87.4	116	91.1	380	99.6	760	104.6
75	87.9	117	91.1	390	99.8	770	104.7
80	88.4	118	91.2	400	100.0	780	104.8
81	88.5	119	91.3	410	100.2	790	104.9
82	88.6	120	91.3	420	100.4	800	105.0
83	88.7	125	91.6	430	100.5	810	105.1
84	88.7	130	91.9	440	100.7	820	105.2
85	88.8	135	92.2	450	100.8	830	105.3
86	88.9	140	92.4	460	101.0	840	105.4
87	89.0	145	92.7	470	101.2	850	105.4
88	89.1	150	92.9	480	101.3	860	105.5
89	89.2	155	93.2	490	101.5	870	105.6
90	89.2	160	93.2	500	101.6	880	105.7
91	89.3	165	93.6	510	101.8	890	105.8
92	89.4	170	93.8	520	101.9	900	105.8
93	89.5	175	94.0	530	102.0	910	105.9
94	89.6	180	94.2	540	102.2	920	106.0
95	89.6	185	94.4	550	102.3	930	106.1
96	89.7	190	94.6	560	102.4	940	106.2
97	89.8	195	94.8	570	102.6	950	106.2
98	89.9	200	95.0	580	102.7	960	106.3
99	89.9	210	95.4	590	102.8	970	106.4
100	90.0	220	95.7	600	102.9	980	106.5
101	90.1	230	96.0	610	103.0	990	106.5
102	90.1	240	96.3	620	103.2	999	106.6
103	90.2	250	96.6	630	103.3		



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ATTACHMENT 3

HEARING PROTECTION TRAINING COMPLETION RECORD

INITIAL

1. I have been informed about the health hazards associated with exposure to excessive sound levels and its potential effect on hearing.
2. I have been informed about the types of work that may result in exposure to excessive sound levels, and the necessary protective steps to prevent excessive exposure, including engineering controls and administrative practices.
3. I understand the purpose for, proper use, and limitations of hearing protection devices, and I have received instructions on selection, fitting, use, and care of such devices.
4. I have been informed about the purpose of audiometric testing and an explanation of the test procedures.
5. Copies of the applicable regulations governing occupational exposure to excessive sound have been made available to me.

PRINT NAME: _____

SIGNATURE: _____

EMPLOYEE NUMBER: _____

DATE: _____

Please File Completed Forms and Forward a Copy to the Knoxville Training Department



PROCEDURE

Subject: PERSONAL PROTECTIVE EQUIPMENT

1.0 PURPOSE AND SUMMARY

This procedure stipulates that the company will provide the personal protective equipment necessary for employees to perform their work safely, as established by the Health & Safety Department. Special purchasing programs for prescription safety glasses and safety shoes are also described. Head, eye, body, and foot protection are discussed in this procedure. Respiratory and hearing protection are cross referenced to the appropriate company procedures.

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 - 5.6 Body Protection
 - 5.7 Providing Personal Protective Equipment to Non-Company Personnel
 - 5.8 Management Duties
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3.0 RESPONSIBILITY MATRIX

3.1 Procedure Responsibility

The EH&S Operations Manager, is responsible for the issuance, revision, and maintenance of this procedure.

3.2 Action/Approval Responsibilities

The Responsibility Matrix is Attachment 1.

4.0 DEFINITIONS

Company – All wholly-owned subsidiaries of Shaw Environmental & Infrastructure, Inc (Shaw E & I).



5.0 TEXT

The company will provide suitable personal protective equipment as required for the nature of the job being performed, such as, but not limited to, boots, protective clothing, respirators, face shields, safety eyewear, respirator ophthalmic hanger devices, hard hats, and gloves. This personal protective equipment will be specified by the Health & Safety Department prior to use, subject to an assessment of the hazards to which employees will be potentially exposed. Documentation shall be in the project-specific Health and Safety Plan (HASP) or equivalent document.

Employees shall use HS-approved protective equipment on any task where there is potential exposure to: physical hazards such as equipment operation, objects dropping from above, or flying particles; or exposure to toxic or irritating gases, fumes, vapors, liquids, or other materials which might cause respiratory distress or skin irritation.

Employees shall be trained in the proper use, maintenance, and limitations of protective equipment. Safety equipment shall be replaced when it is damaged, contaminated, or has worn out. Training requirements are summarized in company Procedure HS050.

Employees shall wear hard hats, eye protection, and steel-toed foot protection (chemical resistant when required) at all job sites (excluding field offices) and industrial facilities, unless HASP/site rules provide exemption. It is the responsibility of all employees to report to any work site prepared to work in Level D PPE. All other protective equipment is the responsibility of the project.

5.1 Eye Protection

All employees engaged in or working in areas adjacent to eye-hazardous activities or operations shall wear appropriate eye protection.

- Safety glasses are required for impact protection, and shall meet ANSI Standard Z87.1 requirements.
- Chemical goggles are required for protection against chemical splash.
- Face shields are required for face protection from chemical splash and are not a substitute for eye protection.
- Full-face respirators can provide eye and face protection in lieu of safety glasses, goggles, or face shields.

5.1.1 Prescription Eye Protection. The company will provide prescription safety glasses (meeting ANSI Standard Z87.1) for field/shop/lab personnel, and computer glasses for computer users, as required by their individual vision status and job. Glasses will be provided every two years unless damaged on-the-job, or the employee exhibits a significant change of prescription.



Lenses shall be clear polycarbonate or plastic. Special tints or dark lenses can be obtained for special applications (e.g., extended outdoor work) with prior written approval from the Health & Safety Department.

Employees requiring corrective lenses inside of respirator face-pieces will be provided with safety lenses and frames sized for respirators and the respirator insert, in addition to conventional prescription safety glasses.

Employees will arrange and pay for the eye examination through the company-provided vision care program. The company will pay for fitting services and the safety glasses.

The company has established a national contract with a protective eyewear provider. Employees should contact the local HS representative (with current lens prescription), who will coordinate with the local purchasing representative to order eyewear. Employees choosing to use another provider will be reimbursed up to \$65 for safety or computer glasses, after the Health & Safety Department has verified that the glasses meet the ANSI Standard requirements.

5.2 Foot Protection

Basic foot protection is required for all job sites and industrial locations. Specialized footwear shall be provided as required by the nature of the work. Special foot protection may include, but is not limited to, chemically resistant, thermally shielded, metatarsal guards, etc.

5.2.1 Leather Safety Shoes. Safety shoes may be used in place of chemical resistant footwear when an employee will be working in a clean or uncontaminated work areas. Generally, when the employee desires to use safety footwear other than standard chemical resistant footwear provided, the company considers it the responsibility of the employee to provide such footwear and ensure that it meets ANSI Standard Z41. Company supervision will enforce the use of appropriate protective footwear per the requirements of the site-specific Health and Safety Plan. Where state or local regulations require (i.e., California and Connecticut), the company will provide all necessary safety equipment.

Employees can purchase safety shoes through national purchasing agreements established by the company. Under the limited circumstances where the company will provide safety shoes, such purchases must be approved by the project or appropriate department/local manager. After the Health & Safety Department has verified that the safety shoes meet ANSI requirements, the employee will be reimbursed for the actual purchase price of the shoes up to a maximum of \$90.00.



Athletic-style safety shoes ("safety sneakers") are prohibited for all field operations due to the difficulties created by these styles in supervising proper use of protective footwear. Employees in fixed laboratory operations may wear athletic-style safety shoes with the prior approval of the Lab Director or HS Coordinator.

5.3 Head Protection

Hard hats meeting ANSI Z89.1 shall be provided to protect employees from impact, penetration, falling objects, and/or limited electrical shock and burn, as appropriate for work site hazards.

5.4 Respiratory Protection

Respirators shall be provided, in accordance with Procedure HS601, Respiratory Protection Program.

5.5 Hearing Protection

Hearing protection shall be provided, in accordance with Procedure HS402, Hearing Conservation Program.

5.6 Body Protection

Protective clothing, gloves, boots, and other protective equipment shall be provided as appropriate for the hazards associated with the tasks being performed.

5.7 Providing Personal Protective Equipment to Non-Company Personnel

The following personal protective equipment may be provided to non-company personnel:

- Hard hats
- Chemical goggles
- Safety glasses (non-prescription)
- Face shields
- Chemical resistant boots
- Chemical resistant gloves
- Hearing protectors
- Disposable chemical resistant personal protective clothing

5.8 Management Duties

It is the responsibility of the Health & Safety Department to specify safety equipment requirements for each job.

It is the responsibility of project managers or location managers to provide adequate quantities of safety equipment required for their job(s) or project(s).

It is the responsibility of supervisors to verify that required safety equipment is properly used and to ensure that any employee provided protective equipment is adequate, properly maintained and in a sanitary condition.



6.0 EXCEPTION PROVISIONS

Variances and exceptions shall be permitted pursuant to the provisions of Procedure HS013, "Health & Safety Procedure Variances".

7.0 CROSS REFERENCES

HS050 Training Requirements

HS402 Hearing Conservation Program

HS601 Respiratory Protection Program

ANSI Standard Z41, *Personal Protection - Protective Footwear*

ANSI Standard Z87.0, *Practice for Occupational and Educational Eye and Face Protection*

ANSI Standard Z89.1, *Protective Headwear for Industrial Workers*

8.0 ATTACHMENTS

1. Responsibility Matrix



ATTACHMENT 1 PERSONAL PROTECTIVE EQUIPMENT

Responsibility Matrix

Action	Procedure Section	Responsible Party			
		EH&S Operations Manager	Local HS Department	Project/ Location Managers	Supervisors
Issue, revise, and maintain this procedure.	3.1	X			
Approve all personal protective equipment prior to use.	5.0		X		
Coordinate reimbursement to employee for PPE purchases.	5.1.1, 5.2.1		X		
Provide adequate quantities of safety equipment as required.	5.8			X	
Verify that required safety equipment is properly used.	5.8				X



PROCEDURE

Subject: RESPIRATORY PROTECTION PROGRAM

1.0 PURPOSE AND SUMMARY

The purpose of this procedure is to prescribe the requirements of the company Respiratory Protection Program (RPP). This procedure provides information and guidance on the proper selection, medical evaluation, training, use, and care of respiratory protective equipment and complies with the requirements of 29 CFR 1910.134 (1998).

All operations which require the use of respiratory protection are subject to the provisions of this procedure.

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 - 5.1 Assignment of Equipment to Contractor/Labor Pool Personnel
 - 5.2 Approval, Selection, and Purchase of Respiratory Protective Equipment
 - 5.2.1 Approval
 - 5.2.2 Selection
 - 5.2.3 Purchase
 - 5.3 Medical Evaluation
 - 5.4 General Program Requirements
 - 5.4.1 Responsibilities
 - 5.4.2 Use of Corrective Lens Eyewear
 - 5.4.3 Obstruction of Face Seal
 - 5.5 Instruction, Training, and Fit Test
 - 5.5.1 Instruction and Training
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 - 5.6 Maintenance Program
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 - 5.7.3 IDLH Atmospheres
 - 5.8 Recordkeeping



- 5.9 Program Evaluation
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3.0 RESPONSIBILITY MATRIX

3.1 Procedure Responsibility

The Director of Health and Safety is responsible for the issuance, revision, and maintenance of this procedure.

3.2 Action/Approval Responsibilities

Program responsibilities are detailed throughout this procedure. The Responsibility Matrix summarizes these items and can be found as Attachment 1.

4.0 DEFINITIONS

Action Level (AL) - Airborne contaminant concentration which is one-half of the Permissible Exposure Guideline (PEG).

Air Purifying Respirator (APR) - Negative pressure respirator (also referred to as a cartridge respirator) which filters contaminated air through chemical or mechanical filter elements. APRs include: cartridge, canister, gas masks, and single-use respirators (single-use respirators are not approved for use by the company).

Approved Respirator - Any respirator, identified by manufacturer and model, that has been approved by NIOSH 42 CFR Part 84 and has been incorporated into the List of Approved Respiratory Protective Equipment (Attachment 2).

Assigned Protection Factor (APF) - A term that is reserved in the OSHA Standard 1910.134 (January, 1998). Attachment 3 provided PFs for the respiratory protective equipment based upon type of device and method of fit testing. The company will continue to use the PFs established by NIOSH until OSHA issues their definition of APF.

Company - All wholly-owned subsidiaries of Shaw Environmental & Infrastructure, Inc. (Shaw E & I).

Contractor Personnel - A group of persons hired to perform a specific activity based on their expertise and ability to operate independent of direct supervision. Contractor personnel are supervised by their management group which reports to an employee of the company for project direction.

End-of-Service-Life Indicator (ESLI) - A system that warns the respirator user of the approach of the end of adequate respiratory protection, for example, that the sorbent is approaching saturation or is no longer effective.



Emergency - Emergency means any occurrence such as, but not limited to, equipment failure, rupture of containers, or failure of control equipment that may or does result in an uncontrolled significant release of an airborne contaminant.

Exposure Limit - Several published airborne contaminant concentration values exist which is used in establishing acceptable personnel exposures to contaminants. OSHA publishes the Permissible Exposure Limit (PEL), NIOSH publishes the Recommended Exposure Limit (REL), and the ACGIH publishes the Threshold Limit Value (TLV). All of these exposure limits are based on an 8-hour work shift, 40-hour work week, and 40-year work life. The values may vary from contaminant to contaminant as well as between publishing bodies.

Field Office - Any office or satellite office performing field activities which may require the use of respiratory protection.

Filtering Facepiece (Dust Mask) - A negative pressure particulate respirator with a filter as an integral part of the facepiece or with the entire facepiece composed of the filtering medium.

Fit Factor (FF) - This term means a quantitative estimate of the fit of a particular respirator to a specific individual and typically estimates the ratio of the concentration of a substance in ambient air to its concentration inside the respirator when worn. The FF incorporates a safety factor of 10 because protection factors in the workplace tend to be much lower than the fit factors achieved during fit testing. Acceptable fit factors are 100 for a tight-fitting half facepiece and 500 for tight-fitting full facepiece respirators.

HASP - Health and Safety Plan.

Health and Safety Representative - A member of the company Health and Safety Functional Resource Group who, through credentials, training, or experience, has the necessary qualifications and authority to specify respiratory protection and evaluate respiratory protection program elements.

Immediately Dangerous to Life or Health (IDLH) - An atmosphere that poses an immediate threat to life, would cause irreversible adverse health effects, or would impair an individual's ability to escape from a dangerous atmosphere.

Labor Pool Personnel - Temporary personnel hired for a given expertise or ability. Labor pool personnel report directly to an employee of the company.

Nuisance Level - Level of airborne contaminants which is below one-half the action level for that contaminant and presents no other health or safety hazard.

Permissible Exposure Guideline (PEG) - This term designates a specific exposure limit and is based on the best available information. The PEG will be the lower (more protective) of the values for the PEL and TLV. However, the REL shall take precedence for Hazardous Waste Operations (subject to 29 CFR 1910.120 or 1926.65) if no PEL exists, or for contaminants where no PEL or TLV exists. If there is no PEL, TLV, or REL, a Health and Safety Representative shall determine an appropriate permissible exposure guideline.



Permissible Exposure Limit (PEL) - An occupational exposure index promulgated by OSHA which carries the force of law. This value represents the allowable concentration to which it is believed an employee may be exposed to 8 hours a day, 40 days a week, for a 40-year working life without experiencing adverse health effects.

Positive Pressure Respirator - A respirator in which the pressure inside the respirator exceeds the ambient air pressure outside the respirator.

Powered Air Purifying Respirator (PAPR) - A positive pressure APR which incorporates a fan and battery pack unit. The system pulls contaminated air through the filter elements before delivery to the facepiece under positive pressure. Air pressure in the mask must remain above ambient pressure.

Qualitative Fit Test - A procedure for assuring that the respirator provides adequate protection based on a pass/fail fit test that relies on the individual's response to the test agent. Standard fit test protocol will utilize the irritant smoke methods as described in Attachment 4.

Quantitative Fit Test - A fit test that provides an assessment of the adequacy of respirator fit by numerically measuring the amount of leakage into the respirator.

Respiratory Protection Program Coordinator (RPP Coordinator) - A person designated by the Health and Safety Representative to administer and supervise the respiratory program at a local facility or project location. This person will have the necessary training or credentials to execute this task.

Recommended Exposure Limit (REL) - An occupational exposure index published by NIOSH which is a recommended guideline for employee protection. This value represents the allowable concentration to which it is believed an employee may be exposed to 10 hours a day, 40 hours a week, for a 40-year working life without experiencing health effects.

Supplied Air Respirator (SAR) - Positive pressure respirator which supplies an independent source of breathing air to the user. Two types of SARs are available: self-contained breathing apparatus (SCBA) and airline.

Threshold Limit Value (TLV) - An occupational exposure index published by ACGIH which is recognized as an industry guideline and represents the concentration to which it is believed that nearly all employees may be exposed to 8 hours a day, 40 hours a week without experiencing adverse health effects.

5.0 TEXT

The company will employ engineering controls (e.g., enclosure, ventilation, material substitution, etc.) as the primary method to limit employee exposure. However, for those situations where engineering and administrative controls are ineffective at controlling employee exposure, the use of respiratory protective equipment may be required.



This RPP provides specific requirements for selection, assignment, training, and medical evaluation for persons expected to wear respiratory protection.

5.1 Assignment of Equipment to Contractor/Labor Pool Personnel

Contractor personnel shall provide their own respiratory protective equipment and shall also confirm meeting all other requirements of their own RPP and that of the company's RPP (i.e., medical clearance, training, etc.).

The company may provide the following respiratory protective equipment to Contractor Personnel:

- Disposable equipment such as filter elements.
- Hardware for airline systems (up to, but not including, the airline and facepiece) which employees are sharing.

The company will not provide the following respiratory protective equipment to Contractor Personnel:

- APR or PAPR facepieces.
- SCBAs, SAR respirators, or airline.

The company may provide respiratory protective equipment to Labor Pool Personnel if the following have been established:

- The labor pool personnel have successfully completed training as required by 29 CFR 1910.134 and other applicable regulations.
- The labor pool personnel have been fit tested in relation to projected exposure levels and contaminants to be encountered.
- The labor pool personnel have been medically approved to wear respirators.
- All other RPP requirements have been met.

5.2 Approval, Selection, and Purchase of Respiratory Protective Equipment

The following requirements are designed to guide correct selection of respiratory protective equipment.

5.2.1 Approval. The Vice President, Health and Safety has approved respirators manufactured by Survivair as the primary respirators for use by employees. For employees who cannot achieve a satisfactory fit or comfort factor in Survivair respirator, Mine Safety Appliance (MSA) respirators will be selected. The list of approved model respirators is included in Attachment 2. Contractor personnel may select any respiratory protective equipment that has received approval from NIOSH.



5.2.2 Selection. The Health and Safety Representative shall base the selection of respiratory protective equipment upon an assessment of potential respiratory hazards that may be encountered. This assessment may utilize a variety of written information such as the NIOSH Pocket Guide to Chemical Hazards, Material Safety Data Sheets, analytical data, air monitoring results, or other applicable information. The selection process shall incorporate the following guidelines:

- Respiratory protection is to be selected by Health and Safety Representatives only. Full facepiece respirators are the usual preference because of superior protection factor and the face/eye protection afforded. Half facepiece respirators can only be used in situations where less than one-half the PEG is expected. The type of respirator selected will be documented in the Project HASP.
- Selection of the appropriate respiratory protective equipment shall include factors such as the chemical state and physical form of the chemical contaminant, atmospheric concentration during routine and emergency events, potential physical hazards, expected job task requirements, and the performance of the respirator in providing the appropriate level of protection against these hazards.
- Consideration shall be given to the nature of the hazardous operation, location of the hazardous area relative to nonhazardous breathing air supply, duration of wear, activities to be performed, and characteristics and function of the respiratory protective equipment to be worn.
- Selected respirators (i.e., Survivair or MSA) shall be NIOSH certified and used in compliance with the conditions of its certification when employees are exposed to toxic materials or other hazardous atmospheres.
- Respirators must provide adequate face and eye protection for the expected task.
- If an APR or PAPR is used, the respirator shall be equipped with an end-of-service life-indicator (ESLI) certified by NIOSH for the contaminant. If an ESLI is not available for the contaminant, a cartridge element change schedule shall be implemented which is based on objective information or data that will ensure that canisters and cartridges are changed before the end of their service life. This information will be described in the HASP.
- The PF for the respirator selected (Attachment 3) shall be used according to the following relationship with the PEG to establish justification for selection:

$$PF \times PEG > \text{Maximum anticipated contaminant concentration}$$

If this equation is false, a respirator with a greater PF must be selected. Also review Attachment 3 to determine the required fit testing for the expected



maximum anticipated contaminant concentration. The Health and Safety Representative may determine that a more conservative approach (e.g., 50 percent PF) may be needed. Decision to do so should be documented in the Project HASP.

- Manufacturer-established limitations of the APR filter elements relative to the contaminants of concern shall be used to establish further justification for the selected respirator should the APRs FF not disqualify its use (e.g., maximum anticipated contaminant concentration).

5.2.3 Purchase. The purchase request of respiratory protective equipment (including cartridges, airlines, compressed air) should be reviewed by a Health and Safety Representative to indicate that the ordered material meets established requirements. **Under no circumstances may anyone (purchasing, warehouse, project manager, etc.) purchase or provide other than the specific respiratory protection equipment selected by the Health and Safety Representative.**

5.3 Medical Evaluation

No employee shall be assigned to a task that requires the use of a respirator unless it has been determined that he/she is physically able to perform the work while using the required respirator. The medical evaluation must be conducted prior to fit testing and work requiring the use of respiratory equipment.

The medical evaluation shall be performed by a physician typically in conjunction with a physical examination meeting the requirements of 29 CFR 1910.120 (f) *Medical Surveillance*. The physician will be informed of the type of work expected of the employee, the types of respiratory protection and personal protective equipment required, and other information indicating the expected stresses of the task. The company medical director shall be given a copy of the company RPP and a copy of 1910.134 (e) *Medical Evaluation*.

The company medical director shall provide a written recommendation regarding the employees ability to use respiratory protection. The company shall ensure that the company medical director supplies the employee with a copy of this recommendation.

Additional medical evaluations will be provided to the employee if:

- Any medical signs or symptoms due to respirator use are reported by the employee, supervisory, or health and safety personnel.
- A change in workplace conditions (e.g., physical work effort, protective clothing, temperature) that may result in a substantial increase in the physiological burden placed on an employee.

5.4 General Program Requirements



5.4.1 Responsibilities. The following information describes the responsibilities for the selection, use, and maintenance of respiratory protective equipment based upon job function:

Management

- Management shall take necessary and cost-effective measures to reduce, where possible, the need for respiratory protective equipment (e.g., enclosed cabs on heavy equipment to reduce airborne dust, operations performed upwind, etc.)
- Respiratory protective equipment shall be provided by management whenever it is determined that such equipment is necessary to protect the health of the employee or when requested by an employee and approved by the Health and Safety Representative.
- Management shall assign work tasks requiring the use of respiratory protective equipment to only those employees who are medically qualified to wear respiratory protective equipment.
- Management shall ensure that employees are trained in the use of respiratory protection prior to being assigned to an activity that requires its use.
- Management shall provide the means for the maintenance of respiratory protection as required.

Health and Safety Representative

- Health and Safety Representatives shall determine appropriate respiratory protection for each job. The decision logic for this selection shall be documented in the Project HASP.
- Health and Safety Representatives shall monitor compliance with the various aspects of this program, provide technical assistance regarding respirator selection and use, evaluate the effectiveness of the RPP, and support respirator training and fit testing at locations under their control.
- Health and Safety Representatives shall conduct regular audits to determine compliance with this procedure. This audit can include a review of maintenance, training, medical and air monitoring records, and review the status of this procedure with regard to current regulatory requirements.
- Health and Safety Representatives shall maintain or oversee maintenance of all other records required by this RPP and shall provide for the training and fit testing of personnel assigned respiratory protective equipment.



- Health and Safety Representatives shall appoint a RPP Coordinator for each location which uses or may have a need to use respiratory protection. The Health and Safety Representative must assure the RPP Coordinator has the necessary training to fulfill his/her responsibilities.

RPP Coordinator

- The RPP Coordinator shall be responsible for cleaning, maintenance, and storage of all respirators not routinely used or not individually assigned.
- The RPP Coordinator shall maintain respirator supplies, including spare parts; submit purchase requests for new equipment; and assure that sufficient quantities of cartridges are available for each field office/project.
- The RPP Coordinator shall assure that air supply and emergency respiratory protection is properly inspected and maintained.
- Respirators shall be repaired by either qualified personnel under the direction of the RPP Coordinator, or by contracted supplier.
- The RPP Coordinator shall maintain models and sizes of respirators available for selection and fitting.
- The RPP Coordinator shall conduct fit testing.

Training Department

- Records pertaining to training and fit testing will be maintained by the Training Department.

Employee

- The employee shall use the provided respiratory protective equipment when instructed to do so in accordance with training received.
- The employee shall clean, disinfect, and properly store the assigned respirator, unless other arrangements are made on a project level.
- The employee shall guard against damage to the assigned respirator.
- The employee shall inspect the respirator before each use and after cleaning.
- The employee shall report any malfunction of the respirator immediately to their supervisor and/or the RPP Coordinator.
- The employee shall report to their supervisor any change in their medical status that may impact their ability to wear a respirator safely.



5.4.2 Use of Corrective Lens Eyewear. In general, contact lenses are permitted to be worn when respiratory protection is used. Although in certain instances, client- or project-specific rules may not allow for their use.

If an employee chooses not to wear contact lenses, management shall assure that the appropriate frames or ophthalmic device attachments are obtained and provided at no cost to the employee.

5.4.3 Obstruction of Face Seal. Employees who wear respirators are required to be clean shaven to the extent that there is no obstruction between the wearer's skin and the facepiece. Trimmed mustaches and facial hair which does not interfere with the seal are allowable.

In addition, respirators shall not be worn when conditions prevent a good face-to-facepiece seal such as corrective lenses or goggles, or other personal protective equipment.

5.5 Instruction, Training, and Fit Test

5.5.1 Instruction and Training. The Training Department shall provide a standard respiratory protective equipment training program for use by qualified personnel such as the Health and Safety Representative or RPP Coordinator. The Training Department will support training at the project location if the project does not have the qualified personnel and/or the equipment to support its own program. As an alternative, the project location may use a respiratory manufacturer's training program if the program meets company requirements, a competent person conducts the training, adequate equipment is available for demonstration, and fit testing is conducted along guidelines established in this procedure. The Training Department must approve all alternative training methods.

The basic respirator training program shall include, as a minimum, the following:

- Training and annual retraining of employees in the selection, use, maintenance, and limitation of each respirator type used.
- Instruction on the nature of the respiratory hazards and potential health effects resulting from exposure.
- Opportunity for "hands on" experience with the respiratory protective equipment.
- Proper fitting, including demonstrations and practice in wearing, adjusting, and determining the fit of the respirator. A selection of respirators shall be available to determine the most comfortable respirator and the best fit.
- Instruction on how to test the face-to-facepiece seal.



- A familiarization period of wear in ambient air.
- For APRs, wearing the respirator in a test atmosphere (typically irritant smoke) for qualitative fit testing. The qualitative fit test shall follow the guidelines outlined in Section 5.5.2.
- Training to recognize and cope with emergency situations (including respirator failure)
- Training and fit testing shall be repeated annually, unless specific OSHA regulations require a more frequent time period (e.g., asbestos, lead operations). Each person receiving training shall complete the Respirator Fit Test Form (Attachment 5).
- Training records will be maintained by the Training Department and the location Health and Safety Representative. On-site records of training and fit testing will be maintained as required by specific regulation (e.g., asbestos work) (refer to Section 5.8).
- It is the responsibility of the RPP Coordinator to verify that all project personnel meet the requirements of this RPP.

5.5.2 Fit Testing. Prior to the use of any negative or positive pressure tight-fitting facepiece, the employee must be fit tested.

- All employees assigned to operations requiring the use of respiratory protective equipment shall have been fit tested within 12 months, or as required by specific regulations (e.g., asbestos, lead operations). Fit test and qualification cards (or a copy of the completed Attachment 5) must be available during operations.
- The employee shall be fit tested with the same size and model as they are expected to wear.
- Qualitative fit test (QLFT) shall be used when a protection factor of 10 or less is required for a negative pressure respirator.
- Quantitative fit test (QNFT) shall be used when a protection factor of greater than 10 is required for a negative pressure respirator. When executing the QNFT, the acceptable test result is 100 for tight fitting half-facepiece respirators and 500 for full-facepiece respirators.
- Fit testing for tight-fitting atmosphere supplying respirators and tight-fitting APRs shall be in a negative pressure mode regardless of the mode of operation that is used for respiratory protection.



- Assessment of comfort shall be made after allowing adequate time for this evaluation. This evaluation shall include reviewing the following points with the employee: positioning of the mask on nose, room for eye protection if required, room to talk, and positioning of the mask on the face and cheeks.
- The following criteria shall be used to help determine the adequacy of the respirator fit: chin properly placed, strap tension, fit across the nose bridge, and tendency to slip.
- If physical obstruction (e.g., facial hair, eyeglasses) interferes with the face-to-facepiece seal, then it shall be altered or removed so as to eliminate any interference and allow for a satisfactory fit. If the employee refuses to alter the physical obstruction, then they shall be denied a satisfactory fit report and referred to his/her supervisor for consideration.
- The fit test protocol (Attachment 4) shall be followed. The Health and Safety Representative and Training Department shall determine which fit test protocol shall be followed depending upon the situation.

5.6 Maintenance Program

Each RPP Coordinator is responsible for verifying the respirator maintenance program is implemented in an effective manner for the facility or project site, the working conditions, and the potential hazards involved. As a minimum, the following aspects must be implemented:

- Inspection
- Cleaning and sanitizing
- Repair
- Respirator storage
- Inspection and repair documentation, as required
- Compliance with manufacturer recommendations.

Detailed information regarding cleaning, inspection, maintenance, and storage is found in Attachment 7. The RPP Coordinator shall verify compliance with the maintenance program by periodic inspections and field audits.



5.6.1 Inspection

- All respiratory protective equipment systems shall be inspected by the wearer for defects and/or deterioration immediately prior to and after each use.
- Any defects shall be reported to their supervisor immediately and the respirator removed from use until it can be repaired or replaced.
- Respiratory protective equipment systems not used routinely (including all SCBAs and equipment designated only for emergency use) shall be inspected before and after each use and at least every 30 days. Cylinders shall be recharged whenever the pressure falls below 90 percent of the manufacturers recommended pressure level. This inspection shall be documented by some method on the unit (i.e., tag). Records of inspections shall be kept through appropriate documentation. Attachment 6 provides an example of inspection documentation for SCBAs. At a minimum, these records will include: date, inspector, and any unusual finding or condition. Any repairs or modifications shall be documented in detail.
- General field inspection shall include a check of the following: tightness of all connections, facepiece, valves, and any connecting tubes or filtering elements.
- Employees who are manufacturer-qualified repair technicians shall be used for all maintenance beyond field inspections, tests, and user-performed cleaning.
- Air supplied respiratory systems shall be inspected by a manufacturer's authorized representative at the manufacturer's recommended schedule. Manufacturers typically require an annual flow test and a complete overhaul every 5 to 7 years.
- **Specific inspection procedures are outlined in Attachment 7.**

5.6.2 Cleaning and Sanitizing. Employees maintaining their own respirators shall be thoroughly briefed on how to clean and disinfect them. On projects where employees clean their own respirator, the generally accepted procedure involves washing with detergent and warm water using a soft brush, submersion in sanitizing agent, thoroughly rinsing in clean water, drying in a clean place, and storage in sealed plastic bags or equivalent. Precautions to be taken to prevent damage from rough handling during this procedure are detailed in Attachment 7.

At locations where employees share respirators, a centralized cleaning and maintenance facility with specialized equipment and/or materials and personnel trained in respirator maintenance must be established. Cleaning and inspection is primarily the responsibility of the user.



5.6.3 Repair. The company will only use respiratory protective equipment that is physically sound.

- If defects are found during any inspection, two remedies are possible. If parts and trained personnel are available, repair and/or adjustment may be made immediately. If parts or trained repair people are unavailable, the device shall be removed from service until it can be repaired. Under no circumstances shall a device that is known to be defective remain in service.
- Replacement or repair shall be done by adequately trained personnel. For negative pressure respirators, the Health and Safety Representative or RPP Coordinator may train or supervise personnel in the replacement of items such as inhalation/exhalation valves, head harness, cartridge adapters, and lenses. For air-supplied respirators, field repairs are limited to replacement of head harness and lenses. All other work must be completed by a factory-certified repair person.

Repair shall only be made with parts designed for the respirator. Substitution of parts from a different brand or type invalidates the respirator's approval and is prohibited.

5.6.4 Storage. Respirators must be stored to protect against dust, sunlight, heat, extreme cold, excessive moisture, damaging chemicals, and mechanical damage.

- Respirators shall be stored in such a manner that the facepiece, exhalation valve, and straps are not distorted.
- Respirators shall be stored in sealable containers (e.g., ziplock bags) after cleaning and disinfecting.
- The storage location of emergency respiratory protection shall be readily accessible and prominently identified.
- Respirators shall be stored in an area free of contamination.

5.7 Field Use

The following guidelines for the use of respirators (or equivalent) shall be incorporated into the Project HASP as appropriate. Additional guidelines may be required based on working conditions and hazards involved. Each location where respiratory protective equipment is required or worn shall include in the Project HASP justification for the selected respiratory protective equipment systems worn as outlined in Section 5.2 of this procedure.

5.7.1 General Requirements. The following general requirements shall be followed whenever respiratory protection is used:



- Employees shall be allowed to leave the regulated area to readjust the facepiece or to wash their faces and to wipe clean the facepieces of their respirators in order to minimize potential skin irritation associated with respirator use.
- Respiratory protective equipment shall not be passed on from one person to another until it has been cleaned and sanitized, per program requirements.
- Respirators will be inspected, and a positive/negative pressure test performed prior to each use.
- Entry into oxygen-deficient (< 19.5 percent O₂) atmospheres, Immediately Dangerous to Life and Health (IDLH) atmospheres, or areas requiring EPA Level A protection is prohibited without the prior approval of the Vice President, Health and Safety or the CIH assigned to the business line.
- Head coverings such as Tyvek hoods shall not be allowed to pass between the face-to-facepiece seal.
- The harness straps of tight-fitting respirators shall not be positioned or worn over hard hats.

5.7.2 Specific Requirements. The following information details specific requirements by respirator class:

Air Purifying Systems

- When APRs are worn, new filter elements shall be installed at the beginning of operations. The filter elements shall be changed whenever the ESLI (color indicators) indicates that cartridge life has expired (e.g., mercury cartridges). When no ESLIs are available, filter replacement will be based on the calculations performed by the Health and Safety Representative. Additionally, the cartridges will be replaced if "breakthrough" is perceived or whenever an increase in breathing resistance is detected. In most cases, the cartridges will be replaced a minimum of once daily, usually at the end of the work shift.

Powered Air Purifying Systems

- When PAPRs are worn, employees shall change filter elements after each day's activities. The filter elements shall be changed whenever the ESLI (color indicators) indicates that cartridge life has expired (e.g., mercury cartridges). When no ESLIs are available, filter replacement will be based on the calculations performed by the Health and Safety Representative. Additionally, the cartridges will be replaced if "breakthrough" is perceived or when airflow through filter elements decreases to an unacceptable level as indicated by the manufacturers test device.



Compressed Air

- Compressed air used for breathing shall meet at least the requirements of the specification for Grade D breathing air or better (D, E, or G; not A, K, or L) as described in the American National Standard Commodity Specification for Air, ANSI/CGA G-7.1-1989. Further information is provided in Attachment 7, Guide to Respiratory Protective Equipment Cleaning, Inspection, Maintenance, and Storage.
- Breathing air suppliers must provide certification of analysis stating conformance, as a minimum, to Grade D breathing air standards as previously referenced for each cylinder and/or air lot.
- Air delivered in bulk, e.g., tube trailers, shall have each tube or unit, or a representative number of tubes or units verified as to oxygen content prior to using that tube.
- Pure oxygen shall NOT be used at any time in open-circuit SCBAs or airline respirators.
- Breathing air cylinders shall be legibly identified with the word "AIR" by means of stenciling, stamping, or labeling as near to the valve end as practical.
- Breathing air cylinders may be stored on their sides provided the valve caps are in place.

Supplied Air Breathing Systems

- Airline couplings shall be incompatible with outlets for other gas systems to prevent inadvertent servicing of airline respirators with nonrespirable gases or oxygen.
- Standard airline couplings for breathing air systems are Foster quick connect fittings with locking dots. Hansen quick connect fitting may also be used, but must not be used where they can be inadvertently actuated and disconnected. For example, Hansen fittings could be used at the regulator connection, but not on the airline unless protected from disconnection by some other means.
- The hose line length shall not exceed 300 feet from the air bank regulator to the user.
- No more than three connections, excluding the connection to the regulator and final connection to the respirator, shall be between the breathing air cylinders and the user.



- Breathing air hose shall be protected from direct contact with chemical materials which may permeate the hose. Acceptable methods of protection include suspension of the hose from the surface or covering with a commercially available sleeve or visqueen. Breathing air hose which has become contaminated will be removed from service and disposed of properly.
- The breathing air regulator shall be adjusted to provide air pressure as per the manufacturer's recommendations. For Survivair units, this pressure shall be between 80 to 125 psi pressure.
- Cascade systems shall be equipped with low pressure warning alarms or similar warning devices to indicate air pressure in the manifold below 500 psi.
- When a cascade system is used to supply breathing air, a worker outside the Exclusion Zone shall be assigned as safety standby within audible range of the low pressure alarm.
- When a cascade system is used to recharge SCBA air cylinders, it shall be equipped with a high-pressure supply hose and coupling rated at a capacity of at least 3,000 psi. The supply hose and coupling shall be relatively short (≤ 3 feet) and secured to prevent whipping when pressurized.
- Large supplied air cylinders shall be stored and handled to prevent damage to the cylinder or valve. Cylinders shall be stored upright with the protective valve cover in place and in such a way (e.g., supported with substantial rope or chain in the upper one-third of the cylinder, or in racks designed for the purpose) as to prevent the cylinder from falling. Cylinders shall not be dropped, dragged, rolled, or allowed to strike each other or to be struck violently. Cylinders shall never be exposed to temperatures exceeding 125°F. Cylinders with visible external damage, evidence of corrosion, or exposure to fire shall not be accepted or used.
- Only cylinders within current hydrostatic test periods shall be used. For fiber wrapped bottles designated by the DOT-E label, hydrostatic testing shall be completed every 3 years. Maximum service life for these cylinders is 15 years. Steel or aluminum cylinders shall be hydrostatically tested every 5 years. No maximum service life is established for steel or aluminum cylinders.
- SCBAs shall only be used in the positive pressure mode when in the Exclusion Zone.
- Standby SCBA equipment must be present when air supply systems are used in IDLH or potentially IDLH atmospheres.



Escape/Egress Units

- These respirators are intended for use in areas where escape with a short-term (5 minute) air supply is necessary. They may be used as adjuncts to airline respirators as a backup air supply, or as independent emergency devices in areas where respiratory protective equipment is not normally required.
- Appropriate training shall be accomplished and documented prior to assigning employees to tasks or locations subject to the use of these respirators.
- Escape/egress units (5-minute air supply) shall never be used as primary standby respirators for confined space entry.
- Escape/egress units shall never be used to enter, or continue working in, a hazardous atmosphere.

5.7.3 IDLH Atmospheres. For all IDLH atmospheres, the company shall ensure that:

- One employee or, when needed, more than one employee is located outside the IDLH atmosphere.
- Visual, voice, or signal line communication is maintained between the employee(s) in the IDLH atmosphere and the employee(s) located outside the IDLH atmosphere.
- The employee(s) located outside the IDLH atmosphere are trained and equipped to provide effective emergency rescue.
- The employer or designee is notified before the employee(s) located outside the IDLH atmosphere enter the IDLH atmosphere to provide emergency rescue.
- The employer or designee authorized to do so by the employer, once notified, provides necessary assistance appropriate to the situation.
- Employee(s) located outside the IDLH atmosphere are equipped with:
- Pressure demand or other positive pressure SCBAs, or a pressure demand or other positive pressure supplied air respirator with escape/egress unit.
- Appropriate retrieval equipment for removing the employee(s) who enter(s) these hazardous atmospheres where retrieval equipment would contribute to the rescue of the employee(s) and would not increase the overall risk resulting from entry. Equivalent means of rescue can be considered.



5.8 Recordkeeping

The following documents must be part of the site recordkeeping program:

- Employees medical clearances for respirator use
- Respirator training and fit testing forms.

5.9 Program Evaluation

This RPP shall be reviewed annually at the direction of the Director Health and Safety.

6.0 EXCEPTION PROVISIONS

Variances and exceptions may be requested pursuant to the provisions of Procedure HS013, Health and Safety Procedure Variances.

7.0 CROSS REFERENCES

Title 29, Code of Federal Regulations, Section 1910.134.

AIHA, *Respiratory Protection, A Manual and Guideline*, 1980.

American National Standards Institute Practices for Respiratory Protection Z88.2-1992 (or most recent publication)

NIOSH, *Certified Equipment List* (most recent version)

Company Health and Safety Procedures:

- HS013 Health and Safety Procedure Variances
- HS040 Stop Work Authority
- HS050 Training Requirement
- HS052 Health and Safety Plans
- HS102 Management of Employee Exposure and Medical Records
- HS104 Employee Notification of Industrial Hygiene Monitoring Records
- HS300 Confined Spaces
- HS304 Compressed Gas Cylinders
- HS600 Personal Protective Equipment

8.0 ATTACHMENTS

1. Responsibility Matrix
2. List of Approved Respiratory Protective Equipment
3. Respirator Type, Protection Factor, and Fit Testing Method
4. Mandatory Respirator Fit Test Protocol
5. Respirator Fit Test Form
6. Emergency Respiratory Protective Equipment Monthly Inspection Checklist
7. Guide to Respiratory Protective Equipment Cleaning, Inspection, Maintenance, and Storage



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ATTACHMENT 1 RESPIRATORY PROTECTION PROGRAM

Responsibility Matrix

Action	Procedure Section	Responsible Party					
		Employee	Health and Safety Representative	Project/ Location Management	Director of Health & Safety	Training	RPP Coordinator
Issue, Revise, and Maintain Procedure	3.1				X		
Assure Proper Selection of Respirators	5.2.2		X				
Review Purchase Requests for Respiratory Equipment	5.2.3		X				
Conduct Fit Testing	5.4		X				X
Assure Compliance with RPP	5.4		X	X			X
Assure Training	5.4		X	X			X
Audit Program Compliance	5.4		X		X		X
Assist/Approve Local Training Program	5.4					X	
Maintenance Program	5.6	X	X	X			X
Field Use	5.7	X	X	X			X
Recordkeeping	5.8	X	X			X	X
Program Evaluation	5.9				X		



ATTACHMENT 2

LIST OF APPROVED RESPIRATORY PROTECTIVE EQUIPMENT

<i>AIR PURIFYING RESPIRATORS (APR)</i>					
Respirator Class	Respirator Type	Respiratory Performance	Manufacturer	Model Name	Model Number
Standard APR	Half-Face	Negative Pressure	Survivair	Blue 1	2100-10 S 2200-10 M 2300-10 L
			MSA	Comfo II	479529 S 479428 M 479530 L
	Full-Face	Negative Pressure	Survivair	20/20	202062 S 202072 M 202082 L
			MSA	Ultra Twin	480263 S 480259 M 480267 L
Powered APR	Hood	Continuous Positive Pressure	Survivair MSA	PAPR Optimair 6	5200-15 480251 S 480247 M 480255 L

<i>SUPPLIED AIR RESPIRATORS (SAR)</i>					
Respirator Class	Respirator Type	Respiratory Performance	Manufacturer	Model Name	Model Number
Airline SAR	Full-Face	Positive Pressure Demand	Survivair	Panther	P968455
			MSA	Premaire	497291
SCBA SAR	Full-Face	Positive Pressure Demand	Survivair MSA	Cougar MMR WorkMask 2216	P 9643310 Varies on Components
Emergency	Escape/Egress Unit	Continuous Flow	Survivair MSA	5 min. EEGA Custom Air V	9750870 484353



ATTACHMENT 3

RESPIRATOR TYPE, PROTECTION FACTOR, AND FIT TESTING METHOD

Respirator Type	Protection Factor	QLFT	QNFT
Half-Face, Negative Pressure (<100 Fit Factor) ₁	10	Yes	Yes
Full-Face, Negative Pressure (<100 Fit Factor) Used in Atmosphere up to 10 Times the PEG	10	Yes	Yes
Full-Face, Negative Pressure (>100 Fit Factor) Used in Atmospheres Over 10 Times the PEG ₂	50	No	Yes
PAPR (>100 Fit Factor) Used in Atmospheres Over 10 Times the PEG ₂	100	Yes	Yes
SCBA/SAR Used in Positive Pressure (Pressure Demand Mode) (>100 Fit Factor) Used in Atmospheres Over 10 Times the PEG ₂	10,000	Yes ₃	Yes ₄

Footnotes:

1. If quantitatively fit tested, the device must demonstrate a fit factor of at least 100.
2. If quantitatively fit tested, the device must demonstrate a fit factor of at least 500.
3. If qualitatively fit tested, the assigned protection factor is 100.
4. If quantitatively fit tested, the assigned protection factor is 10,000



ATTACHMENT 4

MANDATORY RESPIRATOR FIT TEST PROTOCOL

OSHA-Accepted Fit Test Protocols

A. Fit Testing Procedures - General Requirements

The company shall conduct fit testing using the following procedures. The requirements in this attachment apply to all OSHA-accepted fit test methods, both QLFT and QNFT. There are several OSHA-accepted fit test protocols for QLFT. This procedure includes only the irritant smoke protocol since it requires less equipment and is more practical for field use.

1. The test subject shall be allowed to pick the most acceptable respirator from a sufficient number of respirator models and sizes so that the respirator is acceptable to, and correctly fits, the user.
2. Prior to the selection process, the test subject shall be shown how to put on a respirator, how it should be positioned on the face, how to set strap tension, and how to determine an acceptable fit. A mirror shall be available to assist the subject in evaluating the fit and positioning of the respirator. This instruction may not constitute the subjects formal training on respirator use, because it is only a review.
3. The test subject shall be informed that he/she is being asked to select the respirator that provides the most acceptable fit. Each respirator represents a different size and shape, and if fitted and used properly, will provide adequate protection.
4. The test subject shall be instructed to hold each chosen facepiece up to the face and eliminate those that obviously do not give an acceptable fit.
5. The more acceptable facepieces are noted in case the one selected proves unacceptable; the most comfortable mask is donned and worn at least five minutes to assess comfort. Assistance in assessing comfort can be given by discussing the points in the following Item A.6. If the test subject is not familiar with using a particular respirator, the test subject shall be directed to don the mask several times and to adjust the straps each time to become adept at setting proper tension on the straps.
6. Assessment of comfort shall include a review of the following points with the test subject and allowing the test subject adequate time to determine the comfort of the respirator:
 - a. Position of the mask on the nose;
 - b. Room for eye protection;
 - c. Room to talk; and
 - d. Position of mask on face and cheeks.
7. The following criteria shall be used to help determine the adequacy of the respirator fit:
 - a. Chin properly placed;
 - b. Adequate strap tension, not overly tightened;
 - c. Fit across nose bridge;
 - d. Respirator of proper size to span distance from nose to chin;
 - e. Tendency of respirator to slip; and
 - f. Self-observation in mirror to evaluate fit and respirator position.



8. The test subject shall conduct a user seal check, either the negative and positive pressure seal checks. Before conducting the negative and positive pressure checks, the subject shall be told to seat the mask on the face by moving the head from side-to side and up and down slowly while taking in a few slow deep breaths. Another facepiece shall be selected and retested if the test subject fails the user seal check tests.
9. The test shall not be conducted if there is any hair growth between the skin and the facepiece sealing surface, such as stubble beard growth, beard, mustache, or sideburns which cross the respirator sealing surface. Any type of apparel which interferes with a satisfactory fit shall be altered or removed.
10. If a test subject exhibits difficulty in breathing during the tests, he/she shall be referred to a physician or other licensed health care professional, as appropriate, to determine whether the test subject can wear a respirator while performing his/her duties.
11. If the employee finds the fit of the respirator unacceptable, the test subject shall be given the opportunity to select a different respirator and to be retested.
12. *Exercise Regimen:* Prior to the commencement of the fit test, the test subject shall be given a description of the fit test and the test subjects responsibilities during the test procedure. The description of the process shall include a description of the test exercises that the subject will be performing. The respirator to be tested shall be worn for at least 5 minutes before the start of the fit test.
13. The fit test shall be performed while the test subject is wearing any applicable safety equipment that may be worn during actual respirator use which could interfere with respirator fit.
14. *Test Exercises:* The following test exercises are to be performed for all fit testing methods prescribed in this attachment, except for the controlled negative pressure (CNP) method. A separate fit testing exercise regimen is contained in the CNP protocol.

Each test exercise shall be performed for one minute, except for the grimace exercise which shall be performed for 15 seconds. The test subject shall be questioned by the test conductor regarding the comfort of the respirator upon completion of the protocol. If it has become unacceptable, another model of respirator shall be tried. The respirator shall not be adjusted once the fit test exercises begin. Any adjustment voids the test, and the fit test must be repeated.

The test subject shall perform exercises, in the test environment, in the following manner:

- a. *Normal Breathing:* In a normal standing position, without talking, the subject shall breathe normally.
- b. *Deep Breathing:* In a normal standing position, the subject shall breathe slowly and deeply, taking caution so as not to hyperventilate.
- c. *Turning Head Side to Side:* Standing in place, the subject shall slowly turn his/her head from side to side between the extreme positions on each side. The head shall be held at each extreme momentarily so the subject can inhale at each side.



- d. *Moving Head Up and Down:* Standing in place, the subject shall slowly move his/her head up and down. The subject shall be instructed to inhale in the up position (i.e., when looking toward the ceiling).
- e. *Talking:* The subject shall talk out loud slowly and loud enough so as to be heard clearly by the test conductor. The subject can count backward from 100, recite a memorized poem or song or read from a prepared text such as the Rainbow Passage.

Rainbow Passage:

When the sunlight strikes raindrops in the air, they act like a prism and form a rainbow. The rainbow is a division of white light into many beautiful colors. These take the shape of a long round arch, with its path high above, and its two ends apparently beyond the horizon. There is, according to legend, a boiling pot of gold at one end. People look, but no one ever finds it. When a man looks for something beyond reach, his friends say he is looking for the pot of gold at the end of the rainbow.

- f. *Grimace:* The test subject shall grimace by smiling or frowning. (This applies only to QNFT testing; it is not performed for QLFT.)
- g. *Bending Over:* The test subject shall bend at the waist as if he/she were to touch his/her toes. Jogging in place shall be substituted for this exercise in those test environments such as shroud type QNFT or QLFT units that do not permit bending over at the waist.
- h. *Normal Breathing:* Same as Item A.14.a.

B. Qualitative Fit Test (QLFT) Protocols

1. General:

- a. The employer shall ensure that persons administering QLFT are able to perform tests properly, recognize invalid tests, and ensure that test equipment is in proper working order.
- b. The employer shall ensure that QLFT equipment is kept clean and well maintained so as to operate within the parameters for which it was designed.

2. Irritant Smoke (Stannic Chloride) Protocol: This qualitative fit test uses a person's response to the irritating chemicals released in the "smoke" produced by a stannic chloride ventilation smoke tube to detect leakage into the respirator.

a. General Requirements and Precautions:

- 1. The respirator to be tested shall be equipped with high efficiency particulate air (HEPA) or P100 series filter(s).
- 2. Only stannic chloride smoke tubes shall be used for this protocol.
- 3. No form of test enclosure or hood for the test subject shall be used.



4. The smoke take precautions to minimize the test subjects exposure to irritant smoke. Sensitivity varies, and certain individuals may respond to a greater degree to irritant smoke. Care shall be taken when performing the sensitivity screening checks that determine whether the test subject can detect irritant smoke to use only the minimum amount of smoke necessary to elicit a response from the test subject.
 5. The fit test shall be performed in an area with adequate ventilation to prevent exposure of the person conducting the fit test or the buildup of irritant smoke in the general atmosphere.
- b. Sensitivity Screening Check: The person to be tested must demonstrate his/her ability to detect a weak concentration of the irritant smoke.
1. The test operator shall break both ends of a ventilation smoke tube containing stannic chloride, and attach one end of the smoke tube to a low flow air pump set to deliver 200 milliliters per minute, or an aspirator squeeze bulb. The test operator shall cover the other end of the smoke tube with a short piece of tubing to prevent potential injury from the jagged end of the smoke tube.
 2. The test operator shall advise the test subject that the smoke can be irritating to the eyes, lungs, and nasal passages and instruct the subject to keep his/her eyes closed while the test is performed.
 3. The test subject shall be allowed to smell a weak concentration of the irritant smoke before the respirator is donned to become familiar with its irritating properties and to determine if he/she can detect the irritating properties of the smoke. The test operator shall carefully direct a small amount of the irritant smoke in the test subjects direction to determine that he/she can detect it.
- c. Irritant Smoke Fit Test Procedure:
1. The person being fit tested shall don the respirator without assistance, and perform the required user seal check(s).
 2. The test subject shall be instructed to keep his/her eyes closed.
 3. The test operator shall direct the stream of irritant smoke from the smoke tube toward the face seal area of the test subject, using the low flow pump or the squeeze bulb. The test operator shall begin at least 12 inches from the facepiece and move the smoke stream around the whole perimeter of the mask. The operator shall gradually make two more passes around the perimeter of the mask, moving to within 6 inches of the respirator.
 4. If the person being tested has not had an involuntary response and/or detected the irritant smoke, proceed with the test exercises.
 5. The exercises identified in Item A.14 of this attachment shall be performed by the test subject while the respirator seal is being continually challenged by the smoke, directed around the perimeter of the respirator at a distance of six inches.
 6. If the person being fit tested reports detecting the irritant smoke at any time, the test is failed. The person being retested must repeat the entire sensitivity check and fit test procedure.



7. Each test subject passing the irritant smoke test without evidence of a response (involuntary cough, irritation) shall be given a second sensitivity screening check, with the smoke from the same smoke tube used during the fit test, once the respirator has been removed, to determine whether he/she still reacts to the smoke. Failure to evoke a response shall void the fit test.

8. If a response is produced during this second sensitivity check, then the fit test is passed.

C. Quantitative Fit Test (QNFT) Protocols

The following quantitative fit testing procedures have been demonstrated to be acceptable: quantitative fit testing using a nonhazardous test aerosol (such as corn oil, polyethylene glycol 400 [PEG 400], di-2-ethyl hexyl sebacate [DEHS], or sodium chloride) generated in a test chamber, and employing instrumentation to quantify the fit of the respirator; quantitative fit testing using ambient aerosol as the test agent and appropriate instrumentation (condensation nuclei counter) to quantify the respirator fit; quantitative fit testing using controlled negative pressure and appropriate instrumentation to measure the volumetric leak rate of a facepiece to quantify the respirator fit.

1. General:

- a. The employer shall ensure that persons administering QNFT are able to calibrate equipment and perform tests properly, recognize invalid tests, calculate fit factors properly, and ensure that test equipment is in proper working order.
- b. The employer shall ensure that QNFT equipment is kept clean, and is maintained and calibrated according to the manufacturer's instructions so as to operate at the parameters for which it was designed.

2. Ambient Aerosol Condensation Nuclei Counter (CNC) Quantitative Fit Testing Protocol: The ambient aerosol CNC quantitative fit testing (Portacount²) protocol quantitatively fit tests respirators with the use of a probe. The probed respirator is only used for quantitative fit tests. A probed respirator has a special sampling device, installed on the respirator that allows the probe to sample the air from inside the mask. A probed respirator is required for each make, style, model, and size that the employer uses and can be obtained from the respirator manufacturer or distributor. The CNC instrument manufacturer, TSI Inc., also provides probe attachments (TSI sampling adapters) that permit fit testing in an employee's own respirator. A minimum fit factor pass level of at least 100 is necessary for a half-mask respirator and a minimum fit factor pass level of at least 500 is required for a full facepiece negative pressure respirator. The entire screening and testing procedure shall be explained to the test subject prior to conducting the screening test.

a. Portacount Fit Test Requirements:

1. Check the respirator to make sure the sampling probe and line are properly attached to the facepiece and that the respirator is fitted with a particulate filter capable of preventing significant penetration by the ambient particles used for the fit test (e.g., NIOSH 42 CFR 84 Series 100, Series 99, or Series 95 particulate filter) per manufacturer's instruction.
2. Instruct the person to be tested to don the respirator for five minutes before the fit test starts. This purges the ambient particles trapped inside the respirator and permits the



wearer to make certain the respirator is comfortable. This individual shall already have been trained on how to wear the respirator properly.

3. Check the following conditions for the adequacy of the respirator fit: chin properly placed; adequate strap tension, not overly tightened; fit across nose bridge; respirator of proper size to span distance from nose to chin; tendency of the respirator to slip; and self-observation in a mirror to evaluate fit and respirator position.
4. Have the person wearing the respirator do a user seal check. If leakage is detected, determine the cause. If leakage is from a poorly fitting facepiece, try another size of the same model respirator, or another model of respirator.
5. Follow the manufacturer's instructions for operating the Portacount and proceed with the test.
6. The test subject shall be instructed to perform the exercises in Item A.14 of this attachment.
7. After the test exercises, the test subject shall be questioned by the test conductor regarding the comfort of the respirator upon completion of the protocol. If it has become unacceptable, another model of respirator shall be tried.

b. Portacount Test Instrument:

1. The Portacount will automatically stop and calculate the overall fit factor for the entire set of exercises. The overall fit factor is what counts. The Pass or Fail message will indicate whether or not the test was successful. If the test was a Pass, the fit test is over.
 2. Since the pass or fail criterion of the Portacount is user programmable, the test operator shall ensure that the pass or fail criterion meet the requirements for minimum respirator performance in this attachment.
 3. A record of the test needs to be kept on file, assuming the fit test was successful. The record must contain the test subjects name; overall fit factor; make, model, style, and size of respirator used; and date tested.
3. Controlled Negative Pressure (CNP) Quantitative Fit Testing Protocol - The CNP protocol provides an alternative to aerosol fit test methods. The CNP fit test method technology is based on exhausting air from a temporarily sealed respirator facepiece to generate and then maintain a constant negative pressure inside the facepiece. The rate of air exhaust is controlled so that a constant negative pressure is maintained in the respirator during the fit test. The level of pressure is selected to replicate the mean inspiratory pressure that causes leakage into the respirator under normal use conditions. With pressure held constant, air flow out of the respirator is equal to air flow into the respirator. Therefore, measurement of the exhaust stream that is required to hold the pressure in the temporarily sealed respirator constant yields a direct measure of leakage air flow into the respirator. The CNP fit test method measures leak rates through the facepiece as a method for determining the facepiece fit for negative pressure respirators. The CNP instrument manufacturer, Dynatech Nevada, also provides attachments (sampling manifolds) that replace the filter cartridges to permit fit testing in an employee's own respirator. To perform the test, the test subject closes his/her mouth and holds his/her breath, after which an air pump removes air from the respirator facepiece at a pre-selected constant pressure. The facepiece fit is expressed as the leak rate through the facepiece, expressed as milliliters per minute. The quality and validity of



the CNP fit tests are determined by the degree to which the in-mask pressure tracks the test pressure during the system measurement time of approximately five seconds. Instantaneous feedback in the form of a real-time pressure trace of the in-mask pressure is provided and used to determine test validity and quality. A minimum fit factor pass level of 100 is necessary for a half-mask respirator and a minimum fit factor of at least 500 is required for a full facepiece respirator. The entire screening and testing procedure shall be explained to the test subject prior to conducting the screening test.

a. CNP Fit Test Requirements:

1. The instrument shall have a non-adjustable test pressure of 15.0 mm water pressure.
2. The CNP system defaults selected for test pressure shall be set at 15 mm of water (-0.58 inches of water) and the modeled inspiratory flow rate shall be 53.8 liters per minute for performing fit tests.

(Note: CNP systems have built-in capability to conduct fit testing that is specific to unique work rate, mask, and gender situations that might apply in a specific workplace. Use of system default values, which were selected to represent respirator wear with medium cartridge resistance at a low-moderate work rate, will allow inter-test comparison of the respirator fit.)

3. The individual who conducts the CNP fit testing shall be thoroughly trained to perform the test.
4. The respirator filter or cartridge needs to be replaced with the CNP test manifold. The inhalation valve downstream from the manifold either needs to be temporarily removed or propped open.
5. The test subject shall be trained to hold his/her breath for at least 20 seconds.
6. The test subject shall don the test respirator without any assistance from the individual who conducts the CNP fit test.
7. The QNFT protocol shall be followed according to Item C.1 of this attachment with an exception for the CNP test exercises.

b. CNP Test Exercises:

1. Normal Breathing: In a normal standing position, without talking, the subject shall breathe normally for 1 minute. After the normal breathing exercise, the subject needs to hold head straight ahead and hold his/her breath for 10 seconds during the test measurement.
2. Deep Breathing: In a normal standing position, the subject shall breathe slowly and deeply for 1 minute, being careful not to hyperventilate. After the deep breathing exercise, the subject shall hold his/her head straight ahead and hold his/her breath for 10 seconds during test measurement.
3. Turning Head Side to Side: Standing in place, the subject shall slowly turn his/her head from side to side between the extreme positions on each side for 1 minute. The head shall be held at each extreme momentarily so the subject can inhale at each side. After the



turning head side to side exercise, the subject needs to hold head full left and hold his/her breath for 10 seconds during test measurement. Next, the subject needs to hold head full right and hold his/her breath for 10 seconds during test measurement.

4. Moving Head Up and Down: Standing in place, the subject shall slowly move his/her head up and down for 1 minute. The subject shall be instructed to inhale in the up position (i.e., when looking toward the ceiling). After the moving head up and down exercise, the subject shall hold his/her head full up and hold his/her breath for 10 seconds during test measurement. Next, the subject shall hold his/her head full down and hold his/her breath for 10 seconds during test measurement.
5. Talking: The subject shall talk out loud slowly and loud enough so as to be heard clearly by the test conductor. The subject can read from a prepared text such as the Rainbow Passage, count backward from 100, or recite a memorized poem or song for 1 minute. After the talking exercise, the subject shall hold his/her head straight ahead and hold his/her breath for 10 seconds during the test measurement.
6. Grimace: The test subject shall grimace by smiling or frowning for 15 seconds.
7. Bending Over: The test subject shall bend at the waist as if he/she were to touch his/her toes for 1 minute. Jogging in place shall be substituted for this exercise in those test environments such as shroud-type QNFT units that prohibit bending at the waist. After the bending over exercise, the subject shall hold his/her head straight ahead and hold his/her breath for 10 seconds during the test measurement.
8. Normal Breathing: The test subject shall remove and re-don the respirator within a one-minute period. Then, in a normal standing position, without talking, the subject shall breathe normally for 1 minute. After the normal breathing exercise, the subject shall hold his/her head straight ahead and hold his/her breath for 10 seconds during the test measurement. After the test exercises, the test subject shall be questioned by the test conductor regarding the comfort of the respirator upon completion of the protocol. If it has become unacceptable, another model of a respirator shall be tried.

c. CNP Test Instrument:

1. The test instrument shall have an effective audio warning device when the test subject fails to hold his/her breath during the test. The test shall be terminated whenever the test subject failed to hold his/her breath. The test subject may be refitted and retested.
2. A record of the test shall be kept on file, assuming the fit test was successful. The record must contain the test subjects name; overall fit factor; make, model, style, and size of respirator used; and date tested.



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ATTACHMENT 5 RESPIRATOR FIT TEST FORM

NAME (Please Print): _____ SIGNATURE: _____

SSN: _____ - _____ - _____ HOME DEPT: _____ DATE: _____

CONDUCTED BY: _____ LOCATION: _____

FIT TEST PROTOCOL

QUANTITATIVE:

Fit Factor _____

QUALITATIVE:

Irritant Smoke:

Other (specify): _____

TYPE OF RESPIRATOR

(Circle Appropriate One)

APR/HF
SAR/EGS

APR/FF
PAPR

SCBA
OTHER

Respirator Manufacturer: _____

Model: _____

Size: _____

INITIAL:

1. I understand why respiratory protection is needed and where and when it should be used.

2. I know how to use this respirator properly.

3. I know how to clean and inspect this respirator.

4. I understand the limitations and restrictions of this respirator.

5. I wore this respirator in normal air and performed the user seal.

6. I wore this respirator equipment in a test atmosphere.

7. I understand that a good gas-tight face seal cannot be achieved with obstructions such as facial hair or glasses.

8. I understand that corrective lenses compatible with the full facepiece are available by my manager.



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ATTACHMENT 6

EMERGENCY RESPIRATORY PROTECTIVE EQUIPMENT MONTHLY INSPECTION CHECKLIST

INSPECTED BY (Print): _____

DATE: _____

BACKPACK#: _____

AIR CYLINDER#: _____

			PASS	FAIL
A. Backpack and Harness Assembly	1. Straps	Inspect for complete set	☐	☐
		Inspect for damaged straps	☐	☐
	2. Buckles	Inspect for mating ends	☐	☐
		Check locking function	☐	☐
	3. Backplate and Cylinder Lock	Inspect backplate for cracks, missing screws/rivets	☐	☐
		Inspect cylinder hold down strap	☐	☐
		Inspect strap tightener	☐	☐
B. Cylinder and Cylinder Valve Assembly	1. Cylinder	Cylinder tight to backplate	☐	☐
		Current Hydrostatic Test	☐	☐
		Inspect cylinder for dents, gouges	☐	☐
		Is cylinder at least 90% filled?	☐	☐
	2. Head and Valve Assembly	Inspect cylinder valve lock for presence	☐	☐
		Inspect cylinder gauge for condition	☐	☐
C. Regulator and High Pressure Hose	1. High Pressure Hose and Connector	Leakage in hose	☐	☐
		Leakage in hose to cylinder connector	☐	☐
	2. Regulator and Low Pressure Alarm	Read regulator gauge (at least 1,000 psi)	☐	☐
		Low pressure alarm sounds at 500 psi	☐	☐
		Test integrity of diaphragm	☐	☐
		Test for positive pressure	☐	☐
D. Facepiece and Corrugated Breathing Tube	1. Facepiece	Test bypass system	☐	☐
		Inspect harness for deterioration	☐	☐
		Inspect facepiece body for deterioration	☐	☐
		Inspect lens	☐	☐
	2. Breathing Tube and Connector	Inspect exhalation valve	☐	☐
		Inspect breathing tube for deterioration	☐	☐
		Inspect connector for threads and gasket	☐	☐
	3. Leak Test and Cleaning	Perform negative pressure test on facepiece/ breathing tube	☐	☐
		Clean and sanitize facepiece	☐	☐

Note: Any item marked Fail will place the equipment out of service until repaired or replaced.



ATTACHMENT 7

GUIDE TO RESPIRATORY PROTECTIVE EQUIPMENT: CLEANING, INSPECTION, MAINTENANCE, AND STORAGE

A program for the maintenance of respirators shall include the following:

- Cleaning and sanitizing
- Inspection for defects
- Maintenance and repair
- Storage
- Assurance of breathing air quality.

The following maintenance, inspection, and storage program is recommended.

1. **Cleaning and Sanitizing**

Respirators issued to an individual shall be cleaned and sanitized regularly. Each respirator shall be cleaned and sanitized before being worn by different individuals. Respirators intended for emergency use shall be cleaned and sanitized after being used. The following shall be completed in addition to the manufacturers instruction for cleaning:

- a. Remove, when necessary, the following components of respiratory inlet covering assemblies before cleaning and sanitizing:
 1. Filters, cartridges, canisters
 2. Speaking diaphragms
 3. Valve assemblies
 4. Any components recommended by the respirator manufacturer.
- b. Wash respiratory inlet covering assemblies in warm (43EC or 110EF maximum temperature) cleaner sanitizer solution. A stiff bristle (not wire) brush may be used to facilitate removal of dirt or other foreign material.
- c. Rinse the respirator inlet covering assemblies in clean, warm (43EC or 110EF maximum temperature) water.
- d. Drain all water, and air, dry the respiratory inlet covering assemblies.
- e. Clean and sanitize all parts removed from the respiratory inlet covering assemblies as recommended by the manufacturers
- f. If necessary to remove foreign material, hand wipe respiratory inlet covering assemblies, all parts, and all gasket- and valve-sealing surfaces with damp, lint-free cloth.
- g. Inspect parts and replace any that are defective.



- h. Reassemble parts on respirator inlet covering assemblies.
- i. Visually inspect and, where possible, test parts and respirator assemblies for proper function.
- j. Place assembled respirators in appropriate containers for storage.

Machines may be used to expedite the cleaning, sanitizing, rinsing, and drying of large numbers of respirators. Extreme care shall be taken to ensure against tumbling, agitation, or exposure to temperatures above those recommended by the manufacturer (normally 43EC or 100EF maximum), as these conditions are likely to result in damage to the respirators.

Ultrasonic cleaners, clothes washing machines, dishwashers, and clothes dryers have been specially adapted and successfully used for cleaning and drying respirators.

Cleaner sanitizers that effectively clean the respirator and contain a bactericidal agent are commercially available. The bactericidal agent frequently used is a quaternary ammonium compound. Strong cleaning and sanitizing agents and many solvents can damage rubber or elastomeric respirator parts. These materials must be used with caution.

Alternatively, respirators may be washed in a detergent solution and then sanitized by immersion in a sanitizing solution. Some sanitizing solutions that have proven effective are: (a) a hypochlorite (bleach) solution (50 parts per million chlorine), 2-minute immersion; (b) an aqueous iodine solution (50 parts per million of iodine), 2-minute immersion; or (c) a quaternary ammonium solution (200 parts per million of quaternary ammonium compounds in water with less than 500 parts per million total hardness), 2-minute immersion.

Inflammation of the skin of the respirator user (dermatitis) may occur if the quaternary ammonium compounds are not completely rinsed from the respirator. The hypochlorite and iodine solutions are unstable and break down with time; they may cause deterioration of rubber or other elastomeric parts and may be corrosive to metallic parts. Immersion times should not be extended beyond the mentioned time periods, and the sanitizers shall be thoroughly rinsed from the respirator parts.

Respirators may become contaminated with toxic materials. If the contamination is light, normal cleaning procedures should provide satisfactory decontamination; otherwise, separate decontamination steps may be required before cleaning.

2. Inspection

The user shall inspect the respirator immediately prior to each use to ensure that it is in proper working condition. After cleaning and sanitizing, each respirator shall be inspected to determine if it is in proper working condition, if it needs replacement parts or repairs, or if it should be discarded. Each respirator stored for emergency or rescue use shall be inspected at least monthly.

Respirator inspection shall include a check for tightness of connections; for the condition of the respiratory inlet covering, head harness, valves, connecting tubes, harness assemblies,



hoses, filters, cartridges, canisters, end-of-service indicators, electrical components, and shelf-life date(s); and for the proper function of regulators, alarms, and other warning systems. Each rubber or other elastomeric part shall be inspected for pliability and signs of deterioration. Each air and oxygen cylinder shall be inspected to ensure that it is fully charged according to the manufacturers instructions.

A record of inspection dates shall be kept for each respirator maintained for emergency or rescue use. Respirators that do not meet applicable inspection criteria shall be immediately removed from service (a temporary replacement assigned) and repaired or permanently replaced.

Inspection of hoop-wrapped air cylinders will follow the recommendations set forth in the Compressed Gas Association, Inc. publication CGA C-6.2-1988, "Guidelines for Visual Inspection & Requalification of Fiber Reinforced High Pressure Cylinders," and will be examined for the following five types of damage:

- Abrasion is damage caused by wearing, grinding, or rubbing away by friction. Abrasions less than 0.005 inch (0.127 mm) deep are acceptable and should have no adverse effects on the safety of the cylinder. Abrasions with isolated groups of fibers exposed or flat spots with a depth greater than 0.005 inch (0.127 mm) but less than 0.0075 inch (0.191 mm) are acceptable if the damage is repaired. Cylinders abraded in excess of 0.0075 inch (0.191 mm) should be taken out of service until professionally inspected.
- Cuts are damage inflicted by a sharp object. Cuts or scratches less than 0.005 inch (0.127 mm) deep are acceptable regardless of length, number, or direction. For cuts greater than 0.005 inch (0.127 mm) deep and up to a depth of 0.015 inch (0.038 mm) with a maximum 1- or 2-inch (25.4 mm or 50.8 mm) length transverse to the fiber direction, the cylinder should be removed from service until repaired. Cylinders with cuts greater than 0.015 inch (0.038 mm) with a maximum greater than 2 inches (50.8 mm) length transverse to the fiber direction or with bare metal showing through must be condemned.
- Impact damage is caused by a cylinder striking or being struck by another object. Impact damage is considered slight if a frosted area is noted in the impact area. These cylinders may be returned to service. Impact damage is severe if evidence of fiber cutting, delamination, and possible structural damage is apparent. Cylinders sustaining severe impact damage should be evaluated using the guidelines for cuts and structural damage.
- Structural damage is damage which causes a visual change in original cylinder configuration. This change can include any evidence of bulges, a cocked end fitting, concave areas on the domes or on the cylinder section, or, if by visual inspection of the cylinder interior, there is evidence of damage involving deformation of the liner. Structurally damaged cylinders must be immediately removed from service and condemned.
- Heat or fire damage to a cylinder is evident by discoloration, charring, or burning of the composite, labels, paint, or plastic components of the valve. Such damage would cause a



cylinder to be removed from service and condemned. Note: If the cylinder is only soiled from smoke or other debris and is found to be intact underneath, it may be returned to service.

3. Maintenance and Repair

Replacement of parts or repairs shall be done only by persons trained in proper respirator maintenance and assembly. Replacement parts shall be only those designated for the specific respirator repaired. Reducing or admission valves, regulators, and alarms shall be adjusted or repaired by the respirator manufacturer or a technician trained by the manufacturer. Instrumentation for valve, regulator, and alarm adjustments and tests should be calibrated to a standard traceable to the National Institute of Standards and Technology (NIST), at a minimum of every 3 years.

4. Storage

Respirators shall be stored in a manner that will protect them against physical and chemical agents such as vibration, shocks, sunlight, heat, extreme cold, excessive moisture, or damaging chemicals. Respirators shall be stored to prevent distortion of rubber or other elastomeric parts. Respirators shall not be stored in such places as lockers and tool boxes, unless they are protected from contamination, distortion, and damage. Emergency and rescue respirators that are placed in the work areas shall be quickly accessible at all times, and the storage cabinet or container in which they are stored shall be clearly marked.

5. Assurance of Breathing Air Quality

Compressed gaseous air, compressed gaseous oxygen, liquid air, and liquid oxygen used for respiration shall be of high purity. Compressed gaseous air shall meet at least the requirements of the specification for Type I-Grade D breathing air, and liquid air shall meet at least the requirements for Type II-Grade B breathing air as described in ANSI/CGA G-7.1-1989.

The CGA designation for Grade D and Grade E breathing air is as follows:

- Grade D breathing air, as per ANSI/CGA G-7.1-1989, shall contain between 19.5 and 23.5 percent oxygen with the balance predominantly nitrogen, a maximum of 5 mg/m³ oil (condensed), a maximum of 10 ppm carbon monoxide, no pronounced odor, and a maximum of 1,000 ppm carbon dioxide.
- Grade E breathing air, as per ANSI/CGA G-7.1-1989, shall contain between 20 and 22 percent oxygen with the balance predominantly nitrogen, a maximum of 5 mg/m³ oil (condensed), a maximum of 10 ppm carbon monoxide, no pronounced odor, a maximum of 500 ppm carbon dioxide, and 25 ppm total hydrocarbon content (as methane).
- Note: The quality verification for oil is not required for synthesized air whose oxygen and nitrogen components are produced by air liquefaction. Carbon monoxide quality verification is not required for Grade D breathing air if synthesized air when nitrogen component was previously analyzed and meets National Foundry (NF) specification and when the oxygen component was produced by air liquefaction and meets United States Pharmacopeia (USP) specification.



Compressed gaseous air may contain low concentrations of oil introduced from equipment during processing or normal operation. If high-pressure oxygen passes through an oil- or grease-coated orifice, an explosion or fire may occur. Therefore, compressed gaseous oxygen shall not be used in supplied air respirators or in open-circuit type self-contained breathing apparatus that have previously used compressed air. Oxygen concentrations greater than 23.5 percent shall be used only in equipment designed for oxygen service or distribution.

The dew point of air used to recharge self-contained breathing apparatus shall be -65EF or lower (less than 25 ppm water vapor). The driest air obtainable (dew point of -100EF or lower) should be used for recharging SCBA cylinders to be used in environments with ambient temperatures below -25EF. The dew point of breathing air used with supplied air respirators should be lower than the lowest ambient temperature to which any regulator or control valve on the respirator or air-supplied system will be exposed.

Breathing air couplings shall be incompatible with outlets for nonrespirable plant air or other gas systems to prevent inadvertent servicing of supplied air respirators with nonrespirable gases. **It is recommended that Foster or Hansen fittings be reserved for breathing air systems.** Breathing air outlets shall be labeled.

Breathing air may be supplied to supplied air respirators from cylinders or air compressors. Cylinders shall be tested and maintained in accordance with applicable DOT specifications for shipping containers (49 CFR 173 and 178). Breathing gas containers shall be marked in accordance with ANSI/CGA C-4-1990. Specific test recommendations for purchased breathing air are given in the following table.

Method of Preparation	Analysis Recommended
Compression: Supplier does not fill cylinders with any other gases.	Check 10% of cylinders from each lot for ppm CO and odor.
Compression: Supplier fills cylinders with gases other than air.	Analyze all cylinders for percent oxygen. Check 10% of cylinders from each lot for ppm CO and odor.
Reconstitution.	Analyze all cylinders for percent oxygen. Check 10% of cylinders from each lot for ppm CO and odor.

A compressor shall be constructed so as to avoid entry of contaminated air. For all air compressors, including portable types, the air intake location shall be carefully selected, and monitored closely to ensure continued quality of air supply to the compressor. The system shall be equipped as necessary with a suitable in-line air-purifying sorbet bed and filter to further assure breathing air quality. Maintenance and replacement/refurbishment of compressor and associated air-purifying/filter media shall be performed periodically, by trained personnel following manufacturer's recommendations and instructions.



As part of acceptance testing, and prior to initial use, representative sampling of the compressor air output shall be performed to ensure that it complies with the requirements in Paragraph 1 of this section. To ensure a continued high-quality air supply, and to account for any distribution system contaminant input, a representative sample should be taken at distribution supply points. Samples should be collected on a periodic basis, as directed by the Program Coordinator. Specific test recommendations are given in the following table.

Type/Sample	Oil Lubricated	Non-Oil Lubricated	Combustion Engine Powered
Water Vapor	X	X	X
Carbon Monoxide	X		X
Condensed Hydrocarbon	X		X
Carbon Dioxide			X
Odor	X	X	X

NOTES:

1. When using air compressors, intake location shall be carefully selected and monitored closely to ensure air supplied to the compressor is of adequate quality.
2. No frequency for periodic checks of air quality is specified, due to wide variation in equipment types, use, working environments, and operating experience.
3. Continuous monitoring of temperature and carbon monoxide are not required.
4. For non-oil lubricated compressors that operate at less than 35 psi, no sampling for water is required.
5. These requirements apply to systems designed for breathing air, other air-supply systems need to be evaluated on a case-by-case basis for the type and frequency of testing.

Further details on sources of compressed air and its safe use can be found in CGA G-7-1988.



PROCEDURE

Subject: MOTOR VEHICLE OPERATION: GENERAL REQUIREMENTS

1.0 PURPOSE AND SUMMARY

This procedure prescribes the general requirements for the operation of motor vehicles on company business. All operators of company owned, leased, and rented vehicles, as well as personal vehicles used on company business, are covered by this procedure. U.S. Department of Transportation (DOT) regulated personnel must also comply with the guidelines contained in Procedure HS810. Key elements of this procedure include:

- All employees who drive or may drive on company business must be familiar with the requirements of this procedure and certify their acceptance of the Company Rules for Motor Vehicle Operation (Attachment 2). This certification will be evaluated via the established point system to determine driving privilege status.
- All new hire candidates shall complete and be familiar with the company Rules for Motor Vehicle Operation (Attachment 2). This certification will be evaluated via the established point system to determine driving privilege status.
- Employees must report all vehicular citations incurred while on company business to their supervisor as soon as possible, but not longer than 24 hours after the occurrence. Once reported, the established evaluation criteria in Section 5.4 will be used to determine corrective actions.
- Employees have the responsibility to keep track of their non-work related vehicular citations and utilize the established evaluation criteria found in Section 5.3 to determine if their overall MVR citations exceed the Overall Driving Record limits (See Section 5.3.2).
- Employees utilizing vehicles while on company business are required to review this procedure and attend a company-designated driver training class at least once every two years.
- Requests for the re-instatement of denied or revoked driving privileges can be made to the appropriate business line Vice-President and the Director of Health & Safety.

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3.0 RESPONSIBILITY MATRIX

3.1 Procedure Responsibility

The Director of Health and Safety is responsible for the issuance, revision, and maintenance of this procedure.

3.2 Action/Approval Responsibilities

The Responsibility Matrix is Attachment 1.

4.0 DEFINITIONS

Chargeable Vehicle Accident - Any at fault vehicle accident meeting any one of the following criteria:

- An individual other than an employee of the company is a party in the accident.
- Property owned by a person or entity other than the company is damaged.
- When only company employees, company owned or leased (not rented) vehicles and property is involved and damage exceeds \$2,500.00.



Company - Shaw Environmental & Infrastructure, Inc. (Shaw E & I) and its subsidiaries and affiliates.

Motor Vehicle - Any passenger vehicle, including trucks, used upon the highway or in private facilities for transporting passengers and/or property. This includes personal vehicles operated on company business. For the purpose of this procedure, off-road vehicles, such as ATV's (Four Wheelers) earthmoving equipment, forklifts, non-highway use trucks, etc., are not considered vehicles. The use of motorcycles on company business is prohibited

Project Assigned Employees – Any employee that is assigned to a field operations project position. This designation includes Project Managers, Site Managers/Supervisors, Foremen, Technicians, Scientists, Geologists, Project Business Accountants, etc. This does not include employees that are typically assigned to an office but are visiting a site for brief periods of time, such as to provide technical assistance, perform audits, perform program reviews, etc.

5.0 TEXT

5.1 Company Rules for Motor Vehicle Operation

All employees who will or may be required to operate a company owned, leased, or rented motor vehicle or a personal vehicle used on company business shall acknowledge acceptance of the Company Rules for Motor Vehicle Operation & Employee Driving Record Certification (Attachment 2) prior to such operation. The signed form shall be retained by the Baton Rouge, LA Health & Safety Records Department. Each year, the company shall reserve the right to require covered employees to sign a copy of the most current Company Rules for Motor Vehicle Operation.

FAILURE OF EMPLOYEES TO COMPLY WITH COMPANY RULES FOR MOTOR VEHICLE OPERATION OR THIS POLICY SHALL BE SUBJECT TO DISCIPLINARY ACTION UP TO AND INCLUDING (BUT NOT LIMITED TO) REVOCATION OF DRIVING PRIVILEGES FOR COMPANY BUSINESS AND TERMINATION OF EMPLOYMENT.

Those employees who are assigned to use an Employer vehicle which they take home with them must meet the following conditions:

- a) The Employee's supervisor signs an Authorization for Assignment Form (See Attachment 7)
- b) The Employee signs and agrees to be bound to a Vehicle Usage Agreement (See Attachment 8)
- c) The Employee provides proof of insurance on the Employee's personal vehicle which lists the Employee as an insured driver on the insurance and such insurance contains minimum coverage required by law and acknowledges that the Employee's personal insurance will provide primary coverage of the Employee's use of a Company



owned vehicle when such use is not in the course and scope of employment. The authorizing supervisor shall attach a copy of the proof or personal insurance to Attachment 8 for future reference.

The Vehicle Usage Agreement is an agreement by the Employee that his own personal vehicle insurance will be primary as to any claims arising from the Employee's **NON COMPANY** use of Company Vehicles.

Employees operating Company Vehicles without compliance with these requirements, as well as any supervisor who allowed or granted such use, will be deemed to be in violation of Company policy and will be subject to discipline up to and including termination from employment.

5.1.1 Project Assigned Employee Vehicle Use Requirements

The following requirements are set forth as it pertains to Project Assigned Employees.

- Project-assigned employees are not permitted to operate company vehicle (owned, leased or rented) on non-company business after 10:00 p.m. without written authorization from the project manager or the appointed Site Manager/Supervisor with jurisdiction over the vehicle. In those cases where there is shift work, a non-traditional workday (i.e. 3PM to 11PM workday, etc.) or other non-typical circumstances, it is understood that the after 10:00 PM restriction would not be appropriate. However, even in these non-typical circumstances, the Project Manager or the appointed site manager/supervisor shall be required to execute the required written authorization for use of a company vehicle, including the time frame in which employees shall be permitted to use the vehicle after their non-traditional workday.
- Project assigned personnel that are residing in temporary housing / hotels are granted permission to drive to and from the temporary residence and work. Additionally, the Project Manager, or the appointed Site Manager/Supervisor his/her designee (Site Manager, Supervisor, etc.) is required to evaluate and optimize the potential of carpooling of project assigned personnel in an effort to reduce the number of company vehicles being driven to and from the project site.
- Project assigned employees shall not use company vehicles for sight seeing or any other personal/recreational activities.
- Vehicles may be used in support of "daily life activities" such as going to restaurants for dinner, laundromats, local retail stores, grocery stores, etc.
- A maximum distance for "daily life activity" driving shall be no further



than 20-miles from the temporary housing in which an employee resides. In those cases where the maximum allowed distance does not permit daily life activities to be conducted, a written authorization, from the Project Manager or the appointed Site Manager/Supervisor, is required to travel further distances.

- For normal routine travel to and from work, employees shall utilize their own personal transportation.
- If an employee is assigned to a project site that is located within driving distance from the employee's permanent residence, but is too far away to allow for a daily commute, that employee shall utilize their own personal transportation to drive to and from their permanent residence and the project site. (i.e. for initial assignment arrival to the project, trips home on rotation, etc.) Upon arrival to the site, employees shall be allowed to use a company vehicle as required to perform project activities. In these cases, the employee will also be required to drive their personal vehicle to and from the project site from their temporary housing / hotel residence, for personal "daily life activities", etc.
- Employees may drive a Shaw-owned, leased or rented vehicle home during off hours only when authorized in writing by a business line manager, who must hold a position at least one level above the site / project manager to whom the authorized employee reports. In other words, the approval must be signed by the employee's, supervisor's, supervisor or a higher level manager.
- In making vehicle use decisions the authorizing manager shall consider the risk of vehicle accidents, Shaw's liability risks, client and project specific needs, distances to be traveled, employee driving history, and any other relevant factors. Attachments 7 and 8, (Authorization for Assignment and Vehicle Use Agreement forms), shall be used to facilitate this process.

5.2 Pre-employment Evaluation

Human Resources shall distribute a copy of this procedure to all new hire candidates for the completion of Attachment 2. Information provided should be evaluated via the point system in Section 5.3. Human Resources and the hiring manager will be advised regarding any hiring or driving privilege restrictions that may apply. Hiring of persons with regular driving duties (e.g., field technicians and leadmen, sales persons, or others with assigned company motor vehicles) may only proceed after the information contained in Attachment 2 is evaluated.



Once Attachment 2 is completed, it is to be faxed to the Baton Rouge, LA Corporate Health and Safety Records Department at (225) 987-3714. The driving status of the prospective employee will be reported to the appropriate Human Resources Department. Health & Safety will notify the appropriate Human Resources manager when the attachments are not returned.

Discrepancies between the certified driving record report and Attachment 3 shall be reviewed with the prospective employee. Deliberate falsification of driving record information will disqualify prospective employees from being hired.

5.3 Driving Record Point System

The following point system will be used to evaluate the driving record of all existing employees and new hire candidates that can reasonably be expected to operate a motor vehicle during their employment. This data is to be collected through Motor Vehicle Records (MVR) search and by the employee completing Attachment 2 of this policy. Attachment 2 is to be completed by the new hire candidate and reviewed by the regional H&S Assistant to ensure compliance.

Driving Record Point System	
Description	Assigned Point Value
Overweight, loss of load, vehicular equipment infraction, etc.	1
Moving violation: speeding, failure to stop, failure to signal, etc.	2
At-fault accident, seatbelt violation	3
Major citation: reckless driving, tailgating, suspended license, speed contest, improper lane usage, Open Container (Non-Work Related), etc.	6
Driving under the influence, Hit and Run (leaving the scene)	8
Open Alcohol Container (Work Related)	8

5.3.1 Pre-Employment Driving Record Point System Evaluation

If a new hire candidate has accumulated three (3) points or less in the last twelve (12) months or five (5) points or less in the last twenty-four (24) months, they will be given the privilege to drive motor vehicles on company business without restrictions.

If a new hire has accumulated four (4) to six (6) points in the last twelve (12) months or six (6) to eight (8) points in the last twenty-four (24) months, they will be placed on probation for a period of twelve (12) months. They will be afforded the privilege to drive motor vehicles on company business during this probationary period. Any driving infractions (i.e., speeding tickets, at-fault accidents, citations, etc.) accumulated during this probationary period will result in termination of the privilege to drive a motor vehicle on company business.

If the new hire candidate has accumulated seven (7) to eleven (11) points in the last twelve (12) months or nine (9) to fifteen (15) points in the last twenty-four (24) months, they will not be eligible for company driving privileges.



Employment can only be offered with the strict understanding of denial of the privilege to drive motor vehicles on company business. After the first twelve (12) months of employment, the employee can petition the appropriate business line Vice President and the Director of Safety and Health for reconsideration of driving privileges.

If a new hire candidate is expected to drive a vehicle, to fulfill the responsibilities of his/her role, and there has been an accumulation of twelve (12) points or more in the last twelve (12) months or sixteen (16) points or more in the last twenty-four (24) months, the candidate shall not be hired. See Table below:

Candidate's Driving Privilege Status Description	Past 12 Months	Past 24 Months
Can drive without restriction.	0 to 3 points	0 to 5 points
Can drive with understanding of probationary status.	4 to 6 points	6 to 8 points
Not eligible for company driving privileges for first 12 months of employment.	7 to 11 points	9 to 15 points
Candidate not eligible for hire.	12 points or more	16 points or more

5.3.2 Existing Employee Driving Record Point System

An acceptable traffic record is one requirement for continued driving privileges. Accordingly, all affected employee's MVR traffic record is subject to periodic and annual review to ensure compliance with state and federal regulations, as well as company policy.

WORK RELATED TRAFFIC VIOLATIONS

It is the responsibility of all affected employees to provide verbal notice to their supervisor of any work related traffic violations that have occurred as soon as practicable but not longer than 24 hours after the occurrence. This verbal notice shall be followed by the employee completing an updated "Company Rules for Motor Vehicle Operation & Employee Driving Record Certification" (Attachment 2), and "Notification of Work Related Citation" form (Attachment 3). Both Attachment 2 and 3 shall then be immediately forwarded to the Baton Rouge, LA Health and Safety Records office.

NON-WORK RELATED TRAFFIC VIOLATIONS

Employees have the responsibility to keep track of their non-work related vehicular citations and utilize the established evaluation criteria, as described below, to determine if their overall traffic citations exceed acceptable company limits. It is not necessary for employees to report non-work related citations to their supervisor as they occur. However, if an employee's overall MVR record (work related or not) exceeds the company's established points system criteria, the employee must verbally inform their supervisor as soon as practicable but not longer than the following business day after the occurrence. This verbal notice shall be followed by the employee completing an updated Attachment 2



(Company Rules for Motor Vehicle Operation & Employee Driving Record Certification), and it shall then be immediately forwarded to the Baton Rouge, LA Health and Safety Records office.

OVERALL DRIVING RECORD EVALUATION

If it is determined that an employee has accumulated three (3) points or less in the last twelve (12) months or five (5) points or less in the last twenty-four (24) months, they will be allowed to continue with the privilege to drive motor vehicles on company business without restrictions.

If an employee has accumulated four (4) to six (6) points in the last twelve (12) months or six (6) to eight (8) points in the last twenty-four (24) months, the employee will be placed on probation for a period of twelve (12) months. The employee can continue to drive motor vehicles on company business during this probationary period.

If the employee has accumulated seven (7) to eleven (11) points in the last twelve (12) months or nine (9) to fifteen (15) points in the last twenty-four (24) months, they will not be eligible for company driving privileges. Continued employment may only be extended with the strict understanding of denial of the privilege to drive company owned, leased or rented motor vehicles on company business. After the first twelve (12) months following driving privilege revocation, the employee can petition their respective Business Line VP and the Director of Safety and Health for reconsideration of driving privileges. See Table below:

Employee's Driving Privilege Status Description	Past 12 Months	Past 24 Months
Can drive without restriction.	0 to 3 points	0 to 5 points
Can drive with understanding of probationary status.	4 to 6 points	6 to 8 points
Company driving privileges are revoked.	7 to 11 points	9 to 15 points

5.4 Employee Evaluation Criteria

All employees who may operate a motor vehicle on company business will become familiar with the requirements of this procedure, complete the currently-designated company driver training class, and complete Attachment 2 prior to such operation. The employee driving evaluation criteria is based upon all infractions including those incurred while on company business and during off-work hours. It is imperative that employees notify their supervisors immediately as possible and no later than 24 hours following a work-related citation/accident. Once notified, the supervisor will ensure the completion of Attachment 2, forward it to the Baton Rouge, LA H&S Records Office, and initiate one of the following corrective actions as required. Additionally, as it relates to non-work related and work related



traffic violations, it is the employee's responsibility to ensure that their overall driving record does not allow for the exceeding of the driving records points system. Should the employee's driving record points exceed the system limits, that they must notify their supervisor immediately, complete an updated "Company Rules for Motor Vehicle Operation & Employee Driving Record Certification" (Attachment 2 & 3) and forward it to the Baton Rouge, LA Health & Safety Records Department.

5.4.1 Work-Related Minor Citation

When an employee is given a work related minor citation (i.e., speeding ticket, moving violation, failure to signal turn, loss of load, etc.), the employee's supervisor will meet with the employee to discuss the corrective action that must be taken so that further violations do not occur. At a minimum, the supervisor shall require the employee to attend a recognized course in defensive driving on his/her own time and the cost of this training will be borne by the employee. This course shall be pre-approved by the Division Health & Safety Manager. The supervisor will provide written direction to the employee regarding the assigned corrective action(s). The supervisor shall forward a copy of an updated Company Rules for Motor Vehicle Operation & Employee Driving Record Certification form (Attachment 2 & 3) and a form of verification showing the employee's successful completion of an approved defensive driving course to the appropriate regional Human Resources Department for inclusion in the employee's personnel file. These documents shall also be forwarded to the **Baton Rouge, LA Health & Safety Records Department**.

5.4.2 Work Related Major Citation

When an employee is given a work related major citation (i.e., reckless driving, tailgating, suspended license, speed contest, etc.), the supervisor will hold a meeting with the employee, at which time the supervisor will complete the company Disciplinary Action Form (Procedure HR207) thereby informing the employee that any additional infractions will lead to more severe disciplinary action. In addition, the employee will be required to attend a recognized defensive driving course on his/her own time, as described in section 5.4.1, and will be suspended from work for one day without pay. A copy of the Disciplinary Action Form shall be forwarded to the appropriate Human Resources Department for their information and inclusion in the employee's personnel file.

5.4.3 Failure to Notify

Should an employee fail to notify his/her supervisor of any work or non-work related citation or accident within the required reporting time, his/her company driving privilege may be revoked. The supervisor will also take disciplinary action that is appropriate for the unreported event. If the unreported event is work related and is either an at-fault accident, driving under the influence case or a hit and run violation,



the termination process will be initiated. All disciplinary actions shall be documented to the employee by the supervisor. This copy, and any written response by the employee, shall be forwarded to the appropriate Human Resources Department for their information and inclusion in the employee's personnel file.

5.4.4 At-Fault Accident

Whenever an employee is operating a company owned/leased/rented vehicle or their personal vehicle on company business and is involved in an at-fault vehicle accident, an Accident Review Board shall be convened and recommend the corrective action to be taken. At a minimum, the action shall include the completion of a recognized driver safety course on their time and at their expense, as described in section 5.4.1. All disciplinary actions resulting from at-fault vehicle accidents will be reviewed for consistency by the appropriate Safety Council.

Depending upon the circumstances and severity of the accident, termination of the employee can be considered. As above, this must be approved by the appropriate Human Resources Department. All communication to the employee regarding the accident and resulting action shall be in writing with a copy to the appropriate Human Resources Department for their information and inclusion in the employee's personnel file.

5.4.5 Driving Under the Influence, Hit & Run (Leaving The Scene) and Open Container

If an employee is charged with Driving Under the Influence, Hit and Run or an Open Alcohol Container violation, he/she will have their driving privileges temporarily suspended pending final resolution of the charge. If the charge is resolved in the employee's favor, with a final adjudication holding no penalty, driving privileges may be re-instated. However, if any penalty is attached, such as probation, license restrictions, etc., the employee may be considered unqualified to drive for the company. Whenever an employee is convicted or pleads no contest to a company-related driving under the influence, hit and run or open container charge, he/she will be immediately terminated.

In a case that is not work related, and an employee is convicted or pleads no contest to a hit and run or driving under the influence charge, the employee shall notify his supervisor. Accordingly, the employee's company driving privileges will then be revoked for twelve (12) months. After the first twelve (12) months following driving privilege revocation, the employee can petition their respective Business Line VP and the Director of Safety and Health for reconsideration of driving privileges.

5.5 Training

All employees who will, or may reasonably be expected to, drive a company owned/leased/rented vehicle or their personal vehicle on company business shall review



this procedure and complete the currently-designated company driver training class prior to such operation. This class is designed to be taught either via the company's Web-based training program or by local Health and Safety personnel and must include the following elements: federal/state/local driving rules, company driving rules, emergency/accident procedures, and defensive driving techniques. Specific information on the vehicle to be operated will be provided locally. Personnel conducting this class shall provide the Knoxville Health and Safety Training Department with a copy of the course attendance sheet for inclusion in individual training records. All affected employees shall complete a driver safety training class at least once every two years.

5.6 Reinstatement of Driving Privilege

Any employee who has had his/her privilege to drive a motor vehicle on company business revoked or denied, and who desires to reinstate this privilege, must apply to the business line Vice President and the Director of Health and Safety for reinstatement. The Director of H&S, or his designee, shall specify rehabilitation program (if applicable), an external safe driving course, and any other requirements in which he/she deems appropriate. Once the employee completes the program, documentation of successful completion must be formally presented to the appropriate Vice President and the Director of H&S. If the documentation is accepted, the driving privilege may be reinstated. Copies of all documents shall then be forwarded, by the responsible H&S Manager, to Human Resources and to the Baton Rouge, LA Health & Safety Records Department.

Reinstatement of the driving privilege may occur one (1) time, at the discretion of the Director of Health & Safety and the responsible Business Line Vice President. If employee driving performance leads to a subsequent revocation of this privilege, such revocation shall be permanent.

5.7 Non-Shaw Employee Vehicle Use Requirements

Only approved non-Shaw employees (client, subcontractor or temporary/temp agency employees) who have completed and signed the "Non-Shaw Employee Driver Questionnaire" (HS800 Attachment 5) will be allowed to drive a Shaw owned, leased, or rented vehicle. Upon completing the questionnaire and prior to the driver operating a Shaw vehicle, the subject questionnaire must be signed, dated and placed on file at the job site. The primary vehicle operator or the Shaw Project Management representative shall review the questionnaire and determine whether the non-Shaw employee satisfies the driver qualification requirements of HS800. The driver qualification point system can be found in section 5.3 of this policy.

In addition to the above requirement, it is also a requirement of the responsible Shaw Project Manager to forward a fully executed, company specific version of the correspondence that is found in Attachment 6, to the employer of the non-Shaw driver. This correspondence should not be modified except for the fields that specify the name and address of the subcontractor or client to which the letter is being written. This written correspondence will serve to notify that any employee that is assigned by their company to a Shaw project, and is required to operate/drive a Shaw owned, leased, or rented vehicle, will be subject to either meeting or exceeding the



operator requirements for Shaw employees.

As the employer of individuals who are assigned to a Shaw project, the authorized non-Shaw employer representative shall sign and return Attachment 6 to the respective Shaw Project Manager. By signing Attachment 6, the non-Shaw employer is acknowledging that they are either adopting the requirements set forth in this policy (HS800, Motor Vehicle Operation) or have developed a similar policy that meets or exceeds these requirements. Failure of a non-Shaw employer to comply with the requirements set forth in HS800 shall result in the prohibition of their employees driving any Shaw owned, leased or rented vehicles.

5.8 DRIVER SAFETY NOTIFICATION STICKER

A safety notification bumper sticker shall be applied to all Shaw owned / leased vehicles in an effort to ensure continued compliance with driving safety regulations. The notification service will be managed by a third party fleet safety management company and will serve as the recipient of all calls that are placed concerning unsafe driving behavior. The Findlay, OH equipment division will serve as the first point of contact as it pertains to notifications that are received from the third party company who administers the bumper sticker safety call in service. Upon receiving a report from the third party administrator, the equipment division shall determine what business line the vehicle / driver is located within and then contact the respective business line Divisional H&S Manager. The Divisional H&S Manager will then contact the affected employee and the employee's supervisor for a counseling/discussion meeting, concerning the complaint. Upon conclusion of the meeting, the information will be reviewed by the supervisor and the Divisional H&S Manager for determination of corrective or disciplinary action.

The company shall endeavor to ensure that all company owned/leased fleet vehicles shall have a safety notification bumper sticker applied to the rear of the vehicle. It is the responsibility of the driver, who is deemed the primary / responsible operator of the vehicle, to ensure that the sticker remains on the vehicle and remains legible and in no way defaced. If the vehicle is project or program assigned and there is no designated primary operator, then the Project Manager will be considered the primary / responsible operator. The primary / responsible operator shall contact the Equipment Division in Findlay, OH, at 1-800-225-6464 ext. 6051 or direct dial 419-425-605, immediately upon recognizing that the sticker is defaced or removed such that a new one can be re-applied. Failure, on the part of the primary operator, to ensure that a legible sticker remains on the vehicle shall result in disciplinary action, up to and including vehicle usage being revoked, in addition to possible termination of employment.



6.0 EXCEPTION PROVISIONS

Variances and exceptions, not explained herein, may be requested pursuant to the provisions of Procedure HS013, Health and Safety Procedure Variances.

7.0 CROSS REFERENCES

HR207 Employee Disciplinary Action

HS013 Health and Safety Procedure Variances

HS020 Accident Prevention Program: Reporting, Investigation, and Review

HS810 Motor Vehicle Operation: Federal Motor Carrier Safety Regulations for Driver Qualifications

8.0 ATTACHMENTS

1. Responsibility Matrix
2. Company Rules for Motor Vehicle Operation
3. Driving Record Certification
4. Notification of Work-Related Citation
5. Non-Shaw Employee Driver Questionnaire
6. Memo Template for Employers of Non-Shaw Drivers
7. Vehicle Use Authorization Form



ATTACHMENT 1

MOTOR VEHICLE OPERATION: GENERAL REQUIREMENTS RESPONSIBILITY MATRIX

Action	Procedure Section	Responsible Party					
		Local Health & Safety Assistant	Business Line Health and Safety Manager	Supervisor	Accident Review Board	Corporate Human Resources	Director of H&S
Issue, Revise, and Maintain This Procedure	3.1						X
Ensure Employees Complete Attachment 2	5.1			X		X	
Distribute HS800 to New Hire Candidates for Completion of Attachment 2	5.2					X	
Request Evaluation of New Hire Driving Record	5.2	X		X		X	
Obtain Driving Record and Determine Driving Status	5.2	X					
Initiate Corrective Actions	5.4			X		X	
Ensure Completion and Distribution of Attachment 3	5.4	X					
Accident Review	5.4.4				X		
Ensure Drivers Meet Training Requirements	5.5		X	X			
Specify Program for Reinstatement of Driving Privilege	5.6						X
Reinstatement of Driving Privilege	5.6						X
Non-Shaw Employee Vehicle Use Requirements	5.7			X			
Contact Employee to discuss report from Safety Notification Sticker Service	5.8		X	X			



ATTACHMENT 2
COMPANY RULES FOR MOTOR VEHICLE OPERATION

1. Prior to motor vehicle operation, all motor vehicle operators are required to provide the company with current documentation of licensing for the motor vehicle(s) to be operated. Supervisors shall review and approve said documentation.
2. The motor vehicle operator is responsible for the vehicle, and for conducting a pre-trip, walk around inspection prior to use (including load evaluation, if applicable). No vehicle with any mechanical defect, which endangers the safety of the driver, passengers, or the public, shall be used. The motor vehicle operator is also responsible for the Driver Safety Notification sticker (Sec. 5.8)
3. All company owned/leased trucks, should have small convex mirrors attached to the side mirrors.
4. The operator shall drive defensively at all times and is responsible for complying with all state and local traffic laws, as well as customer regulations concerning motor vehicle operation.
5. The operator and all passengers shall use seat belts at all times when the vehicle is in motion.
6. No employee shall operate a motor vehicle when abnormally tired, temporarily disabled, or under the influence of alcohol or drugs.
7. No employee shall allow a company owned, leased, or rented motor vehicle to be operated by an unauthorized employee or non-employee. (See also: unauthorized personal use of company vehicles) (Sec. 5.7)
8. The operator shall not allow for any open alcoholic beverage containers within a company vehicle or within a personal vehicle while it is being utilized for company business.
9. No employee shall drive beyond any barricades or into any area with designations such as HAZARDOUS, DO NOT ENTER, etc.
10. Use caution when driving through congested areas, or near where personnel and equipment are working.
11. Whenever possible, a spotter shall be used for backing all vehicles. This may be a fellow company employee, or a non-company employee who is willing to help.
12. Unless required, such as on a client's property, keys shall not be left in an unattended vehicle.
13. Employees shall not leave the driver's seat of a vehicle while the motor is running. Exemption: Vehicles equipped with a power take-off device with parking brake set and chocks in place.
14. No motorcycles are to be operated on company business.
15. Radar detectors are prohibited in all company owned, leased, or rented vehicles or in personal vehicles while being used for company business.
16. Analytical samples will be transported in accordance with 49 CFR regulations. Regulated hazardous substances shall not be transported in personal vehicles.
17. In case of an accident, the following steps shall be taken:
 - A. Stop.
 - B. Call for medical assistance in case of injuries.



- C. Notify police.
 - D. Complete Vehicle Accident Report and submit to your supervisor as soon as possible.
-
- 18. Whenever a vehicle is stopped upon the traveled portion of a highway or the shoulder of a highway, for any cause other than necessary traffic stops, the driver shall, as soon as possible, place or activate the warning devices with which the vehicle is equipped.
 - 19. Employee must notify the supervisor as soon as possible, but not longer than 24 hours after occurrence, for work related citations, accidents, and license expiration, suspension, or revocation.
 - 20. No employee is authorized to operate a company vehicle (including rentals) after having been on duty for a period of 16 hours. No employee may drive for more than 12 hours in any single on-duty period. Once either of these criteria has been met, a period of 8 consecutive hours off duty is required before driving duties may be resumed. These are maximum, not minimum, requirements and employees may be unfit to drive after shorter on-duty periods. Commercial DOT drivers are subject to the more restrictive hours of service regulations described in Procedure HS810.
 - 21. Project-assigned employees are not permitted to operate company owned, leased, or rented vehicles after 10:00 p.m. without written authorization from their supervisor. (See section 5.1.1)
 - 22. Employees shall not operate company vehicles for any type of personal use, no exceptions. Personal use includes any usage that is not directly related to company business. See section 5.1.1 for definitions concerning "daily life activities" for Project Assigned Employees.
 - 23. Employees shall not use a company vehicle to visit an establishment that has a primary function of providing nighttime entertainment including the dispensing of alcoholic beverages.
 - 24. Temporary or non-Shaw employees shall be allowed to utilize Shaw company vehicles only after the driver has completed Attachment 5 and has satisfied the point system requirements set forth in Section 5.3 of this policy. In addition, the employer of that driver shall have satisfied the requirement set forth in section 5.7 of this policy and signed a copy of the memo set forth in Attachment 6. This includes clients or subcontractors.
 - 25. Employees shall not transport family members, friends or any other unauthorized guest passenger unless it is arising out of course and scope of company business.
 - 26. Employees may not drive company owned, leased, or rented vehicles home when off of duty except when authorized in writing by a designated business line manager and in accordance with Sec. 5.1.1.
 - 27. Employees needing to use a mobile phone or engage in other potentially distracting activity while operating a Motor Vehicle are advised to pull off the road when safe to do so for the duration of the activity.

I have read and understand company procedure HS800 and the company rules for Motor Vehicle Operation and agree to abide by all requirements

Employee's Name (Printed)

Employee Signature

Date



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ATTACHMENT 3 DRIVING RECORD CERTIFICATION

Fair Credit Reporting Act Disclosure Statement

In accordance with the provisions of Section 604 (b)(2)(A) of the Fair Credit Reporting Act, Pubic Law 91-508, as amended by the Consumer Credit Reporting Act of 1996 (title II, Subtitle D, Chapter I, of Pubic Law 104-208), you are being informed that reports verifying your driving record may be obtained on you for employment purposes. These reports are required by Sections 382.413, 391.23 and 391.25 of Federal Motor Carrier Safety Regulations. You have the right to receive a copy of the reports and have the prescribed allotment of time by law to have any errors corrected and the reports obtained after corrections have been posted.

	Assigned Point Value
Overweight, loss of load, vehicular equipment infraction, etc.	1
Moving violation: speeding, failure to stop, failure to signal turn, etc.	2
At-fault accident	3
Major citation: reckless driving, tailgating, suspended license, speed contest, improper lane usage, open container, etc.	6
Driving under the influence or Hit and Run (Leaving the Scene)	8

In the space provided below, please list all violations and accidents currently listed on your driving record by the state issuing your driver's license (include all states for which you have held a driver's license during the last two [2] years). Determine the number of points assigned from the table above, and write in column labeled Points. Finally, write the sum total of all points where indicated.

<u>Violations/Accidents</u>	<u>Driver License #/State</u>	<u>Date (mo/yr)</u>	<u>Points</u>
-----------------------------	-------------------------------	---------------------	---------------

Total Points _____

I hereby certify that the information provided is a complete and accurate statement of my driving record for the previous twenty-four (24) months. I authorize the company to obtain a copy of my driving record from the state of issuance of my license(s). I understand that falsification of data will disqualify me from being hired or may result in revocation of my company driving privileges.

Driver's License No. _____

Driver's Lic. State of Issuance _____

Expiration Date _____

Date of Birth _____

Print Name _____

Social Security Number _____

Signature _____

Date _____

PLEASE FAX THIS FORM TO THE BATON ROUGE H & S RECORDS DEPARTMENT AT (225) 987-3714



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ATTACHMENT 4

NOTIFICATION OF WORK-RELATED CITATION

This form is to be completed by employees incurring a work-related vehicular citation. Once complete, it is to be signed by the employee's supervisor and forwarded to the appropriate Human Resources Department for inclusion in the employee's personnel file.

Employee Name _____ Employee No. _____ Date _____

Nature of Citation _____

Location of Citation (City, State) _____

Date/Time Citation Received _____

Is Citation Being Contested? ↑ No ↑ Yes Details _____

Employee Signature _____ Date _____

Corrective Action Being Taken _____

Supervisor Signature _____ Date _____

PLEASE FAX THIS FORM TO THE BATON ROUGE H & S RECORDS DEPARTMENT AT (225) 987-3714



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ATTACHMENT 5

Non-Shaw Employee Driver Questionnaire

Date

Time

*Vehicle is assigned to what Shaw
Employee?*

Signature of Shaw Employee

Non-Shaw Driver's Name

Do you have a valid driver's license?

Yes

No

State in which license was issued, DL Number and Exp Date _____

Have you had any citations or accidents in the past 24 months? Yes No

If yes, please list type of citations and the associated dates below:

(Refer to HS800, Section 5.3, to determine driver eligibility based on the points system provided)

By signing below, I, the temporary driver, am acknowledging that the above information is true and accurately represents my driving record. I understand and agree that any misrepresentation or omission of material fact on this questionnaire will constitute sufficient grounds for your removal from the project site and will restrict the future use of Shaw vehicles.

I have read and fully understand the above:

Signature of Non-Shaw Driver

Date



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ATTACHMENT 6

Address
Address
Phone
Fax:

Memorandum

Date:

To:

CC:

From: Project Manager

RE: Requirements for Motor Vehicle Operation

Attached is Shaw Environmental & Infrastructure, Inc. (Shaw) policy HS800 - Motor Vehicle Operation: General Requirements. As you can see, this policy applies to all operators of Shaw owned, leased, or rented vehicles, as well as personal vehicles used on Shaw business.

Accordingly, you are hereby notified that any employee that is assigned by your company to a Shaw Environmental & Infrastructure, Inc project and is required to operate/drive Shaw owned, leased, or rented vehicles, will be subject to either meeting or exceeding the operator requirements for Shaw employees. Please be aware that as the employer of individuals who are assigned to a Shaw project, you must ensure that your company either adopts the requirements set forth in policy HS800 (Motor Vehicle Operation) or develop a similar policy that meets or exceeds those requirements

Only approved non-Shaw employees, who have completed and signed the "Non-Shaw Employee Driver Questionnaire" (HS800 Attachment 5) will be allowed to drive a Shaw vehicle. Furthermore, prior to the driver operating a Shaw vehicle, the subject questionnaire must be completed and placed on file at the job site. The primary vehicle operator or responsible Shaw management representative shall review the questionnaire and determine whether the non-Shaw employee satisfies the driver qualification requirements of HS800.

Failure to comply with the requirements of this correspondence or the requirements set forth in HS800 shall result in disciplinary action up to and including driving privilege revocation or removal of an affected non-Shaw employee from a project site. If the duties of your employees are expected to include driving a Shaw owned, leased or rented vehicle, please complete Attachment 5, for all of your affected personnel, and provide these to Shaw's site management. Alternatively, please be aware and make your employees aware that they are not authorized to drive a Shaw owned, leased, or rented vehicle without such compliance.

By signing this document, I, an authorized employee and agent of the subject company/employer, am acknowledging acceptance of the above information and agree to my employer's compliance with the referenced requirements stated herein.

Signature / Title

Date



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ATTACHMENT 7
AUTHORIZATION FOR ASSIGNMENT FORM

I, the hereby undersigned Supervisor / Manager, give my consent and approval for the Employee listed below to be assigned a Company Owned and/or Rented vehicle ("Company Vehicle") as specified herein and in accordance with the Company Motor Vehicle Use Policy and the Company Rules for Motor Vehicle Operation. I have given a copy of the Rules and the Policy to the Employee listed below and the Employee has signed and agreed to be bound by the Vehicle Usage Agreement.

Employee Name _____
VIN Number of Vehicle _____
Company Vehicle ID Number _____
Period of Allowance _____
Phone: _____
Company by which employed: _____

I, the undersigned Supervisor, personally attest that the following things have been done and are in proper order: *(Please check off when complete and attach appropriate documents)*

- ☐ Employee Driving Record Complete within the last six months
- ☐ Employee Driving Record rating allows operation of motor vehicle in accordance with policy
(List Rating _____ Date Completed _____)
- ☐ Employee has presented a valid driver's license *(attach a copy)*
- ☐ Employee has signed the Vehicle Use Agreement and a copy has been obtained by the Company
(attach a copy)
- ☐ Employee has been given a copy of Motor Vehicle Use Policy and Company Rules for Motor Vehicle Operation
- ☐ Employee has provided sufficient Proof of Insurance as required by the Policy *(attach a copy)*

SUPERVISOR SIGNATURE: _____
Printed Name: _____
Date: _____
Phone Number: _____

FAX A COPY OF THIS FORM TO THE EQUIPMENT DIVISION IN FINDLAY, OHIO @ 419-425-6295. ALSO NOTE THAT THE AUTHORIZED EMPLOYEE AND THE AUTHORIZING MANAGER IS RESPONSIBLE FOR MAINTAINING COPIES OF THIS FORM FOR FUTURE REFERENCE AND AUDITING.

DO NOT FAX THIS FORM TO THE BATON ROUGE H & S RECORDS DEPARTMENT



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ATTACHMENT 8

VEHICLE USE AGREEMENT

THIS VEHICLE USE AGREEMENT made and entered into this _____ day of _____, _____, between the undersigned Employee listed below ("Employee") and the undersigned Company below ("Company")

WITNESSETH:

WHEREAS, Employee has been granted permission to be assigned a Company owned/leased vehicle ("Company Vehicle") as is set forth and approved on the AUTHORIZATION FOR ASSIGNMENT FORM

In consideration of being assigned use of a Company Vehicle, Employee agrees to the following:

1. Employee will not use the Company Vehicle for personal use. .
2. Employee will follow all rules and requirements set forth in the Company's Motor Vehicle Use Policy, a copy of which Employee has received;
3. Employee certifies that Employee has automobile insurance on a personal vehicle of Employee, Employee has provided to Company a copy of such insurance, and a copy is attached to this agreement;
4. Employee agrees that for any claims for damage, injury or death related to Employee's operation of the Company Vehicle while operating the vehicle on non-company business (personal use), that Employee's own personal automobile liability insurance will be primary and will pay the claim **FIRST AND BEFORE** any insurance of Company. In the event that Employee fails to secure and maintain personal automobile insurance coverage and there is a claim for damage or injury related to Employee's operation of the vehicle for personal use, the Employee will then be responsible and accepts liability for any claims paid by Company up to the minimum limits of insurance required in the state of the Employee's permanent residence.
5. Employee understands that violation of this Agreement or any policy or provision or rule contained in the Motor Vehicle Use Policy or any other Policy of the Company will subject the Employee to discipline including the potential loss of driving privileges for the Company or suspension or termination.

I am a person who is able to read in English and I have read this document and agree to all of its terms and conditions. I understand that the privilege to be assigned a Company Vehicle to take home can be withdrawn by the Company at any time for any reason (and without cause) with notice to me. I agree to comply with return of the vehicle when requested by the Company.

Employee _____
Date: _____
Address: _____
Phone: _____

COMPANY Supervisor / Manager:

Name (Print & Sign): _____ Date: _____

FAX A COPY OF THIS FORM TO THE EQUIPMENT DIVISION IN FINDLAY, OHIO @ 419-425-6295. ALSO NOTE THAT THE AUTHORIZED EMPLOYEE AND THE AUTHORIZING MANAGER IS RESPONSIBLE FOR MAINTAINING COPIES OF THIS FORM FOR FUTURE REFERENCE AND AUDITING.

DO NOT FAX THIS FORM TO THE BATON ROUGE H & S RECORDS DEPARTMENT

APPENDIX C
ACTIVITY HAZARD ANALYSES

ACTIVITY HAZARD ANALYSIS FOR SITE PREPARATION				
Task Breakdown	Potential Hazards	Critical Safety Practices	Personal Protective Clothing and Equipment	Monitoring Devices
Equipment/ Facility Set-up	Slips, Trips, Falls	• Clear walkways work areas of equipment, tools, vegetation and debris • Exit equipment slowly and maintain three point contact • Mark, identify, or barricade other obstructions		
	Spills	• Clean up spills before initiating maintenance • Review maintenance procedures for safety practices		
	Struck By/ Against Heavy Equipment	• Wear reflective warning vests when exposed to vehicular traffic • Isolate equipment swing areas • Make eye contact with operators before approaching equipment • Understand and review hand signals • Follow hand signals of ground workers for equipment manipulation when placing/loading equipment into bucket. • Step away from equipment when bucket adjustments are made • Do not attempt verbal communication in high noise backgrounds	Warning vests, Hard hat, Safety glasses, Steel toe work boots	
	Pinch points	• Review equipment adjustment procedures, identify pinch points • Isolate/block pinch points to limit motion when inserting pins, fasteners, closing tackles	Leather gloves	
	Equipment failure	• Perform daily maintenance inspections on operating equipment		

ACTIVITY HAZARD ANALYSIS FOR SITE PREPARATION				
Task Breakdown	Potential Hazards	Critical Safety Practices	Personal Protective Clothing and Equipment	Monitoring Devices
Equipment/facility set-up (continued)	Electrical Shock	• De-energize or shut off utility lines at their source before work begins • Use double insulated or properly grounded electric power-operated tools • Provide an equipment-grounding conductor program or employ ground-fault circuit interrupters • Use qualified electricians to hook up electrical circuits • Inspect all extension cords daily for structural integrity, ground continuity, and damaged insulation • Cover or elevate electric wire or flexible cord passing through work areas to protect from damage • Keep all plugs and receptacles out of water • Use approved water-proof, weather-proof type if exposure to moisture is likely • Inspect all electrical power circuits prior to commencing work • Follow IT procedure HS315, Control of Hazardous Energy and the Site Specific Lockout/Tagout/Try Plan	Lockout/Tagout Devices	Voltage Meter or Tic Tracer
	Handling Heavy Objects	• Observe proper lifting techniques • Obey sensible lifting limits (60 lb. Maximum per person manual lifting) • Use mechanical lifting equipment (hand carts, trucks) to move large, awkward loads • Avoid carrying heavy objects above shoulder level • Avoid manual lifting/carrying tasks		

ACTIVITY HAZARD ANALYSIS FOR SITE PREPARATION				
Task Breakdown	Potential Hazards	Critical Safety Practices	Personal Protective Clothing and Equipment	Monitoring Devices
Equipment/facility setup (continued)	Sharp Objects	- Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects - Maintain all hand and power tools in a safe condition	Leather gloves	
	Ladders	- Inspect ladders before use for mud buildup on treads - Clean mud from boots before climbing on ladders - Follow the three point of contact rule		
	High Noise Levels	Use hearing protection when exposed to excessive noise levels (greater than 85 dBA over an 8-hour work period)	Ear plugs	
	Burns associated with loading/unloading equipment on trucks	- Identify heavy objects for loading that may have hot surfaces - Allow objects to cool or cover hot surfaces with non-combustible material to protect workers from buns		
	Walking on machine tracks	- Avoid walking on machine tracks whenever possible; clean tracks for safe walking/working surfaces - Observe track surfaces when walking, move cautiously on uneven, slippery surfaces - Avoid sudden awkward motions (pulling/jerking fuel hoses)		
	High/Low Ambient Temperature	- Provide fluids to prevent worker dehydration - Monitor for Heat/Cold stress in accordance with IT Health and Safety Procedures # HS400, HS401	Insulated Clothing (subject to ambient temperature)	Meteorological Equipment

ACTIVITY HAZARD ANALYSIS FOR SITE PREPARATION				
Task Breakdown	Potential Hazards	Critical Safety Practices	Personal Protective Clothing and Equipment	Monitoring Devices
EQUIPMENT REQUIRED		INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS	
- Forklifts/hand carts - Ladders - Hand tools		- Daily equipment inspections as per manufacturers requirements - Inspection of all emergency equipment (i.e.: first aid kits, fire extinguishers)	- Review AHA with all task personnel - Review Site Specific Health and Safety Plan. - Review operations/safety manuals for all equipment utilized	

ACTIVITY HAZARD ANALYSIS FOR SITE RESTORATION				
Task Breakdown	Potential Hazards	Critical Safety Practices	Personal Protective Clothing and Equipment	Monitoring Devices
Site Restoration	Struck by/ Against Heavy Equipment, Protruding Objects	- X Wear reflective warning vests when exposed to vehicular traffic - X Avoid equipment swing areas - X Make eye contact with operators before approaching equipment - X Wear hard hats, safety glasses with side shields, or splash/face shields and goggles, and steel-toe safety boots at all times - X Understand and review hand signals	Warning vests, Hard hat, Safety glasses, Steel toe work boots	
	Slips, Trips, Falls	- X Clear, walkways of equipment, tools, debris, other materials - X Mark, identify, or barricade other obstructions		
	High Noise Levels	X Use hearing protection when exposed to excessive noise levels (greater than 85 dBA over an 8-hour work period)	Ear plugs	
	Handling Heavy Objects	- X Observe proper lifting techniques - X Obey sensible lifting limits (60 lb. per person for manual lifting) - X Use mechanical lifting equipment (hand carts, trucks) to move large, awkward loads		

ACTIVITY HAZARD ANALYSIS FOR SITE RESTORATION				
Task Breakdown	Potential Hazards	Critical Safety Practices	Personal Protective Clothing and Equipment	Monitoring Devices
Site Restoration (continued)	High/Low Ambient Temperature	X Provide fluids to prevent worker dehydration X Monitor for Heat/Cold stress in accordance with IT Health and Safety Procedures # HS400, HS401	Insulated Clothing (subject to ambient temperature)	Meteorological Equipment
EQUIPMENT TO BE USED		INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS	
- Bob Cat or Forklift for moving bulky loads - Grass Seed		- Equipment inspections - Inspection of all emergency equipment (i.e.: first aid kits, fire extinguishers)	- Review HASP - Review site-specific AHA with all task personnel - Review operation manuals for the pumps and related equipment	

ACTIVITY HAZARD ANALYSIS FOR FIELD SAMPLING AND OFFSITE ANALYSIS				
Task Breakdown	Potential Hazards	Critical Safety Practices	Personal Protective Clothing and Equipment	Monitoring Devices
Sampling	Handling Heavy Objects (coolers)	- Observe proper lifting techniques - Obey sensible lifting limits (60 lb. maximum per person manual lifting) - Use mechanical lifting equipment (hand carts, trucks) to move large, awkward loads		
	Slips, Trips, Falls	- Clear walkways, work areas of equipment, tools, vegetation, excavated material, and debris - Mark, identify, or barricade other obstructions		
	Spills	- Wear splash protection as necessary to prevent dermal contact - Ensure spill cleanup equipment/material on hand/ready for use (i.e.: Baking soda to neutralize and sample preservative spills) - Cleanup spills immediately	Full face shield /guard and goggles	
	Inhalation and Contact with Hazardous Substances	- Review hazardous properties of site contaminants with workers before operations begin - Monitor breathing zone air and work area to determine levels of contaminants - Dampen material using light water spray to prevent fugitive dust emissions	Modified Level 'D'; Upgrade per section 8.1 of SSHSP	FID/PID

ACTIVITY HAZARD ANALYSIS FOR FIELD SAMPLING AND OFFSITE ANALYSIS				
Task Breakdown	Potential Hazards	Critical Safety Practices	Personal Protective Clothing and Equipment	Monitoring Devices
	High/Low Ambient Temperature	• Monitor for Heat / Cold stress in accordance with Shaw Health and Safety Procedures HS400, HS401 • Provide fluids to prevent worker dehydration • Take adequate rest periods in a cool/warm shaded area • During rest breaks, replenish body fluids by drinking plenty of fluids (water and Gatorade type liquids). Do not drink caffeinated beverages • Remove PPE if possible during rest periods • Include plenty of salt in your food intake, however, do not take salt tablets	Insulated Clothing (subject to ambient temperature)	Meteorological Equipment
EQUIPMENT REQUIRED		INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS	
• Sample supplies • PID/FID		• Daily equipment inspections as per manufacturers requirements • Inspection of all emergency equipment (i.e.: first aid kits, fire extinguishers)	• Review AHA with all task personnel • Review Site Specific Health and Safety Plan	

ACTIVITY HAZARD ANALYSIS FOR SAMPLING (DIRECT PUSH)				
Task Breakdown	Potential Hazards	Critical Safety Practices	Personal Protective Clothing and Equipment	Monitoring Devices
Soil Sampling	Struck by/ Against Heavy Equipment, Flying Debris, Protruding Objects	• Wear reflective warning vests when exposed to vehicular traffic • Isolate equipment swing areas • Make eye contact with operators before approaching equipment • Barricade or enclose the sampling area • Restrict entry to the work area to authorized personnel during drilling activities • Understand and review hand signals	Warning vests, hard hat, safety glasses and steel toe work boots	
	Sharp Objects	• Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects (i.e. cutting open sample tube) • Keep guards in place during use • Observe work area and location of other personnel before lifting or moving objects with sharp edges	Leather gloves	
	Overhead Utilities	• Maintain at least 10 feet from overhead power lines, up to 50 kV • For voltages over 50 kV, add 0.4 inches per kV to obtain the safe distance between equipment and power lines • If voltage is unknown, remain at least 20 feet from overhead power lines. • Do not drive the drill rig from hole to hole with the mast in the raised position. Before raising the mast, check for overhead obstructions.		
Soil Sampling (continued)	Underground Utilities	• Identify all underground and overhead utilities around the excavation site before work commences • Complete the underground utility permit in accordance		

ACTIVITY HAZARD ANALYSIS FOR SAMPLING (DIRECT PUSH)				
Task Breakdown	Potential Hazards	Critical Safety Practices	Personal Protective Clothing and Equipment	Monitoring Devices
		with Health and Safety procedure HS308 Cease work immediately if unknown utility markers are uncovered		
	Equipment Malfunction/Damage	- Conduct daily equipment inspections. - Shut down equipment to make repairs or adjustments. Release all pressure on the hydraulic systems, the fluid system, and the air pressure systems of the equipment prior to performing maintenance - Maintain all equipment in a safe condition - Keep all guards in place during use - De-energize and lock-out machinery before maintenance or service		
	Horseplay	- Prohibit horseplay on all project sites - Review rules about horseplay with subcontract supervisors and workers - Remind workers not to respond/participate in horseplay started by others		
	Slips, Trips, Falls	- Clear walkways and work areas of equipment of debris and other materials - Mark, identify, or barricade other obstructions		
	Inhalation and Contact with Hazardous Substances	- Provide workers proper skin, eye and respiratory protection based on the exposure hazards present - Review hazardous properties of site contaminants with workers before operations begin	Modified Level D as outlined in HASP (as necessary to prevent contact with hazardous materials)	PID/FID

ACTIVITY HAZARD ANALYSIS FOR SAMPLING (DIRECT PUSH)				
Task Breakdown	Potential Hazards	Critical Safety Practices	Personal Protective Clothing and Equipment	Monitoring Devices
Soil Sampling (continued)	Fire/ Explosion	• Eliminate sources of ignition from the work area • Prohibit smoking • Provide ABC (or equivalent) fire extinguishers in all work areas, flammable storage areas, generator and compressor locations • Store flammable liquids in well ventilated areas • Prohibit storage, transfer of flammable liquids in plastic containers • Post "NO SMOKING" signs • Store combustible materials away from flammables • Separate Flammables and Oxidizers by 20 feet minimum	Portable ABC dry chemical fire extinguishers	
	Drum Handling	• Drums will be safely transported onsite using conventional drum handling techniques including a bobcat, dump truck, or front-end loader. • Extreme care will be taken during drum handling operations to prevent release and to ensure safe working conditions. Once at the staging cell, drums will be placed on wooden pallets to facilitate drum movement and to protect the liner of the staging cell. All drums will be staged and labeled in accordance with the RCRA drum storage regulations. • Ensure that your body, material, tools and equipment are safe from such unexpected movement as falling, slipping, rolling, tripping, blowing, or any other uncontrolled motion.	Leather gloves, and chemical protection as required by HASP	
	High/Low Ambient Temperature	• Monitor for Heat Stress in accordance with Shaw Health and Safety Procedures #HS400 and 401 • Provide fluids to prevent worker dehydration		Meteorological Equipment

ACTIVITY HAZARD ANALYSIS FOR SAMPLING (DIRECT PUSH)				
Task Breakdown	Potential Hazards	Critical Safety Practices	Personal Protective Clothing and Equipment	Monitoring Devices
EQUIPMENT TO BE USED		INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS	
• Sample Rig • Sample supplies • PID/FID		• Inspect the sampling rig • Inspection of all emergency equipment (i.e.: first aid kits, fire extinguishers)	• Review HASP with all site personnel • Review AHA with all task personnel • Review site specific contamination	

ACTIVITY HAZARD ANALYSIS FOR SITE GEO-PHYSICAL AND GENERAL SITE SURVEY ACTIVITIES				
Task Breakdown	Potential Hazards	Critical Safety Practices	Personal Protective Clothing and Equipment	Monitoring Devices
Geo-physical and General Site Survey	Struck By/ Against Motor Vehicles/ Operating Equipment	• Wear reflective warning vests when exposed to vehicular traffic • Avoid/isolate survey activities in high traffic areas, warehouse shipping/receiving areas • Make eye contact with vehicle operators before approaching/crossing high traffic areas • Understand and review hand signals • Emphasize the “Buddy System” where injury potential exists	Reflective vest, hard hat, safety glasses and steel toe work boots	
	Slips, Trips, Falls	• Clear walkways, work areas of equipment and tools • Mark, identify, or barricade other obstructions		
	Handling Heavy Objects	• Observe proper lifting techniques • Obey sensible lifting limits (60 lb. maximum per person manual lifting) • Warm up muscles before engaging in manual lifting activities • Avoid actions/activities that contribute to over exertion • Review lifting posture/techniques regularly at safety meetings		
Geo-physical and General Site Survey (continued)	Insect/Animal Bites	• Review injury potential with workers • Avoid insect nests areas, habitats outside work areas • Emphasize The Buddy System where such injury potential exists • Use insect repellant to protect against sting injuries	Tyvek® coveralls, duct tape bottom of coveralls to boots or latex boot covers when there is a potential for	

ACTIVITY HAZARD ANALYSIS FOR SITE GEO-PHYSICAL AND GENERAL SITE SURVEY ACTIVITIES				
Task Breakdown	Potential Hazards	Critical Safety Practices	Personal Protective Clothing and Equipment	Monitoring Devices
		- Wear PPE and tape joints to keep insects away from the skin - Use protective insect repellents containing 25% DEET to prevent insect bites - Check limbs/body for insects/ insect bites during decontamination and/or shower	insect/animal bite	
	Contact Dermatitis/ Poison Ivy	- Wear long sleeve shirts / trousers to avoid skin contact with plants or other skin irritants - Identify and review poisonous plants with workers - Avoid unnecessary clearing of plant/vegetation areas - Cover vegetation with plastic (visqueen) where survey position raises exposure potential - Apply protective cream/lotion to exposed skin to prevent poison ivy or similar reactions - Identify workers who are known to contract poison ivy	Tyvek® coveralls, duct tape bottom of coveralls to boots or latex boot covers when there is a potential for contact dermatitis/ poison ivy	
	High/Low Ambient Temperature	- Monitor for heat/cold stress in accordance with Shaw Health and Safety Procedures HS400 and HS401 - Provide fluids to prevent worker dehydration		Meteorological Equipment
EQUIPMENT TO BE USED		INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS	
- Survey equipment - Warning vests		- Equipment inspections - Inspection of all emergency equipment (i.e.: first aid kits, fire extinguishers)	- Review SSHP - Review site-specific AHA with all task personnel	

ACTIVITY HAZARD ANALYSIS FOR SURFACE WATER/SEDIMENT SAMPLING				
Task Breakdown	Potential Hazards	Hazard Control Measures	Personal Protective Equipment	Air Monitoring
Sampling	Inhalation and Contact with Hazardous Substances	- Review hazardous properties of site contaminants with workers before operations begin - Ensure hazardous levels of vapors are not present - Provide workers proper skin, eye and respiratory protection based on the exposure hazards present	Modified Level D: nitrile or rubber over gloves over surgical type nitrile gloves	PID/FID
	Musculoskeletal Disorders (MSD)	- Observe proper lifting techniques - Obey sensible lifting limits (60 lb. maximum per person manual lifting) - Ensure proper body positioning, do not work in awkward positions		
	Slips, Trips, Falls	- Mark, identify, or barricade other obstruction - Work areas, platforms, and walkways should be kept free of materials, debris, and obstructions such as grease or oil that could cause a surface to become slick or otherwise hazardous - Clear walkways of tools and debris		
	Fire/ Explosion	- Eliminate sources of ignition from the work area - Prohibit smoking near wells and in work area. - Ground the interface probe to the well box/metal casing		
	Sharp Objects	- Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects - Maintain all hand and power tools in a safe condition	Leather gloves	

ACTIVITY HAZARD ANALYSIS FOR SURFACE WATER/SEDIMENT SAMPLING				
Task Breakdown	Potential Hazards	Hazard Control Measures	Personal Protective Equipment	Air Monitoring
	Adverse weather conditions:	• Monitor weather forecast • Shut down operations should severe weather conditions exist		
	High/Low Ambient Temperature	• Monitor for Heat Stress in accordance with Shaw Health and Safety Procedures #HS400 and 401 • Provide fluids to prevent worker dehydration		Meteorological Equipment
	Insect/ Snake Bites	•... Review injury potential and types of snakes with workers •... Avoid insect nests areas, likely habitats of snakes outside work areas •... Emphasize The Buddy System where such injury potential exists •... Use insect repellent, wear PPE to protect against sting/bite injuries	Use Tyvek coveralls or duct tape bottom of slacks to boots; wear light colors and long sleeves	
	Contact Dermatitis	•... Wear PPE to avoid skin contact with contaminated soil, plants, or other skin irritants •... Identify and review poisonous plants with workers •... Apply protective cream/lotion to exposed skin to prevent poison ivy or similar reactions	Use Tyvek coveralls or duct tape bottom of slacks to boots; use Ivy Block	
	Vehicular Traffic Areas	•... Use traffic cones or barricades •... Position your vehicle adjacent to the well as a barrier	Wear reflective traffic vest	

ACTIVITY HAZARD ANALYSIS FOR SURFACE WATER/SEDIMENT SAMPLING				
Task Breakdown	Potential Hazards	Hazard Control Measures	Personal Protective Equipment	Air Monitoring
	Work near Water	- Wear USCG Approved personal flotation devices for work activities on or near water where potential for drowning exists - Conduct work during low tide - Provide a floating ring buoy with at least 90 feet in the immediate boat launch/land areas - Place ring buoys not more than 200 feet apart	USCG approved flotation device	
EQUIPMENT TO BE USED		INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS	
- Miscellaneous hand tools - PID/FID - Safety Equipment - Sampling Equipment		- Equipment inspections - Inspection of all emergency equipment (i.e.: first aid kits, fire extinguishers)	- Review HASP - Review site-specific AHA with all task personnel	

ACTIVITY HAZARD ANALYSIS FOR SOIL GAS SAMPLING				
Task Breakdown	Potential Hazards	Critical Safety Practices	Personal Protective Clothing and Equipment	Monitoring Devices
Sampling	Handling Heavy Objects (coolers)	- Observe proper lifting techniques - Obey sensible lifting limits (60 lb. maximum per person manual lifting) - Use mechanical lifting equipment (hand carts, trucks) to move large, awkward load		
	Slips, Trips, Falls	- Clear walkways, work areas of equipment, tools, vegetation, excavated material, and debris - Mark, identify, or barricade other obstructions - Watch footing on uneven surfaces, sloped surfaces, grassy areas, wet leaves		
	Inhalation and Contact with Hazardous Substances	- Review hazardous properties of site contaminants with workers before operations begin - Monitor breathing zone air and work area to determine levels of contaminants - Position up-wind of sampling point to avoid inhalation of gases that may be released during sampling.	Modified Level 'D': inner/outer nitrile sample gloves	PID/FID

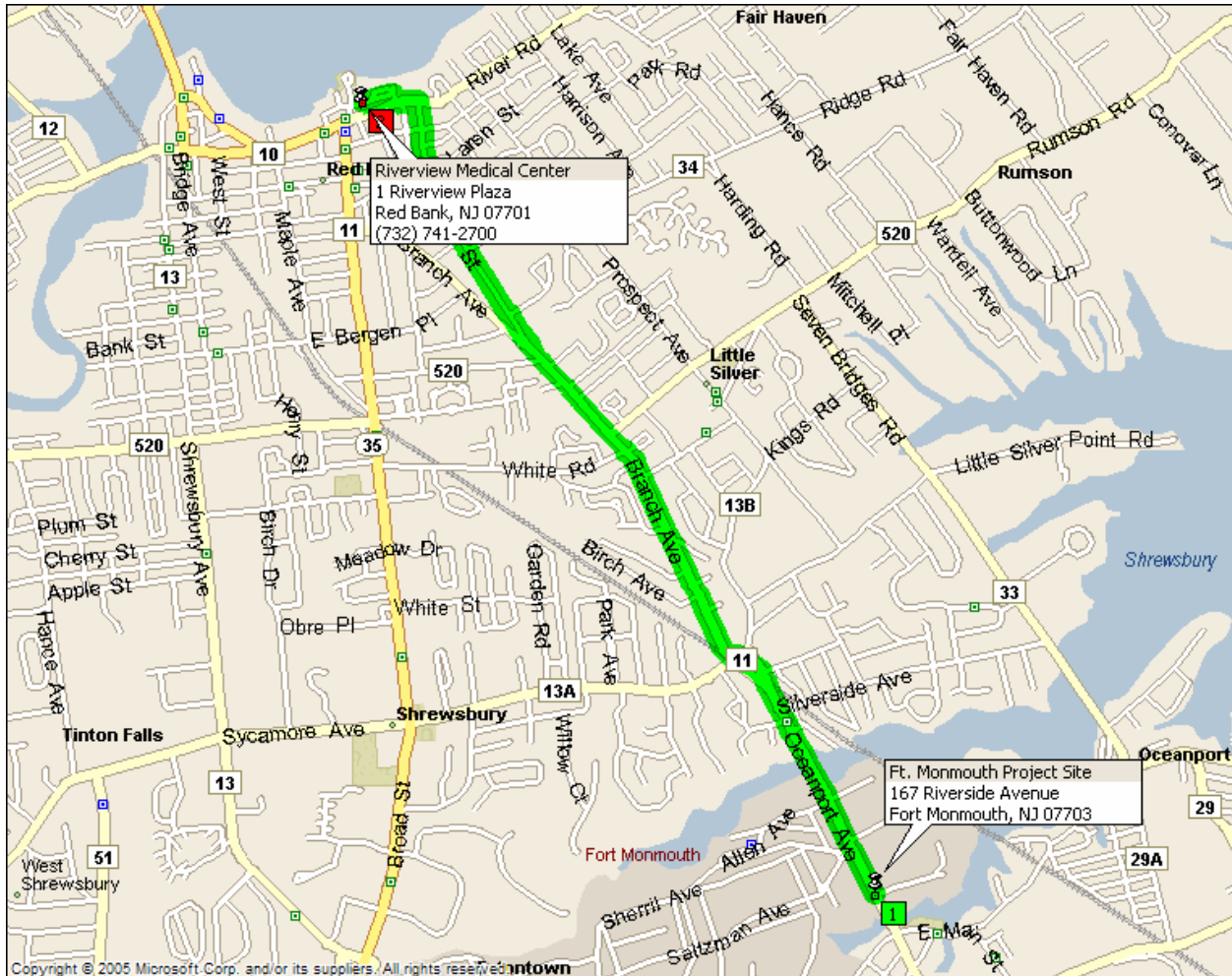
ACTIVITY HAZARD ANALYSIS FOR SOIL GAS SAMPLING				
Task Breakdown	Potential Hazards	Critical Safety Practices	Personal Protective Clothing and Equipment	Monitoring Devices
	High/Low Ambient Temperature	• Monitor for Heat / Cold stress in accordance with Shaw Health and Safety Procedures HS400, HS401 • Provide fluids to prevent worker dehydration • Take adequate rest periods in a cool/warm shaded area • During rest breaks, replenish body fluids by drinking plenty of fluids (water and Gatorade type liquids). Do not drink caffeinated beverages • Remove PPE if possible during rest periods • Include plenty of salt in your food intake, however, do not take salt tablets	Insulated Clothing (subject to ambient temperature)	Meteorological Equipment
EQUIPMENT REQUIRED		INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS	
• Sample supplies • PID/FID		• Daily equipment inspections as per manufacturers requirements • Inspection of all emergency equipment (i.e.: first aid kits, fire extinguishers)	• Review AHA with all task personnel • Review Site Specific Health and Safety Plan	

ACTIVITY HAZARD ANALYSIS FOR INDOOR AIR SAMPLING				
Task Breakdown	Potential Hazards	Critical Safety Practices	Personal Protective Clothing and Equipment	Monitoring Devices
Sampling	Handling Heavy Objects (coolers)	- Observe proper lifting techniques - Obey sensible lifting limits (60 lb. maximum per person manual lifting) - Use mechanical lifting equipment (hand carts, trucks) to move large, awkward load		
	Slips, Trips, Falls	- Clear walkways, work areas of equipment, tools, vegetation, excavated material, and debris - Mark, identify, or barricade other obstructions - Watch footing on uneven surfaces, sloped surfaces, grassy areas, wet leaves		
	Use of Ladders/Elevated Work	- Evaluate fall hazards above 4 ft.; use fall protection equipment (harness/lanyard), standard guardrails or other fall protection systems when working on elevated platforms above 6 ft. - Use heavy duty industrial (type IA) ladders - Install and inspect scaffolds according to manufacturers requirements - Only trained operators are permitted to use aerial lifts - Tie-off all straight/extension ladders or manually hold by co-worker at base - Anchorage points for fall arrest systems must support at least 5,400 pounds for each worker	Fall Protection	
	Inhalation and Contact with Hazardous Substances	- Review hazardous properties of site contaminants with workers before operations begin - Monitor breathing zone air and work area to determine levels of contaminants	Modified Level 'D': inner/outer sample gloves	

ACTIVITY HAZARD ANALYSIS FOR INDOOR AIR SAMPLING				
Task Breakdown	Potential Hazards	Critical Safety Practices	Personal Protective Clothing and Equipment	Monitoring Devices
		Position up-wind of sampling point to avoid inhalation of gases that may be released during sampling.		
	High/Low Ambient Temperature	- Monitor for Heat / Cold stress in accordance with Shaw Health and Safety Procedures HS400, HS401 - Provide fluids to prevent worker dehydration - Take adequate rest periods in a cool/warm shaded area - During rest breaks, replenish body fluids by drinking plenty of fluids (water and Gatorade type liquids). Do not drink caffeinated beverages - Remove PPE if possible during rest periods - Include plenty of salt in your food intake, however, do not take salt tablets	Insulated Clothing (subject to ambient temperature)	Meteorological Equipment
EQUIPMENT REQUIRED		INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS	
Sample supplies		- Daily equipment inspections as per manufacturers requirements - Inspection of all emergency equipment (i.e.: first aid kits, fire extinguishers)	- Review AHA with all task personnel - Review Site Specific Health and Safety Plan	

APPENDIX D
DIRECTIONS TO THE HOSPITAL AND HEALTH RESOUCCE CLINIC

**Directions to Hospital
Riverview Medical Center
1 Riverview Plaza
Red Bank, NJ 07701
(732) 741-2700**



Summary: 3.3 miles (8 minutes)

Time	Mile	Instruction	For	Toward
9:00 AM	0.0	Depart Riverside Ave, Fort Monmouth, NJ 07703 on CR-11 [Oceanport Ave] (North)	0.8 mi	
9:01 AM	0.8	Bear LEFT (North-West) onto CR-11 [Branch Ave]	0.9 mi	
9:02 AM	1.8	Keep STRAIGHT onto CR-11 [CR-520]	0.3 mi	
9:03 AM	2.1	Keep STRAIGHT onto CR-11 [Branch Ave]	43 yds	
9:03 AM	2.1	Keep RIGHT onto Spring St	0.9 mi	
9:06 AM	3.1	Turn LEFT (West) onto CR-10 [E Front St]	120 yds	
9:06 AM	3.1	Turn RIGHT (North) onto N Washington St, then immediately turn LEFT (West) onto Riverview Plaza	0.1 mi	
9:08 AM	3.3	Arrive 1 Riverview Plaza, Red Bank, NJ 07701		

Route To Clinic
Concerta Medical Center
135 Raritan Center Parkway
Edison, NJ 08837
(732) 225-5454



Summary: 26.0 miles (30 minutes)

Time	Mile	Instruction	For	Toward
9:00 AM	0.0	Depart Riverside Ave, Fort Monmouth, NJ 07703 on CR-11 [Oceanport Ave] (North)	0.8 mi	
9:01 AM	0.8	Bear LEFT (North-West) onto CR-11 [Branch Ave]	0.9 mi	
9:02 AM	1.8	Keep STRAIGHT onto CR-11 [CR-520]	0.3 mi	
9:03 AM	2.1	Bear LEFT (West) onto CR-520 [Pinckney Rd]	0.6 mi	
9:04 AM	2.7	Turn LEFT (South) onto SR-35 [CR-520]	0.1 mi	
9:05 AM	2.8	Turn RIGHT (West) onto CR-520 [Newman Springs Rd E]	0.6 mi	
9:07 AM	3.4	Keep STRAIGHT onto CR-520 [Newman Springs Rd]	0.7 mi	
9:08 AM	4.1	Road name changes to CR-50 [CR-520]	0.6 mi	
9:09 AM	4.7	Keep RIGHT onto Ramp	0.5 mi	Garden State Parkway North
9:10 AM	5.1	*Toll road* Merge onto Garden State Pky	6.4 mi	
9:15 AM	11.5	*Toll road* Take Ramp (LEFT) onto Garden State Pky Express Ln	8.6 mi	Express / Woodbridge / North Jersey

9:22 AM	20.2	*Toll road* Merge onto Garden State Pky	1.5 mi	
9:24 AM	21.7	*Toll road* Road name changes to Alfred E. Driscoll Bridge [Driscoll Bridge]	0.4 mi	
9:24 AM	22.1	*Toll road* Road name changes to Garden State Pky	0.4 mi	
9:24 AM	22.5	At exit 127, keep RIGHT onto Ramp	0.1 mi	RT-9 / RT-440 / I-287 / Woodbridge / Staten Island
9:25 AM	22.6	Keep RIGHT to stay on Ramp	0.1 mi	RT-440 / Industrial Ave / I-287 N
9:25 AM	22.7	Keep LEFT to stay on Ramp	0.4 mi	RT-440 / Industrial Ave / I-287 N
9:25 AM	23.1	Take Ramp (LEFT) onto SR-440	1.2 mi	RT-440 / I-287
9:27 AM	24.3	Turn RIGHT onto Ramp	0.2 mi	CR-514 / I-95 / New Jersey Turnpike / Woodbridge
9:27 AM	24.5	Keep LEFT to stay on Ramp	0.4 mi	CR-514 / I-95 / New Jersey Turnpike
9:28 AM	24.9	Keep LEFT to stay on Ramp	0.3 mi	CR-514
9:28 AM	25.2	Bear RIGHT (West) onto CR-514 [Woodbridge Ave]	0.2 mi	
9:29 AM	25.4	Keep RIGHT onto Ramp	0.3 mi	Raritan Center
9:30 AM	25.8	Keep LEFT to stay on Ramp	43 yds	
9:30 AM	25.8	Keep STRAIGHT onto Raritan Center Pky	0.2 mi	
9:30 AM	26.0	Arrive 135 Raritan Center Pkwy, Edison, NJ 08837		

APPENDIX E
HEALTH AND SAFETY PLAN
AMENDMENT DOCUMENTATION FORM

**Site-Specific Health & Safety Plan
Amendment Documentation**

Project Name:

Project No.

Amendment No.

Date:

The Amendment Addresses the Following Sections:

Task(s) Amendment Affects:.

Reason For Amendment:

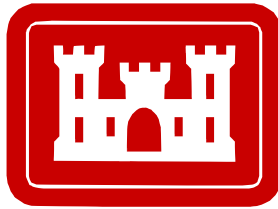
Amendment:

Completed by:

Approved by:

APPENDIX F
HURRICANE PREPAREDNESS PLAN

**HURRICANE PREPAREDNESS PLAN
FORT MONMOUTH SITE INVESTIGATION**



Prepared for:

**U.S. Army Corps of Engineers
Baltimore District**

**Contract No.
W912DR-05-D-0026**

Prepared by:

Shaw Environmental, Inc.
111 Howard Blvd., Suite 110
Mt Arlington, NJ 07856

SHAW PROJECT NUMBER 124976

TABLE OF CONTENTS

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4.0	EMERGENCY OPERATING PROCEDURES	5
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ATTACHMENTS

- A Hurricane Preparedness Responsibility Punch List
- B Emergency Phone Numbers
- C Hurricane Tracking Map

LIST OF ACRONYMS

COR	Conditions of Readiness
mph	miles per hour
NOAA	National Oceanic and Atmospheric Administration
SSO	Site Safety Officer
USACE	U.S. Army Corps of Engineers

1.0 INTRODUCTION

PURPOSE

This Hurricane Preparedness Plan outlines the general responsibilities and actions to be taken in preparation for and response to a hurricane or hurricane warnings at Fort Monmouth, NJ. All personnel should understand that predicting the occurrence and path of a hurricane is difficult; however, the risk can be minimized and controlled by following the procedures in this plan.

SCOPE

This procedure is applicable to all site personnel, including subcontractors and all equipment utilized at the project sites.

DISCUSSION

This procedure provides information on how to protect personnel and property in the event of a hurricane. In the Monmouth County, New Jersey area, attention must be paid to all hurricanes, since there is no way to determine with 100 percent accuracy whether a hurricane will actually hit the area until a few hours before landfall.

The following table demonstrates that the accuracy of forecasting where a hurricane landfall will occur is very low more than 24 hours in advance of a storm.

Hours Before Landfall	Maximum Probability Values
72 Hours	10 Percent
48 Hours	13-18 Percent
36 Hours	20-25 Percent
24 Hours	35-45 Percent
12 Hours	60-70 Percent

2.0 DEFINITIONS

The following definitions apply to various terms used in this document.

Conditions of Readiness (COR):

Condition V - Destructive winds are possible at the Fort Monmouth, NJ site within 96 hours. Normal daily job-site cleanup and good housekeeping practices.

Condition IV - Destructive winds are possible at the Fort Monmouth, NJ site within 72 hours. Normal daily job-site cleanup and good housekeeping practices. Collect and store in piles or containers, scrap lumber, waste material, and rubbish for removal and disposal at the end of each work day. Maintain the construction site, including storage areas, free of accumulation of debris. Stack form lumber in neat piles less than 4 feet high. Remove all trash debris and other objects which could become missile hazards. Contact Contracting Officer In Charge of Construction (Tim Peck, U.S. Army Corps of Engineers [USACE] Baltimore District – 410-962-3416) for Condition requirements, updates, and completion of required actions.

Condition III - Destructive winds are possible at the Fort Monmouth, NJ site within 48 hours. Maintain Condition IV requirements. Begin securing the job site for and taking those actions necessary for Condition I that cannot be completed within 18 hours. Cease all routine activities that might interfere with securing operations. Begin collecting and stowing all gear and portable equipment. Make preparations for securing buildings. Review requirements pertaining to Condition II and continue action as necessary to attain Condition III readiness.

Condition II - Destructive winds are possible at the Fort Monmouth, NJ site within 24 hours. Curtail or cease routine activities until securing operations are complete. Reinforce or remove form work and scaffolding. Secure machinery, tools, equipment and materials, or remove from job site. Expend every effort to clear all missile hazards and loose equipment from the job site. Contact Tim Peck, USACE Baltimore District (410-962-3416) for weather and COR updates and completion of required actions.

Condition I - Destructive winds are possible at the Fort Monmouth, NJ site within 12 hours. Perform and complete all remaining actions required for lower conditions of readiness. Secure the job site and leave the government premises.

Destructive Winds - Generally winds reaching or exceeding the force of a tropical storm (≥ 39 miles per hour [mph] or 34 knots). Winds from any storm system (tropical or otherwise) that are determined to have the potential to cause property damage or personal injury that would warrant a Condition IV alert.

Gale - Non-tropical windstorm with winds 38 to 63 mph (33 to 55 knots).

Hurricane Watch - An announcement for specific areas where a hurricane or an incipient hurricane poses a possible threat to a coastal area, generally within 36 hours.

Hurricane Warning - A warning that sustained winds of 74 mph (64 knots) or higher, associated with a hurricane are expected in a specified coastal area in 24 hours or less.

Hurricane - A tropical cyclone in which the maximum sustained surface wind is 74 mph (64 knots) or greater.

Missile Hazard - Any object that may become airborne during high winds.

Severe Weather - Any storm of tropical or non-tropical origin that has the capacity to produce destructive winds.

Small Area Storms - Thunderstorms or tornadoes.

Small Area Storms Condition I - Destructive winds, heavy rain, lightening and hail are imminent within 1 hour.

Small Area Storms Condition II - Destructive winds, heavy rain, lightening and hail are expected within 6 hours.

Storm - Non-tropical windstorm with winds 38 to 63 mph (33 to 55 knots).

Storm Surge - An abnormal rise in sea level accompanying a hurricane or other intense storm, and whose height is the difference between the observed level of the sea surface and the level that would have occurred in the absence of the storm.

Storm Tide - The actual sea level resulting from the astronomical tide combined with the storm surge. This term is used interchangeably with "Hurricane Tide."

Tornado - Violent rotating columns of air with winds 115 to 288 mph (100 to 250 knots).

Tropical Depression - A tropical low pressure system in which the maximum sustained surface wind is 38 mph (33 knots) or less.

Tropical Storm - A tropical low pressure system in which the maximum surface wind ranges from 39 to 73 mph (34 to 63 knots) inclusive. This is the strength at which the National Hurricane Center applies a name to the storm.

Tropical Storm Watch - Tropical storm conditions pose a threat to a coastal area generally within 36 hours.

Tropical Storm Warning - A warning for tropical storm conditions with sustained winds within the range of 39 to 73 mph (34 to 63 knots) that are expected in a specified coastal area within 24 hours or less.

3.0 RESPONSIBILITIES

Project Manager – Douglas Schicho

The Project Manager is responsible for ensuring that all adequate measures have been taken to prepare for hurricanes and to protect site personnel and property in the event of a hurricane. The Project Manager will ensure that ample resources are available to implement this plan and that all personnel are aware of this plan and their responsibilities.

Site Superintendent – Mark Magness

The Site Superintendent will communicate all hurricane information to site personnel and keep the site personnel continually informed of the measures to be taken. The Site Superintendent is responsible for the coordination and direction of site equipment shut-down and will oversee the preparation of site facilities for any imminent storm. The Site Superintendent will oversee the coordination of both pre- and post-storm operations and will ensure that the proper material, equipment, and supplies are utilized to implement this procedure.

Site Safety Officer (SSO) – Mark Magness

The SSO will monitor weather information, including the National Weather Service probability values for landfall. The SSO will maintain the necessary emergency supplies, and will periodically tour the site to ensure that proper steps are being taken to protect site personnel and property. The SSO will develop the emergency contact list, which will be maintained in a site-dedicated vehicle.

Note: When personnel identified in Section 3.0 leave the site, they are responsible for notifying the Site Superintendent or a designated back-up person. The back-up person will be instructed in their responsibilities in the event of a hurricane.

4.0 EMERGENCY OPERATING PROCEDURES

Condition V - Early Preparedness.

The Site Superintendent will notify the Project Manager when a tropical storm has been named and/or any severe weather has the potential to produce destructive winds at Fort Monmouth within 96 hours. This will initiate COR Condition V. This phase will continue until:

- The storm or condition is downgraded.
- The storm track poses no threat to the site.
- Condition IV applies.

During Condition V, the progress of the storm will be monitored and tracked. The Program Manager will be contacted at least twice daily for Condition Requirements updates and to inform him of completion of required actions for Condition V.

See Attachment A for the Hurricane Preparedness Responsibility Punch List - Condition V.

Condition IV - (Destructive winds are possible within 72 Hours).

This COR starts when severe weather is within 72 hours of posing a threat to the project location. The SSO will ensure that the following steps are taken:

- Monitor the storm and inform the Project Manager of its progress.
- Check Personal Protective Equipment supplies and equipment to determine if any shipments are required or if pending shipments should be advanced or postponed.

During Condition IV, the progress of the storm will be continuously monitored and tracked. The Site Superintendent will instruct site personnel to begin general cleanup of all loose materials that may pose a hazard during high winds or rain. This will include removal of all debris, trash, and other items that may become missile hazards. All lumber will be stacked in neat piles less than 4 feet high. The Program Manager will be contacted at least twice daily for Condition Requirements updates and to inform him of completion of required actions for Condition IV.

The Site Superintendent will keep all site personnel advised of the status of the storm and site preparation activities. Due to the urgency and amount of work involved in preparing for a threatening storm, all construction operations that might interfere with securing operations, such as starting a major excavation, will cease.

The Site Superintendent will ensure that the following steps are taken:

- Fuel tanks in all equipment on site are filled.
- Stockpiled material on site is secured.
- Requirements for Condition II are reviewed with all site personnel.
- Condition IV requirements are maintained.

See Attachment A for the Hurricane Preparedness Responsibility Checklist - Condition IV.

Condition III - Tropical Storm Warning (Destructive winds are possible Within 48 Hours).

This COR starts when severe weather places the project site under a tropical storm warning. Condition III activities will also start if a threatening tropical storm is upgraded to a hurricane, or a severe storm approaching Fort Monmouth has generated destructive winds in other locations. The Project Manager, Site Superintendent and SSO will determine when to cease all operations based upon current weather conditions and/or as directed by Tim Peck, USACE Baltimore District (410-962-3416). If the storm or Condition is downgraded, the Project Manager and Site Superintendent will meet with the Program Manager and Tim Peck, USACE Baltimore District (410-962-3416) to decide if a downgrade of the COR is appropriate. Actions for Condition III will be maintained and the following shall also be completed:

- Machinery, tools, equipment, and materials will be secured or removed from the site.
- Actions to secure job site necessary for Condition II that cannot be completed within 18 hours will be taken.

See Attachment A for the Hurricane Preparedness Responsibility Checklist - Condition III.

Condition II - Destructive Winds are anticipated within 24 hours or a Small Area Storm is anticipated within 6 hours.

Condition II begins when destructive winds are anticipated within 24 hours, a small area storm within 6 hours, and/or as directed by Tim Peck, USACE Baltimore District (410-962-3416). The Project Manager and Site Superintendent will determine when to demobilize from the site based upon weather conditions. During this phase, the Site Superintendent will direct the following actions:

- Machinery, tools, equipment and materials will be secured or removed from the job site.
- A roll call of personnel on-site will be conducted and the SSO informed.
- Personnel on leave will be notified of schedule changes.
- Personnel needing to leave the project to attend to personal matters will notify their Site Superintendent immediately.
- Heavy equipment will be secured according to the manufacturer's recommendations.
- All small field equipment will be secured.
- All visitors from the site will be evacuated.
- A final site walk-through will be made to determine that the site is secure and all missile hazards are cleared from the job site.
- The Project Manager will be informed that all personnel are being released from the site.

If the storm or Condition is downgraded, the Project Manager and Site Superintendent will meet to decide if a downgrade of the phase is necessary.

See Attachment A for the Hurricane Preparedness Responsibility Checklist - Condition II.

Condition I - Destructive winds are anticipated within 12 hours or a Small Area Storm is imminent within 1 hour.

- Complete all remaining actions required for lower conditions of readiness.
- Secure job site access and evacuate to safe refuge.

See Attachment A for the Hurricane Preparedness Responsibility Checklist - Condition I.

Resume Site Operations

The Project Manager will contact the Program Manager to determine when site operations will resume. Although the hurricane/severe weather has passed, hazards may still exist because of water damage, other hazardous conditions, dangers from electric shock, poisonous snakes, etc.

The Site Superintendent and SSO will conduct a damage survey with the Project Manager. Photographs of the storm damage at the site will be taken by the Site Superintendent or SSO. They will develop a prioritized recovery plan from the survey findings. Subsequently, all site personnel will be notified when it is safe to return to work. Required personnel and subcontractor expertise will be mobilized to the site to repair any damaged equipment.

See Attachment A for the Hurricane Preparedness Responsibility Checklist - Resume Site Operations.

5.0 DEBRIEFING

Following the return to work of site personnel, the Site Superintendent will conduct a debriefing with site personnel. The debriefing will accomplish the following objectives:

- Finalize a recovery plan.
- Review the Hurricane Plan for effectiveness.
- Suggest and agree on improvements to the plan.
- Incorporate plan changes.

When completed, the Project Manager and Site Superintendent will meet with site personnel to discuss any corrective actions or changes in this plan.

6.0 REFERENCES

The list of emergency telephone numbers is included as Attachment B. In addition, an example of a Hurricane Tracking Chart is presented in Attachment C.

The following references and sources of information may be consulted for additional guidance on hurricane preparedness and response:

- Disaster Planning Guide for Business and Industry, Federal Emergency Management Administration.
- U.S. Department of Commerce, National Oceanic and Atmospheric Administration (NOAA).

ATTACHMENT A
HURRICANE PREPAREDNESS RESPONSIBILITY
CHECKLISTS

HURRICANE PREPAREDNESS CHECKLIST

Condition V

Date/Time Entered Condition V:_____

Severe Weather/Tropical Storm: _____

Action Items

- ☐ Project Manager Notified.
- ☐ Track of Storm Poses No Threat.
- ☐ Storm or Condition is Downgraded.
- ☐ Upgrade to Condition IV.

Storm Location

Date/Time:_____

Date/Time:_____

Location/Coordinates:_____

Location/Coordinates:_____

Date/Time:_____

Date/Time:_____

Location/Coordinates:_____

Location/Coordinates:_____

Condition V Action Items Complete:_____ **Date:**_____

HURRICANE PREPAREDNESS CHECKLIST

Condition IV (Landfall within 72 hours)

Date/Time Entered Condition IV:_____

Action Items:

- ☐ Notify Project Manager.
- ☐ Notify Project Superintendent.
- ☐ Notify Site Personnel.
- ☐ Assemble shift personnel to begin preparation.
- ☐ Track storm on hurricane tracking map (Attachment C) (if applicable).
- ☐ Secure all heavy equipment located at the site in accordance with manufacturer's specifications. All equipment will be moved to a secured site location.
- ☐ All equipment fuel tanks will be filled.
- ☐ All subcontractors with equipment or supplies on-site will be notified to begin removal procedures.

Condition IV Action Items Complete:_____ **Date:**_____

HURRICANE PREPAREDNESS CHECKLIST

Condition III (Landfall within 48 hours)

Date/Time Entered Condition III:_____

Action Items:

- ☐ Provide the status of the storm to site personnel on an hourly basis.
- ☐ Take actions to secure job site necessary for Condition I that cannot be accomplished in 18 hours.
- ☐ Recheck all items on checklist IV to ensure they are complete (i.e. gas tanks are still filled).

See itemized equipment checklist (itemized list of equipment to be secured/removed and COR for action).

Condition III Action Items Complete:_____ **Date:**_____

HURRICANE PREPAREDNESS CHECKLIST

Itemized Equipment Checklist, Condition III

[illegible]

HURRICANE PREPAREDNESS CHECKLIST

Condition II

Date/Time Entered Condition II: _____

Action Items:

- ☐ Evacuate all visitors from the site.
- ☐ Conduct a role call of site personnel and inform the Project Manager.
- ☐ Check the status all incoming shipments of supplies and equipment.
- ☐ Remove all unnecessary vehicles from the site.
- ☐ Secure heavy equipment in accordance with manufacturer's specification.
- ☐ Secure all valuable records and equipment.
- ☐ Release personnel from the site.
- ☐ Recheck all items on checklist IV and III to ensure they are complete (i.e., gas tanks are still filled).

Condition II Action Items Complete: _____ **Date:** _____

HURRICANE PREPAREDNESS CHECKLIST

Condition I

Date/Time Entered Condition I: _____

Action Items:

- ☐ Complete all action items for lower conditions of readiness.
- ☐ Secure job site access and evacuate to safe refuge.

Condition I Action Items Complete: _____ **Date:** _____

HURRICANE PREPAREDNESS CHECKLIST

Resume Site Operations

Date/Time Resume Site Operations:_____

Action Items:

- ☐ Conduct a damage survey.
- ☐ Notify all site personnel when to return to work.
- ☐ Develop a prioritized recovery plan.
- ☐ Inspect electrical equipment before re-energizing to detect and repair damage.
- ☐ Provide bottled water for drinking until normal drinking water is deemed safe to drink.
- ☐ Remove storm debris from site.
- ☐ Notify Program Manager of the resumption of site activities.

Resume Site Operations Action Items Complete:_____ **Date:**_____

ATTACHMENT B

EMERGENCY PHONE NUMBERS

<u>Local Agencies –</u> Ambulance Fire Police	911 911 911
<u>Hospital</u> Riverview Medical Center 1 Riverview Plaza Red Bank, NJ 07701 <u>Health Resource Clinic</u> Concerta Medical Center 135 Raritan Center Parkway Edison, NJ 08837 Directions to the Health Resource Clinic and the hospital are located in Appendix D of the SSHSP	Emergency – 911 (732) 741-2700 (732) 225-5454
Regional Poison Control Center	800-552-6337
<u>Federal Agencies</u> Agency for Toxic Substances and Disease Registry National Response Center	(404) 639-0615 (24 hr.) 800-424-8802
<u>Army</u> Timothy Peck, USACE Baltimore District Wanda Green, Fort Monmouth DPW	(410) 962-3416 (office) Redacted - Privacy Act (cellular) (732) 532-8341 (office)
<u>Shaw Personnel</u> Project Manager – Doug Schicho Site Superintendent/Site Safety Officer – Mark Magness Program Safety Manager – Robert A Brooks, CSP Regional Health & Safety Manger – Winston (Doug) Russell,	(973) 770-5306 (office) (973) 770-5302 (office) Redacted - Privacy Act (cellular) (973) 770-5325 (office) Redacted - Privacy Act (cellular) Redacted - Privacy Act (cellular) (865) 692-3584 (office)
Shaw Corporation (24 hour)	866-299-3445

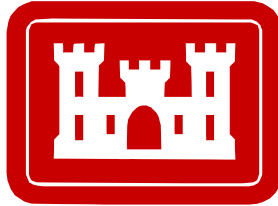
ATTACHMENT C

HURRICANE TRACKING MAP

This map will be posted on the job site in the event of an actual hurricane. The map will be updated daily for the NOAA web site.

APPENDIX G
ACCIDENT PREVENTION PLAN

**ACCIDENT PREVENTION PLAN
FORT MONMOUTH SITE INVESTIGATION**



Prepared for:

**U.S. Army Corps of Engineers
Baltimore District**

**Contract No.
W912DR-05-D-0026**

Prepared by:

Shaw Environmental, Inc.
111 Howard Blvd., Suite 110
Mt Arlington, NJ 07856

SHAW PROJECT NUMBER 124976

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LIST OF ACRONYMS AND ABBREVIATIONS

AHA	Activity Hazard Analysis
ANSI	American National Standards Institute
APP	Accident Prevention Plan
ASTM	American Society for Testing and Materials
CD	Compact Disc
CFR	Code of Federal Regulations
EH&S	Environmental Health and Safety
EMR	Experience Modification Rate
HAZWOPER	Hazardous Work Operations
HSM	Health and Safety Manager
NIOSH	National Institute for Safety and Health
OSHA	Occupational Safety and Health Administration
PM	Project Manager
PPE	Personal Protective Equipment
Shaw	Shaw Environmental, Inc.
SSHSP	Site-Specific Health and Safety Plan
SS/SSO	Site Supervisor/Site Safety Officer
USCG	U.S. Coast Guard

1.0 BACKGROUND INFORMATION

The primary site tasks include the following:

- Mobilization and Site Preparation.
- Radiological Survey (covered in specific detail in **Appendix L**).
- Soil Gas Sampling.
- Indoor Air Sampling – Summa Canister.
- Geophysical Surveys.
- Soil Sampling.
- Surface Water/Sediment Sampling.
- Geoprobe® Soil and Groundwater Sampling.
- Existing Monitoring Well Groundwater Sampling.
- Exploratory Test Pit Excavation.
- Site Restoration/Demobilization.

Activity Hazard Analyses (AHAs) have been prepared for the above activities and are included in Attachment C of the Site-Specific Health and Safety Plan (SSHSP).

Shaw Environmental, Inc. Accident Experience

YEAR	Experience Modification Rate (EMR) (Interstate)	OSHA Recordable Incident Rate
2006	0.52	0.83
2005	0.49	1.03
2004	0.50	1.07

2.0 STATEMENT OF SAFETY AND HEALTH POLICY

CORPORATE POLICY

Subject: SAFETY

PURPOSE AND SUMMARY

It is the policy of Shaw Environmental, Inc. (Shaw) to provide a safe and healthful workplace for all employees, subcontractors, and consultants in compliance with governmental requirements. Additionally, the requirements of our clients shall take precedence provided that their requirements exceed those of Shaw and governmental regulations.

We believe in two fundamental principles of safety: all accidents, injuries, and occupational illnesses are preventable; and if an operation cannot be done safely, we will not do it. To put these principles into practice, every associate will receive the appropriate training, equipment, and other resources necessary to complete assigned tasks in a safe and efficient manner.

Safety, industrial hygiene, and loss prevention are the direct responsibility of all members of management, who must create an environment in which everyone shares a concern for their own safety and the safety of their associates. Safety shall take precedence over expediency or shortcuts. It is a condition of employment that all employees work safely and follow established safety rules and procedures. No individual(s) may pose a direct threat to the health and safety of other individuals in the workplace.

Managers must conduct their businesses in compliance with governmental safety regulations and company procedures. All Shaw health and safety procedures shall be implemented for all Shaw employees on all projects where Shaw is the subcontractor, or a joint venture partner. If Shaw is the prime contractor, Shaw procedures shall be applied to all Shaw and subcontractor personnel.

The implementation of effective safety and health practices is a key measure of managerial performance. Management, with the assistance of the internal health and safety professional staff, will conduct audits to assess the effectiveness of the safety program(s) in place, and to identify areas for improvement. All deficiencies shall be corrected promptly.

All injuries, occupational illnesses, vehicle accidents, and incidents with potential for injury or loss will be investigated. Appropriate corrective measures will be taken to prevent recurrence, and to continually improve the safety of our workplace.

3.0 RESPONSIBILITIES AND LINES OF AUTHORITY

Safety responsibilities, accountability and lines of authority are discussed in Section 2.0 of the SSHSP. The Project Manager (PM), Site Supervisor/Site Safety Officer (SS/SSO), and Health and Safety Manager (HSM) are responsible for formulating and enforcing health and safety requirements, and implementing the SSHSP.

4.0 SUBCONTRACTORS AND SUPPLIERS

Each subcontractor working on the project site will be required to adhere to the SSHSP and the requirements presented below.

4.1 SUBCONTRACTOR/SUPPLIER COORDINATION AND CONTROL

All subcontractors will be screened for safety performance and compliance with Federal alcohol and drug testing requirements prior to being issued any contract for site work. Subcontractors will comply with the requirements for site safety as outlined in Shaw's Health and Safety Procedure HS011 (Attachment B of the SSHSP). The SS/SSO will be responsible for the conduct and control of Shaw subcontractors.

4.2 SUBCONTRACTOR/SUPPLIER SAFETY RESPONSIBILITIES

All subcontractor employees are subject to the same training and medical surveillance requirements as Shaw personnel depending on job activity. All activities involving the potential for exposure to hazardous waste materials will require medical and training certification as mandated by 29 Code of Federal Regulations (CFR) 1910.120 and 29 CFR 1926.65. All subcontractor personnel will be required to sign in daily and attend a daily meeting discussing operations and safety issues. All subcontractors involved in construction/remedial activities will complete a Subcontractor Pre-Job Safety Checklist prior to the start of work at the site. Subcontractors will submit AHAs for their work activities to the SS/SSO. The subcontractor reports directly to the PM. All incidents involving subcontractor employees shall be reported to the SS/SSO and a copy of the subcontractor's injury/illness report shall be submitted to the SS/SSO within 24 hours.

Subcontractors are required to read and sign the SSHSP and comply with all requirements of this Accident Prevention Plan (APP). Contractors not in compliance will be immediately dismissed from the site.

Suppliers delivering various materials to the project site or providing equipment/ equipment maintenance will comply with all Naval Facility rules and regulations. Supplier personnel will not be permitted into contaminated areas unless training and medical surveillance is in accordance with 29 CFR 1910.120/1926.65. Contractors will not ride on tractors, forklifts or similar vehicles unless specific seats are provided. They will follow facility hot work rules if hot work is required for vehicle or equipment maintenance. Trucks will be loaded and unloaded in a safe and effective manner, and materials will be stored safely in designated locations only. Associated packaging will be properly disposed of, and litter will not be permitted to be scattered or blown from truck beds. Operators of mobile equipment on site must observe all traffic rules such as speed limits and right-of-ways of pedestrians.

5.0 TRAINING

Outlines of the site safety orientation and training for site personnel, subcontractors, and visitors are provided in Section 10.0 of the SSHSP.

5.1 MANDATORY TRAINING AND CERTIFICATIONS

Mandatory training and certifications are discussed in Section 10.0 of the SSHSP.

5.2 EMERGENCY RESPONSE TRAINING

All Shaw personnel who have completed the Shaw 40-hour Hazardous Work Operations (HAZWOPER) Training are qualified as emergency responders per 29 CFR 1910.120/1926.65 (e)(3)(iv). Site-Specific Emergency Response Procedures will be reviewed with all site personnel as a part of site indoctrination.

5.3 SUPERVISORY AND EMPLOYEE SAFETY MEETINGS

The Shaw SS/SSO will conduct daily safety meetings at the start of each work shift for on-site personnel and will require subcontractors to follow similar meeting procedures or participate in the Shaw daily safety meetings. Daily safety meetings will comply with HS051 (Attachment B of the SSHSP).

6.0 HEALTH AND SAFETY INSPECTIONS

6.1 INSPECTIONS

The Shaw Project Manager and SS/SSO are required to conduct bi-monthly inspections of the sites using the Project Safety Inspection Report. The SS/SSO is responsible for conducting and preparing reports of daily safety inspections of work processes, site conditions, and equipment conditions and submitting them to the HSM. The SS/SSO will discuss any necessary corrective actions with the SS/SSO and review new procedures. Copies of these reports are maintained on file at the project locations.

The Shaw HSM representative may periodically conduct site visits and perform Site Safety Assessments. These reports are kept on file at the Mount Arlington, New Jersey, office and are tracked in a database for each Shaw PM and SS/SSO, including the number of action items noted during the visit and written confirmation of the corrective actions for each item. These responses are compiled and provided to program management for review.

6.2 EXTERNAL INSPECTIONS/CERTIFICATIONS

Shaw does not anticipate the use of outside sources for safety inspections, but may consider their use should it become necessary.

As required, safety equipment will comply with appropriate regulations of OSHA (Occupational Safety and Health Administration), NIOSH (National Institute for Occupational Safety and Health), ANSI (American National Standards Institute), ASTM (American Society for Testing and Materials), U.S. Coast Guard (USCG), or other recognized certification organizations.

7.0 SAFETY AND HEALTH EXPECTATIONS, INCENTIVE PROGRAMS, AND COMPLIANCE

Shaw considers safety the highest priority during work at a site containing potentially hazardous materials and has established a goal of **zero incidents** for all projects. All projects will be conducted in a manner that minimizes the probability of near misses, equipment/property damage or injury. Shaw will establish programs to recognize people and projects that demonstrate excellence in safety performance. Shaw will use safety observation programs to identify and correct unsafe acts and conditions. Safety awareness programs will be used to provide continuous training and development of good safety practices. Shaw site supervision will investigate all incidents to determine root causes and institute corrective actions to prevent recurrence. Shaw will provide and enforce safety rules to protect employees, subcontractors, clients, and the public.

7.1 SHAW SAFETY INCENTIVE PROGRAMS

A copy of the Shaw Safety Incentive Award Program will be available at each project. The Shaw PM will develop a site-specific program for approval by the HSM and the Program Manager within 10 days of project mobilization.

7.2 SHAW EMPLOYEE SAFETY RESPONSIBILITY REQUIREMENTS

Each employee is responsible for personal safety as well as the safety of others in the area and is expected to participate fully in the **Safety Improvement Process**, particularly the Safety Observation Program. The employee will use all equipment provided in a safe and responsible manner as directed by the SS/SSO. All Shaw personnel will follow the policies set forth in the Shaw Health and Safety Procedures HS001-999 (Available on site on compact disc [CD]). Site personnel concerned with any aspect of health and safety shall bring it to the attention of the SS/SSO. If not satisfied, they should contact the HSM. All project personnel have the authority to stop work if in their judgment serious injury could result from continued activity. The SS/SSO shall be notified immediately if this becomes necessary. To protect the health and safety of all personnel, employees that knowingly disregard safety policies/procedures may be subject to disciplinary actions up to and including termination. Shaw Employee Safety Responsibility is fully detailed in HS010 Employee Safety and Health Work Rules (Attachment B of the SSHSP).

7.3 MANAGERS AND SUPERVISORS SAFETY ACCOUNTABILITY

It is the duty of the first line supervisor to motivate employees to adhere to Shaw's safety policy in each work situation. A first line supervisor for these purposes is defined as that person designated to give immediate on-site supervision to personnel involved in a task.

All supervisors shall have complete knowledge of the safe procedure for all jobs and tasks under their supervision, or when in doubt, shall seek assistance prior to initiating a task. This is the only acceptable manner in which to perform the task. If the task cannot be accomplished safely, it will not be attempted.

Supervisors will:

- Explain the safety procedure involved with a task to each employee and check frequently to see that the employee understands and works as instructed.
- Allocate sufficient time for the training and coaching of all employees to insure that everyone knows the correct procedure for safely accomplishing required tasks.
- Prevent new employees from performing any tasks until required training is completed.
- Immediately correct unsafe conditions that involved site employees or contractors.
- Ensure that the employees are outfitted with and wear personal protective equipment (PPE) as specified by this APP, SSHSP, other Shaw procedures, or as directed by the HSM.
- Set a good safety example.
- Obtain the cooperation of employees and contractors.
- Provide a safe work environment for employees and contractors.
- Confirm contractor safety performance records have been verified prior to contract award and monitor contractor performance during operations.
- Report all accidents, near misses, and property damage in accordance with the Incident Management and Reporting Procedure.
- Establish a safety culture, using the elements of the Shaw Safety Improvement process, which promotes awareness, encourages participation, and recognizes excellence.

8.0 ACCIDENT REPORTING

8.1 EXPOSURE DATA (MAN-HOURS WORKED)

Shaw's Environmental Health and Safety (EH&S) Manager tracks and maintains incident records as to Federal reporting requirement. Incident rates are reported monthly to Shaw's EH&S Manager. Incident Rates and Workers Compensation losses are tracked for each business line.

8.2 ACCIDENT INVESTIGATIONS, REPORTS AND LOGS

The SS/SSO conducts accident/incident investigations. A report is completed by the SS/SSO and it must be submitted to the Shaw Baton Rouge, Louisiana, Safety Department within 24 hours. All incident reporting forms are provided in HS020.

8.3 IMMEDIATE NOTIFICATION OF MAJOR INCIDENTS

Shaw will immediately notify the client of any major incident, including injury, fire, equipment/property damage, and environmental incident. A full report will be provided within 24 hours. The following procedure will be followed in response to any major personal injury.

8.4 ACCIDENT RESPONSE

The nearest workers will immediately assist a person who shows signs of medical distress or who is involved in an accident. The work crew supervisor will be summoned.

The work crew supervisor will immediately make radio contact with the SS/SSO to alert him of a medical emergency situation. The work crew supervisor will advise the following information:

- Location of the victim at the work site.
- Nature of the emergency.
- Whether the victim is conscious.
- Specific conditions contributing to the injury, if known.

9.0 *MEDICAL SUPPORT*

On-site Medical Support/Off-site Medical Arrangements will be outlined in Section 9.0 of the SSHSP.

10.0 PERSONAL PROTECTIVE EQUIPMENT

Protection levels provided in the SSHSP will be established for the site work activities based on the levels of site contaminants and the scope of work. Once on site, results of air monitoring and visual inspection of the work activities may indicate the need for changes in these PPE level(s). Any significant change in the PPE level will be approved by the SS/SSO in consultation with the Certified Industrial Hygienist and/or HSM. PPE selection criteria are outlined in HS600 and HS601 (Attachment B of the SSHSP).

All personnel using respiratory protection will be cleared by a physician for use of a respirator and will be fit-tested to assure they can achieve an acceptable fit. Physician clearance and results of fit testing will be documented as required by HS100 (Attachment B of the SSHSP).

11.0 PLANS REQUIRED BY THE SAFETY MANUAL

11.1 HAZARD COMMUNICATION PROGRAM

The Site-Specific Hazard Communication Program is included Section 4.2 of the SSHSP. Shaw Hazard Communication Program complies with 29 CFR 1926.59/1910.1200 and is outlined in HS060 (Attachment B of the SSHSP).

11.2 EMERGENCY RESPONSE PLANS

The Emergency Response and Contingency Plan is included in Section 9.0 of the SSHSP.

11.3 LAYOUT PLANS

Work zones are defined in Section 5.0 of the SSHSP.

11.4 RESPIRATORY PROTECTION PLAN

The primary objective of respiratory protection is to prevent employee exposure to atmospheric contamination. When engineering measures to control contamination are not feasible, or while they are being implemented, personal respiratory protective devices will be used.

The criteria for determining respirator need have been evaluated based on the site contaminants. Air monitoring will be conducted to confirm that respiratory protection levels are adequate. All respirator users will be OSHA trained in proper respirator use and maintenance. The SS/SSO will observe workers during respirator use for signs of stress. The SS/SSO and HSM will also periodically evaluate the implementation of the SSHSP to determine its continued effectiveness with regard to respiratory protection. All persons assigned to use respirators will have medical clearance to do so.

11.5 CONTINGENCY PLAN FOR SEVERE WEATHER

Contingency plans for severe weather are included in Section 9.0 of SSHSP. A Hurricane Preparedness Plan is located in Attachment F of the SSHSP.

11.6 ALCOHOL AND DRUG ABUSE PREVENTION PLAN

Shaw substance abuse procedures are outlined in Shaw HS101 – Drug and Alcohol Testing.

12.0 CONTRACTOR INFORMATION TO MEET THE REQUIREMENTS OF THE MAJOR SECTIONS OF EM 385- 1-1

In addition to this APP, Shaw has prepared a SSHSP to meet the major requirements of United States Army Corps of Engineers Manual 385-1-1. Additional procedures for major requirements are provided in the Shaw Health and Safety Procedures Manual HS001-999 (Available on site on CD).

APPENDIX H
SAFETY PLAN ACKNOWLEDGEMENT

WORKER ACKNOWLEDGEMENT TO HEALTH-AND-SAFETY PLAN

Page 1 of 3

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I have been informed of, and will abide by, the procedures set forth in the SSHSP developed for the Fort Monmouth Site Investigation Sampling Activities. I have also been provided with an opportunity to read this SSHSP and the hazard communication program. I have been properly trained, medically monitored, and fit tested for the work that I am to perform.

[illegible]

WORKER ACKNOWLEDGEMENT TO HEALTH-AND-SAFETY PLAN

Page 2 of 3

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I have been informed of, and will abide by, the procedures set forth in the SSHSP developed for the Fort Monmouth Site Investigation Sampling Activities. I have also been provided with an opportunity to read this SSHSP and the hazard communication program. I have been properly trained, medically monitored, and fit tested for the work that I am to perform.

[illegible]

WORKER ACKNOWLEDGEMENT TO HEALTH-AND-SAFETY PLAN

Page 3 of 3

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I have been informed of, and will abide by, the procedures set forth in the SSHSP developed for the Fort Monmouth Site Investigation Sampling Activities. I have also been provided with an opportunity to read this SSHSP and the hazard communication program. I have been properly trained, medically monitored, and fit tested for the work that I am to perform.

[illegible]

APPENDIX I
OSHA 300 LOG

Log of Work-Related Injuries and Illnesses

 Year 2006

Form approved OMB no. 1218-0176

Establishment name	Shaw E&I (Federal Business Line)
--------------------	----------------------------------

City Alexandria State Virginia

[illegible]

Public

Be sure to transfer these totals to the Summary page (Form 300A) before you post it.

Page totals

Page 1 of 1

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APPENDIX J
BLOOD BORNE PATHOGENS EXPOSURE CONTROL PLAN

Blood-Borne Pathogen Exposure Control Plan

Blood-borne pathogens are microorganisms (i.e., bacteria, virus) sometimes present in blood and certain body fluids, which are capable of causing human disease or death. These pathogens can also be present on objects and surfaces that have had contact with infected blood or certain body fluids. Blood-borne pathogens are also capable of causing human disease or death to unprotected people who are exposed to infected blood or body fluids. Diseases caused by blood-borne pathogens include, but are not limited to, hepatitis A, hepatitis B, hepatitis C, malaria, acquired immunodeficiency syndrome (AIDS), and other sexually transmitted diseases. The most significant of these and of greatest concern are hepatitis B and AIDS.

Hepatitis B is a serious disease caused by the hepatitis B virus (HBV), which attacks the liver. The virus can cause lifelong infection, cirrhosis (scarring) of the liver, liver cancer, liver failure, and death. Exposure symptoms include fever, fatigue, nausea, vomiting, muscle aches, loss of appetite, and jaundice (yellowing of the eyes or skin). Hepatitis diagnosis is difficult because some symptoms are similar to the flu and may remain mild for an extended period. The HBV can remain infectious for up to 10 days, even in dried blood. Hepatitis B vaccine is available for all age groups to prevent HBV infection.

Human immunodeficiency virus (HIV) is the virus that causes AIDS. People with HIV have what is called HIV infection. Some of these people will develop AIDS because of their HIV infection. Humans may be infected with HIV for many years without experiencing any symptoms. Upon development of AIDS, symptoms may include weight loss, skin lesions, dry cough, fever, fatigue, diarrhea, swelling of the lymph glands, and death. Presently, no cure exists for HIV or AIDS, and no vaccination is currently available.

A hazard exists for blood and other bodily fluids to be infected with dangerous, infectious pathogens. Employees could become infected if they are exposed to these blood-borne pathogens.

The purpose of this Blood-borne Pathogen Exposure Control Plan is to provide the information, procedures, and requirements necessary to prevent employee exposure to blood-borne pathogens.

Regulatory, Requirement, and Policy Compliance

This Blood-borne Pathogen Exposure Control Plan has been prepared in compliance with:

- 29 CFR 1910.1030, Blood-borne Pathogens
- *EM 385-1-1, Safety and Health Requirements Manual* (USACE, 2003a), Section A.03.06
- Shaw E & I Procedure No. HS512

Exposure Determination

The OSHA requires employers to perform an exposure determination, identifying employees who may incur occupational exposure to blood or other potentially infectious materials. The exposure determination is made without regard to the use of PPE. For exposure determination purposes, employees are considered to be exposed, even if they wear PPE.

Activities at this project do not present a high risk of employee exposure to blood or other body fluids. An exception to this would be under circumstances when personnel administer first aid care or CPR to injured workers and when personnel clean-up areas and equipment that may have been exposed to blood because of the incident. In these cases, there is reasonable potential for employee skin, eye, mucous membrane, or potential contact with blood or other bodily fluids.

The OSHA requires a listing of job classifications with identification of tasks performed in which some employees may have potential for occupational exposure. This requirement is for employees to clearly understand the tasks that they may perform have a potential for occupational exposure to infectious materials. The job classifications and associated tasks with an exposure potential are as follows:

- Field Supervisor—Administer first aid or CPR; decontaminate or disinfect surfaces and articles that have contacted infectious materials, and prepare biohazard waste for temporary storage and subsequent disposal.
- Site Safety and Health Officer—Administer first aid or CPR; decontaminate or disinfect surfaces and articles that have contacted infectious materials, and prepare biohazard waste for temporary storage and subsequent disposal.
- Laborer—Administer first aid or CPR; decontaminate or disinfect surfaces and articles that have contacted infectious materials, and prepare biohazard waste for temporary storage and subsequent disposal.

These employees have potential for exposure to blood-borne pathogens when administering first aid or CPR and when performing post-accident clean-up operations due to the following:

- Contact or absorption of blood or blood-contaminated objects through open or broken skin (i.e., cuts, scratches, and rashes)
- Blood splashes to their eyes, nose, or mouth, or other mucous membranes
- Punctures through the skin with a contaminated sharp object (such as, scissors)

Workers can reduce their risk of contacting blood-borne pathogens by implementing the recommended work practices (outlined in this plan) before, during, and after responding to emergency medical incidents primarily involving personal injuries.

Schedule of Implementation

The procedures in this Blood-borne Pathogen Exposure Control Plan are to be implemented immediately.

Implementation includes:

- Verifying personnel who are available to voluntarily provide first aid care and CPR hold a valid training certificate from a reputable training provider (American Red Cross or American Heart Association).

The SSHO is responsible for verifying that an appropriate number of personnel have been trained in and hold valid certification to perform first aid and CPR.

- Verifying that personnel voluntarily providing first aid care, CPR, post-accident clean-up operations, and biohazard waste handling have received the specialized training meeting the requirements of 29 CFR 1910.1030; *EM 385-1-1, Safety and Health Requirements Manual* (USACE, 2003a), Section A.03.06; and Shaw E & I Procedure No. HS512. This training is required for applicable personnel prior to the commencement of work and at least annually thereafter. This training shall cover the following elements:
 - Copy of 29 CFR 1910.1030 and this procedure including an explanation of the contents
 - General explanation of the epidemiology and symptoms of blood-borne diseases
 - Explanation of the modes of transmission of blood-borne pathogens

- Explanation of the appropriate methods for recognizing tasks and other activities that may involve exposure to blood and other potentially infectious materials
- Explanation of the use and limitations of practices that will prevent or reduce exposure including appropriate engineering controls, work practices, and PPE
- Information of the types, proper use, location, removal, handling, decontamination, and/or disposal of PPE
- Explanation of the basis for selection of PPE
- Information on the hepatitis B vaccine, including information on its efficacy, safety, and the benefits of being vaccinated
- Information on the appropriate actions to take and persons to contact in an emergency
- Explanation of the procedure to follow if an exposure incident occurs including the method of reporting the incident and the medical follow-up that will be made available
- Information on the medical counseling that is provided for exposed individuals
- Explanation of required signs and labels

The SSHO is responsible for verifying that this blood-borne pathogen training has occurred.

- Verifying that engineering controls are readily available at the project for use in an emergency. Engineering controls for this project include the following:
 - (5) Red-bags for temporary storage of contaminated PPE and cleaning materials
 - (1) Appropriately labeled, 30-gallon hard-plastic container for the temporary storage of red-bagged waste
 - (1) Whisk-broom and dust pan for cleaning up contaminated broken glass
 - (1) Gallon container of Clorox® household bleach
 - (1) Large utility sponge

- (2) Rolls of paper towels
- (1) Container of liquid disinfectant hand soap
- (10) “Biohazard” warning labels
- (10) Individually packaged disinfectant towelettes
- (2) CPR barriers

The SSHO is responsible for verifying that this inventory of engineering controls is readily available at the project site for emergency use.

- Verifying that the appropriate PPE for use in an emergency is readily available at the project site.

Personal protective equipment is necessary to prevent employee exposures to infectious materials. The necessary PPE, which shall be maintained separately for use in an emergency include the following:

- (Five) P-100 Particulate filtering face-piece respirator (3-M 8293 or equivalent)
- (Two) Face-shields with ratcheting head-suspension
- (Three-pair) Safety glasses with clear lens
- (Box of 100) Disposable nitrile examination gloves
- (Three-pair) PVC Monkey Grip work gloves
- (Four) Poly-coated or Saran-coated disposable Tyvek® coveralls with attached hood
- (Eight-pair) Vinyl or latex disposable boot covers
- (Eight) Fluid-resistant surgical hoods

The SSHO is responsible for verifying that the above inventory of PPE is readily available at the project site for emergency use.

Work Practice Controls

Work practice controls reduce the likelihood of exposure by altering the manner in which a task is performed. The work practice controls outlined in this section are applicable to the administration of first aid and the subsequent clean-up operations.

Work practice controls shall be instituted whenever there is potential for employee contact with blood and bodily fluid. Situational examples where these controls are to be implemented include, but are not limited to:

- The voluntary administration of first aid care, such as application of bandages to minor or major cuts and abrasions of another person. This care may allow for contact with sores, wounds, broken skin, blood, or other bodily fluids.
- The voluntary administration of first aid care, such as providing CPR.
- Clean-up activities involving handling soiled articles (e.g., gauze, bandages, compresses, etc.) and the decontamination or disinfecting of surfaces and articles that have contacted potentially infectious materials, such as blood or other bodily fluids.
- Prepare biohazard waste for temporary storage and subsequent disposal.

Based upon professional judgment, an employee may choose to temporarily forego the use of PPE if the employee determines that the use of the PPE will further jeopardize his well-being or that of the injured worker. This limited application must be carefully evaluated and considered by the employee. If this situation does occur, Shaw will investigate and document the circumstances in an effort to provide alternative means to avoid further occurrence.

The following are specific work practice controls that shall be implemented in the above noted situations or whenever an employee determines that the implementation of these work practices is prudent or necessary:

- The appropriate PPE shall be donned prior to engaging in any activities that have the potential for employee contact with potentially infectious materials, such as blood or other bodily fluids.
- Hands and face will be washed as soon as possible after engaging in any activities that have the potential for employee contact with potentially infectious materials, such as blood or other bodily fluids. If wash facilities are not readily available, individually packaged disinfectant towelettes may be used in the interim.
- Eating, drinking, or smoking is not allowed in any work area where a potential exists for occupational exposure to blood-borne pathogens.
- Open wounds or cuts shall be promptly bandaged.
- Work surfaces and areas shall be cleaned and disinfected immediately after being contacted by potentially infectious materials. A 10 percent bleach solution (one part bleach added to nine parts water) shall be applied and

allowed to have a contact time of 15 minutes. Non-disposable articles, equipment, or materials contaminated with potentially infectious materials shall be similarly cleaned/disinfected prior to reuse.

- All bins, pails, cans, and similar receptacles intended for reuse, which have become contaminated with blood or other potentially infectious materials shall be cleaned and disinfected immediately after use.
- Broken glassware, which may be contaminated, shall not be picked up directly by hand. Broken glass shall be picked-up using mechanical means, such as by using a whiskbroom and dustpan.
- All PPE shall be immediately removed upon leaving the potentially contaminated work area, or as soon as possible if visibly contaminated. The contaminated PPE shall be placed in a labeled “red-bag” and then placed in the 30-gallon container for temporary storage and subsequent disposal.
- Any clothing that has contacted blood or other potentially infectious fluids shall be removed as soon as possible.
- Any clothing that has contacted blood or infectious fluids shall be placed in a labeled “red-bag” and then placed in the 30-gallon container for temporary storage and subsequent disposal.

Universal Precautions

Universal precautions is a method of infection control, which operates on the assumption that all human blood and bodily fluids are to be treated as if they are known to be infectious for HIV, HBV, or other blood-borne pathogens. Universal precautions shall be observed to prevent contact with blood or other potentially infectious materials. Universal precautions consist of the following practices:

- All workers shall routinely use appropriate barrier precautions to prevent skin and mucous-membrane exposure when contact with blood or other bodily fluids is anticipated. Gloves should be worn for touching blood and bodily fluids, mucous membranes, or non-intact skin and for handling items or surfaces contaminated with blood or body fluids. Masks and protective eyewear or face shields shall be worn during procedures that are likely to generate droplets of blood or other body fluids to prevent exposure of mucous membranes of the mouth, nose, and eyes. Protective suits shall be worn during procedures that are likely to generate splashes of blood or other bodily fluids.
- Hands and other skin surfaces shall be washed immediately and thoroughly if contaminated with blood or other bodily fluids. Hands shall be washed immediately after gloves are removed, using a disinfectant soap.

- Cardiopulmonary resuscitation barriers or other ventilation devices should be available for use in areas in which the need for resuscitation is foreseeable.
- Workers who have exudative lesions or weeping dermatitis shall be excluded from handling potentially infectious materials until the condition resolves.
- Pregnant workers should be especially familiar with and strictly adhere to precautions to minimize the risk of transmission.

Personal Protective Equipment

The proper use of PPE is an effective work practice control. The following requirements for PPE are mandatory whenever there is potential for employee contact with blood and bodily fluid:

- Inspect PPE prior to use to verify it is in good working order and without defects.
- Blood or other potentially infectious materials.
- Disposable (single use) gloves, such as surgical or examination gloves shall be replaced when visibly soiled, torn, punctured, or when their ability to function as a barrier is compromised. Gloves should be changed as soon as possible after contact with blood or bodily fluids. After use, remove gloves from top to bottom inside out, not allowing unprotected skin to contact the exterior of the gloves. Hands and other skin surfaces shall be washed with disinfectant soap immediately after care has been rendered or clean up has been completed. Gloves reduce the incidence of blood contamination of hands, but they cannot prevent penetrating injuries caused by sharp objects. Do not reuse gloves once removed. A CPR barrier shall be used when administering CPR.
- Protection for the eyes, face, hands, body, feet, and against inhalation hazards shall be provided as appropriate for each job.
- Gloves shall be worn when employees have the potential for direct skin contact with or when handling items or surfaces soiled with blood, other potentially infectious materials, mucous membranes, and non-intact skin.
- Polyvinyl chloride work gloves may be disinfected for immediate reuse if the integrity of the glove is not compromised; however, gloves must be discarded if they are cracked, peeling, discolored, torn, punctured, or exhibit other signs of deterioration. All gloves shall be discarded at the conclusion of the activity or at the end of the shift – whichever comes first.
- Masks and eye protection or chin-length face shields shall be worn whenever splashes, spray, splatter, droplets, or aerosols of blood or other potentially infectious materials may be generated and there is a potential for eye, nose, or mouth contamination.

- Fluid-resistant clothing (e.g., coated Tyvek® suits) shall be worn if there is a potential for splashing or spraying of blood or potentially infectious materials. Coated Tyvek® coveralls shall also be worn during clean-up activities involving decontamination or disinfecting of surfaces and articles that have contacted potentially infectious materials, and when preparing biohazard waste for temporary storage and subsequent disposal.
- Fluid-resistant clothing (e.g., coated Tyvek® suits) shall be worn if there is a potential for clothing becoming soaked with blood or other potentially infectious materials.
- Surgical caps or hoods shall be worn if there is a potential for splashing or splattering of blood or potentially infectious materials on the head.
- Fluid-proof coverings shall be worn if there is a potential for shoes or boots to contact blood or other potentially infectious materials.
- Disposable nitrile or vinyl gloves shall be worn for touching blood and bodily fluids requiring universal precautions, mucous membranes, or non-intact skin and for handling items or surfaces soiled with blood or bodily fluids to which universal precautions apply.

Waste Handling

All wastes generated because of administering emergency first aid care and the subsequent clean-up activities shall be placed in red-bags, labeled as a biohazard, and kept separately from other trash. Wastes used in medical emergency treatment (i.e., gloves, towels, and gauze) shall also be bagged and stored in an identical manner. Red-bagged, biohazard waste shall be placed in the 30-gallon collection container, labeled, and secured for temporary storage and disposal. Additional containers shall be obtained as needed and containers shall not be overfilled.

Biohazard Waste Disposal

A Shaw Transportation and Disposal Coordinator shall be contacted to arrange for proper disposal of biohazard wastes. The waste shall remain secured on site in labeled container(s) until disposal arrangements have been made at an approved disposal facility. Disposal of the infectious waste container(s) shall be in accordance with applicable local, state, and federal regulations.

Medical Requirements

Employees receive medical evaluations in accordance with Shaw E & I Procedure No. HS100. The medical requirements of this exposure control plan include provisions for vaccinations to all exposed employees as well as for post-exposure procedures and evaluations. All employees with potential for occupational exposure to blood-borne

pathogens shall receive the hepatitis B vaccination and tetanus vaccination prior to workplace exposure, unless they read and sign a Hepatitis B and Tetanus Vaccination Declination form .

Hepatitis B Vaccination

All potentially exposed employees will have made available to them, at no cost, a hepatitis B vaccination. Recombivax or Accelerated Recombivax vaccines shall be utilized. If the employee has previously received the hepatitis B vaccination and/or antibody testing reveals that the employee is immune, a new vaccination is not required. Employees may be subjected to occupational exposure immediately after receiving the first shot in the hepatitis B vaccination series. Antibody testing shall be performed 30-days after completing the hepatitis B vaccination series. Employees unable to develop immunity shall be precluded from further occupational exposure. If a physician recommends a booster dose(s), the doses shall be provided according to standard recommendations for medical practice. The employee will also receive training as to the vaccine's efficacy, safety, benefits, and consequences prior to administration. The vaccination series may also be initiated within 24-hours of an incident with exposure potential.

Tetanus Vaccination

All employees subject to this policy shall maintain current status documentation of their tetanus vaccination [current status for tetanus vaccination is within five (5) years]. All potentially exposed employees shall be offered a tetanus vaccination at no cost.

Post-Exposure Procedures and Evaluation

All exposure incidents shall be reported as required by Shaw E & I Procedure No. HS020, "Accident Prevention Program: Reporting, Investigation and Review." The Corporate Medical Director shall be advised in addition to standard notification procedures.

Following a report of an exposure incident, each involved employee shall be offered a confidential medical evaluation and follow-up, which includes at least the following elements:

- Documentation of the route(s) of exposure.
- Hepatitis B virus and HIV antibody status of the source patient(s) (if known), and how the exposure occurred.
- The medical confidentiality rights of the source patient shall be preserved at all times.

- If the source patient can be determined and permission is obtained, collection of and testing of the source patient's blood to determine the presence of HIV or HBV infection shall be conducted under the direction of the attending physician.
- Collection of blood from the exposed employee as soon as possible after the exposure incident for the determination of HIV and/or HBV status. Actual core antibody and surface antigen testing of the blood or serum sample may be done at that time or later if the employee so requests. If the test is deferred, arrangements shall be made through the attending physician to properly archive the specimen.
- Follow-up of the exposed employee including antibody and antigen testing, counseling, illness reporting, and safe and effective post-exposure prophylaxis, according to standard recommendations for medical practice as defined by the Corporate Medical Director.

Where applicable laws require employee consent, documented consent shall be obtained prior to testing. If an employee refuses the blood test, documentation of the refusal will be made. Documentation of the test results shall be made available to the exposed employee(s). All test results shall be kept confidential.

Physician Information

The following information shall be provided to the evaluating physician:

- Copy of 29 CFR 1910.1030 and its appendices
- Description of the affected employee's duties as they relate to the employee's occupational exposure

Physician Opinion

For each potentially exposed employee evaluation, the employee shall receive a copy of the evaluating physician's written opinion within 15 working days of the completion of the evaluation. The written opinion shall be limited to the following information:

- The physician's recommended limitations upon the employee's ability to receive the hepatitis B vaccination.
- A statement that the employee has been informed of the results of the medical evaluation and that the employee has been told about any medical conditions resulting from exposure to blood or other potentially infectious materials, which require further evaluation or treatment.

- Specific findings or diagnoses, which are related to the employee's ability to receive the HBV vaccination. Any other findings and diagnoses shall remain confidential.

Hazard Communication

There are regulatory requirements for labels, signs, and training. The provisions and exceptions for these are contained in the subsections below.

Warning Labels

Containers used for disposal of blood-contaminated supplies and waste will be labeled in accordance with the word "biohazard." The following symbol shall be an integral part of the label:



Warning Signs

There are no designated areas for medical treatment on site, because first aid is provided on an emergency basis only; therefore, warning signs are not applicable. In cases of potential exposure, observers and nonessential personnel should be verbally warned to keep a safe distance from injured personnel.

Employee Training Program

All employees who are first aid/CPR trained and may provide assistance shall be trained in the requirements for voluntary providers as described in Shaw E & I Procedure No. HS512, this SHERP and its addenda, and the general provisions of this procedure.

Recordkeeping

There are federal record-keeping requirements for training, medical, and incident reporting documentation. The provisions for keeping these records are contained in the subsections below.

Training Records

All employees covered under this exposure plan shall be trained as required. A record of the training shall be appropriately generated. The training record will contain the date of the training session(s), the contents or a summary of the training session(s), the names of

persons conducting the training, and the names of all persons attending the training sessions.

The training records will be maintained by the Shaw Training Department for at least five (5) years from the training date.

Medical Records

Medical records necessary for Shaw employees will include documentation of HBV vaccination status, medical follow-up, post-exposure testing, and a medical professional's written evaluation.

The employee medical records will be forwarded to and maintained by Health Resources, 600 West Cumming Park, Suite 3400, Woburn, Massachusetts 01801-6350 for inclusion in the employee's medical file. Confidentiality of all medical records shall be maintained.

Shaw Environmental, Inc. maintains employee medical records for the duration of the employee's employment plus 30 years thereafter. If, for whatever reason, Shaw no longer does business and no successor exists, Shaw will notify the director of NIOSH in writing three (3) months prior to the disposal of records. If so directed, the records shall be transferred to the director of NIOSH.

Incident Recording

An incident that occurs because of rendering emergency medical care will be recorded on the OSHA 300 log as OSHA defines work-related injuries and illnesses. All injuries involving the release of blood or bodily fluids must be immediately reported to the Project CIH for proper reporting and follow-up.

Plan Review and Update

This Blood-borne Pathogen Exposure Control Plan shall be reviewed and updated on an annual basis.

APPENDIX K
ACCIDENT REPORTING PROCEDURE



PROCEDURE

Subject: ACCIDENT PREVENTION PROGRAM: REPORTING, INVESTIGATION, AND REVIEW

1.0 PURPOSE AND SUMMARY

The purpose of this procedure is to establish the requirements for incident reporting, investigation, and review. This procedure is an integral part of the company's overall accident prevention program and aids in the identification of potential causal factors and corrective actions. Key elements of this procedure include:

- **All occupational injuries/illnesses, vehicle accidents, and near miss incidents must be promptly reported and investigated.**
- All Occupational Safety and Health Administration (OSHA) recordable injuries/illnesses and chargeable vehicle accidents must be reviewed by an Accident Review Board. The Accident Review Board report is submitted to the Baton Rouge Corporate Safety Department, for production to and retention on behalf of the Legal Department.
- All incidents involving a fatality, major injury/illness, or resulting in significant property damage will be immediately reported to: the business line Health & Safety Manager; the Corporate Health and Safety Department; Business Line Vice President and the Legal Department.
- All investigations and associated materials obtained and/or produced, in association with OSHA recordable injuries/illnesses, chargeable vehicle accidents, fatalities, major injury/illness, or incidents resulting in significant property damage, are to be performed for & on behalf of the legal department and will be subject to being classified as Confidential Attorney-Client / Attorney Work Product.
- All business line Health & Safety Managers are required to prepare a Monthly Loss Report summarizing all current month, and year-to date, chargeable vehicle accidents, injury/illness cases (requiring outside medical care), lost work day totals and restricted work day totals. This report shall then be forwarded, by the 10th day of the following month, to the Baton Rouge Corporate Safety Office.

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3.0 RESPONSIBILITY MATRIX

3.1 Procedure Responsibility

The Corporate Health & Safety Department is responsible for the issuance, revision, and maintenance of this procedure.

3.2 Action/Approval Responsibilities

The Responsibility Matrix is Attachment 1.

4.0 DEFINITIONS

Chargeable Vehicle Accident - Any **at-fault** vehicle accident meeting any **one** of the following criteria:

- An individual other than an employee of the company is a party in the accident
- Property owned by a person or entity other than the company is damaged
- When company owned, leased or rented vehicles are involved and damage exceeds \$2,500.00.
- When an employee is driving a personal vehicle while on company business and damage exceeds \$2,500.00.

Company - All affiliates, indirect and wholly owned subsidiaries of Shaw Environmental & Infrastructure, Inc. (Shaw E & I).

Days Away From Work - Days away from work are the number of **calendar** days following the injury or illness, excluding the date of the injury.

Job Safety Analysis (JSA) – The JSA is an effective management technique for identifying hazardous conditions and unsafe acts in the workplace. A JSA is intended to analyze the individual



steps or activities, which together create a job or specific work duty, and to detect any actual or potential hazards that may be present. (See HS045: Job Safety Analysis)

Restricted Work – Occurs when, as the result of a work-related injury or illness:

- A physician or other licensed health care professional recommends that the employee not perform one or more of the routine functions of his or her job, or not work the full workday that he or she would otherwise have been scheduled to work

Near Miss Incident - Any incident where no injury occurred, but where the potential for injury existed.

OSHA Recordable Case – See Attachment 8

Vehicle - Any passenger vehicle, including trucks, used upon the highway or in private facilities for transporting passengers and/or property. For the purpose of this procedure, off-road vehicles such as earthmoving equipment, forklifts, non-highway use trucks, etc., are not considered vehicles. (See HS800 Motor Vehicle Operation: General Requirements)

5.0 TEXT

5.1 Incident Reporting Process

Employees are required to immediately report to their direct supervisor all occupational injuries, illnesses, accidents and near miss incidents having the potential for injury. Site Business Line Managers or Supervisors (supervisor directly responsible for the employee involved in the incident) with first-hand knowledge of an incident is required to:

- Immediately arrange for appropriate medical attention and notify the responsible health and safety representative.
- **As soon as practical, but not longer than one hour after gaining knowledge of the occurrence**, notify the Shaw Notification Hotline/Helpdesk by calling 1-866-299-3445 (Attachment 10) of any injury requiring off-site medical treatment, any chargeable vehicle accident or equipment incident involving property damage exceeding \$2,500 in value (Shaw or third party).
- Inform Health Resources of all incidents requiring off-site medical attention by calling 1-800-350-4511. This call should be made **prior** to transporting the employee such that they can coordinate physicians services prior to arrival of the employee to the clinic, and provide the following information:
 - Company Name (Shaw E&I) & Business Line (e.g. DOD, Commercial)
 - Employee Name
 - Name of anticipated, treating medical facility and phone number
 - Brief description of incident.



Health Resource's role is to interface with the treating physician, to ensure that appropriate care is provided to the injured employee.

- Complete the *Authorization for Treatment, Release of Medical Information, and Return to Work* (Attachment 9A, 9B, 9C) and the *Supervisor's Employee Injury Report* (Attachment 2) for all cases requiring off-site medical attention. The Site Safety and Health Representative or responsible supervisor shall ensure that the forms are completed and faxed to Health Resources at (800) 853-2641 prior to leaving the medical facility or as soon as reasonably possible.
- Post accident drug and alcohol testing shall occur in accordance with HS101 Drug and Alcohol Testing, immediately following an incident.

NOTE: Prior to performing non-DOT post accident testing, it is the responsibility of the employee's supervisor to ensure that Health Resources has verified that this testing is not prohibited or restricted by state or local regulations.

- Prior to an injured employee returning to his/her job duties, a follow-up call by Health Resources will be made to the project site. The purpose of this call is to ensure work restrictions are clarified and planned work activities are consistent with medical recommendations.
- The Supervisor shall initiate/complete the appropriate company documentation in accordance with the following incident classifications: (note: if a Site Safety and Health Representative is on site, he should work in concert with the supervisor)
 - OSHA Recordable Cases
 - a. Supervisor's Employee Injury/Illness Report (Attachment 2)
 - b. Incident Investigation Report (Attachment 5)
 - c. Witness Statement Form (Attachment 6)
 - d. Accident Review Board (Attachment 7)
 - First Aid Cases
 - a. Supervisor's Employee Injury/Illness Report (Attachment 2)
 - b. Incident Investigation Report (Attachment 5)
 - c. Witness Statement Form (Attachment 6)
 - Chargeable Vehicle Accidents
 - a. Vehicle Accident Report (Attachment 3)
 - b. Incident Investigation Report (Attachment 5)
 - c. Witness Statement (Attachment 6)
 - d. Accident Review Board (Attachment 7)
 - e. Driving Record Certification (Procedure HS800)
 - Non-Chargeable Vehicle Accidents
 - a. Vehicle Accident Report (Attachment 3)



- b. Incident Investigation Report (Attachment 5)
- c. Witness Statement (Attachment 6)

- Equipment, Property Damage and General Liability Incidents

- a. Incident Investigation Report (Attachment 5)
- b. Witness Statement Form (Attachment 6)
- c. Equipment, Property Damage and General Liability Loss Report (Attachment 4).

- Near Miss

- a. Incident Investigation Report (Attachment 5)

5.2 Supervisor's Employee Injury/Illness Report (Attachment 2)

The Supervisor's Employee Injury Report is to be completed for all incidents that result in an employee occupational injury or illness requiring off-site medical attention. It is to be initiated by the supervisor of the injured employee and forwarded to the respective Business Line Safety Manager for review / comments. Upon completion of review and comments the report should be forwarded, **within 24 Hours**, to the Shaw Corporate Claims department in Baton Rouge, via the corporate claims fax number (225.932.2636).

5.3 Vehicle Accident Report (Attachment 3)

The Vehicle Accident Report must be completed for any vehicle accident in which a company vehicle is involved. This includes company-owned or leased vehicles, rental vehicles, and personal vehicles being used for company business. This report is to be initiated by both the employee involved in the accident and his/her direct supervisor and forwarded to the respective Business Line Safety Manager for review / comments. Upon completion of review and comments the report should be forwarded to the Shaw Corporate Claims department in Baton Rouge (fax number 225.932.2636).

5.4 Equipment, General Liability, Property Damage, and Loss Report (Attachment 4)

The General Liability, Property Damage, and Loss Report is to be used for all losses or damage to company property in excess of \$2,500.00. This form must be completed for all third party property, regardless of value, damaged as a result of company activities. The employee most familiar with the events that contributed to the loss or damage will complete the form, and then forward it to the project/location manager. The Corporate Claims Department and the respective Business Line Safety Manager must receive a copy of the report within one business day of the incident.

5.5 Incident Investigation Report (Attachment 5)

All injuries, illnesses, accidents, and near miss incidents will be investigated. Once arrangements for immediate medical care have been made, the employee's direct supervisor, with assistance from the health and safety representative and Business Line Health and Safety Manager, will:

- Collect the facts;



- Describe and document (include sketch, photos, etc.) how the incident occurred;
- Collect support documentation (JSA's, AHA's, Tailgate Safety Meetings, Work Orders, etc.);
- List witnesses and collect written statements;

If applicable, contact the employee's Functional Manager in an effort to gain relevant information

- Identify the causative factors;
- Identify potentially unsafe acts or unsafe conditions that may have contributed to the incident;
- Identify potential curative action; and
- List the corrective actions which are to be executed, appropriate curative action, the person(s) responsible for the corrective action, and the date by which action is to be completed.

The investigation will be started as soon as possible following the incident and the relevant reports and support documentation (JSA's, AHA's, Tailgate Safety Meetings, Work Orders, etc.) shall be submitted to the appropriate Business Line Health and Safety Manager within 72 hours. In addition to the previous information, reports from external sources (police, insurance carriers, testing laboratories, etc.) are to be obtained as soon as they become available and forwarded by the Business Line Safety Manager to the Corporate Claims department in Baton Rouge.

5.6 Injured Employee Statement & Witness Statement Forms (Attachment 6a & 6b)

The Injured Employee and Witness Statement Forms allow for consistency in the development of the investigation process. The Injured Employee Statement must be completed in all cases where an employee injury results in off site medical treatment. If there are witnesses to the accident/incident, the Witness Statement form should be completed and signed by the subject witness. Both of these forms should be attached to the incident investigation report. It is essential that these statements are executed immediately following the incident to ensure an accurate account of the events.

5.7 Accident Review Board (ARB) (Attachment 7)

The purpose of the Accident Review Board is to collect and review the information gathered for each incident, report that information to the Legal Department and take appropriate curative action. In all cases, the purpose of the entire investigative process, inclusive of conducting an ARB, is to identify curative actions as it relates to the incident / injury. Accordingly, a diligent and concerted effort to accomplish these tasks must be established at the onset of all of the subject incidents.



In order to assist the Legal Department in evaluating the risk to, or liability of, the company, associated with OSHA recordable injuries, chargeable vehicle accidents, fatalities or incidents resulting in significant property damage, the responsible Project / Location Manager is required to coordinate with all parties and set up the ARB such that it occurs **within 10 days of the accident**. The respective Business Line Health and Safety Manager, whose project/location experiences accident is then required to conduct the subject ARB.

The Accident Review Board shall be composed of the project/location manager, the employee's direct supervisor (at time of incident), a health and safety representative, and the employee(s) involved in the incident.

Additionally, there may be cases that involve an employee that has been assigned to a project and the Functional Manager of that employee may not have direct knowledge of an incident. In cases such as these, the Functional Manager shall be notified of the incident and requested to participate in the ARB. Also, as determined by the Business Line Health and Safety Manager, a representative of other internal sources of expertise should be involved where applicable.

All investigations and associated materials obtained and/or produced, in association with injuries/illnesses resulting in OSHA recordable classification, chargeable vehicle accidents, fatalities or incidents resulting in significant property damage, are to be performed for and on behalf of the legal department and will be subject to being classified as Confidential Attorney-Client / Attorney Work Product. If the ARB is initiated under a Confidential Attorney-Client / Attorney Work Product status, all documents and other work product arising out of, or associated with, the investigation process, including the ARB, shall be prepared in anticipation of litigation. The Accident Review Board report, and associated documents, is submitted to the Corporate Safety Department, for production to and retention on behalf of the Legal Department.

The ARB report, and all associated documents, shall be completed as soon as practicable, but not more than 5 business days following the ARB meeting, and forwarded by the Business Line Safety Manager to the Corporate Safety Department, via the Corporate Claims fax number. The original documents shall then be mailed to the Corporate Safety Department. These documents shall then be filed in a lockable cabinet, separate from files not meeting the subject criteria, by the Corporate Safety Department, for production to and retention on behalf of the Legal Department. In the event that copies of these files are maintained by Business Line Safety Managers and / or the respective location in which the injury occurred, the same filing criteria shall be followed. The criteria shall be that these documents are filed in lockable cabinets, separate from files not meeting the subject Attorney-Client / Attorney Work Product criteria.

It is generally not acceptable to discipline an employee for having an accident. However, if in the opinion of the Accident Review Board, it is determined that the accident resulted from an intentional unsafe act or intentional violation of company procedure on the employee's part, the employee may be subject to disciplinary action in accordance with



the company's progressive disciplinary action system (see Human Resources Procedure HR207).

5.8 Monthly Loss Report

Each business line Health and Safety Manager is responsible to submit a Monthly Loss Report summarizing incidents that took place within their business line during the previous month. The business line Health and Safety Manager is responsible for submitting a consolidated package for the entire business line to the corporate health and safety office for **receipt no later than the 10th working day of the following month.**

6.0 EXCEPTION PROVISIONS

Variances and exceptions may be requested pursuant to the provisions of Procedure HS013, Health and Safety Procedure Variances.

7.0 CROSS REFERENCES

HR207 Disciplinary Action
HS013 Health and Safety Procedure Variances
HS101 Drug and Alcohol Testing
HS800 Motor Vehicle Operations - General Requirements
HS810 Commercial Motor Vehicles

8.0 ATTACHMENTS

1. Responsibility Matrix
2. Supervisor's Employee Injury/Illness Report
3. Vehicle Accident Report
4. Equipment, Property Damage and General Liability Loss Report
5. Incident Investigation Report
6.
 - a. Injured Employee Statement
 - b. Witness Statement
7. Accident Review Board Report
8. Injury/Illness Classification Guidelines
9. Medical Forms
 - a. Authorization for Treatment of Occupational Injury/Illness
 - b. Authorization for Release of Medical Information
 - c. Return to Work Examination Form.
10. Help Desk / Hotline Notification Guidelines



ATTACHMENT 1

ACCIDENT PREVENTION PROGRAM: REPORTING, INVESTIGATION, AND REVIEW RESPONSIBILITY MATRIX

Action	Procedure Section	Responsible Party					
		Employee	Supervisor	Project/ Location Manager	Site Health and Safety Rep. / Officer	Business Line Health and Safety Manager	Corporate Health & Safety Manager
Issue, Revise, and Maintain Procedure	3.1						X
Report All Incidents to Supervisor	5.1	X					
Notify Health and Safety Representative	5.1		X				
Arrange Medical Care	5.1		X		X		
Notify Health Resources or Gates McDonald of Incident	5.1		X		X		
Initiate/Complete Company Forms	5.1		X		X		
Complete Investigation of incident	5.5		X	X	X	X	
Complete Equipment, Property Damage and General Liability Loss Report Incident	5.4	X					
Coordinate and Set up Accident Review Board	5.7			X			
Conduct Accident Review Board	5.7					X	
Participate in Accident Review Board	5.7	X	X	X	X	X	
Complete Monthly Loss Report	5.8					X	



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Attachment 2

REPORT ALL WORKER'S COMPENSATION INJURIES TO SHAW CLAIMS DEPARTMENT
FAX REPORT WITHIN 24 HOURS OF INCIDENT TO **225-932-2636**.

Phone all injuries/ illnesses to Shaw Notification

Hotline/Helpdesk

1-866-299-3445

Supervisor's Employee Injury/Illness Report Form

EMPLOYEE INFORMATION

Employee's Social Security Number:		Claim Number:	
Employee's Name:		Home Phone Number:	
Home Address:		Business Line Code:	
Male	Female	Date of Birth:	Hire Date:
Dependents:		Dependents Under 18:	Marital Status:
Occupation:		Department Name:	
State Hired:	Currently Weekly Wage:	Hourly Wage:	
Hours/Days Worked Per Week:	Days Per Week	Hours Worked Per Day:	
Employment Status:	Employee Report No.: N/A	Employee ID No.:	N/A
Salaried Continued:	Paid For Date of Injury:	Education No. of Years:	
Ever Injured on the Job:	Supervisor Name & Phone:		

EMPLOYER INFORMATION

Employer Name:	The Shaw Group, Inc.		
Work Location:			
Contact Name:	John Mollere	Telephone Number:	(800)747-3322, Ext. 572
Employer SIC:	Employer Location Code:		
Employer FED ID:	Employer Code: N/A		
Nature of Business:			
Policy Number:			

ACCIDENT INFORMATION

Date and Time of Injury:	
Did the Accident Occur at the Work Location:	If no, where did the accident occur? N/A
Accident Address:	
Nature of Accident:	
Give a Full Description of the Accident: (Be as Factually Complete As Possible)	
Are Other WC Claims Involved?	No
Date and Time Reported to Employer:	
Person Reported To:	



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WITNESS INFORMATION

Were There Any Witnesses?

If Yes, List Names and How to Contact Them:

INJURY INFORMATION

Which Part of the Body Was Injured? (e.g. Head, Neck, Arm Leg)

What Was the Nature of Injury? (e.g. Fracture, Sprain, Laceration)

Part of Body Location: (e.g. Left, Right, Upper, Lower)

Injury Description:

Source of Injury:

Is Employee Hospitalized?

Lost Time:

If Yes, What was First Full Day Out:

Date Last Day Worked:

Date Disability Began:

N/A

Date Returned to Work:

Estimated Return Date:

N/A

MEDICAL INFORMATION

ER Treated & Released:

Hospitalized:

Phy./Clinic:

Hospital - Name, Address, Phone Number:

Was Employee Transported via Ambulance:

Yes No

N/A

Clinic - Name, Address, Phone Number:

ADDITIONAL COMMENTS & INFORMATION

REPORT PREPARED BY

Name:

Title:

Signature:

Phone:



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ATTACHMENT 3
VEHICLE ACCIDENT REPORT
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ACCIDENT DESCRIPTION

This report is to be initiated by the employee involved in the accident or his/her direct supervisor. Please answer all questions completely. This report must be forwarded to the appropriate health and safety representative within 24 HOURS of the accident. Attach police report.

ACCIDENT DATE _____ TIME _____ ☐ A.M. or ☐ P.M.
LOCATION OF ACCIDENT (CITY, STATE) _____
DESCRIPTION OF ACCIDENT _____

WITNESS _____ PHONE NO. _____
ADDRESS _____ CITY _____ STATE _____ ZIP _____
POLICE OFFICER'S NAME AND BADGE # _____ DEPARTMENT _____

COMPANY VEHICLE

DRIVER _____ DRIVERS LICENSE NO. _____ STATE _____
ADDRESS _____ CITY _____ STATE _____ ZIP _____
WORK PHONE NO. (____) _____ S.S. NO. _____ PROJECT NAME/NO. _____
VEHICLE NO. _____ YEAR _____ MAKE _____ MODEL _____ LICENSE PLATE NO. _____
STATE _____ VEHICLE OWNER: ☐ COMPANY ☐ LEASED/RENTED ☐ PRIVATE VEHICLE
VEHICLE TYPE: ☐ COMMERCIAL MOTOR VEHICLE ☐ NON-COMMERCIAL
IF NOT COMPANY-OWNED: OWNER _____ PHONE NO. (____) _____
ADDRESS _____ CITY _____ STATE _____ ZIP _____
VEHICLE DAMAGE _____
NO. OF VEHICLES TOWED FROM SCENE _____ NUMBER OF INJURIES _____ NUMBER OF FATALITIES _____
WERE HAZARDOUS MATERIALS RELEASED? ☐ NO ☐ YES IF YES, DESCRIBE MATERIALS _____

OTHER VEHICLE

DRIVER _____ DRIVERS LICENSE NO. _____ STATE _____
ADDRESS _____ CITY _____ STATE _____ ZIP _____
PHONE NO. (____) _____ S.S. NO. _____
OWNER'S NAME (☐ CHECK IF SAME AS DRIVER) _____
ADDRESS _____ CITY _____ STATE _____ ZIP _____
INSURANCE COMPANY _____ POLICY NO. _____
AGENT'S NAME _____ PHONE NO. (____) _____
ADDRESS _____ CITY _____ STATE _____ ZIP _____
VEHICLE YEAR _____ MAKE _____ MODEL _____ PLATE NO. _____ STATE _____
VEHICLE I.D. NO. _____
VEHICLE DAMAGE _____
PASSENGERS: ☐ NO ☐ YES INJURIES: ☐ NO ☐ YES (If Yes, list names and telephone numbers below)



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VEHICLE ACCIDENT REPORT

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WEATHER: ☐ Clear ☐ Cloudy ☐ Fog ☐ Rain ☐ Sleet ☐ Snow Other _____
PAVEMENT: ☐ Asphalt ☐ Steel ☐ Concrete ☐ Wood ☐ Gravel/Dirt
☐ Brick/Stone Other _____
CONDITION: ☐ Dry ☐ Wet ☐ Icy ☐ Pot Holes Other _____
TRAFFIC CONTROL: ☐ Traffic Light ☐ Stop Sign ☐ Railroad ☐ No Intersection ☐ No Control
ROADWAY: Number of Lanes Each Direction: _____ ☐ Residential ☐ Divided Highway ☐ Undivided Highway

Draw and name roadways showing each vehicle, direction of travel, and point of impact. Indicate travel before the accident with a solid line, and post-accident movement with a broken line.

SYMBOLS:

Your Vehicle ①
Other Vehicle(s) ② ③
Pedestrian 
Stop Sign 
Yield 
Railroad 

ADDITIONAL
INFORMATION:

EMPLOYEE _____ (Print) _____ (Signature) _____ (Date)
SUPERVISOR _____ (Print) _____ (Signature) _____ (Date)
HEALTH & SAFETY REP. _____ (Print) _____ (Signature) _____ (Date)

ATTACH POLICE REPORT TO VEHICLE ACCIDENT REPORT

REPORT MUST BE FAXED TO:
CORPORATE CLAIMS DEPARTMENT (FAX: 225-932-2636)
WITHIN 24 HOURS, OR NOT LATER THAN NEXT BUSINESS DAY.

REPORT ALL CHARGEABLE VEHICLE ACCIDENTS TO SHAW NOTIFICATION HOTLINE/HELPDESK
(PHONE: 1-866-299-3445)



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ATTACHMENT 4

EQUIPMENT, PROPERTY DAMAGE AND GENERAL LIABILITY LOSS REPORT

This report is to be completed for all losses or damage to company property in excess of \$2,500.00 and all third party damage, regardless of value, resulting from company activities.

PROJECT/LOCATION _____ PROJECT NO. _____ DATE _____

ADDRESS _____

HOW DID DAMAGE OR LOSS OCCUR: _____

DESCRIPTION AND VALUE (\$) OF DAMAGED/LOST/STOLEN PROPERTY: _____

LOCATION OF DAMAGED/LOST/STOLEN PROPERTY (Before Loss): _____

DATE AND TIME OF DAMAGE, LOSS, OR THEFT: Date: _____ Time: _____ a.m./p.m.

OWNER OF DAMAGED/LOST/STOLEN PROPERTY:

Name _____ Phone No. (____) _____

Address _____ City _____

Employer and Address _____

INJURED PARTIES (Also complete a Supervisor's Employee Injury Report if a Company Employee):

Name _____ Phone No. (____) _____

Address _____ City _____

Employer and Address _____

Description of Injury _____

WITNESSES:

1. Name _____ Home Phone (____) _____

Home Address _____ City _____

Employer and Address _____

2. Name _____ Home Phone (____) _____

Home Address _____ City _____

Employer and Address _____

WERE PICTURES TAKEN? ☐ YES ☐ NO

WERE POLICE NOTIFIED? ☐ YES ☐ NO DEPT. _____ REPORT NO. _____

COMPLETED BY: _____

(Print)

(Signature)

(Date)

PROJECT/LOCATION MANAGER: : _____

(Print)

(Signature)

(Date)

REPORT MUST BE FAXED TO:
CORPORATE CLAIMS DEPARTMENT (FAX: 225-932-2636)
WITHIN 24 HOURS, OR NOT LATER THAN NEXT BUSINESS DAY



ATTACHMENT 5 INCIDENT INVESTIGATION REPORT

*** Must Be Completed Within 72 HOURS & Relevant Support Documentation Must Be Attached / Submitted***

Investigation Date _____ Date of Incident _____

Employee Name _____

Supervisor Name _____

Project Number/Name _____ / _____

Location of Incident _____

• Incident Classification

Injury

- ☐ First Aid
☐ OSHA Recordable
☐ Lost Workday
☐ Restricted Workday

Vehicle

- ☐ Chargeable
☐ Non-chargeable

DOT

- ☐ DOT Vehicle
☐ DOT Reportable

Near Miss ☐

General Liability ☐

• Description (Provide facts, describe how incident occurred, provide diagram [on back] or photos)

• Analysis (What unsafe acts or conditions contributed to the incident?)

• Corrective Action(s) (List corrective action items, responsible person, scheduled completion date)

• Witness Names (Complete Attachment 6 – Employee Witness Statement)

Investigated By _____
Print Name Signature Date

Project/Location Mgr. _____
Print Name Signature Date



**ATTACHMENT 6a
Injured Employee Statement**

MUST BE COMPLETED WITHIN 24 HOURS OF THE INCIDENT

This form should be completed by the injured employee involved in the incident. Describe only the facts for which you have personal knowledge. If you have no knowledge of a particular question, write "no knowledge".

Company _____

Exact Location of Incident/Accident _____

Name of Injured Employee _____

Date of Incident/Accident _____ Time _____ am _____ pm

Date of this Statement _____ Time _____ am _____ pm

Time your shift begins? _____ Time _____ am _____ pm Time your shift ends? _____ Time _____ am _____ pm

Name of Known Witnesses:

Name _____

Name _____

Name _____

Name _____

Your Immediate Supervisors Name _____

If not employed by Shaw E&I, enter name of company and phone number _____

Have you had a prior injury similar to this injury? _____

Was it while you were at work? _____

What date did the prior injury occur? _____

Stating Only Factual Information, Describe in Detail What Happened and Include Any Applicable Events Leading to the Incident/Accident.

I certify that, to the best of my knowledge, all of the above information is complete, accurate and factual. I acknowledge that the intentional falsification or altering of facts or making misleading statements may be grounds for disciplinary action.

Signature/Date

Print Name



ATTACHMENT 6b
Employee Witness Statement

MUST BE COMPLETED WITHIN 24 HOURS OF THE INCIDENT

This form should be completed by every employee working in the crew of the injured employee and by every other employee with knowledge of events or circumstances involved in the incident. This information is being solicited from you so that the company can accurately assess the reported incident to avoid similar occurrences in the future. Describe only the facts for which you have personal knowledge. If you have no knowledge of the incident, write "no knowledge".

Company _____

Exact Location of Incident/Accident _____

Name of Injured Employee _____

Date of Incident/Accident _____ Time _____ am pm

Date of this Statement _____ Time _____ am pm

Time your shift begins? Time _____ am pm Ends _____ am pm

Witness Information:

Name _____

Home Phone No. _____

Home Address _____

County _____ Zip _____

Witness' Supervisor Name _____

If not employed by Shaw E&I, enter name of company _____

Company Phone Number _____

Did You See the Incident/Accident? _____

How Far From You (approx., in feet) Did the Incident/Accident Occur? _____

Stating Only Factual Information, Describe in Detail What Happened and Include Any Applicable Events Leading to the Incident/Accident.

I certify that, to the best of my knowledge, all of the above information is complete, accurate and factual. I acknowledge that the intentional falsification or altering of facts or making misleading statements may be grounds for disciplinary action.

Witness Signature/Date

Print Name



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ATTACHMENT 7

ACCIDENT REVIEW BOARD

DATE:		LOCATION:	
BOARD MEMBERS:			
ACCIDENT DATE:		EMPLOYEE(S) INVOLVED IN INCIDENT:	
INVESTIGATION COMPLETE: YES ☐ NO ☐		ACCIDENT CLASSIFICATION:	
THE FOLLOWING INFORMATION <u>MUST</u> BE PROVIDED BY THE REVIEW BOARD FOR THIS INCIDENT (PRINT):			
SUPERVISOR: _____		PROJECT/LOCATION MGR.: _____	
POTENTIAL CAUSE OF ACCIDENT:			
ACTION BY BOARD*:			
* ALL ACTIONS BY THE ACCIDENT REVIEW BOARD ARE SUBJECT TO FINAL REVIEW BY THE HUMAN RESOURCES AND LEGAL DEPARTMENTS.			
ACCEPTED:			
_____ (Employee Signature)		_____ (Supervisor Signature)	
APPROVED:		REJECTED FOR:	
_____ (Project/Location Manager)		_____ _____	
APPROVED:		REJECTED FOR:	
_____ (Business Line Health and Safety Manager or Designee)		_____ _____	
APPROVED:		REJECTED FOR:	
_____ (Business Line Vice President)		_____ _____	



ATTACHMENT 8

INJURY/ILLNESS CLASSIFICATION GUIDELINES

First Aid Treatment – If the incident requires only the following types of treatment, consider it first aid. **Do Not** record the case if it involves only:

- Using non-prescription medications at non-prescription strength
- Administering tetanus immunizations
- Cleaning, flushing, or soaking wounds on the skin surface
- Using wound coverings such as bandages, Band-Aids™, gauze pads, etc., or using SteriStrips™ or butterfly bandages
- Using hot or cold therapy
- Using any totally non-rigid means of support, such as elastic bandages, wraps, non-rigid back belts, etc.
- Using temporary immobilization devices while transporting an accident victim (slings, neck collars, or back boards)
- Drilling a fingernail or toenail to relieve pressure, or draining fluids from blisters
- Using eye patches
- Using simple irrigation or a cotton swab to remove foreign bodies not embedded in or adhered to the eye
- Using irrigation, tweezers, cotton swab or other simple means to remove splinters or foreign material from areas other than the eye
- Using finger guards
- Using massages
- Drinking fluids to relieve heat stress

Medical Treatment – Includes managing and caring for a patient for the purpose of combating disease or disorder. The following are **not** considered medical treatments and are not recordable:

- Visits to a doctor or Licensed Health Care Professional (LHCP) solely for the purpose of observation or counseling
- Diagnostic procedures, including administering prescription medications that are used solely for diagnostic purposes
- Any procedure that can be labeled first aid (see above descriptions)

OSHA Recordable Injuries and Illnesses

Work related injuries and illnesses that result in the following should be recorded on the OSHA 300 Log:

- Death
- Loss of consciousness
- Days away from work
- Restricted work activity or job transfer
- Medical treatment beyond first aid.



You must also record any **work related** injury or illness that involves cancer, chronic irreversible disease, a fractured or cracked bone, or a punctured eardrum.

Additional Recordable Criteria

You must also record the following conditions when they are work related:

- Any needle stick injury or cut from a sharp object that is contaminated with another person's blood or other potentially infectious material
- Any case requiring an employee to be medically removed from a site under the requirements of an OSHA health standard
- Any Standard Threshold Shift (STS) in hearing (i.e., cases involving an average hearing loss of 10dB or more in either ear)
- Tuberculosis infection as evidenced by a positive skin test or diagnosis by a physician or other licensed health care professional after exposure to a known case of active tuberculosis.



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**ATTACHMENT 9B
MEDICAL FORMS**

AUTHORIZATION FOR TREATMENT OF OCCUPATIONAL INJURY/ILLNESS

Employee Name: _____
Social Security #: _____
Job Title: _____
Project/Location: _____
Telephone #: _____
H&S Representative: _____
Body Part(s) Injured: _____
Describe in detail how incident occurred: _____
Injury: ☐ Illness: ☐
Incident Date: _____
Location of Accident/Exposure: _____

TO TREATING PHYSICIAN:

In the case of occupational injury/illness, please examine the employee and render necessary conservative treatment directly related to the occupational injury/illness.

Light Duty Work:

It is the policy of our company to provide work assignments, whenever possible, for employees with physical activity restrictions resulting from an occupational injury/illness. If the employee will be subject to a restriction, please contact **Health Resources** before releasing the employee, so that a light duty assignment may be arranged.

Medically Unfit to Return to Work:

It is the policy of our company to assist employees unable to return to work, due to an injury/illness, in obtaining needed medical care and other available benefits. Medical findings are also used to help evaluate unsafe conditions that may have led to the incident. Please help us assist our employees by contacting **Health Resources** with your findings as soon as possible, preferably before the employee leaves your office, but not later than the close of business on the day of initial treatment.

Health Resources: Telephone: 1-800-350-4511 Fax: (800) 853-2641

Please Send Reports To **Health Resources** AND **The Shaw Group, Inc. Corporate Claims Department**
Both of the Following: 600 West Cummings Park, Suite 3400 4171 Essen Lane
Woburn, Massachusetts 01801 Baton Rouge, LA 70809

Please Send Bills To: **The Shaw Group, Inc. Corporate Claims Department**
4171 Essen Lane
Baton Rouge, LA 70809

DOCTOR, Please provide:

Medical Diagnosis: _____
Treatment Provided: _____

Recommended Work Limitation/Restriction: _____
Return Visit Needed: No ☐ Yes ☐ Date if Yes _____ First Aid Only ☐
Physician Name: _____ Physician Telephone: _____
Physician Signature: _____ Date: _____

**YOU MUST CALL HEALTH RESOURCES FOR ALL OCCUPATIONAL INJURIES/ILLNESSES
REQUIRING OUTSIDE MEDICAL TREATMENT: 1-800-350-4511.**

FAX COMPLETED FORM TO HEALTH RESOURCES (800) 853-2641.

Send Bills to Shaw Corporate Claims Department



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**ATTACHMENT 9B
MEDICAL FORMS
AUTHORIZATION FOR RELEASE OF PROTECTED MEDICAL INFORMATION**

Printed Name: _____ Date of Birth: _____

Address: _____

Social Security #: _____ Home Telephone: _____

Authority to Release Protected Health Information

I hereby authorize the release of medical information, identified in this authorization form, and provide such information to:

HEALTH RESOURCES

600 West Cummings Park, Suite 3400
Woburn, Massachusetts 01801
Phone: (800) 350-4511
Fax: (800) 853-2641

AND

The Shaw Group Inc.

4171 Essen Lane
Baton Rouge, Louisiana 70809
Phone: 225-932-2500
Fax: 225-932-2636

The Information To Be Released includes the following:

Complete health record	Discharge summary	Progress notes
History and physical exam	Consultation reports	X-ray films / images
Laboratory test results	X-ray & Image reports	Itemized bill
Diagnosis & treatment codes	Complete billing record	

Other, (specify) _____

Purpose of the Requested Disclosure of Protected Health Information

I am authorizing the release of my Protected Health Information.

Drug and/or Alcohol Abuse, and/or Psychiatric, and/or HIV/AIDS Records Release

I understand if my medical or billing record contains information in reference to, psychiatric care, sexually transmitted disease, hepatitis B or C testing, previous drug and/or alcohol abuse and/or other sensitive information, I agree to its release. **Check One:** ☐ **Yes** ☐ **No**

I understand if my medical or billing record contains information in reference to HIV/AIDS (Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome) testing and/or treatment I agree to its release. **Check One:** ☐ **Yes** ☐ **No**

Right to Revoke Authorization

Except to the extent that action has already been taken in reliance on this authorization, the authorization may be revoked at any time by submitting a written notice to **The Corporate Claims Dept. at The Shaw Group Inc., 4171 Essen Lane, Baton Rouge, Louisiana 70809.** Unless revoked, this authorization will expire at which time completion of treatment for the injury or illness has been accomplished.

Re-disclosure

I understand the information disclosed by this authorization may be subject to re-disclosure by the recipient and no longer be protected by the Health Insurance Portability and Accountability Act of 1996.

Signature of Patient or Personal Representative Who May Request Disclosure

I understand that I do not have to sign this authorization. However, if health care services are being provided to me for the purpose of providing information to a third-party (e.g. fitness-for-work test), I understand that services may be denied if I do not authorize the release of information related to such health care services to the third-party. I can inspect or copy the protected health information to be used or disclosed. **I hereby release and discharge The Shaw Group Inc of any liability and the undersigned will hold The Shaw Group Inc harmless for complying with this Authorization.**

Signature: _____ Date: _____

Description of relationship if not patient: _____



**ATTACHMENT 9C
MEDICAL FORMS**

RETURN-TO-WORK EXAMINATION FORM

Exam Date: ____/____/____ Employee Name: _____
Birth Date: ____/____/____ Social Security #: ____ - ____ - ____
Job Title: _____ Sex: ☐ Male ☐ Female

Examining Provider: Please complete this form and fax to Health Resources at (800) 853-2641. Please contact Health Resources at (800) 350-4511 to report status of employee post-treatment.

DIAGNOSIS: _____
TREATMENT PLAN: _____
MEDICATIONS: _____
PHYSICAL THERAPY: _____
OTHER: _____

- ☐ May return to full duty work effective ____/____/____
☐ May return to limited duty from ____/____/____ to ____/____/____
☐ Unable to return to work from ____/____/____ to ____/____/____

WORK LIMITATIONS:

- ☐ Restricted lifting/pushing/pulling: maximum weight in lbs: _____ (company limits all lifting to ≤ 60 lbs).
☐ Work only with right/left hand. ☐ Restricted repetitive motion right/left hand.
☐ Sitting job only. ☐ Restricted operation of moving equipment.
☐ Other: _____

FOLLOW-UP PLAN:

- ☐ Release from care.
☐ Schedule for follow-up appointment on ____/____/____.
Time _____ AM/PM
☐ Referral to _____
Appointment date ____/____/____ Time _____ AM/PM

Comments: _____

Examiner's Name (*print*)

Examiner's Signature

Date



ATTACHMENT 10

HELP DESK / HOTLINE NOTIFICATION GUIDELINES

Any incident, as defined in the bulleted items below, requires corporate notification **as soon as practical but not longer than one hour after occurrence**, via the Health and Safety Help Desk / Hotline. This requirement is a corporate wide directive and applies to all Shaw Group companies, not just Shaw E&I. As such, the responsibility for whom makes this notification has purposefully not been defined. This is due to the various types of projects in which The Shaw Group performs activities. Some projects may only consist of three technicians at a site; others may involve multiple levels of site management and consist of 200+ employees. Therefore, the intent is for the supervisory/management person to communicate the notification requirements to his/her employees and make the appropriate determination as to how the notification takes place.

Immediate Corporate Notification via Help Desk: 1-866-299-3445

- Illness and/or injury (doctors cases and above);
- Property damage (dollar amount greater than \$2,500);
- Automobile accidents (All);
- Criminal activity (i.e. bomb threat, theft);
- Natural disaster (i.e. earthquakes, flood, storm damage, hurricanes);
- Explosion and/or fires (that results in property damage greater then \$2,500 or result in injury);
- Environmental spills/releases (incidents that requires regulatory notification or have an offsite impact);
- Regulatory visit (i.e. OSHA, EPA, DEQ, MSHA, etc.);
- Fatalities

Note:

- Help Desk / Hotline notification is in addition to the requirement to inform Health Resources of all incidents requiring off-site medical attention by calling 1-800-350-4511. This call should be made **prior** to transporting the employee such that they can coordinate physicians' services prior to arrival of the employee to the medical facility.
- As stated above, the notification requirements are a corporate directive and apply to the entire Shaw Group. . Accordingly, Shaw E&I managers/supervisors should use sound judgment as it pertains to the two bulleted items that have been highlighted above. Although they may not be desired events, some Environmental spills/releases that occur may not be an uncommon situation at a particular site. In addition, there may be projects in which the EPA or some other regulatory agency visits on some normal frequency. Events such as these, which would typically be unusual at a construction or fabrication site, are not so unusual to some of our environmental projects. As such, a notification to the helpdesk would not be required.

APPENDIX L
RADIATION PROTECTION PLAN

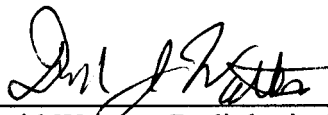


CABRERA SERVICES

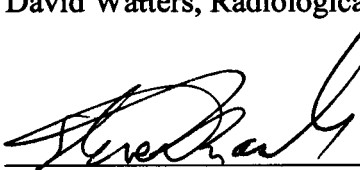
RADIOLOGICAL • ENVIRONMENTAL • REMEDIATION

Radiation Safety Program

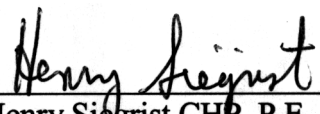
Revision 0

Reviewed By: 
David Watters, Radiological Safety Engineer

Date: 1/24/00

Approved By: 
Steven Masciulli CHP, CSP, Radiation Safety Officer

Date: 1/24/00

Approved By: 
Henry Siegrist CHP, P.E., Corporate Health Physicist

Date: 1/24/00

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1.0 PURPOSE

Cabrera Services, Inc. (CABRERA) is engaged in radiological activities that require the documentation and implementation of a Radiation Safety Program (RSP) compliant with radiation protection regulations. The elements of the CABRERA Radiation Protection Program are set forth by this RSP and the appropriate guidelines to which CABRERA must implement for the scope of activities requested. This RSP defines the CABRERA approach to health physics and includes the applicable provisions of 10 CFR 19, 10 CFR 20, 10 CFR 61, 10 CFR 835 and DOE Order 5400.5. The RSP is presented in a program level document form, from which specific project health physics procedures are to be developed and implemented.

The purpose of this document is to define program requirements and radiation protection standards in support of CABRERA operations. In addition, this document is to fulfill the requirement of a documented Program for sites or projects where CABRERA is required to implement such a Program. Examples include work under a CABRERA Nuclear Regulatory Commission (NRC) Service license at a customer's facility or a Department of Energy (DOE) D&D project where CABRERA would be required to implement a Program rather than participate in the existing site Program. CABRERA intends to use this Program to ensure through monitoring and ALARA practices, the health and safety of employees and workers, their protection from ionizing radiation, and the prevention of any release of radioactive contaminant releases that could adversely affect the environment.

Portions of the Program will be implemented during CABRERA's performance of site surveys, remediation activities, decontamination activities, waste characterization, waste packaging and waste shipment.

2.0 PHILOSOPHY

CABRERA's philosophy is to control the possession, receipt, use, transfer, and disposal of radioactive materials at a customers facility in such a manner that the total dose to any individual does not exceed standards for protection against radiation prescribed in the regulations set forth by the NRC, DOE, Environmental Protection Agency (EPA), state regulatory agencies and licenses or permits issued to CABRERA or our customers by NRC, EPA or state regulatory agencies. In addition to maintaining radiation exposure within regulatory standards, CABRERA is committed to maintaining radiation exposure As Low As is Reasonably Achievable (ALARA) through the use of engineering controls, employee training and administrative procedures. These exposure controls must be maintained for the sum of doses received by all exposed individuals as well as each individual. All personnel are responsible for making recommendations that would further reduce personnel radiation exposures.

3.0 POLICY(S)

3.1 ALARA

It is the policy of CABRERA to maintain exposures to workers, members of the public and environment As Low As is Reasonably Achievable (ALARA), taking into account the state of technology and the economics of improvements in relation to benefits. CABRERA has established a comprehensive ALARA program designed to comply with applicable regulations, including 10 CFR 20 and 10 CFR 835.

Responsibilities – The president of the company is responsible for ensuring that a meaningful ALARA program is developed and implemented. To meet this responsibility, the President assigns responsibility for assuring that ALARA is given proper consideration in project planning and in operations to the Corporate Health Physicist.

The Corporate Health Physicist is responsible for ensuring that ALARA considerations are included in the design of project plans.

Project Managers are responsible to ensure that radiological operations and activities are pre-planned and conducted to allow for the effective implementation of dose reduction, contamination reduction and control measures to achieve specific ALARA goals and objective for the facility/site.

All employees of CABRERA involved in radiological work are responsible for maintaining their exposure ALARA, keeping track of their radiation exposure status and obeying posted, written and oral radiological control instructions and procedures.

CABRERA Health Physicists are responsible for assisting Project Managers, the RSO, and the CHP in the development and implementation of the CABRERA radiation safety program, which shall include the operational ALARA program. The Health Physicists are also responsible for assisting with ALARA input to system and facility/site designs, which involve potential exposure of personnel to radiation or radioactive materials.

The key to the success of an ALARA program depends upon the understanding and cooperation of each individual performing radiation-related activities. Each individual is responsible for maintaining his own exposure as low as is reasonably achievable and to assure that his actions do not adversely affect the exposures of other individuals.

All supervisors are responsible for planning and coordinating work to ensure that their personnel comply with all established procedures, instructions, and policies for health physics and reducing exposure.

Goals – The ALARA program shall be incorporated into the radiation safety program so that ALARA becomes an integral part of all aspects of the day-to-day operations involving radiation exposure and radioactive materials. The overall goal of the ALARA program is to maintain the annual internal and external radiation dose to each individual and the annual collective dose to personnel ALARA.

3.2 Respiratory Protection Policy

It is CABRERA's policy to maintain personnel exposure to known or suspected airborne radioactive and/or hazardous material as low as is reasonably achievable (ALARA) with regulatory guidance.

The respiratory protection program is an integral part of the Health and Safety program. The primary objective of the respiratory protection program is to limit, to the extent practicable, the inhalation of airborne radioactive materials and/or hazardous material. Under normal circumstances, this objective shall be achieved by the application of practicable engineering controls such as process, containment, and ventilation equipment. When such controls cannot be applied or are not feasible, respirators may be used.

The management of CABRERA does not consider protection of workers from airborne radioactive materials through the use of respirators to be a routine operation, and for this reason their use, except for emergencies, shall only be authorized pursuant to an approved radiation work permit. The use of respirators as a backup system for practicable engineering controls is an acceptable practice for routine operations provided an approved radiation work permit covers their use.

Nonroutine operations are those that occur infrequently at irregular intervals and for this reason the application of engineering controls may be impracticable. The protection of workers from airborne radioactive material and/or hazardous materials by the use of respirators during nonroutine operations is acceptable to the management of CABRERA provided that such use is authorized pursuant to an approved radiation work permit.

Emergency conditions are unplanned events characterized by the need for rapid and aggressive actions to prevent or mitigate the effects of rapidly deteriorating conditions. The use of respirators during such is often a reasonable substitute for engineering controls that must be assumed to be nonfunctional or ineffective. The use of respirators in emergency conditions is acceptable.

The use of a respirator subjects the wearer to added stress and some discomfort. For this reason, no specific limits have been placed on time duration that a respirator may be worn. It is the policy of CABRERA that a person wearing a respirator may leave the area at any time to seek relief. This may be for reasons of equipment malfunction, physical or psychological distress, procedural or communication failure, significant deterioration of operating conditions, or any other condition that might require such relief.

3.3 Training Policy

CABRERA has a strong commitment to training. CABRERA believes that properly trained individuals are a large part of ALARA. Thus, CABRERA is committed to ensure that individuals receive training that, at a minimum, is commensurate with NUREG -1556, 10 CFR 19 and 20, federal and state regulations.

4.0 IMPLEMENTATION OF POLICY

Corporate policies will be implemented by the Radiation Safety Committee (RSC) and the Radiation Safety Officer (RSO). The RSC will be composed of members extracted from various company-wide areas that would use, manage the use of, or train personnel in the use of sources of ionizing radiation. The implementation of recommendations or decisions by the RSC is the responsibility of the RSO who will ensure implementation by Radiation Safety Staff members.

5.0 INDIVIDUAL(S) RESPONSIBLE FOR RADIATION SAFETY PROGRAM

5.1 Executive Management

The President of CABRERA will act as the executive manager. Under this role he will be responsible for oversight of the RSP and have the ultimate responsibility for the license and the activities associated with the license. Due to the various structures of different organizations, the executive manager may need to delegate certain responsibilities to other managers for the day-to-day oversight of the program.

The executive manager will be involved in selecting the chairperson and members of the RSC and the RSO. The executive manager will define the role, duties, and responsibilities of each RSC member and the RSO.

5.2 Radiation Safety Committee

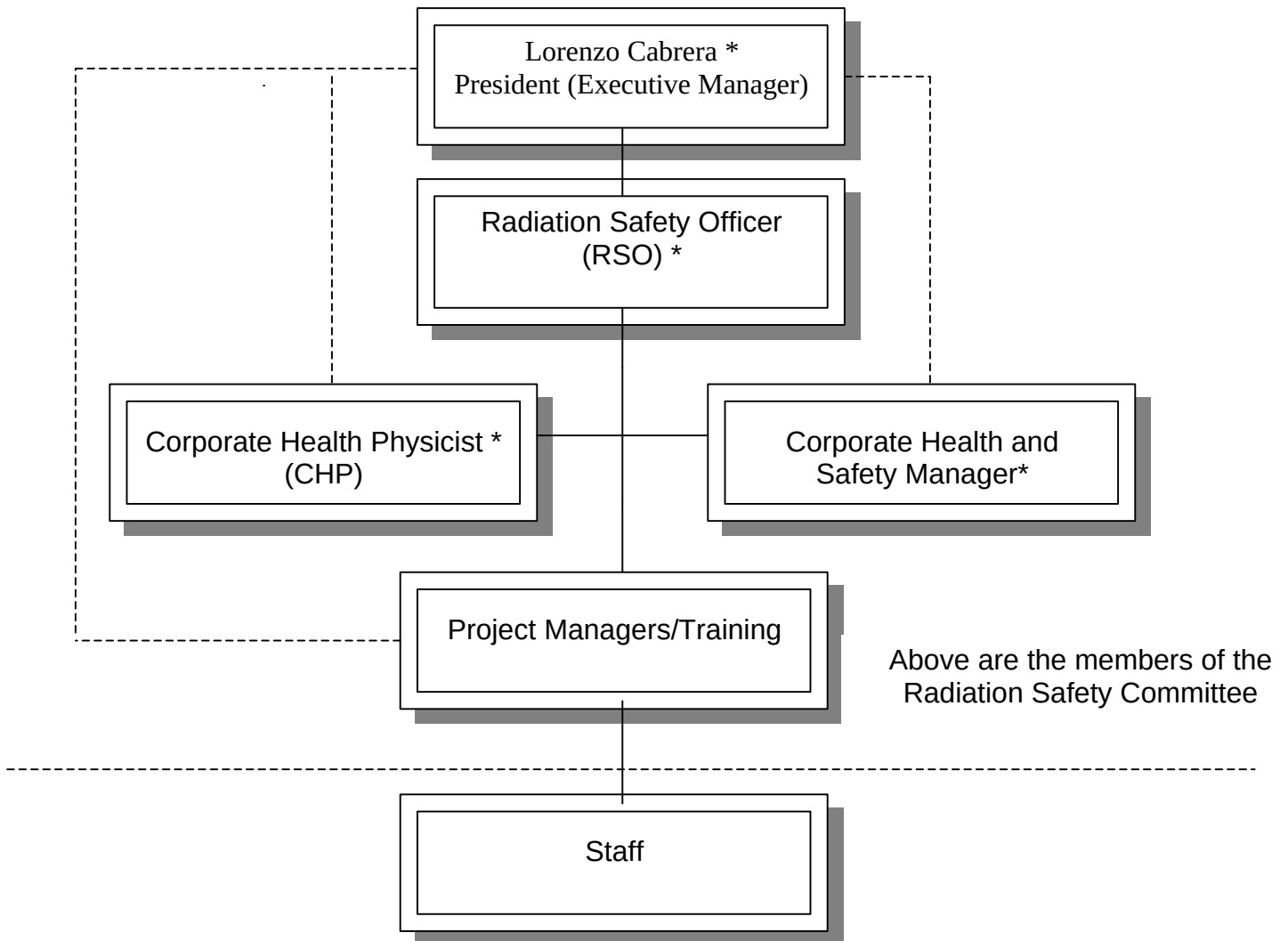
The Radiation Safety Committee (RSC) reports directly to the president of CABRERA as shown in Figure 1. Figure 2 is example of the member of the RSC. The RSC works with executive management and the RSO in implementing the RSP, and will be involved in establishing policies and procedures for managing the RSP. The RSC has the approval of the executive management and the authority and flexibility necessary to effectively fulfill its role in managing the RSP. The RSC is responsible for the following duties.

- 5.2.1 Meet as often as necessary to conduct business, but not less than quarterly.
- 5.2.2 Conduct periodic audits and inspections, reviews of the RSP, and along with the RSO and staff, review records, reports from the RSO, results of NRC inspections and written safety procedures. Observe audits and/or inspections performed by the RSO and Staff to ensure adequacy of the management control systems. An independent auditor may conduct these reviews; at the same time it does not relieve the RSC of the responsibilities to ensure that the reviews are conducted in accordance with applicable regulations. Examples of a review include, but are not limited to, the following:
 - Personnel dosimetry data
 - Results of required radiation surveys
 - Any significant incidents, including spills
 - Contamination controls
 - Results of the annual audit of the radiation safety program
 - Programs for maintaining dose ALARA and providing any necessary recommendations to ensure dose is ALARA.
 - Project documents, such as the Specific Work Plan, Health and Safety Plan and QA Plan.
 - Review and approval of permitted program and procedural changes by at least two members of the Radiation Safety Committee prior to implementation.
 - Review of operating procedures to ensure compliance with this program, pertinent federal regulations, license and customer requirements.

- 5.2.3 Ensure that operations comply with the provisions of this program and all other pertinent federal and state regulations.

Figure 1

Cabrera Services, Inc.



* Indicates Members of Executive Management

**EXAMPLE OF THE
MEMBERS OF THE RADIATION SAFETY COMMITTEE**

As of: _____

Lorenzo CABRERA,
President, Operations

Executive Manager

Henry Siegrist, CHP, PE
Corporate Health Physicist

Chairman

Steven Masciulli, CHP, CSP
Senior Health Physicist & RSO

Radiation Safety Officer

Paul Schwartz, CIH, CSP
Corporate Health & Safety Manager

Health and Safety/Hazardous Materials

David Watters
Health Physicist

Projects

Ray Holmes, CHP
Project Manager

Training

TBA

Certified Waste Broker

5.2.4 Establish a radiation control program for those projects involving radioactive materials and implement development of procedural guidance for the program and the projects. The RSC is authorized to make program changes and changes to procedures specifically identified in the license application, without prior NRC approval, so long as:

- The proposed revision is documented, reviewed, and approved by the Radiation Safety Committee.
- The revised program is in accordance with regulatory requirement, will not change license conditions, and will not decrease the effectiveness of the Radiation Safety Program.
- The staff is trained in the revised procedures prior to implementation.
- The audit program evaluates the effectiveness of the change and its implementation.

The RSC may authorize changes in the following without notifying the NRC.

- Programs and procedures referenced in the license
- Changes indicated by NRC rule changes
- Training for individuals working in or frequenting restricted areas
- The audit program
- Radiation monitoring instruments
- Material receipt and accountability
- Occupational dose
- Safe use of Radionuclides and emergency procedures
- Surveys
- Changes in contractors for bioassay or waste disposal or for servicing, calibrating, and processing personnel dosimeters (providing the new dosimetry contractor is NVLAP approved),

- Changes in contractors for other outsourcing services (labs, project personnel, equipment rental, etc.). Providing the new contractor presents equivalent or better credentials and,
- Changes in a piece of referenced equipment providing the replacement is equivalent or better or the need has been altered.

5.2.5 Ensure that employees working with radioactive materials have received the required training in operating procedures, rules, and special precautions prior to being occupationally exposed to radiation.

5.2.6 Evaluate CABRERA's overall efforts for maintaining doses ALARA on an annual basis that will include the efforts of the RSO, authorized users, and workers as well as those of management.

5.2.7 Provide final approval of authorized users of radioactive materials on the license.

5.2.8 Inform the president of CABRERA on program status and radiation safety objectives, the quality of the RSP in meeting our customer needs, maintaining dose to personnel and members of the public ALARA, and assuring protection of the environment.

5.2.9 Evaluate new users and new uses of byproduct material.

5.3 RSC Membership and Qualifications

5.3.1 The Committee is composed of members from the following activities or areas of responsibility:

- Health Physics
- Health and Safety
- Training
- Management Liaison
- Projects

5.3.2 The membership of the RSC may be changed as required to meet programmatic needs. The designated representative of each of these areas is valid from the date the NRC license is issued to CABRERA.

- 5.3.3 RSC members must have a college level degree and two (2) years of experience at a senior level in the area that they represent, or five (5) years of experience at a senior or management level in the area that they represent. Members must be familiar with CABRERA RSP and procedures, applicable Federal and State regulations and our license requirements.
- 5.3.4 A quorum of the RSC is authorized to act on the behalf of the committee for approval of necessary actions between regular meetings of the Committee. A quorum shall consist of the executive manager (or his/her alternate), Chairman, the RSO, and at least one (1) other committee member or a minimum of 50% of the RSC members.
- 5.3.5 The RSC is required to keep minutes of all quarterly meetings, and any ancillary actions of the committee that affect or are affected by the RSP. At a minimum, the minutes will include the date of the meeting, the members present and absent to demonstrate a quorum was present, a summary of the discussions, recommendations and the results of votes.

6.0 QUALIFICATIONS AND RESPONSIBILITIES

6.1 Qualifications

- 6.1.1 Corporate Health Physicist (CHP) – must have a B. S. or higher degree in Health Physics or a related field and at least (5) years of practical health physics experience, unless certified by the American Board of Health Physics.
- 6.1.2 Project Manager (PM) – must have a college degree in Health Physics, or a related science, or engineering, and at least five (5) years of practical experience, of which at least one (1) year must be in field operations experience. In addition to the field experience, at least two (2) years of the practical experience must be in a similar position and/or equivalent training.
- 6.1.3 Radiation Safety Officer (RSO) – must have a college degree in Health Physics or a related science, or engineering, and at least five (5) years of practical experience, of which at least two (2) years must be in a similar position and/or equivalent training.
 - 6.1.3.1 In the absence of the RSO, the CHP serves in that capacity. For a specified purpose, i.e. required for two (2) or more projects at the same time, other qualified persons may act as or represent the office of the RSO for that function. These

personnel may assume the duties of the RSO at the same time the responsibility for decisions of the RSO remain with license designated RSO.

6.1.3.2 Minimum qualifications for an RSO duly authorized representative (or a Program Manager designate) shall be similar to the qualifications required to hold the office. The designee should have the required degree and at least five (5) years of practical experience of which at least two (2) years must be in a similar position and/or in equivalent training, or at least eight (8) years of practical radiation safety experience, of which at least three (3) years must be in a similar position and/or in equivalent training.

6.1.4 Corporate Health and Safety Manager – Must have a B.S. or higher degree in Occupational Safety, Industrial Hygiene, Environmental Health, or related field and at least five (5) years practical occupational health and safety experience. Certification by the Board of Certified Safety Professionals (BCSP) and/or the American Board of Industrial Hygiene (ABIH) is required.

6.1.5 Radiation Staff (Health Physics Technician) must have a two year college degree in Health Physics or a related science, or engineering, and at least three (3) years of practical experience or a high school degree, and at least six (6) years of practical experience of which at least two (2) years must be in a similar position and/or equivalent training.

6.1.6 Waste Broker must have at least three (3) years of brokering as a significant activity with a minimum of twenty varying shipments. The shipments could include all or some of the following: A shipment to a qualified disposal facility (i.e., Barnwell, Hanford, Envirocare), an LSA shipment to a qualified disposal facility, a RAM nos shipment to a qualified disposal facility, an excepted package shipment, a hazardous waste shipment, a Federal Express shipment, and a shipment to a processing facility.

6.2 Responsibility

Note: The RSO, duly authorized representative, Project Manager, and Health Physics Technician have the authority to stop any work or activity that in their opinion could pose a hazard to the health and safety of the employees or general public. Only the RSO or duly authorized representative has the authority to re-start the work.

- 6.2.1 The CHP is responsible for supporting management, the RSC, and the RSO on radiological issues at a minimum, relating to any CABRERA project, the license, state and federal regulations. The CHP reports to the Vice President of Operations.
- 6.2.2 The Radiation Safety Officer (RSO) is qualified in the field of health physics and heads the RSP. The RSO performs or supervises others to ensure that the duties specified are performed in a timely manner. The person designated as the CHP is available to the RSO for technical support and auditing purposes. The RSO is the Vice President of Operations or reports to the Vice President of Operations and has unrestricted access to the President of CABRERA on all matters pertaining to radiological health and safety of CABRERA personnel. The RSO is assisted by the Radiation Safety Staff to administer the RSP as set forth in this program. The RSO performs audits of all areas of use and individuals who are authorized to use radioactive material to ensure work is done in accordance with the license, regulations, and user permit conditions. Specific duties and responsibilities of the RSO at a minimum, include:
- Responsible for oversight of the day-to-day health physics program established by the radiation safety committee.
 - Monitoring and surveys of all areas in which radioactive material is used.
 - Packaging, labeling, surveys, etc., of all radioactive shipments.
 - Determine, review, and approve appropriate radiation detection instrumentation to utilize in the field based upon knowledge of the processes and radionuclides and /or field characterization of the radionuclides involved and the radiations and the abundances emitted by these radionuclides
 - Personnel monitoring program including determining the need for and evaluating bioassays, monitoring personnel exposure records, and developing corrective actions for those exposures approaching maximum permissible limits.
 - Training program
 - Waste disposal program
 - Inventory and leak tests of sealed sources
 - Decontamination

- Investigating any incidents and responding to any emergencies
- Maintaining all required records
- Communications with senior management and the RSC regarding program implementation and compliance status.
- Be available to provide advice and assistance to the RSC and management on radiological safety matters whenever necessary.
- Review and make recommendations to the RSC regarding the list of qualified users of radioactive materials in support of the license.
- Report to the RSC, at periods not to exceed one year, on all findings and recommendations to reduce exposure to personnel.
- Serve as the CABRERA liaison to the U.S. Nuclear Regulatory Commission on license inspection matters.

6.2.3 The Project Manager (PM) reports to the Vice President of Operations on matters other than those specific to health physics. The PM should have at least three (3) years of experience in managing the various aspects of projects. At least one (1) year must be field experience in the area(s) specific to the planned evolution, i.e., of radiological remediation, soil movement, and/or characterization. A less qualified PM may be assigned simpler tasks (in training) as long as they report directly to an experienced PM or the CHP. The PM has the following duties and responsibilities:

- Ensure that all radioactive materials are handled in accordance with the provisions of this program, the radioactive materials license and pertinent state and federal regulations.
- Provide technical advice and assistance to CABRERA management and personnel on all matters pertaining to project operations, specific work plan execution, project field personnel as those related to needs, qualifications and abilities.
- Assist the RSO and Training Coordinator in training and orientations programs, for occupationally exposed individuals, for handling and processing of radioactive materials, and other personnel as required.
- Stop any job or activity that in their opinion could pose a hazard to the health and safety of employees and the general public.

Conduct a complete review of the noncompliance and obtain RSC approval prior to allowing the job or activity to continue.

6.2.4 The Corporate Health and Safety Manager is responsible for ensuring Cabrera Services, Inc. meets its commitment to provide a safe work environment for its employees, contractors, visitors, and the general public at all locations where it engages in business activities as well as advising management on all matters relating to compliance with federal, state, and local Occupational Safety and Health regulatory requirements. The Corporate Health and Safety Manager reports to the Vice President of Operations.

6.2.5 Radiation Safety Staff

The Radiation Safety Staff are responsible for performing radiological projects as directed by the RSO or duly authorized representative. Projects will be managed following license, federal, and state requirements. The RSO and the Radiation Safety Staff have the following duties and responsibilities:

- Implement and maintain an effective RSP that complies with the most recent provisions and conditions of this program, operating procedures, the radioactive materials license and applicable federal and state regulations.
- Provide necessary information on all aspects of health physics personnel at all levels of responsibility pursuant to 10 CFR 19.12 and 10 CFR 20.
- Maintain surveillance of overall activities involving radioactive material, including monitoring and surveys of all areas in which radioactive material is used or stored.
- Maintain a current ionizing radiation source inventory under CABRERA control and a record of their location to ensure that sources are secure against loss or unauthorized use.
- Performance or arrangement of leak test evaluations on all sealed sources and calibration of radiation detection survey instruments.
- Develop, coordinate, and participate in orientation and training programs for occupationally exposed individuals at periodic intervals (refresher training), and other personnel as required by changes in procedures, equipment regulations etc.

- Maintain current, all applicable required license amendments, and apply for amendments and renewals in a timely manner as approved by the RSC.
- Distribute and process personnel radiation monitoring equipment, determine the need for and evaluate bioassays, monitor records for trends and unexpected exposures, notify individuals and their supervisors of radiation exposures approaching maximum permissible amounts, and recommend appropriate remedial action as necessary.
- Formulate, revise, and maintain procedures for and in support of, the RSP.
- Stop any job or activity that in their opinion could pose a hazard to the health and safety of employees or the general public. Conduct a complete review of the noncompliance and obtain RSC approval prior to allowing the job or activity to continue.

6.2.6 Waste Broker

The Waste Broker reports to the Vice President of Operations on all matters other than those specific to health physics. The Waste Broker has the following duties and responsibilities:

- Package and ship radioactive materials in accordance with all provisions of this program, the radioactive materials license, and pertinent state and federal regulations.
- Provide technical advice and assistance to CABRERA management and personnel on all matters pertaining to packaging, marking, labeling, shipping and transportation of radioactive materials.
- Assist the RSO and Training Coordinator in training orientation programs, for occupationally exposed individuals, for handling and transportation of radioactive materials and other personnel as required.

6.2.7 Radiation Workers

Employees of CABRERA who are assigned to work activities involving radioactive material have the following responsibilities, in accordance with 10 CFR 19 and this program.

- Obey posted, verbal and written health physics procedures.

- Wear dosimetry devices as instructed by procedure and when required by other specific instruction of this program, project health physics, etc.
- Promptly report any lost or damaged devices to their supervisor and/or the RSO or duly authorized representative.
- Promptly report to their supervisor or RSO any incident, personnel injury, suspected overexposure, contamination, internal deposition, and any suspicious or questionable occurrence involving radioactive material.
- Be thoroughly familiar with equipment, procedures and requirements for the use of any special devices, prior to using or working with any source or device that produces ionizing radiation.
- Avoid any unnecessary exposure by use of the concept of time, distance and shielding when working in the presence of radiation sources to maintain their exposure As Low As is Reasonably Achievable (ALARA).

7.0 TRAINING

- 7.1 Before beginning work with or in the vicinity of licensed material, all general employees, radiation workers, and HPT assigned to the project who are likely to receive an occupational dose in excess of 100 mrem in a year shall receive radiation safety training. The training will be commensurate with their assigned duties and specific to the licensee's RSP. The purpose of the training is to ensure personnel that receive occupational exposure are adequately trained in radiation safety to perform assigned work and to maintain exposure ALARA. Each individual shall also receive periodic refresher training. Retaining shall be performed whenever there is a change in duties or the work environment and at a frequency sufficient to ensure that all staff is adequately trained.
- 7.2 The CABRERA training program provides a commitment to initial training, retraining, and continuing education. The type and amount of instruction will be based on regulatory requirements (10 CFR 19.12(a) and 19.12(b)), past documented experience, and will be commensurate with potential radiological health protection problems in the areas in which the employees are expected to work. Performance based training modules and continuing education are considered important aspects of this training program. The training may take any form which may include utilizing video tapes or interactive on line or off line computer programs.
- 7.2.1 In accordance with 10 CFR 19.12, all radiation workers will receive general and site-specific instruction prior to beginning work with licensed materials. The elements of this training will include but are not limited to:
- Applicable regulations and license conditions.
 - Area locations where radioactive material is used and/or stored.
 - Potential hazards associated with radioactive material.
 - Appropriate health physics procedures.
 - Individual 's obligation to report unsafe conditions to the RSO or applicable authorities.
 - Appropriate response to emergencies and unsafe conditions.
 - Locations of pertinent procedures, regulations, licenses and other material required by regulations.

- Radiation Work Permit (RWP).
- 7.2.2 In addition to basic classroom instruction, performance-based (on-the-job) training specific to the individual's duties may be conducted. This helps to ensure safe handling of radioactive materials in accordance with ALARA principles.
- 7.2.3 Since different radiation hazards will be encountered with different types of projects, site specific programs and/or job specific programs will be developed to instruct each different group with appropriate information in accordance with 10 CFR 19. This information may be incorporated into other training programs or may be presented separately. Specialized training, such as, emergency procedures OSHA, etc. are examples of training programs that would be presented as a separate training subject.
- 7.3 Each radiation worker shall, prior to performing any radiation work, successfully complete radiation safety training including the following topics as a minimum. The student attaining a minimum score of 80% on a written exam will demonstrate successful completion of this training.
- Types and sources of ionizing radiation contributing to personnel exposure,
 - Biological effects and risks associated with exposure to ionizing radiation,
 - Radiation exposure limits and control levels,
 - Specifics for using time, distance and shielding to maintain individual exposures ALARA,
 - Specific personnel dosimetry requirements,
 - Operating, maintenance, handling and accountability procedures for radioactive sources,
 - Facility or site survey requirements and procedures,
 - Responsibilities of individuals,
 - Emergency procedures and,
 - Specific survey instrument requirements and operating procedures.

- 7.4 Initial training will be a minimum of eight hours and conducted by the RSO or a designated representative. Completion of the training course includes successfully completing a minimum 20 question exam with a passing grade of 80%. An alternative to attending the eight hour class is passing a 50 question challenge exam with a minimum grade of 80%. This alternative is designed for an individual with prior experience, similar qualification at another facility, or formal training in radiological controls or health physics.
- 7.5 Once an individual has successfully completed the course, they are classified as a Radiological Worker I (RW-1) for a period of two (2) years. This re-qualification period will be tracked through the personnel and training matrix documentation that will be maintained by either or both the radiation safety office and the Training office. The worker will be retrained or may challenge not later than the end of the month in which their two-year RW-1 classification expires.
- 7.6 Radiation Worker training will be given annually or sooner if deemed necessary by the Radiation Safety Staff.
- 7.7 The instructor must have a college level degree and two (2) years of experience in training, or five (5) years of experience in training of radiological issues. The instructor must be familiar with CABRERA RSP and procedures, applicable Federal and State regulations and our license requirements.
- 7.8 To ensure the training program is successful in ensuring workers understand the concerns of working with or around radioactive material, the RSO or independent consultant will conduct an annual assessment of the program. The assessment will be documented and any recommended changes will be approved by the RSC.
- 7.9 Records of training will be maintained for a minimum of three (3) years. Training records will include, but are not limited to:
- A list of topics presented.
 - An approximation of the time spent on each topic.
 - Names of instructors and students, including a manner of positive identification.
 - Date(s) of training.
 - A written assessment or test for each student that documents satisfactory completion of training.

8.0 RADIATION PROTECTION STANDARDS

Every effort will be made to maintain personnel radiation exposures below the indicated radiation protection standards as set forth in this section and consistent with the ALARA principle. The occupational exposure standards prescribed in this section are exposures received by an individual assigned duties involving exposure to radiation and to radioactive materials. Radiation exposures received from background radiation and medical exposures are not included in the radiation exposure limits specified in this section.

8.1 Contamination Standards

Radioactive material will be controlled in such a manner that the surface contamination does not exceed the levels specified in Regulatory Guide 1.86, Termination of Operating Licenses for Nuclear Reactors, and in the USNRC, Division of Industrial and Medical Nuclear Safety, August 1987 guideline document, Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct, Source, or Special Nuclear Material, and as set forth in Table I. Each of these sources cite the same levels.

The contamination levels in Table I represent the maximum allowable levels and every effort should be made to maintain contamination levels below these levels by implementing contamination control levels lower than the levels indicated. Contamination control levels for customer facilities where CABRERA works may, in fact, be lower than the levels indicated in the table. In those cases and in all cases of lower contamination levels, the more stringent contamination control levels will be used to maintain compliance with customer requirements.

Table I Contamination Limits

RADIONUCLIDE	ALLOWABLE SURFACE CONTAMINATION (DPM/100 CM ²)	
	REMOVABLE	FIXED + REMOVABLE
Transuranics, Ra-226, Ra-228, Th-230, Th-228, Pa-231, Ac-227, I-125, I-129	20	100
Th-Natural, Th-232, Sr-90, Ra-223, Ra-224, U-232, I-126, I-131, I-133	200	1000
U-Natural, U-235, U-238, and associated Decay products	1000 α	5000 α
Beta-Gamma emitters (radionuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above.	1000 β - γ	5000 β - γ

8.2 Airborne Radioactivity Standards

The amount of radioactive materials taken into a workers body will be limited to less than 10% of the ALI as specified in Table I, Columns 1 and 2, of Appendix B of 10 CFR Part 20, providing the total effective dose to the individual is maintained ALARA.

9.0 VISITORS

Exposure to radiation will be controlled by administrative procedures, employee training and engineering controls. Only through the mutual cooperation and commitment of all employees can CABRERA meet its goal of maintaining personnel exposures As Low As is Reasonably Achievable (ALARA).

Casual visitors will always be escorted in any restricted area. Casual visitors may not perform work nor supervise personnel performing work.

Routine visitors who will receive occupational dose will be escorted during their entry into any controlled area. Training information commensurate with the hazard or risk involved will be provided and documented for retention in the visitor file. An attachment documenting the entry will be provided to the visitor upon completion of the entry/visit.

Escorted visitors will not be allowed to enter any high radiation area, contaminated or airborne radioactivity areas. Permission to deviate from this must be obtained on a case-by-case basis, in writing, from the RSO. The visitor may be requested or required to become a CABRERA radiation worker. Some level of formal training will be required in all cases.

10.0 AUDITS AND INSPECTIONS

Audits and inspections shall be performed on a routine basis to evaluate the effectiveness of the RSP, and the level of compliance with applicable regulations, standard operating procedures, and license conditions. At a minimum, an audit of the RSP, based on an approved written plan, shall be performed annually. A qualified individual having no direct responsibility for the operation being audited shall be used to perform the annual audit in order to ensure unbiased and competent results. The annual audit for radiological safety shall be performed by an individual with at least two years experience in applied health physics. Items requiring corrective action shall be documented in a report distributed to the RSO and RSC. Follow-up actions will be documented.

At a minimum, Inspections shall be scheduled quarterly. Inspections can be performed by Radiation Staff members and will follow an approved written plan. Items requiring corrective action shall be documented in a report distributed to the RSO and members of the RSC. Follow-up actions will also be documented and distributed to members of the RSC. The RSC will review and evaluate the findings and corrective actions of the most recent inspections. The RSC may initiate corrective actions at that time.

11.0 RADIATION MONITORING INSTRUMENTS

Instruments used for radiation detection and measurement shall have a standard operating procedure written and approved by the RSO or duly authorized representative. Such procedures shall contain instructions on the proper use of the instrument, as well as calibration instructions for those instruments, which are calibrated by a NRC licensed contract company. Radiation detection instruments are calibrated semiannually and after each repair that would affect the accuracy of the instrument.

Only personnel trained in their use and in accordance with CABRERA procedures will use radiation detection instruments. Instrumentation is calibrated on a six (6) month schedule and after each repair that would affect the accuracy of the instrument by the manufacturer or a certified calibration laboratory. A calibration sticker shall be attached to the instrument to allow the operator to verify the instrument is within current calibration prior to use. If an instrument is found to have a past due calibration, the instrument SHALL NOT be used and SHALL BE tagged with an "OUT OF CALIBRATION" sticker or equivalent tag.

All health physics instruments shall be visually inspected, battery checked, and source checked prior to use.

12.0 MATERIAL RECEIPT AND ACCOUNTABILITY

The RSO shall approve or place all orders for radioactive material and ensure that the requested material, quantities, manufacturer, and model are authorized by the license and that the possession limits are not exceeded.

During normal working hours, carriers shall be instructed to deliver radioactive packages directly to the Radiation Safety Office or designated receiving area.

During off-hours, designated-trained personnel shall be instructed by the RSO to accept delivery of radioactive packages in accordance with this procedure. Upon receipt of the package, the RSO shall be notified.

13.0 OCCUPATIONAL DOSE

The RSP shall be implemented to control exposure through approved standard operating procedures. The procedures shall reference and provide instructions to ensure compliance with the applicable federal regulatory documents such as 10 CFR 19 & 20, and ensure that no occupational exposure limits set forth in 10 CFR 20 and the NRC license are exceeded. Radioactive materials and sources of radiation will be controlled in such a manner that radiation exposures to workers do not exceed limits specified in 10 CFR 20, Subpart C.

Radiation monitoring (external and/or internal) shall be conducted continuously when it is likely that any individual will exceed 10 percent of the annual limit. Occupationally exposed workers who have received radiation exposure prior to employment with CABRERA are required to provide their radiation exposure history records or names and addresses of previous employers and locations where they have received exposures. Copies of this letter will be sent to the individual, and maintained in the individual's personnel exposure file by CABRERA.

13.1 Personnel Monitoring

Personnel likely to receive in one year from radiation sources external to the body, a dose in excess of 10% of the applicable limits will be monitored by personnel dosimetry. The personnel dosimetry devices will indicate the amount of ionizing radiation to which the wearer was exposed. The personnel dosimeter will normally be worn on the upper front torso. Personnel are responsible to wear dosimetry as directed by the RSO. If a personnel dosimeter is lost, misplaced, or indicates an off-scale reading, the employee is required to notify their supervisor, health physics and/or the RSO immediately.

13.2 Embryo/Fetus

All reasonable efforts will be made to keep ionizing radiation exposure to the unborn child to the lowest practical level, as prescribed in 10 CFR 20.1208. Once a female employee determines that she is pregnant, she is encouraged to notify CABRERA in writing of her pregnancy. CABRERA will then institute radiation control measures that will limit radiation exposure to the unborn fetus to less than 500 mrem for the term of the pregnancy and below 50 mrem per month in any month after declaration.

13.3 Minors

No individual under the age of 18 years will be assigned radiation worker duties.

14.0 PUBLIC DOSE

Members of the general public are not permitted in CABRERA work areas where radioactive materials are handled. If an individual requires entry into a CABRERA work area for inspection or audit purposes, they will be required to provide the necessary information regarding their personal radiation worker training status. Appropriate supplemental training and dosimetry will be provided commensurate with the hazards involved in the work area and activity. Radiation exposures to the general public will be maintained below the following limits as prescribed in 10 CFR 20.1301.

- The dose in any unrestricted area will be maintained below 2 mrem in any one hour period.
- The maximum exposed individual's total effective dose equivalent (TEDE) from occupancy in all unrestricted areas will not exceed 100 mrem per calendar year.

In certain cases the provisions of EPA environmental radiation standards as listed in 40 CFR part 190 may also apply.

15.0 SAFE USE OF RADIONUCLIDES

CABRERA shall develop and implement procedures that will be used to ensure the security and safe use of all licensed material from the time it arrives at the facility until it is used, transferred, and/or disposed.

When any licensed materials are in use in controlled or unrestricted areas, they must be under constant surveillance so that the radiation worker can prevent others from becoming contaminated by or exposed to the material, or prevent persons from removing the material from the area.

15.1 Licensed Material

CABRERA's work with licensed materials will be performed within the requirements specified in a Radioactive Materials License issued by the NRC or an agreement state.

15.2 Exempt Materials

CABRERA may and does possess exempt quantities of radioactive materials in the form of check sources that are used to check instrument operation. Radioactive sources (that are exempt from licensing) are kept in a source storage locker located within the CABRERA Radiation Safety Office located in East Hartford, Connecticut. When these sources are used for field assignments, they are transferred by the RSO or authorized representative out of the storage locker to the individual user who is then responsible for their positive control. Upon completion of the field assignment, the sources are then returned to the storage locker and logged in by the RSO or duly authorized representative. These sources may be inventoried in their field locations, as required.

15.3 Receiving and Opening Packages

In accordance with 10 CFR 20.1906, packages containing radioactive materials will be surveyed for radioactive contamination and radiation levels. The survey will be performed within three (3) hours after receiving the transported package during normal working hours, or not longer than three (3) working hours from the beginning of the next scheduled working day after receipt, if delivered after work hours.

15.4 Contaminated Areas and Materials

All licensed materials at customer facilities shall be stored in secured areas when not in use or under surveillance by personnel to prevent unauthorized removal or access. Contaminated Areas that exceed the contamination limits in Table I shall be secured to prevent unauthorized or inadvertent entry or removal of contamination.

15.5 Posting of Radiation Areas

Any area accessible to personnel in which there exists ionizing radiation at dose-rate levels such that an individual could receive a deep dose equivalent in excess of 5 mrem in 1 hour at 30 centimeters from the radiation source or from any surface that the radiation penetrates shall be posted. Sufficient indicators (such as barrier rope or ribbon) shall be used to identify the boundary of the radiation area. At a minimum, the posting shall have a sign with the following:

CAUTION RADIATION AREA

An exemption to this requirement is permitted in areas or rooms containing radioactive materials for periods of less than 8 hours, if each of the following conditions is met.

- o The materials are constantly attended during these periods by an individual who takes the precautions necessary to prevent exposure to radiation or radioactive materials in excess of the limits specified above and stated in 10 CFR Part 20.
- o The area or room is subject to the licensee's control. For example, the area around a truck loading radioactive waste does not require posting if the above conditions are met.

15.6 High Radiation Areas

Any radiation area accessible to personnel in which there exists ionizing radiation at such levels that an individual may receive in excess of 100 mrem in 1 hour at 30 centimeters from the radiation source or from any

surface that the radiation penetrates shall be locked or continuously guarded and posted. At a minimum, the posting shall have a sign with the following:

CAUTION, HIGH RADIATION AREA
or
DANGER, HIGH RADIATION AREA

15.7 Very High Radiation Areas

Any area accessible to personnel in which there exists ionizing radiation at such levels that an individual could receive in excess of 500 Rad in 1 hour at 1 meter from the radiation source or from any surface that the radiation penetrates shall be locked or continuously guarded when open and posted. At a minimum, the posting shall have a sign with the following:

GRAVE DANGER
VERY HIGH RADIATION AREA

15.8 Airborne Radioactivity Area

Any room, enclosure, or area in which airborne radioactive material exist in concentrations in excess of the derived air concentrations (DAC's) specified in Table I, Column 3 of Appendix B, Title 10 Part 20 of the Code of Federal Regulations, or concentrations such that an individual present in the area without respiratory protective equipment could exceed, during the hours the individual is present in a week, an intake of 0.6 percent of the annual limit on intake (ALI), i.e., 12 DAC-hours, shall be posted. At a minimum, the posting shall have a sign with the following:

CAUTION - AIRBORNE RADIOACTIVITY AREA
or
DANGER, AIRBORNE RADIOACTIVITY AREA

15.9 Radioactive Materials Area

Any room, or area in which there is used or stored an amount of licensed material exceeding 10 times the quantity of such material specified in Appendix C, Title 10 Part 20 of the Code of Federal Regulations shall be posted. At a minimum, the posting shall have a sign with the following:

CAUTION, RADIOACTIVE MATERIALS AREA
or
DANGER, RADIOACTIVE MATERIALS AREA

15.10 Labeling Containers

A container that contains licensed material shall have a durable clearly visible label bearing the radiation symbol and the words "CAUTION, RADIOACTIVE MATERIAL" or "DANGER, RADIOACTIVE MATERIAL." The label shall also contain the following information that will allow

individuals working with or around the containers to implement precautions to avoid or minimize exposures:

- Radionuclide present.
- An estimate of the quantity of radioactivity and date of estimate.
- Radiation levels.
- Types of material and if appropriate, mass enrichment.

Containers are exempt from the above labeling requirements if the following conditions are met:

- Containers holding licensed material in quantities less than the quantities listed in Appendix C, Title 10 Part 20 of the Code of Federal Regulations,
- Containers holding licensed material in concentrations less than those specified in Table 3 of Appendix B to Title 10 Part 20 of the Code of Federal Regulations,
- Containers are attended by an individual who takes the necessary precautions to prevent the exposure of others in excess of 10CFR20 limits
- Containers when they are in transport and packaged and labeled in accordance with the regulations of the Department of Transportation.
- Containers that are accessible only to individuals authorized to handle, use, or work in their vicinity provided the containers are in locations identified to individuals by a readily available written record (containers in storage vaults, hot cells, etc.)

16.0 EMERGENCY PROCEDURES

It is the policy of CABRERA to provide whatever response is necessary in order to protect the health of our workers and all others at or in the immediate area of the CABRERA work site. It is important for all CABRERA employees to recognize that response to emergency situations must be prompt and accurate in order to maximize our efficiency to deal with potential insults to the working population or members of the general public.

CABRERA shall develop and implement a procedure that incorporates large sections of the NUREG-1556, Appendix R "Emergencies Procedure."

CABRERA will immediately notify the NRC and the licensee for which the work is being performed if any of the following conditions listed in 10 CFR 20, Subpart M exist.

17.0 SURVEYS

Survey is defined in NUREG 1556, Volume 11 as an evaluation of the radiological conditions and potential hazards incident to the production, use, transfer, release, disposal, or presence of radioactive material or other sources of radiation. CABRERA will develop and implement procedure(s) to perform surveys in a manner that meets compliance with 10 CFR 20. At a minimum, the procedures shall address the requirements of this program in the area of contamination control, release of materials for facility which CABRERA is working at, radiation work permits, surveys, personnel access, frisking, posting, and personnel protective equipment.

At a minimum, radiation staff members shall perform the following frequency for surveys performed at facilities where CABRERA is performing work under the CABRERA'S NRC license:

- Radiation surveys of areas not posted as radiation areas will be required monthly;
- Contamination surveys of areas not posted as contamination areas will be required monthly;
- Contamination survey of areas posted as contaminated will be performed weekly or daily when work is performed.
- Radiation surveys of areas posted as radiation areas will be performed weekly or daily when work is performed.
- Air samples shall be taken weekly or as required by the RWP.
- Additional surveys will be performed for work related activities and in support of RWPs as required by responsible radiation staff members, work plans, and/or operating procedures.

Many different types of surveys may need to be performed due to the particular use of licensed materials. Some of the more important are:

- Surveys for radioactive contamination that could be present on surfaces of floors, walls, furniture, and equipment.

- Measurements of radioactive material concentrations in air for areas where radioactive materials are handled or processed in unsealed form and where operations could expose workers to the inhalation of radioactive material or where licensed material is or could be released to unrestricted areas.
- Measurements of radioactive material concentrations in water that is released to the environment or to the sanitary sewer.
- Bioassays to determine the kinds, quantities or concentration, and in some cases, the location of radioactive material in the human body.
- Surveys of external radiation exposure levels in both restricted and unrestricted areas.

17.1 Radiation Surveys

Radiation surveys are performed to determine radiation conditions in the work area and provide personnel awareness to implement the CABRERA ALARA commitment. Radiation surveys also identify radiation conditions that require special posting as required by regulations to alert personnel of elevated radiation levels in a particular work area. Worker exposures can be estimated and controlled by understanding specific exposure levels and working time.

Radiation surveys are also used to determine the levels of radioactive material on surfaces when characterizing sites and facilities. These surveys determine if residual activity is below “unrestricted” release criteria or identifies specific areas that must be decontaminated to meet the release criteria.

17.2 Contamination Surveys

Contamination surveys are used to determine the levels of fixed and removable radioactive materials on surfaces and equipment. The survey technique uses disc smears (swipes) on surfaces to determine the amount of radioactivity that may be removed from the surface. The smears are then counted using a sample counter to determine the alpha and beta activities that were removed in the test. The fixed plus removable contamination is determined by direct measurement on surfaces. If the fixed and removable contamination is below the limits specified in Table I, the area or equipment can be further evaluated for release or disposal as “uncontaminated.”

Contamination surveys also identify areas or items that must be placed under control to prevent the dispersion or release of radioactive materials. Once identified, the area or materials are confined using roped off areas

and entry controlled to isolate the contamination until the levels are reduced by decontamination techniques below the “unrestricted” release criteria.

17.3 Air Sampling

Periodic air samples are taken as required verifying that air concentrations routinely remain below 10% of the DAC, to maintain the Committed Effective Dose Equivalent (CEDE) ALARA. Air samples are taken using personal lapel (or equivalent) air samplers or grab samplers that provide measurement of concentrations in the workers breathing zone. If the air concentration exceeds 10% of DAC values, the RSO should be notified so appropriate corrective actions can be taken and exposures received by workers evaluated and included in their personal exposure file.

17.4 Bioassay

In the event of an emergency where an individual may become contaminated and radioactive material was taken into the body through skin absorption or other means, or is suspected of having ingested or inhaled radioactive material, an estimate of the amount of material taken into the body may be required.

Bioassay is used to assess inhaled, ingested, or absorbed radioactive materials in order to determine internal and/or total dose to workers. The detection level for bioassay samples shall be 10% of the Annual Limit of Intake (ALI) or lower, if practical.

17.5 Leak Test

Sealed sources used for instrument calibration and response checks shall be inventoried and stored in a secure location. A leak check of inventoried sources will be performed and documented every six months. Leak testing is not required if:

- Sources contain only hydrogen-3 (tritium)
- Sources only contain byproduct material with a half-life of less than 30 days
- Sources contain only a radioactive gas
- Sources contain 100 microcuries or less of beta or gamma emitting material or 10 microcuries or less of alpha emitting material
- The sources are stored and not being used (they must be leak tested before use or transfer)

18.0 TRANSPORTATION

CABRERA shall develop and implement procedures that ensure compliance with NRC and Department of Transportation (DOT) regulations. CABRERA shall use only qualified Waste Brokers that meet the shipping requirements of the waste disposal facilities. The Waste Broker will report to the RSO on issues related to shipment of radioactive waste and/or materials.

19.0 WASTE MANAGEMENT

CABRERA shall develop and implement procedures that ensure compliance with NRC and EPA regulations. The procedures shall be developed for handling of waste, safe and secure storage, waste characterization, waste minimization, and disposal of radioactive waste.

19.1 Release into air and water

CABRERA employees shall not release radioactive material into the air or water.

19.2 Disposal of Waste at Licensed Landfill

A licensee can dispose of licensed (radioactive) material by transferring the material to an authorized recipient, i.e., another licensee with a valid license to receive and store or receive and bury (provide final disposition) the material. In order to provide a disposal service in a land disposal facility licensed under 10 CFR Part 61, the authorized recipient must be specifically licensed to receive waste containing the specified or identified licensed material. The transfer of material between a licensee and an authorized receiver must be accompanied with a system of manifesting, a certification or characterization process and control/tracking system.

19.3 Disposal of Liquids in Sanitary Sewer

CABRERA employees shall not dispose of liquids containing radioactive or hazardous materials in a sanitary sewer.

19.4 Incineration of Waste

CABRERA employees shall not incinerate waste materials containing radioactive materials.

19.5 Disposal of Wastes From Contaminated Areas Following Surveys

Materials, items, and waste that have been decontaminated and a thorough survey indicates contamination levels are below those specified in Table I can be evaluated for disposal in a sanitary land fill. More restrictive limits may apply at certain customer facilities where CABRERA works and the most restrictive contamination limits will prevail. Items from contaminated areas that are known not to have been contaminated and exhibit no detectable activity above background, as measured with an instrument appropriate for the material may be released. If the waste consists of containers that have held contained radioactive materials any radioactive materials signs shall be removed or defaced clearly indicating that the container no longer contains radioactive material.

19.6 Operation of a Waste Compactor or Compaction Equipment

CABRERA employees shall not operate a waste compactor or compaction equipment unless performed under contract, at a client site. Any CABRERA personnel requested to operate this type of equipment shall be trained and that training shall be documented prior to any operation.

CABRERA personnel must comply with all conditions of their license prior to beginning any equipment operations.

20.0 RECORDS, REPORTS AND NOTIFICATIONS

20.1 Personnel Records

A personnel file is maintained for each employee assigned work duties involving radioactive materials. The content of these files include:

- A record of radiation exposure received by the individual during previous employment is maintained by requesting personal exposure information from previous employers where the individual worked with radioactive materials.
- A record of personnel dosimeter measurements is recorded in the personnel file to provide a permanent record of radiation exposure received during the course of CABRERA work assignments.
- If a personal dosimeter is lost or damaged, an exposure investigation will be performed and an exposure will be assigned for the monitoring period. A report detailing the exposure estimate will be included in the personnel record.

- If the air concentration in the work area exceeds 10% of DAC values, air samples and bioassay samples will be used to estimate internal exposures received by the worker and included into their personal exposure file.
- If a worker finds contamination on their person above the limits specified in Table I, a report of the incident will be placed in the personnel file to determine exposure from the incident.

The personnel records will be maintained indefinitely and personnel may review their file or request copies of information within their files. The licensee for which work is performed will be provided individual exposure information as required by their license or applicable regulations.

20.2 Radiation and Contamination Records

Radiation and contamination survey records collected during site surveys, remediation/decontamination activities, and radiological characterization activities are stored in site-specific files at the East Hartford office. Duplicate copies of the records are also supplied to the licensee where the work was performed.

20.3 Records of Waste Disposal

Radiation Survey Records, contamination survey records, shipping manifests, and certifications generated for a licensee's shipment of radioactive materials to a licensed disposal site shall be stored in specific shipment files in the East Hartford office. Duplicate copies of the records are supplied to the licensee for which the work was performed.

21.0 PROCEDURES

CABRERA procedures have been developed for all aspects of the radiation safety program through the use of federal regulatory guidance documents and other applicable guidance documents. These procedures will facilitate the control of radiation exposures, contamination and airborne radioactivity on all CABRERA projects and worksites. Attachment 1 provides a list of Cabrera Services radiation safety program procedures.

Administrative procedures define specific program functions and the methods to be used when carrying out each program function. All radiological CABRERA job functions will be governed by the rules and regulations set forth in the administrative procedures.

Operational procedures define precise methods used to perform specific radiological job functions properly and safely. These operational procedures are governed by the program functions set forth by the administrative procedures. The methods vary according to each particular procedure but remain consistent in their methodical approach to each objective.

Attachment 1
List of Procedures

AP-001	Record Retention
AP-002	[Reserved]
AP-003	Radiological Conditions Awareness Report
AP-004	Radiological Compliance Audits
AP-005	ALARA
AP-006	Respiratory Protection Program
AP-007	Bioassay Program
AP-008	Dosimetry Program
AP-009	Training
AP-010	Personnel Protective Equipment
AP-011	Emergency Response
AP-012	Radiation Work Permits
AP-013	Packaging Radioactive Material
AP-014	Classifying Radioactive Waste
AP-015	[Reserved]
AP-016	Radioactive Material Tracking
OP-001	Radiological Surveys
OP-002	Air Sampling and Analysis
OP-003	[Reserved]
OP-004	Unconditional Release of Material from Radiological Control Areas
OP-005	Volumetric and Material Sampling
OP-006	[Reserved]
OP-007	[Reserved]
OP-008	Chain of Custody
OP-009	Use and Control of Radioactive Check Sources
OP-010	[Reserved]
OP-011	Procurement and Receipt of Radioactive Material
OP-012	Opening Radioactive Material Containers
OP-013	[Reserved]
OP-014	Contamination Containment Devices
OP-015	Step-Off Pads
OP-016	Portable HEPA Systems and Vacuum Cleaners
OP-017	Empty Transport Vehicle Radiological Surveys
OP-018	Decontamination of Equipment and Tools
OP-019	Radiological Posting
OP-020	Operation of Contamination Survey Meters
OP-021	Alpha-Beta Counting Instrumentation
OP-022	Operation of Ionization Chambers
OP-023	Operation of Micro-R Meters
OP-024	Direct Reading Dosimeters

Attachment 3 CABRERA SOP OP-001: Radiological Surveys



CABRERA SERVICES

Radiation Safety Procedure

For

Radiological Surveys

OP-001

Revision 1

Approved By:

Henry Siegrist
Henry Siegrist, CIIP, P.E., Corporate Health Physicist

Date:

7/4/05

Approved By:

David Watters
David Watters, CHP, Vice President Operations

Date:

7/4/05

1.0 PURPOSE

The purpose of this procedure is to establish the framework and to define the requirements for Cabrera Services, Inc., (CABRERA) personnel performing radiological surveys. Adherence to this procedure will provide reasonable assurance that the radiological surveys performed maintain reproducible results. In addition, adherence to this procedure will provide adequate control of radiation exposures As Low As Reasonably Achievable (ALARA).

2.0 APPLICABILITY

This procedure provides the requirements for identifying, scheduling, and performing routine, radiation, contamination, and airborne surveys by radiation safety personnel. Remediation and facility areas that are radiologically controlled (restricted areas) due to the potential for fixed or transferable contamination are considered for routine survey performance. This procedure does not include survey requirements for radiation generating devices and survey requirements specified in radiation work permits (RWP's).

The following types of surveys may be performed using this procedure.

- Surveys for shipping radioactive materials (DOT regulations may require additional consideration).
- Surveys performed to characterize facilities, sites, and/or release items potentially contaminated with radioactive materials from restricted areas.
- Surveys performed to provide information used to guide or direct decontamination and decommissioning of facilities and sites.

3.0 PRECAUTIONS, LIMITATIONS AND REQUIREMENTS

3.1 Precautions

- 3.1.1 Instruments used to perform routine surveys should be operated in accordance with the respective operating procedures or manufacturer's recommendations.
- 3.1.2 Large area smears may be used to augment (but not replace) the 100 cm² smear survey. Large area smears may be counted with a Ludlum Model-3 and 43-89 probe or equivalent. Large area smears are used to obtain immediate information concerning loose contamination for the purpose of radiological protection and to minimize time spent performing smears on an item easily identified as contaminated.

- 3.1.3 Personnel performing routine surveys shall be logged in on a Radiation Work Permit in accordance with AP-012 (if applicable).
- 3.1.4 Audible response instruments should be used during direct scan surveys.
- 3.1.5 The instruments used for routine surveys shall be within current calibration and shall have had a performance test check performed daily or before use in accordance with the instrument's operating procedure.

3.2 Limitations

- 3.2.1 The maximum probe speed during direct scan surveys of surfaces shall be 3 cm/sec.
- 3.2.2 The probe face shall be held within $\frac{1}{4}$ inch of the surface being surveyed for alpha radiation, and within $\frac{1}{2}$ inch of the surface being surveyed for beta-gamma radiation.
- 3.2.3 If an instrument used to perform routine surveys fails operational checks, it shall be removed from service. Data collected during the period of instrument failure must be evaluated by the RSO or duly authorized representative.
- 3.2.4 Posting of radiological control areas shall be performed in accordance with OP-019.

3.3 Requirements

- 3.3.1 Individuals performing surveys should obtain and review any previous surveys performed in the area or on the object to determine radiation conditions which may be encountered.
- 3.3.2 Qualified individuals shall perform surveys. Qualification will be determined on a case basis by the Project Manager, RSO or duly authorized representative field. Qualification considers prior training, experience, and certifications such as, Health Physics Technician (HPT), NRRPT, etc.
- 3.3.3 To ensure achieving the required sensitivity of measurements, survey samples will be analyzed in a low-background area whenever practical.
- 3.3.4 Dose rate surveys, at a minimum, should be performed in locations where workers are exposed to radiation levels that might result in radiation doses in excess of 10% of the occupational dose limits or

where an individual is working in a dose rate area of 2.5 mrem/hr or more.

- 3.3.5 If contamination is found in unrestricted areas, prevent access to the area and immediately notify the RSO or duly authorized representative.

4.0 REFERENCES

- 10 CFR 20, Subpart E Radiological Criteria for License Termination
- 10 CFR 20, Subpart F Surveys and Monitoring
- 10 CFR 20.2103 Records of Surveys
- RSP Radiation Safety Program
- AP-001 Record Retention
- AP-010 Personnel Protective Equipment
- OP-020 Operation of Contamination Survey Meters
- OP-021 Alpha-Beta Counting Instrumentation
- OP-022 Operation of Micro-R Meters
- OP-023 Operation of Ionization Chambers

5.0 DEFINITIONS AND ABBREVIATIONS

- 5.1 Radiological Control / Restricted Area – An area to which access is controlled to protect individuals against undue risks from exposure to radiation and radioactive materials.
- 5.2 Contamination Survey – A survey technique to determine fixed and removable radioactive contamination on components and facilities.
- 5.3 Radiation Survey – is defined as an evaluation of the radiological conditions and potential hazards incident to the production, use, transfer, release, disposal, or presence of radioactive material or other sources of radiation.
- 5.4 ALARA – (acronym for “as low as is reasonably achievable”) An approach to radiation exposure control to maintain personnel exposures as far below the federal limits as technical, economical and practical considerations permit.

6.0 EQUIPMENT

Instruments used to perform routine surveys shall be used in accordance with the applicable CABRERA administrative and operational procedures. Authorized suppliers of properly calibrated and maintained equipment will supply/calibrate instruments. Equipment counting efficiencies may be determined by qualified Cabrera personnel.

Radiation and Contamination survey meters will be selected based on job specific requirements and be identified in the Site Work Plans.

7.0 RESPONSIBILITIES

- 7.1 Project Manager (PM) – the PM is responsible for ensuring that personnel assigned the task of performing routine surveys are familiar with this procedure, adequately trained in the use of this procedure, and have access to a copy of this procedure.
- 7.2 Radiation Safety Officer (RSO) – The RSO is responsible for monitoring compliance with this procedure and training personnel in performing radiation and contamination surveys. The RSO can also assist in the interpretation of the results obtained during surveys.
- 7.3 Radiological Field Supervisor (RFS) – During field assignments, the RFS is responsible for ensuring that this procedure is implemented. When the RSO is not on site, the RFS will act as the RSO's duly authorized representative for radiological issues.
- 7.4 Health Physics Technicians (HPT) – The HPT performing radiation and contamination surveys are responsible for knowing and complying with this procedure.

8.0 INSTRUCTIONS

8.1 Safety Considerations

The safety requirements specified in the job specific Health and Safety Plans and Work Plans, the Radiation Safety Program, and other safety documentation must be adhered to when performing surveys.

8.2 Initial Preparations

Obtain and review any previous surveys performed in the area to determine radiation conditions, which may be encountered.

- 8.2.1 Obtain appropriate survey instruments and assure daily QC checks have been performed prior to instrument use.
- 8.2.2 Obtain necessary forms, smears, and protective clothing, which will be used during the survey.
- 8.2.3 Plan any strategy for performing the survey before entering the area to reduce exposure time within the area.

- 8.2.4 If smearable contamination is expected to be above allowable limits, set up an entry/exit area which will prevent the spread of contamination.

8.3 Radiation Surveys

- 8.3.1 If radiation levels are unknown or previous surveys remain in question, first measure general area radiation levels using a Micro-R Meter or equivalent dose rate meter to determine if elevated radiation levels exist in the survey area.

- 8.3.2 Small Areas/Items/Containers – This survey technique is used to establish exposure rates from small areas, items, or containers, which contain radioactive materials.

- 8.3.2.1 Scan the entire surface area of the area, item, or container with a Micro-R or equivalent meter and record locations and readings on OP-001-02 or equivalent form.

- 8.3.2.2 Measure the exposure rate at 30 centimeters from all surfaces or sides of the area, item, or container and record the location and readings on OP-001-02 or equivalent form.

- 8.3.2.3 Large waste containers used for shipment of bulk quantities of soil debris etc., may have a single dose rate measurement per accessible side of the container for ALARA purposes. DOT regulations may require additional dose rate measurements prior to shipping not covered by this procedure. Note readings on OP-001-02 or equivalent form.

- 8.3.3 Facility Surveys – This survey technique may be used to release facilities (buildings etc.) to “unrestricted” status or determine status of facilities requiring decontamination and decommissioning. Final release of a facility will be established using MARSSIM guidance.

- 8.3.3.1 Establish a 1 meter by 1 meter grid system of the facility surfaces using a marking system that assigns a unique number/letter system to the center of each grid. Graphically illustrate the location of the grid system on OP-001-02 or equivalent form.

- 8.3.3.2 Using a Micro-R Meter, obtain radiation levels at 1 meter from the grid center point and at contact with the grid center point. Record reading on OP-001-02 or equivalent Form. If elevated readings are noted, scan the surface of the grid

and note location of any elevated readings with a marker and on OP-001-02 or equivalent Form.

- 8.3.3.3 Obtain Micro-R readings from locations surrounding the facility or within the facility, which do not contain activity. This establishes a background level for comparison to the reading taken in step 8.3.3.2 above.

- 8.3.4 Area Surveys – This survey technique may be used to release land masses to “unrestricted” status or determine status of areas requiring decontamination before release. Final release of a site area will be established using MARSSIM guidance

- 8.3.4.1 Establish a 10 meter by 10 meter grid system of the area to be surveyed using surveyor stakes or equivalent, which are numbered with a unique number/letter system to identify the center of each grid. List the locations of the “gridded” system on OP-001-02 or equivalent form.

- 8.3.4.2 Using a Micro-R meter or equivalent, obtain radiation levels at 1 meter above the ground surface in the center of the grid. Record all readings on OP-001-02 or equivalent Form.

- 8.3.4.3 Survey the remainder of the grid at the surface using an “S” pattern for the instrument. If elevated readings are noted above or below the grid center point reading, subdivide the grid into additional subgrids and obtain readings at 1 meter above the ground surface. Record all readings on OP-001-02 or equivalent.

8.4 Contamination Surveys

- 8.4.1 If removable contamination is suspected or previous surveys are in question, first scan likely contaminated areas with an α and/or β probe to determine if elevated areas of contamination exists. Obtain smear samples from any elevated areas and count smears in sample counter. If smearable contamination above limits set for the job are found, use appropriate protective clothing and entry control techniques to prevent the spread of contamination.
- 8.4.2 Small Areas/Items/Containers – This survey technique is used to establish total and transferable contamination levels on small areas, items, or containers, which contain radioactive materials.

- 8.4.2.1 If the area, item, or container contains alpha activity, scan the area with an alpha probe at $\frac{1}{4}$ inch above the surface. Note total (fixed plus transferable contamination) readings on OP-001-02 or equivalent form.
- 8.4.2.2 If the area, item, or container contains beta activity, scan the area with a beta probe at approximately $\frac{1}{2}$ inch above the surface to be surveyed and obtain reading following meter stabilization. Record meter reading on OP-001-02 or equivalent form. The surface of a container can only be directly surveyed for beta activity if the radiation level from the container does not significantly elevate the beta probe background. Note total fixed plus transferable contamination readings on OP-001-02 or equivalent survey form.
- 8.4.2.3 Provide transferable smear contamination survey on the area, item or container by performing 100 cm² smears at routine intervals on the subject area, item, or container.
- 8.4.2.4 Large waste containers used for shipment of bulk quantities of material will have one or more contact readings taken at routine intervals on the accessible sides of the container. Note total (fixed plus transferable) contamination readings on OP-001-02 or equivalent form. DOT regulations may require additional survey points.
- 8.4.2.5 For large waste containers used for shipment of bulk quantities of material for disposal (or other large items such as soil moving equipment), determine the transferable surface contamination by taking Large Area Smears (LAS). Use Masslin cloth or equivalent material to obtain a large area smear representative of the potentially contaminated area. Count the LAS in a low background area using alpha and beta detection equipment. If no transferable contamination above limits is found on the LAS, take several confirmatory 100 cm² smears at routine intervals on the object and count smears for alpha and beta activity. Record results on OP-001-02 or equivalent form. DOT regulations may require additional survey points.

NOTE: The presence of activity above transferable limits on an LAS signifies potential contamination. Determine actions to be taken with the RSO or RFS.

- 8.4.3 Facility Surveys – This survey technique is used to aid in the release of facilities (buildings etc.) to “unrestricted” status or determine status

of facilities requiring decontamination and decommissioning. Final release of a facility will be established using MARSSIM guidance.

8.4.3.1 The grid system established in section 8.3.3.1 will also be utilized for contamination surveys.

8.4.3.2 Hold the beta probe at approximately $\frac{1}{2}$ inch above the grid center point and obtain reading following meter stabilization. Record the meter reading on OP-001-02 or equivalent form.

8.4.3.3 If the readings are at background levels, randomly scan the remainder of the grid, concentrating on cracks, floor/wall joints, top of horizontal surfaces, ventilation ducts and grills, and other areas that might collect radioactive materials. Mark any locations above the release criteria on OP-001-02 or equivalent form.

8.4.3.4 If readings are at or near the release levels, scan grid surface and identify portion of the grid that is above the release criteria. Note these areas on the survey form and mark the area of the grid with spray marker (or equivalent) on OP-001-02 or equivalent form.

Repeat steps 8.4.3.2 through 8.4.3.4 with an alpha probe at $\frac{1}{4}$ inch above the grid center point. If sufficient documentation of previous history is known about the facility, the alpha survey may not be required if alpha contamination is known not to be present.

8.4.3.5 One smear sample from a 100 cm² area will be taken in each grid. If the above survey found no elevated readings in the grid, the smear sample will be taken in the center of the grid. If elevated levels readings are identified the smear sample will be taken from the area where the highest reading was obtained.

8.4.3.6 Each smear sample will be labeled with the grid location and counted for alpha and beta activity in the sample counter. The smear sample results will be recorded on OP-001-02 or equivalent Form.

8.4.4 Area Surveys – This survey technique is used to aid release of land masses to “unrestricted” status or determine status of area requiring decontamination before release. Final release of a facility will be established using MARSSIM guidance.

- 8.4.4.1 The grid system established in section 8.3.4, will be utilized for contamination surveys.
- 8.4.4.2 Hold the beta probe at $\frac{1}{2}$ inch above the grid center point and obtain reading following meter stabilization. Record the meter reading on OP-001-02 or equivalent form.
- 8.4.4.3 If readings are at background levels, randomly scan the remainder of the grid. Mark any locations above release criteria on OP-001-02 or equivalent form.
- 8.4.4.4 If readings are at or near the release levels scan the grid surface and identify portion of the grid that is above release criteria. Note these areas on OP-001-02 or equivalent form.
- 8.4.4.5 Areas contaminated with radioactive materials may require soil sample analysis to determine the activity concentration. The quantity and location of samples will be determined on a case-by-case basis.

8.5 Frequency and Requirements for Routine Surveys

Appropriate routine radiological surveys shall be performed at the following frequencies as a minimum:

8.5.1 Radiation Surveys

- Upon initial entry after extended periods of closure
- Daily, at contamination control points, where the potential exists for personnel to be exposed to dose rates greater than 2 mrem/hr
- Daily, during continuous operation, and when levels are expected to change
- Weekly, in routinely occupied areas adjacent to radiological control areas with dose rates greater than 2 mrem/hr
- Weekly for operating HEPA-filtered ventilation units
- Weekly, for any temporary Radiation Area boundaries to ensure that the Radiation Areas do not extend beyond posted boundaries
- Monthly, or upon entry if entries are less than monthly, for Radioactive Material Storage Areas

8.5.2 Contamination Surveys

- Daily, at contamination control points from areas exhibiting contamination above surface contamination limits for the job site
- Daily, in office spaces located in the radiological control areas
- Weekly in lunchrooms or eating areas adjacent to radiological control areas
- Weekly, in routinely occupied locker rooms or the shower areas adjacent to radiological control areas associated with site radiological work
- Weekly, or upon entries, if entries are less frequent, in the areas where radioactive materials are handled or stored
- Weekly for all project offices on site

8.5.3 Airborne Surveys:

Airborne survey frequency, locations, and methods are determined by the radiation work permits (RWP's) and by the RSO.

8.6 Identifying and Scheduling Routine Radiological Surveys

8.6.1 To assist in assuring surveys are scheduled, the RSO or duly authorized representative shall identify and schedule routine surveys as required by the radiological conditions and work activities.

8.6.2 Routine Survey Schedules or equivalent should be developed using a standard system for designating surveys such as:

Frequency of Survey

- | | |
|-----------------|---|
| • Daily | D |
| • Weekly | W |
| • Monthly | M |
| • Quarterly | Q |
| • Semi-Annually | S |
| • Annually | A |
| • Upon Entry | U |

Type of Survey

- | | |
|-----------------|---|
| • Radiation | R |
| • Contamination | C |
| • Area TLD | T |

- Air Sample A

Example: DRC-1

Where:

D: is the survey frequency (Daily in this example)
R: is the type of survey (Radiation in this example)
C: is a type of survey (Contamination)
1 corresponds to the numerical sequence of the survey

8.6.3 Routine survey schedules should be submitted to and reviewed by the RSO or duly authorized representative.

8.6.4 Routine Survey Schedules should be indicated on form OP-001-01 or equivalent. Task Leaders may elect alternate methods of determining the information contained on OP-001-01.

8.7 Using As Low As is Reasonably Achievable (ALARA) Principles for Scheduling and Performing Surveys

8.7.1 Routine surveys should not be performed in High Radiation Areas unless other work necessitates entry. Boundary verification surveys would be appropriate if an entry is not required.

8.7.2 Routine surveys should be performed in conjunction with other work surveys as much as practicable.

8.8 Performance of Routine Surveys

8.8.1 HPT's and qualified individuals shall perform routine surveys in accordance with the applicable operational procedure.

8.8.2 Upon completion of a routine survey, the HPT shall initial and date the appropriate Survey Form.

8.9 Periodic Evaluation of Routine Surveys

8.9.1 Routine survey schedules should be reviewed and updated periodically to ensure that all areas within the project boundaries are receiving the appropriate routine survey coverage.

8.9.2 Changes of conditions within the project area will be reported to the RSO or duly authorized representative and may require a modification of the routine radiological survey schedule.

8.10 Management Notification

- 8.10.1 The RSO should be notified, by the project manager or duly authorized representative, of failure to complete a routine survey as scheduled. The missed survey will be completed within 24 hours (or next working day) of discovering the inconsistency.

9.0 QUALITY ASSURANCE/RECORDS

9.1 Quality Assurance

- 9.1.1 Instruments used to perform routine radiological surveys will be inspected for serviceability each day and checked against check sources to verify they are in proper working condition per the applicable Operational Procedure and standard work practices.
- 9.1.2 Radiation and Contamination surveys will be reviewed by the RSO or duly authorized representative for accuracy and completeness.

9.2 Records

- 9.2.1 At a minimum, each survey record should include the following:
- A diagram of the area surveyed, if applicable.
 - A list of items and equipment surveyed.
 - Specific locations on the survey diagram where wipe test were taken.
 - Background radiation levels with appropriate units.
 - Contamination levels with appropriate units.
 - Make, model number, and serial number of instruments used.
 - Name of the person making the evaluation and recording the results and date.
- 9.2.2 Radiological Survey Records, routine survey schedules, and tracking forms are generated during the performance of this procedure. Electronic equivalents of forms may be utilized.
- 9.2.3 Documented information shall be legibly written in ink.
- 9.2.4 Data shall not be obliterated by erasing, using white-out, or by any other means. Incorrect entries shall be corrected by striking a single line across the entry. The correction shall be entered, initialed, and dated.

- 9.2.5 Personnel performing the survey shall ensure that this procedure is the most current and approved revision.
- 9.2.6 Personnel performing the survey shall review forms and any other electronic equivalents for accuracy and completeness.
- 9.2.7 Entries on forms and any other pertinent forms must be dated and initialed by the individual performing the survey to be valid.
- 9.2.8 The RSO or duly authorized representative shall review any applicable completed forms. The review shall be for accuracy and completeness.

10.0 ATTACHMENTS

- OP-001-01 Routine Survey Schedule
- OP-001-02 Survey Form

**OP-001-01
ROUTINE SURVEY SCHEDULE**

Survey Designation	Location of Survey

Prepared By: _____

Date: _____

Reviewed By: _____

Date: _____

OP-001-02 Radiological Survey Sheet

Location: Site:				RWP#				Survey #				Survey Type:				pg. 1 of	
Smear Results CPM/100cm ²																	
No.	α	β	No.	α	β												
1			26														
2			27														
3			28														
4			29														
5			30														
6			31														
7			32														
8			33														
9			34														
10			35														
11			36														
12			37														
13			38														
14			39														
15			40														
16			41														
17			42														
18			43														
19			44														
20			45														
21			46														
22			47														
23			48														
24			49														
25			50														
Comments																	
Surveyed By:		Date:		Instrument	Serial #	α Eff.	β Eff.	α Bkg.	β Bkg.	Cal. Due	Key						
												Smear	*.*	Boundary			
												Dose Rate mrem/hr		A/S Location			
Reviewed By:		Date:									*	Direct Reading CPM/100 cm ²					
												Grab Sample					

STANDARD OPERATING PROCEDURE

SOP No.: SAM-0202
Revision No.: 7
Date Revised: 9/20/07
Page 1 of 5

CATEGORY: Sample Handling
TITLE: Field Sampling

- 1 PURPOSE: To document the current procedures for sample collection.
- 2 RESPONSIBILITY: Designated field samplers who have been properly instructed and trained in field sampling protocol and techniques.
- 3 SAMPLE COLLECTION, PRESERVATION AND HANDLING:
 - 3.1 For sample collection, preservation and handling, please refer to SOP No. SAM-0200.
- 4 REFERENCES:
 - 4.1 Field Sampling Procedures Manual, Aug. 2005, New Jersey Department of Environmental Protection.
- 5 SUMMARY:
 - 5.1 This SOP represents all general field sampling requirements as required by the NJDEP. It specifically addresses the proper use of protective equipment, collection of QA/QC samples, field decontamination procedures, proper documentation of all field activities, collection of samples into proper containers with the proper preservation and the techniques for collecting each type of sample.
- 6 DEFINITIONS:
 - 6.1 PPE: Personal Protective Equipment.
 - 6.2 DI Water: Distilled and deionized water.
- 7 SAFETY:
 - 7.1 For safety, please refer to CTSC Fort Monmouth, NJ Health and Safety Plan (HASP).
 - 7.2 Employees must use personal protective equipment (PPE) for adequate protection and to limit the level of exposure on site. The equipment selected must be appropriate to protect against all known and potential hazards. All field personnel are required to be familiar with the potential hazards that may be encountered on site prior to entry.
 - 7.3 At a minimum, all field personnel are required to have work boots (steel toe construction), safety glasses or goggles, a hard hat and gloves available for all

Prepared By:_____	Date:_____
Laboratory Director:_____	Date:_____
QA/QC Manager:_____	Date:_____

CATEGORY: Sample Handling

TITLE: Field Sampling

sampling activities.

7.3.1 Standard latex surgical gloves will be worn at all times when samples are collected or handled.

8 EQUIPMENT AND MATERIALS:

- 8.1 Personal Protective Equipment (PPE) including appropriate gloves, glasses or goggles.
- 8.2 Acid(s), liquid(s), or solid material(s) for preservation.
- 8.3 Bottles of the appropriate volume and type for the parameters to be sampled.
- 8.4 Well pumps (peristaltic or submersible).
- 8.5 Polyethylene (food grade) or other dedicated tubing.
- 8.6 Teflon bailers, polyethylene bailers, Bacon bombs.
- 8.7 Sludge judge, extend scoops and various other sample devices.
- 8.8 Stainless steel soil augers, trowels, and bowls.
- 8.9 Geoprobe Macrocore Sampler Assembly.
 - 8.9.1 Including screens, points and risers.

9 STANDARDS/REAGENTS:

- 9.1 pH solutions.
- 9.2 Conductivity solutions.
- 9.3 Oxidaton Reduction Cal solution.
- 9.4 Turbidity solutions.
- 9.5 NO3 cal solutions.
- 9.6 Nitric Acid 69.0-70.0 %.
- 9.7 Sulfuric Acid 50% (w/w) solution.
- 9.8 Hydrochloric Acid (trace metal grade).
- 9.9 Ice for keeping samples at <4 degrees Celsius.

10 QUALITY CONTROL:

- 10.1 QA/QC samples are intended to provide control over the collection of environmental measurements and subsequent validation, review and interpretation of generated analytical data.
 - 10.1.1 Trip Blank: Used exclusively for Volatile organic analysis and its purpose is to measure possible cross contamination of samples during shipping to and from the site.
 - 10.1.1.1 The trip blank is never opened and it travels to the site with the empty sample bottles and then back with the collected samples.
 - 10.1.1.2 Contaminated trip blanks may indicate improper bottle cleaning procedures or blank water of questionable quality.
 - 10.1.1.3 Trip blanks must be included at the rate of one per sample shipment (not to exceed two consecutive field days).

CATEGORY: Sample Handling

TITLE: Field Sampling

- 10.1.2 Field Blank: Used to place a mechanism of control on sample equipment handling, preparation, storage and shipment.
 - 10.1.2.1 The field blank travels and is stored with the sample bottles.
 - 10.1.2.2 Field blanks are collected in the following manner:
 - 10.1.2.2.1 Two identical sets of bottles are prepared.
 - 10.1.2.2.2 One of the sets is filled with laboratory demonstrated analyte free water (same water used for trip and method blanks).
 - 10.1.2.2.3 All of the filled bottles are shipped with the other empty sample containers.
 - 10.1.2.2.4 At the field location, in an area where contamination is suspected, the water is passed from the full set of like-bottles through a dedicated or field contaminated sampling device and into the empty set of like-bottles.
 - 10.1.2.3 Field blanks are preserved identically to samples receiving the same analyses.
 - 10.1.2.4 They are collected and analyzed for all of the same parameters as the samples collected that day.
- 10.1.3 Field Duplicates: Duplicate samples may be required on a contract or site-specific basis.
 - 10.1.3.1 For aqueous samples, duplicates are taken by alternating filling containers from the same sampling device for each of the required parameters.
 - 10.1.3.2 For non-aqueous matrices, obtaining duplicates requires homogenization of the sample aliquot prior to filling the sample containers.
 - 10.1.3.2.1 Regardless, volatile organic samples must always be taken from discrete locations or intervals without compositing or mixing.
 - 10.1.3.3 Samples shall be properly preserved and the correct size, shape and color containers shall be used at all times.
 - 10.1.3.4 Guidelines for sample containers and preservation can be found in SOP SAM-0200.

11 PROCEDURE:

11.1 Decontamination procedures for Field Sampling Equipment:

- 11.1.1 Aqueous Sampling:
 - 11.1.1.1 Detergent plus a tap water wash.
 - 11.1.1.2 Generous tap water rinse.
 - 11.1.1.3 DI water rinse.
 - 11.1.1.4 Nitric acid rinse (if sampling for metals).

CATEGORY: Sample Handling

TITLE: Field Sampling

- 11.1.1.5 DI water rinse.
- 11.1.1.6 Acetone rinse (if sampling for organic parameters).
- 11.1.1.7 Total air dry.
- 11.1.1.8 DI water rinse.
- 11.1.2 Non-aqueous Sampling:
 - 11.1.2.1 Detergent plus tap water wash.
 - 11.1.2.2 Generous tap water rinse.
 - 11.1.2.3 DI water rinse.
- 11.1.3 Proper decontamination of all site activities is crucial. Documentation must be maintained to trace the possession and handling of the samples from the time of collection, through analysis and disposal.
- 11.2 Every field sampler (team) is required to maintain a bound field-sampling logbook with permanently numbered pages. All field activities and notes will be documented in this book. Notations shall be made in logbook fashion, noting the time and date of all entries. Information recorded in the will include:
 - 11.2.1 Name and location of the site investigation.
 - 11.2.2 Date and time of arrival and departure.
 - 11.2.3 Persons contacted.
 - 11.2.4 Weather conditions.
 - 11.2.5 Samples taken, method used, time of collection and the depths if required.
- 11.3 Field instrument calibrations are kept in separate books.
- 11.4 Sample labels can be completed before sample collection and the time noted after collection. Sample labels will include the following information:
 - 11.4.1 Well or field sample identification.
 - 11.4.2 Parameters to be analyzed.
 - 11.4.3 Preservatives used.
 - 11.4.4 Date and time of sample collection.
 - 11.4.5 Sampler's initials.
 - 11.4.6 Site name and/or location.
- 11.5 A chain of custody (COC) form must be completed in the field and it must accompany each set of samples collected. The COC is a legal record of possession of the samples and of request for analysis. It bears the name of the person assuming responsibility of the sample. This responsibility must be relinquished upon transfer of possession. A copy of a chain of custody is enclosed for reference (Appendix 1).
- 11.6 Due to the variety of sampling techniques, it is impractical to summarize them in this document. It is therefore required that each field technician reads and reviews the May 1992 NJDEP Field Sampling Guidebook for the specific required techniques.

12 POLLUTION PREVENTION:

- 12.1 For pollution prevention, please refer to SOP No. SAM-0222.

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13 WASTE MANAGEMENT:
13.1 For sample disposal, please refer to SOP No. SAM-0220.

14 TABLES AND DIAGRAMS:

Fort Monmouth Environmental Testing Laboratory

Chain of Custody Record

Customer:			Project No: Location:			Analysis Parameters								Comments: Remarks / Preservation Method			
Phone #:						Sample	#										
()DERA ()OMA ()Other:_____																	
Samplers Name / Company :				Type	bottles												
Lab Sample I.D.		Sample Location		Date	Time												

STANDARD OPERATING PROCEDURE

SOP No.: SAM-0204
Revision No.: 3
Date Revised: 12/9/05
Page 1 of 7

CATEGORY: Sample Handling

TITLE: Geoprobe® Sampling Methods

1 PURPOSE:

1.1 To document the current procedures for sample collection with a Geoprobe®.

2 RESPONSIBILITY:

2.1 It is the responsibility of designated field samplers who have been properly instructed and trained in field sampling protocol and techniques.

3 SAMPLE COLLECTION, PRESERVATION AND HANDLING:

3.1 For sample collection, preservation and handling, please refer to SOP No. SAM-0200.

4 REFERENCES:

- 4.1 Field Sampling Procedures Manual, August 2005, New Jersey Department of Environmental Protection.
- 4.2 Geoprobe® Tools and Equipment Catalog 2002/2003.

5 SUMMARY:

5.1 This SOP represents the general field sampling requirements as required by the NJDEP. It specifically addresses the proper use of protective equipment, collection of QA/QC samples, field documentation procedures, proper documentation of all field activities, collection of samples into proper containers (with the proper preservation) and the techniques for collecting each type of sample.

6 DEFINITIONS:

- 6.1 PETG: Glycolised Polyester.
- 6.2 FID: Flame Ionization Detector.
- 6.3 PID: Photo Ionization Detector.
- 6.4 ORC/HRC: Oxygen Releasing Compounds/Hydrogen Releasing Compounds.

7 SAFETY:

7.1 For safety, please refer to the CTSC Fort Monmouth, NJ Health and Safety Plan (HASP).

Prepared By:_____	Date:_____
Laboratory Director:_____	Date:_____
QA/QC Manager:_____	Date:_____

CATEGORY: Sample Handling

TITLE: Geoprobe® Sampling Methods

- 7.2 Employees must use personal protective equipment (PPE) for adequate protection and to limit the level of exposure on site. The equipment selected must be appropriate to protect against all known and potential hazards. All field personnel are required to be familiar with the potential hazards that may be encountered on site prior to entry.
 - 7.3 At a minimum, all field personnel are required to have work boots (steel toe construction), safety glasses or goggles, a hard hat and gloves available for all sampling activities. Standard latex surgical gloves will be worn at all times when samples are collected or handled.
-
- 8 EQUIPMENT AND MATERIALS:
 - 8.1 Geoprobe ® Model 5400 Vehicle.
 - 8.2 Geoprobe ® Macro Core Sampler.
 - 8.3 Geoprobe ® Large Bore Sampler.
 - 8.4 Geoprobe ® DT-21 Dual Tube Sampler.
 - 8.5 Geoprobe ® GP-15 Groundwater Sampler.
 - 8.6 Bedrock Brand 1" PVC .10 Slot Screen and Riser.
 - 8.7 R.E. Rupe ORC/HRC Injection Pump.
 - 8.8 Cole Palmer Peristaltic Pump.
 - 8.9 Methanol Extraction Kit.
 - 8.10 Depth to Water Indicator.
 - 8.11 Small Diameter Bailer.
 - 8.12 Food Grade Polyethylene Bailer.
 - 8.13 Foxboro TVA 100B Dual FID/PID Gas Analyzer.
 - 8.14 Hnu PID Gas Analyzer.
-
- 9 STANDARDS/REAGENTS:
 - 9.1 Methanol Extraction Solvent.
 - 9.2 Deionized Water.
 - 9.3 Potable Tap Water.
 - 9.4 Isobutylene Calibration Gas.
 - 9.5 Methane Calibration Gas.
 - 9.6 Zero Air Calibration Gas.
-
- 10 QUALITY CONTROL:
 - 10.1 QA/QC samples are intended to provide control over the collection of environmental measurements and subsequent validation, review and interpretation of generated analytical data.
 - 10.2 The Trip Blanks are used exclusively for volatile organic analysis. For aqueous sampling, 2 40-ml vials are filled with deionized water and preserved with HCl. For soil samples, a 2-ounce soil jar is filled with 25-ml methanol and surrogates. The purpose of the Trip Blank is to measure any possible cross contamination during

CATEGORY: Sample Handling

TITLE: Geoprobe® Sampling Methods

shipping to and from the site. It is never opened and it travels to the site with the empty sample bottles and back from the site with the collected samples. Contaminated Trip Blanks may also indicate that the bottle cleaning procedure or the blank water is of questionable quality. Trip Blanks must be included at the rate of one per sample shipment (not to exceed two consecutive field days).

10.3 The purpose of a Field Blank is to place a mechanism of control on sampling equipment, handling, preparation, storage and shipment. The Field Blank travels and is stored with the sample bottles. It is a representative of the bottle shipment effects on sample quality. Field Blanks are collected in the following manner:

10.3.1 Two identical sets of bottles are prepared.

10.3.1.1 One set is filled with laboratory demonstrated analyte free water (the same water used for the Trip and Method Blanks).

10.3.2 The filled bottles are shipped with all of the empty bottles.

10.3.3 At the field location, in an area where contamination is suspected, the water is passed from the full set of like-bottles through the dedicated or field decontaminated sampling device and into the empty set of like-bottles.

10.3.4 Field Blanks are collected and analyzed for all of the same parameters as the collected samples.

10.4 Field Duplicate samples may be required on a contract or site-specific basis. For aqueous samples, Duplicates are taken by alternating filling the containers from the same sampling device for each of the required parameters. For non-aqueous matrices, obtaining duplicates requires homogenization of the sample aliquot prior to filling the sample containers. If this cannot be performed in the field, the aliquot is returned to the laboratory and the homogenization is performed there. Regardless, volatile organic samples must always be taken from discrete locations or intervals without compositing or mixing.

10.5 The laboratory must be supplied with field designated Matrix Spike/Matrix Spike Duplicate (MS/MSD) samples every twenty locations. Triple volume must be collected for aqueous samples.

11 CALIBRATION:

11.1 The TVA 1000B and the Hnu Instruments are calibrated when used according to the manufacturers' specifications. The instruments are sent to the various manufacturers or an authorized representative for a factory calibration on an annual basis.

12 PROCEDURE:

12.1 Geoprobe® Sampling for Soils:

12.1.1 Sampling with the Macro Core Sampler:

12.1.1.1 The Macro Core Sampler is a steel tube that measures two inches in diameter by forty-eight inches in length. The complete assembly

CATEGORY: Sample Handling

TITLE: Geoprobe® Sampling Methods

consists of the tube, a cutter shoe, a liner tube and a drive head that is connected to a drill rod and advanced into the soil strata. The liner is manufactured of PETG material as well as other materials. The liner is one and a half inches in diameter and forty-six inches long. It can hold up to approximately thirteen hundred milliliters of soil when full recovery is obtained. The device is decontaminated, put together and introduced into the soil from zero grade and is driven to the desired depth. The tool is meant to be used mainly as an open advanced borehole system. Other devices available to the operator allow this device to be advanced in minimally sloughed material. The sampler is pushed or percussion hammered into the soil, extracted out of the soil and opened up.

12.1.2 Sampling with the Large Bore Soil Sampler:

12.1.2.1 The Large Bore sampler is a solid barrel, piston sealed, direct pushed device for collecting discrete interval samples of unconsolidated materials at depth. The sampler is one and a half inches in diameter and thirty inches in length. The complete assembly consists of the tube, a cutter shoe, a piston assembly, a liner and a drive head that is connected to a drill rod and advanced into the soil strata to discreet sample depths. A lock pin is backed out inside the drill rod, the tool is advanced two additional feet pushing the piston point into the sampler allowing soil to be introduced into the device. The sampler is extracted out of the soil and opened up.

12.1.3 Sampling Procedures:

12.1.3.1 After the sampler is extracted out of the borehole, the liner is removed, cut open and screened with a PID and/or FID device (Hnu/OVA). If a volatile sample is to be taken, the sample should be taken as soon as possible so that the soil will not volatilize. Depending upon the sampling plan, additional organic samples may be required for sections with detectable readings. Field notes will be written as to note soil structure, colors and any other materials in field notebooks. Odors and any other factors regarding the sample shall also be noted.

12.2 Geoprobe® Sampling for Groundwater:

12.2.1 Groundwater Sampling with the use of a Passively Placed Narrow Diameter Point (PPNDP). A narrow diameter point (PPNDP) is a small diameter (<-1 inch outer diameter, OD) screened casing passively placed in a borehole. Schedule forty PVC is used for collection of groundwater samples. No filter or gravel pack is used in the installation. Installation is for temporary use (less than 48 hours). A solid push rod (bull point) is used to create a narrow diameter hole to a depth below the water table. This can be performed by hand or with a

CATEGORY: Sample Handling

TITLE: Geoprobe® Sampling Methods

rotary hammer. A piece of schedule 40 PVC screen with 0.010-inch slots and an end cap is placed to the bottom of the hole.

12.2.2 Installation: Pre-drill a borehole with a diameter slightly larger than the casing using a bull point drive rod. The hole should be made to a depth of 1-3 feet below the water table. The screened section of PVC is placed into the borehole so the screened section is across the groundwater table. Prior to installation of any PPNDP, knowledge of the depth to water should be known by previous site data for proper placement of the probe. Caution should be used when using the passively placed slotted PVC casing in areas of contaminated soil. Possible cross contamination may be introduced to the casing as it passes through the zone of contamination. Installation of the tool is required to comply with all permit, license, sealing and grouting requirements. Any tool left in the ground longer than 48 hours is considered a monitor well and therefore must comply with the permit, installation and license requirements for monitor wells.

12.2.3 Sampling Procedure: Three to five volumes of the standing water in the PPNDP must be purged. This is due to the potential for cross contamination of the screen from upper soil horizons. This can be accomplished utilizing a peristaltic pump, inertial pump or a small centrifugal pump. The tubing used for the well purging is food grade polyethylene and silicon surgical tubing that is discarded after each well. Disposable Teflon™ bailers are used to extract the sample for volatile organics and base neutrals. Other aqueous samples can be taken out of the pump tubing at a low flow rate. The acquisition of samples and water level measurements must be performed by one of several recommended methodologies described in the August 2005 edition of the NJDEP Field Sampling Procedures Manual.

12.2.4 Quality Assurance/Quality Control: The PPNDP and associated equipment (bull point, riser pipe, etc.) must be decontaminated between borings using the following procedure:

12.2.4.1 Remove all adherent soil material.

12.2.4.2 Wash with a laboratory grade glassware detergent.

12.2.4.3 Rinse with potable water and/or steam clean.

12.2.4.4 Rinse with distilled and deionized ASTM Type II water.

12.2.4.5 Field Blanks must be obtained in the same manner as the sample. The blank water must pass through the sample device and PPNDP prior to installation and then into the sample container. The parameters and frequency for Field Blanks are designated in the August 2005 edition of the NJDEP Field Sampling Procedures Manual.

12.2.5 Groundwater sampling with the use of a Small Diameter Direct Push Point (SDDPP): A small diameter direct push point (SDDPP) is a «-1 inch outer diameter, OD casing (slotted or blank) which can be driven or pushed through the soil into the groundwater. It is used for the collection of a groundwater

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sample or estimating piezometric data. The casing can be constructed of stainless steel or carbon steel. No filter or gravel pack is used in the installation. Installation is for temporary use (less than 48 hours).

- 12.2.6 Installation: SDDPPs constructed of blank stainless steel or carbon steel casing with a sacrificial tip or a telescoping screen with a sacrificial tip is employed by driving the point to the desired depth with hydraulics or a rotary hammer. The probe is placed a minimum of 2 feet below the water table. Once at depth, the casing is pulled back leaving the point in place and exposing the telescoping screen. Groundwater fills the screen for sample acquisition.
- 12.2.7 Sampling Procedures: Purging for slotted SDDPPs, three to five volumes of the standing water must be purged. This can be accomplished utilizing a peristaltic pump, inertial pump or a small centrifugal pump. Purging is not required for SDDPPs that are sealed until they are opened at the target depth for sample acquisition. Sampling due to the small diameter of a SDDPP, the sampling tools are limited. The acquisition of samples and water level measurements must be performed by one of several recommended groundwater-sampling methodologies described in the August 2005 edition of the NJDEP Field Sampling Procedures Manual.
- 12.2.8 Quality Assurance/Quality Control: The SDDPP and associated equipment (points, casing, etc.) must be decontaminated between borings using the following procedure:
 - 12.2.8.1 Remove all adherent soil material.
 - 12.2.8.2 Wash with a laboratory grade detergent.
 - 12.2.8.3 Rinse with potable water and/or steam clean.
 - 12.2.8.4 Rinse with distilled and deionized ASTM Type II water.
 - 12.2.8.5 Field Blanks must be obtained in the same manner as the sample. The blank water must pass through the sample device and SDDPP prior to installation and then into the sample container. The parameters and frequency for Field Blanks are designated in the August 2005 edition of the NJDEP Field Sampling Procedures Manual.
 - 12.2.8.6 Rod sealing is important when using the SDDPP below the water table. The drive rod/casing joints must be sealed. This will prevent fluid from entering the rods and potentially contaminating the sample. The rods are sealed with O-rings at the threads for sealing and the tool also has O-rings that seal off fluids in the borehole. These all must be removed and changed out with new O-rings before starting a new borehole.

13 POLLUTION PREVENTION:

- 13.1A spill prevention kit is available on the Geoprobe® Unit. For further information, please refer to SOP No. SAM-0222.

STANDARD OPERATING PROCEDURE

SOP No.: SAM-0204

Revision No.: 3

Date Revised: 12/9/05

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14 WASTE MANAGEMENT:

14.1 For sample disposal, please refer to SOP No. SAM-0220.

STANDARD OPERATING PROCEDURE

SOP No.: SAM-0223
Revision No.: 3
Date Revised: 12/8/06
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TITLE: Low Flow Monitor Well Sampling

1 PURPOSE:

- 1.1 To document current procedures for low flow monitoring, well purging and sampling. The procedure applies to monitoring wells that have an inner casing with a diameter of 2.0 inches or greater, and maximum screened intervals of ten feet unless multiple intervals are sampled. This procedure is appropriate for the collection of ground water samples that will be analyzed for volatile and semi-volatile organic compounds, pesticides, PCBs, metals, and microbiological contaminants in association with all EPA programs.

2 RESPONSIBILITY:

- 2.1 Designated field samplers who have been properly trained and instructed in low flow methods and in the NJDEP field sampling procedures and protocols.

3 SAMPLE COLLECTION, PRESERVATION AND HANDLING:

- 3.1 For sample collection, preservation and handling please refer to SOP No. SAM-0200.

4 REFERENCES:

- 4.1 Field Sampling Procedures Manual, August 2005. New Jersey Department of Environmental Protection.
- 4.2 USEPA Region II Ground Water Sampling Procedure Low Stress (Low Flow) Purging and Sampling, www.epa.gov/Region2/desa/hsw/lowflow.txt.
- 4.3 "Low Flow (Minimal Drawdown) Ground Water Sampling Procedures" by Robert W. Puls and Michael J. Barcelona. EPA Ground Water Issue. EPA/540/S-59/504.
- 4.4 "Low Flow/Low Volume Purging and Sampling" Standard Operating Procedure, City of San Diego, Environmental Services Department, Refuse Disposal Division, February 25, 2004.
- 4.5 Laboratory SOPs: SAM-0200, SAM-0202 and OQC-0302.

5 SUMMARY:

- 5.1 The purpose of the low flow purging and sampling is to collect ground water samples from monitoring wells that are representative of ambient ground water conditions in

Prepared By:_____	Date:_____
Laboratory Director:_____	Date:_____
QA/QC Manager:_____	Date:_____

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the aquifer. This is accomplished by setting the intake velocity of the sampling pump to a flow rate that limits drawdown inside the well.

5.2 Low flow purging and sampling has three primary benefits.

5.2.1 First, it minimizes the disturbance of sediment in the bottom of the well, thereby producing a sample with low turbidity (low concentration of suspended particles).

5.2.2 Second, this procedure minimizes aeration of the ground water during sample collection, which improves the sample quality for volatile organic analysis.

5.2.3 Third, the amount of ground water purged from a well is usually reduced as compared to conventional ground water purging and sampling methods.

5.3 Since the method allows for the collection of ground water samples with low turbidity, it was originally used for collecting samples for inorganic analysis. The method typically allows the collection of samples for total metals analysis and eliminates the need to filter the samples for dissolved metals analysis.

5.4 The method also minimizes aeration of the samples. It can be used to collect samples for analysis of volatile and semi-volatile organic compounds, provided that the appropriate pumps are used in sample collection.

5.5 Advantages of low flow purging and sampling are:

5.5.1 Groundwater samples tend to be more representative of actual aquifer conditions with respect to mobile contaminants and turbidity.

5.5.2 It causes minimal disturbance of the formation adjacent to the screened aquifer.

5.5.3 It is generally less prone to sampling variability compared to other ground water sampling techniques (bailers).

5.5.4 Smaller purge volumes and associated disposal expense

5.5.5 Increased sample consistency from dedicated systems and reproducibility of data due to reduced operator variability.

5.6 Disadvantages of low flow purging and sampling are:

5.6.1 Misconceptions regarding reduced purging and sampling time.

5.6.2 Sampling from non-dedicated systems requires greater set-up time.

5.6.3 .Sampling from dedicated systems requires higher initial capital expenses.

5.6.4 Increased technical complexity.

5.6.5 Increased training needs for sampling personnel.

5.6.6 Not a first round sampling option.

5.6.7 Not recommended for wells with long screen intervals unless multiple samples are collected.

6 DEFINITIONS:

6.1 LFPS = Low Flow Purging and Sampling.

6.2 PPE = Personal Protective Equipment.

6.3 NIST = National Institute of Standards and Technology.

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7 SAFETY:

- 7.1 For safety, please refer to CTSC Fort Monmouth, NJ Health and Safety Plan (HASP).
- 7.2 Preparation: It should be noted that before going out into the field, certain preparations should be made. This includes the selection of PPE, safety plans, proper bottle acquisition for the analytes being tested, site entry, map information and equipment.
- 7.3 Avoid skin contact and ingestion of purge water.
- 7.4 Avoid breathing constituents venting from the well.

8 EQUIPMENT AND MATERIALS:

- 8.1 YSI 600XL Sonde (or equivalent) with temperature, pH, Specific conductivity and DO probes or other probes as needed.
- 8.2 YSI 6820 Sonde (or equivalent) if oxidation reduction potential (ORP) is needed.
- 8.3 YSI 650 MDS Data Logger (or equivalent) with appropriate cables.
- 8.4 HNU photo ionization detector (PID).
- 8.5 HACH turbidity meter (or equivalent).
- 8.6 Peristaltic well pumps.
- 8.7 Pump heads and power cables.
- 8.8 Water level meter, accurate to 0.01 foot.
- 8.9 Oil/water interface probe.
- 8.10 Submersible well pumps.
- 8.11 Various batteries.
- 8.12 Buckets.
- 8.13 Polyethylene sheeting.
- 8.14 Miscellaneous tools, i.e. screwdriver and well wrench.
- 8.15 Miscellaneous equipment supplies and tools.
- 8.16 Deionized water sprayer.
- 8.17 Paper towels and scrub brushes.
- 8.18 Graduated cylinder.
- 8.19 Gas generator and fuel supply if needed.
- 8.20 Silicone thick wall (lab grade) tubing ¼ inch diameter.
- 8.21 Polyethylene (food grade) tubing ¼ inch diameter. Sufficient tubing must be available so that each well has dedicated tubing.
- 8.22 Stop watch.
- 8.23 Sample bottles, preservation supplies, sample labels and chain of custody forms.
- 8.24 Coolers (for sample transport).
- 8.25 Approved Quality Assurance Project Plan.
- 8.26 Well keys and map of well locations.
- 8.27 Field notebook, ground water sampling logs and calculator.

9 STANDARDS/REAGENTS:

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9.1 Buffer solutions, calibration gases, decontamination materials and acid for preservation.

9.1.1 Buffer solutions:

9.1.1.1 7.00 standard buffer solution.

9.1.1.2 10.00 standard buffer solution.

9.1.1.3 4.00 standard buffer solution.

9.1.2 Oxidation Reduction Calibration solution.

9.1.3 Appropriate NTU Turbidity solutions for calibration.

9.1.4 Distilled/deionized water.

9.1.5 Alconox.

9.1.6 10 % Nitric acid rinse (trace metal or higher grade HNO₃ diluted with distilled/deionized ASTM Type II water).

9.1.7 Acetone, pesticide grade.

9.1.8 Pure nitrogen for blow out.

9.1.9 Acids/materials used in preserving samples:

9.1.9.1 Nitric acid 69.0-70.0%.

9.1.9.2 Sulfuric acid 50% (w/w) solution.

9.1.9.3 Hydrochloric acid (trace metal grade).

9.1.10 Ice for keeping samples at less than 4 degrees Celsius.

10 QUALITY CONTROL:

10.1 Quality control samples must be collected to verify that sample collection and handling procedures were performed adequately and that they have not compromised the quality of the ground water samples.

10.2 Sample containers: Before sample collection begins, consideration must be given as to what type of container will be used to transport and store samples. The laboratory provides containers based upon requested methodologies. Selection is based on the matrix, potential contaminants, analytical methods and the laboratories internal QA/QC requirements. They should be selected upon review of the following:

10.2.1 Reactivity of the container material with the sample. Glass is recommended for hazardous material samples since it is chemically inert to most substances. Plastic may be used when analytes of interest or sample characteristics dictate the use of instead.

10.2.2 Volume of the container. The analytical method and the matrix of the sample dictate the volume of sample needed. The laboratory will supply bottles that allow for sufficient volumes of sample to be collected.

10.2.3 Color of container. Whenever possible, amber glass is used to prevent photo degradation. If not available, samples should be kept protected from light. One exception is the 40 mL clear glass VOA vials used for volatile organics.

10.2.4 Container closures. All containers utilized have a leak proof seal and are constructed out of material that is inert with respect to sampled materials. The

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closure may also be separated by a closure liner that is inert to the sample material.

10.2.5 Decontamination of containers and chain of custody. Sample containers are laboratory cleaned or bought precleaned from the vendor. Bottles being shipped are accompanied by a chain of custody in a cooler with a custody seal. Custody must accompany the containers to the field, during collection, back to the laboratory and during analysis. This helps to assure that no tampering or contamination occurs from outside sources.

10.2.6 Storage and transport. Care is taken to avoid contamination. Clean transport and storage environments are observed. Sample or bottle storage is never near solvents, gasoline, or other equipment that is a potential source of contamination. The samples are secured in coolers for transport with chain of custody forms inside the coolers or in the hands of authorized personnel.

10.2.6.1 . Additionally, a temperature blank is included in each cooler to measure the temperature of the samples on ice in the coolers (ideally a constant ≤ 4 degrees Celsius).

10.2.7 Tubing decontamination. Food grade polyethylene tubing is used and discarded after each use. Avoid pump and tubing contact with ground surfaces. All tubing is rinsed and wiped with distilled/deionized water to remove any possible residual materials on it before entering the well.

10.2.8 Pump decontamination. Since a peristaltic pump never contacts the water, it only needs to be kept in clean, running order. Silicone tubing used in the pump head needs to be replaced each time the pump is used. For a submersible pump, the following daily decontamination and in between well decontamination procedures should be followed:

10.2.8.1 Daily decontamination:

10.2.8.1.1 Pre-rinse: Operate the pump in a deep basin containing 8-10 gallons of potable water for 5 minutes and flush the other equipment with potable water for 5 minutes.

10.2.8.1.2 Wash: Operate the pump in another deep basin containing 8-10 gallons of a non-phosphate detergent solution such as Alconox for 5 minutes and flush the other equipment with fresh detergent solution for 5 minutes.

10.2.8.1.3 Rinse: Operate the pump in a deep basin of potable water for another 5 minutes and flush the other equipment for 5 minutes with potable water.

10.2.8.1.4 Disassemble pump (refer to the pump directions).

10.2.8.1.5 Wash the parts of the pump: Place the disassembled parts of the pump into a basin containing another 8-10 gallons of non-phosphate detergent. Scrub all parts with a test tube brush.

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- 10.2.8.1.6 Rinse the pump parts with potable water.
- 10.2.8.1.7 Rinse the following parts with distilled/deionized water:
Inlet, screen, shaft, suction interconnector, motor lead
assembly, and the stator housing.
- 10.2.8.1.8 Place the impeller assembly in a large glass beaker and
rinse with 1% nitric acid.
- 10.2.8.1.9 Rinse the impeller assembly with potable water.
- 10.2.8.1.10 Rinse the impeller assembly with isopropanol.
- 10.2.8.1.11 Finally, rinse the impeller assembly with
distilled/deionized water.
- 10.2.8.2 Between well decontamination:
 - 10.2.8.2.1 Pre-rinse: Operate the pump in a deep basin containing 8-
10 gallons of potable water for 5 minutes and flush the
other equipment with potable water for 5 minutes.
 - 10.2.8.2.2 Wash: Operate the pump in another deep basin containing
8-10 gallons of a non-phosphate detergent solution such as
Alconox for 5 minutes and flush the other equipment with
fresh detergent solution for 5 minutes.
 - 10.2.8.2.3 Rinse: Operate the pump in a deep basin of potable water
for another 5 minutes and flush the other equipment for 5
minutes with potable water.
 - 10.2.8.2.4 Final rinse: Operate the pump in a deep basin of
distilled/deionized water to pump out 1-2 gallons of this
water.
- 10.3 Disposal of development, purge, pump test, and decon waters: To determine whether
wastewaters are contaminated, field instrument readings and previous analytical data
are used for characterization. Water that is not considered contaminated can be re-
applied directly to the ground surface and permitted to percolate back into the
groundwater system. Care should be taken to avoid nuisance situations where
discharge may cause undue concern. When water is considered contaminated, the
water generated can be reapplied back only if the following conditions are met:
Ground water is not permitted to migrate off site. No potential for contaminating a
previously uncontaminated aquifer. Discharge will not cause an increase to ground
surface soil contamination. If these conditions cannot be met, then water is collected
and secured in a single locale. It may be re-applied to the ground surface if the
analytical results indicate the above requirements have been met. If not, arrangements
are made for proper disposal. Please refer to the NJDEP Field Sampling Procedures
Manual, Chapter 2A, pages 24-25.
- 10.4 QA/QC samples: These samples are intended to provide control over the collection of
measurements and subsequent validation, review and interpretation of analytical data.
A trip blank is used for volatile organics and its purpose is to measure possible cross

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contamination of samples in transit and at the site. It is **never** opened and travels to the site or sites with **empty** sample bottles and back **with** the samples. The trip blank may also indicate poor cleaning. Likewise, a field blank is used to determine a control on the equipment handling, preparation, storage and shipment. It travels with the samples and is a representative of shipment effects on sample quality. By being opened in the field, transferred over a cleaned sampling device, the field blank is indicative of ambient and equipment conditions that may affect the quality of associated samples. It also serves as an additional check on the possible sources of contamination. Blank water is demonstrated analyte free and is from the same common source and physical locale in the laboratory.

10.4.1 QA/QC blank requirements:

10.4.1.1 Field blanks: They are preserved and analyzed for all of the same parameters as the samples collected that day. They may be required in order to detect cross contamination from ambient air during a potable sampling if known sources are within proximity or monitoring equipment indicates their presence as background. These blanks should be prepared during the middle to end of a sampling event by filling sample containers with water from like containers poured over the decontaminated equipment. Field blanks must be taken once a day during sampling.

10.4.1.2 Equipment blanks: They are preserved and analyzed for all of the same parameters as the samples collected that day. They may be required in order to detect cross contamination from ambient air during a potable sampling if known sources are within proximity or monitoring equipment indicates their presence as background. These blanks should be prepared at the beginning of the sampling event by filling sample containers with water from like containers poured over the decontaminated equipment. Equipment blanks are not necessary if the equipment is dedicated to the well.

10.4.1.3 Trip blanks: They consist of a set of bottles each filled at the lab with analyte free water. They accompany the bottles both to and from each site. They are never opened in the field. They are also returned in the same bottles they were sent out in. At a minimum, a trip blank must be analyzed for volatile organics. Inclusion of additional parameters is at the discretion of the NJDEP. Trip blanks and the samples they accompany are not held on site for more than 2 calendar days. A trip blank is included in each sample shipment or trip to the field, not to exceed 2 consecutive field days.

10.4.2 Additional QA/QC samples:

10.4.2.1 Duplicate samples: The collection of a duplicate provides for evaluation of the laboratory performance by comparing the analytical

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data of two samples from the same location. They are included 1 for every 20 samples (5% or 1 a day per site) and submitted as blind samples. They are obtained by alternately filling sample bottles from the same source/device for each parameter. Samples collected for volatile organics are sampled from the same bailer and the first set of bottles filled.

10.4.2.2 Matrix spike/matrix spike duplicate or MS/MSD samples: The laboratory is supplied with triple volume in order to perform the MS/MSD samples. This does not include trip or field blanks. They should occur once in every case of field samples, every 20 field samples or each 14 day calendar period in which a site is being worked at and samples collected.

10.5 Sample preservation: Sample bottles are preserved by the laboratory according to the analytical requirements. Refer to SOP SAM-0200, Sample Containers, Preservation and Holding Times and also the NJDEP Field Sampling Procedures Manual.

11 CALIBRATION:

11.1 All instruments used for field readings are calibrated as follows:

- 11.1.1 The use of YSI Sondes must start out with a calibration using pH buffer solution standards and specific conductivity solutions to check and calibrate accuracy before each day of use.
- 11.1.2 HNUs are calibrated with a known calibration gas before each day of use.
- 11.1.3 Dissolved oxygen meters are checked against a Winkler method test weekly.
- 11.1.4 Turbidity meters are checked against standards regularly with each use.
- 11.1.5 Cooler thermometers are calibrated against a NIST traceable thermometer annually.
- 11.1.6 All calibrations for a given days use are recorded in the logbook provided for each instrument.
- 11.1.7 Refer to the equipment directions for calibration instructions.

12 PROCEDURE: The following describes the purging and sampling procedures for the low flow method for the collection of ground water samples. It provides steps for dedicated and non-dedicated systems.

12.1 Pre-Sampling Activities (Dedicated and Non-dedicated systems):

- 12.1.1 Start with the well known or believed to have the least contaminated ground water and proceed systematically to the well with the most contaminated ground water.
- 12.1.2 Check and record the condition of the monitoring well for damage or evidence of tampering. Lay out polyethylene sheeting and place monitoring, purging and sampling equipment on the sheeting.

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- 12.1.3 Unlock the well head and remove the well cap. Record the location, time, and date in the field logbook.
- 12.1.4 Monitor for volatile organics with a PID at the rim of the casing and record the reading in the field logbook.
- 12.1.5 Free product check (Light non-Aqueous Phase liquids and Dense Non-Aqueous Phase Liquids):
 - 12.1.5.1 An ORS meter is used to determine interfaces and the presence or absence of product is also determined. If product is detected, the thickness of the product is measured and recorded.
 - 12.1.5.2 The thickness of DNAPLs and LNAPLs must be performed prior to purging the well. The layers of LNAPLs and DNAPLs are sampled and analyzed for chemical and physical parameters. The LNAPLs are sampled by using a bottom filling bailer, lowered through the LNAPL layer but not significantly down into the next phase. LNAPLs have a low solubility in water and tend to float on the water surface. The LNAPL sample should be analyzed for chemical composition (volatile and semi-volatile organics) and physical parameters (specific gravity, water solubility and vapor pressure of the liquid). DNAPLs are sampled by using a dual check valve bailer or bladder pump. DNAPLs include chlorinated solvents and other chemicals that have specific gravities greater than water. The DNAPL sample should be analyzed for chemical composition by fingerprinting (TCE or coal tar) and physical composition (specific gravity, water solubility and equilibrium vapor pressure of the liquid).
- 12.1.6 Measure the depth to water (nearest 0.01 feet) relative to the reference measuring point on the well casing and record it in the field logbook. This measurement should be taken a second time for confirmation.
- 12.1.7 Check the well or field information for the total depth of the monitoring well. Use the depth to water and the total depth of the monitoring well to calculate the volume of the water in the well or the volume of one casing. Record the information in the field logbook.
- 12.2 Purging and Sampling Activities:
 - 12.2.1 Non-dedicated system: Slowly lower the pump and tubing down the well until the location of the pump intake is set at a pre-determined location within the screen interval. Record pump location in the field logbook.
 - 12.2.2 Dedicated system: Pump has already been installed. Refer to the well information and record the depth of the pump intake in the field logbook.
 - 12.2.3 Non-dedicated and dedicated systems: Measure the water level (nearest 0.01 feet) and record it in the logbook, leave the water level indicator probe in the well.

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- 12.2.4 Non-dedicated and dedicated systems: Connect the discharge line from the pump to the flow cell. A “T” connection is needed prior to the flow cell to allow for the collection of water for the turbidity measurements. The discharge line from the flow-through cell must be directed to a container to contain the purge water during the purging and sampling of the well.
- 12.2.5 Non-dedicated and dedicated systems: Start pumping the well at a low flow rate (0.2-0.5 L/min) and slowly increase the speed. The water level should be monitored at approximately every 5 minutes. Maintain a steady flow rate while maintaining a drawdown of less than 0.33 feet. If drawdown is greater than 0.33 feet, lower the flow rate. This flow rate may be difficult to maintain and may require several adjustments.
- 12.2.6 Non-dedicated and dedicated systems: Measure the discharge rate of the pump with a graduated cylinder and a stop watch. Also, measure the water level and record both the flow rate and water level in the logbook. Continue this monitoring every five minutes during purging.
- 12.2.7 Non-dedicated and dedicated systems: During the purging, a minimum of one tubing volume must be purged prior to recording the water quality indicator parameters. Then monitor the water quality indicator parameters every five minutes. The water quality indicator parameters are turbidity, dissolved oxygen, specific conductance (conductivity), pH, redox potential and temperature. The well is considered stabilized and ready for sample collection when the indicator parameters have stabilized for three consecutive readings as follows:
- 12.2.7.1 Parameter, pH, stabilization criteria, ± 0.1 pH units.
- 12.2.7.2 Parameter, Conductivity, stabilization criteria, $\pm 3\%$ S/cm.
- 12.2.7.3 Parameter, redox potential, ± 10 millivolts.
- 12.2.7.4 Parameter, turbidity, stabilization criteria, $\pm 10\%$ NTUs.
- 12.2.7.5 Parameter, dissolved oxygen, stabilization criteria, ± 0.3 mg/L.
- 12.2.8 If the water level is approaching the top of the screen and the well cannot be maintained at 0.33 feet, reduce the flow rate or turn the pump off (for 15 minutes) and allow for recovery. Under no circumstances should the well be pumped dry. Begin pumping at a lower flow rate, if the water draws-down to the top of the screened interval again turn the pump off and allow for recovery. If two tubing volumes have been removed during purging then sampling can proceed next time the pump is turned on. This information should be noted in the field logbook with a recommendation for a different purging and sampling procedure.
- 12.2.9 Non-dedicated and dedicated systems: Maintain the same pumping rate or reduce it slightly for sampling (0.2 to 0.5 liters per minute) in order to minimize disturbance of the water column. Samples should be collected directly from the discharge port of the pump tubing prior to passing through the flow-through cell. Disconnect the pump’s tubing from the flow-through cell so that the samples are

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collected for dissolved gases or volatile organic analyses, the tubing needs to be completely full of ground water to prevent the ground water from being aerated as the ground water flows through the tubing. All sample containers should be filled with minimal turbulence by allowing the ground water to flow from the tubing gently down the inside of the container. When sampling the volatile organic containers, a meniscus must be formed over the mouth of the vial to eliminate the formation of air bubbles and head space prior to capping. The samples are collected in the following order:

- 12.2.9.1 Volatile organics.
- 12.2.9.2 Purgeable organic carbons.
- 12.2.9.3 Purgeable organic halogens.
- 12.2.9.4 Total organic halogens.
- 12.2.9.5 Total organic carbon.
- 12.2.9.6 Base neutrals/acid extractables.
- 12.2.9.7 TPHC/oil and grease.
- 12.2.9.8 PCB's/pesticides.
- 12.2.9.9 Total metals.
- 12.2.9.10 Dissolved metals.
- 12.2.9.11 Phenols, cyanide.
- 12.2.9.12 Sulfate and chloride.
- 12.2.9.13 Turbidity.
- 12.2.9.14 Nitrate and ammonia.
- 12.2.9.15 Preserved inorganics.
- 12.2.9.16 Radionuclides.
- 12.2.9.17 Non-preserved inorganics.
- 12.2.9.18 Bacteria.
- 12.2.10 Non-dedicated systems: Remove the pump from the well. Decontaminate the pump and properly dispose of the tubing.
- 12.2.11 Dedicated system: Disconnect the tubing that extends from the plate at the wellhead (or cap) and discard after use.
- 12.2.12 Non-dedicated system: Before locking the well, measure and record the well depth (to 0.1 feet). Measure the depth a second time to confirm the initial reading. The measurements should agree to within 0.01 feet or remeasure.
- 12.2.13 Non-dedicated and dedicated systems: Close and lock the well.
- 12.2.14 Decontamination procedures for the water level meter and field parameter sensors:
 - 12.2.14.1 The water level meter will be hand washed with Alconox and a scrubber. They will then be rinsed with distilled/deionized water.
 - 12.2.14.2 The field parameter sensors will be rinsed with distilled/deionized water between sampling locations. After the sampling event, the

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sensors must be cleaned and maintained per the manufacturer's requirements.

12.2.15 Decontamination procedure for the pump:

12.2.15.1 The outside of the pump, tubing, support cable and electrical wires must be pressure sprayed with soapy water, tap water and distilled/deionized water. Spray until water is flowing off tubing after each rinse. Use a scrubber to help remove visible dirt and contaminants.

12.2.15.2 Place the sampling pump in a bucket with distilled/deionized water. It must be completely submerged in the water. Add a small amount of Alconox to the water.

12.2.16 To prevent cross-contamination, the sampling should proceed from the least to the most contaminated wells.

12.2.17 Several activities need to be completed and documented once ground water sampling has been completed.

12.2.17.1 Ensure that all of the field equipment has been decontaminated and returned to their proper storage locations.

12.2.17.2 All paperwork should be processed this includes chain of custody and field notes.

13 CALCULATIONS:

13.1 The following are calculations performed in the field:

13.1.1 Linear feet of water: This is calculated by knowing the total depth of the well and subtracting the depth to water measured by a depth meter. These two numbers should be measured to within 0.01 feet. Through this calculation, the linear feet of water is determined (total well depth – depth to water = linear feet of water).

13.1.2 Volume to be purged and volume not to be exceeded: Utilizing the linear feet of water and then multiplying it by the volume per foot for the appropriate casing will equal the amount of water in the casing. The amount of water in the casing multiplied by 3 equals the total minimum volume to be purged. It should be noted that the amount purged should not exceed 5 times the amount of standing water in the well.

13.1.2.1 Capacity of Common Casing Diameters:

Casing Diameter (ft)	Gallons/linear foot
2 inch (0.1667)	0.1632
4 inch (0.3333)	0.6528
6 inch (0.5000)	1.4688
8 inch (0.6667)	2.6112
10 inch (0.8333)	4.0800

STANDARD OPERATING PROCEDURE

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CATEGORY: Sample Handling
TITLE: Low Flow Monitor Well Sampling

12 inch(1.0000) 5.8752

13.1.3Purge rate: Multiply the flow rate (ml/min) by 0.0002642 to get gallons per minute.

14 POLLUTION PREVENTION:

14.1For pollution prevention, please refer to SOP No. SAM-0222.

15 WASTE MANAGEMENT:

15.1For sample disposal, please refer to SOP No. SAM-0220.

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CATEGORY: Sample Handling
TITLE: Low Flow Monitor Well Sampling

16 TABLES AND DIAGRAMS:

Table 1

MONITORING WELL SAMPLING DATA

LOCATION:	Hnu Calibration:
MW # :	Sonde Calibration:
NJDEP ID # :	pH: 7.00/10.00/4.00 Buffers
NJDEP CERT# :	Sp Cond/Cond: 26.5u ohms/cm Sol (KCl)
SAMPLING CONTRACTOR:	DO: % Humidity 760mm (Bar Press)
SAMPLER:	Temp:
DATE:	Turb: Stab Cal set for 2100P
WEATHER:	ORP: 235 MV Zobell Sol
TIDE:	HACH Meter Lot:
WELL CONDITION:	
LNAPLs:	DNAPLs:
ELEV. OF INNER CASING SURVEY MARE: ft	
INNER CASING DIA: inch	
DEPTH TO WATER: ft	
Before Purge Start: ft Previous Day: ft	After Sampling: ft
DEPTH OF WELL: ft	
DEPTH TO TOP OF SCREEN: ft	
DEPTH of PUMP/TUBE INTAKE: ft	TUBING: Food Grade ¼ " Polyethylene
HEIGHT OF WATER: ft	
() X 0.163 or 0.65 X 3 =	
GALLONS OF H ₂ O TO BE PURGED: Gal	
PURGE METHOD: (FLOW at >100 to <500 gpm): 2" REDIFLO 2 GRUNDPHOS SUBMERSIBLE PUMP	
Purged at mL/Min or Gal/Min (mL to Gal = mL X 0.0002642 = Gal	
PURGED RATE: gpm Start at at mL/min to mL/min at until end	
Hnu READING: ppm (well)	
Hnu READING: ppm (well cap)	
PURGE START TIME:	
pH: su ORP mv	Temperature: °F Turbidity: NTU
Dissolved O ₂ : mg/L	Specific Conductivity: us/cm
PURGE END TIME:	
pH: su ORP mv	Temperature: °F Turbidity: NTU
Dissolved O ₂ : mg/L	Specific Conductivity: us/cm
DEPTH TO H ₂ O AFTER PURGE AND SAMPLING: ft	
SAMPLING METHOD: (Through pump and tubing, flow cell disconnected)	
SAMPLE START TIME:	
pH: su ORP mv	Temperature: °F Turbidity: NTU
Dissolved O ₂ : mg/L	Specific Conductivity: us/cm
SAMPLE END TIME:	
ANALYTES:	COMMENTS:

STANDARD OPERATING PROCEDURE

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CATEGORY: Sample Handling
TITLE: Low Flow Monitor Well Sampling

Table 2

Low Flow Well Sampling Data

Date:

Well ID:

NJDEP # :

Initial Purge Start:

Initial Depth to Water:

Time	Temp °C	pH (su)	Cond (us/cm)	DO (mg/L)	ORP (mv)	Turbidity (NTU)	Depth to Water (ft)	Flow Rate (ml/min)

Sample Start Time:

STANDARD OPERATING PROCEDURE

SOP No.: SAM-0206

Revision No.: 3

Date Revised: 04/11/06

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CATEGORY: Sample Handling

TITLE: Decontamination Procedures for Field Equipment

1 PURPOSE:

- 1.1 To document the current procedures for equipment decontamination. This SOP provides a description of the methods used to prevent, minimize and limit cross-contamination of samples due to inappropriate or inadequate equipment decontamination.

2 RESPONSIBILITY:

- 2.1 This method is restricted to use by or under the direct supervision of designated field samplers and lab personnel who have been properly instructed and trained in equipment decontamination protocol and techniques as defined by the NJDEP.

3 SAMPLE COLLECTION, PRESERVATION AND HANDLING:

- 3.1 For sample collection, preservation and handling please refer to SOP No. SAM-0200.

4 REFERENCES:

- 4.1 Field Sampling Procedures Manual, August 2005. New Jersey Department of Environmental Protection.

5 SUMMARY:

- 5.1 This SOP will cover procedures for laboratory and field decontamination of both aqueous and non-aqueous sampling equipment. Cross-contamination can be removed by physical decontamination procedures.
- 5.2 The first step is a soap and water wash to eliminate all visible matter. The second is a tap water rinse to remove the soap followed by a distilled/deionized rinse. An acid rinse is then used to remove any trace metals. This is followed by another distilled/deionized rinse. A high purity solvent rinse is then performed to remove trace organics. The solvent is allowed to evaporate completely and then it is followed by a final distilled/deionized rinse.

6 DEFINITIONS:

- 6.1 ASTM – American Society for Testing and Materials.

Prepared By:_____	Date:_____
Laboratory Director:_____	Date:_____
QA/QC Manager:_____	Date:_____

CATEGORY: Sample Handling

TITLE: Decontamination Procedures for Field Equipment

6.2 PPE – Personal Protective Equipment.

7 INTERFERENCES:

- 7.1 Distilled/deionized water that has not been supplied by the laboratory need to be verified that it is analyte-free.

8 SAFETY:

- 8.1 For safety, please refer to CTSC Fort Monmouth, NJ Health and Safety Plan (HASP).
- 8.2 Employees must use personal protective equipment (PPE) for adequate protection and to limit the level of exposure on site. The equipment selected must be appropriate to protect against all known and potential hazards. All personnel are required to be familiar with the potential hazards that may be encountered with any of the decontamination materials, contaminants of concern and equipment being cleaned.
- 8.3 At a minimum, all personnel will use surgical gloves of the appropriate nature that are to be worn at all times when decontaminating equipment. If a material or substance is in question, the material should be researched and the correct personal protective equipment should be selected. Splash proof safety eyewear is always worn when handling liquids.

9 EQUIPMENT AND MATERIALS:

- 9.1 PPE including goggles, glasses, or face shield.
- 9.2 Gloves (latex or otherwise specified type for the appropriate contaminants and reagents).
- 9.3 Container of appropriate size and volume.
- 9.4 Wash clothes and scrub brushes.
- 9.5 Distilled/deionized water source container.
- 9.6 Paper towels.
- 9.7 Field logbook.
- 9.8 Sample containers.
- 9.9 Aluminum foil.
- 9.10 Miscellaneous tools as needed.

10 STANDARDS/REAGENTS:

- 10.1 Distilled/deionized water.
- 10.2 Alconox or laboratory grade glassware detergent.
- 10.3 10% nitric acid rinse (trace metal or higher grade HNO₃ diluted with distilled/deionized ASTM Type II water).
- 10.4 Acetone (pesticide grade).
- 10.5 Pure nitrogen for blow out.

11 QUALITY CONTROL:

CATEGORY: Sample Handling

TITLE: Decontamination Procedures for Field Equipment

- 11.1 A rinsate blank is a specific type of quality control sample associated with field decontamination procedures.
- 11.2 Rinsate blanks are obtained by running analyte free water over the decontaminated sampling equipment. The blank water is collected in sample containers for handling, shipment and analysis. These samples are treated and analyzed for the same parameters as the samples collected that day.
- 11.3 A rinsate blank is used to assess cross-contamination brought about by incorrect decontamination procedures.

12 PROCEDURE:

- 12.1 Aqueous sampling equipment decontamination (laboratory and field).
 - 12.1.1 All field sampling equipment must be lab cleaned, wrapped and dedicated to a particular sampling point or location during the sampling event. Instances where this is not feasible must have NJDEP permission for field cleaning prior to collection of any samples and must be referenced in the site field sampling quality assurance plan. Field sampling equipment cleaning and decontamination are as follows:
 - 12.1.1.1 A laboratory grade glassware detergent plus tap water wash.
 - 12.1.1.2 A generous tap water rinse.
 - 12.1.1.3 Distilled/deionized (ASTM Type II) water rinse.
 - 12.1.1.4 10 % nitric acid rinse. This step is required only if the samples are going to be analyzed for metals.
 - 12.1.1.5 Distilled/deionized (ASTM Type II) water rinse.
 - 12.1.1.6 Acetone (pesticide grade) rinse. This step is required only if the samples are going to be analyzed for organics.
 - 12.1.1.7 Total air dry or pure nitrogen blowout. This step is required only if the samples are going to be analyzed for organics.
 - 12.1.1.8 Distilled/deionized (ASTM Type II) water rinse.
 - 12.1.2 Sampling devices should be numbered in a manner that will not affect their integrity and wrapped in a material (aluminum foil) that has been cleaned and oven baked at 105 degrees Celsius or cleaned in the same manner as the equipment. The equipment is then custody sealed and information concerning the decontamination, methodology, date, time and personnel recorded in a field logbook for equipment if applicable.
 - 12.1.3 Distilled/deionized water available from commercial sources is acceptable for sampling equipment decontamination. NJDEP may require lot numbers or analytical verification that the water meets ASTM Type II specifications.
 - 12.1.4 In instances where Acetone is a parameter of concern, another solvent may be used but must be approved by the NJDEP.

CATEGORY: Sample Handling

TITLE: Decontamination Procedures for Field Equipment

12.1.5 Decontamination should be carried out over a container of appropriate size and volume and the material disposed of off-site. Wastes from decontamination must be disposed of properly.

12.2 Non-aqueous sampling equipment decontamination (laboratory and field).

12.2.1 All non-aqueous field sampling equipment should be laboratory cleaned, wrapped and dedicated to a particular sampling point or event when possible but field cleaning may be more practical. The process is as follows:

12.2.1.1 Laboratory grade glassware detergent and tap water scrub to remove visual contamination.

12.2.1.2 Generous tap water rinse.

12.2.1.3 Distilled/deionized (ASTM Type II) water rinse.

12.2.2 If visual contamination persists or gross contamination is suspected, the full eight step decontamination procedure as listed under aqueous equipment decontamination should be performed.

12.2.3 Sampling devices should be numbered in a manner that will not affect their integrity and wrapped in a material (aluminum foil) that has been cleaned and oven baked at 105 degrees Celsius or cleaned in the same manner as the equipment. The equipment is then custody sealed and information concerning the decontamination, methodology, date, time and personnel recorded in a field logbook for equipment if applicable.

12.2.4 Distilled/deionized water available from commercial sources is acceptable for sampling equipment decontamination. NJDEP may require lot numbers or analytical verification that the water meets ASTM Type II specifications.

12.2.5 In instances where Acetone is a parameter of concern, another solvent may be used but must be approved by the NJDEP.

12.2.6 Decontamination should be carried out over a container of appropriate size and volume and the material disposed of off-site. Wastes from decontamination must be disposed of properly.

13 POLLUTION PREVENTION:

13.1 For pollution prevention, please refer to SOP No. SAM-0222.

14 WASTE MANAGEMENT:

14.1 For sample disposal, please refer to SOP No. SAM-0220.

STANDARD OPERATING PROCEDURE

SOP No.: SAM-0207

Revision No.: 3

Date Revised: 04/12/06

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CATEGORY: Sample Handling

TITLE: Field Sampling/Methanol Extraction

1 PURPOSE:

- 1.1 This method describes the container preparation, field sampling and field extraction/preservation to be used for sample collection of soil samples for volatile organics.

2 RESPONSIBILITY:

- 2.1 Designated field samplers who have been properly instructed and trained in the field sampling protocols and techniques of soil samples for volatile organics.

3 SAMPLE COLLECTION, PRESERVATION AND HANDLING:

- 3.1 For sample collection, preservation and handling please refer to SOP No. SAM-0200.
- 3.2 SOP SAM-0203, Preparation of Soil Sample Jars for Methanol Volatile Analysis.

4 REFERENCES:

- 4.1 Field Sampling Procedures Manual, August 2005. New Jersey Department of Environmental Protection.
- 4.2 NJDEP Methodology for the Field Extraction/Preservation of Soil Samples with Methanol for Volatile Organic Compounds. February 1997.

5 SUMMARY:

- 5.1 Soil samples collected for volatile organic analysis must be handled in a manner that will minimize the loss of contaminants due to volatilization and biodegradation. Field extraction/preservation with Methanol must be conducted to ensure that contaminants do not degrade or volatilize during sample handling and transport.
- 5.2 A small diameter soil core-sampling device is used to collect a 10-gram soil sample. The sample is extruded into a tared sample container supplied by the laboratory performing the analysis. Purge and trap grade methanol and surrogate compounds are included in this container.

6 DEFINITIONS:

- 6.1 NJDEP-New Jersey Department of Environmental Protection.

Prepared By:_____	Date:_____
Laboratory Director:_____	Date:_____
QA/QC Manager:_____	Date:_____

CATEGORY: Sample Handling

TITLE: Field Sampling/Methanol Extraction

7 SAFETY:

- 7.1 For safety, please refer to CTSC Fort Monmouth, NJ Health and Safety Plan (HASP).
- 7.2 Methanol must be handled with all safety precautions related to toxic and flammable liquids.
- 7.3 Use protective gloves when handling the methanol vials and store away from sources of ignition. The vials of methanol should always be stored in a cooler with ice at all times.
- 7.4 Containers should be opened and closed quickly during the sample preservation procedure and they must be handled in a well ventilated area.

8 EQUIPMENT AND MATERIALS:

- 8.1 Soil sampling device.
- 8.2 Modified disposable 10-30 mL syringe.
- 8.3 Small electronic balance.

9 STANDARDS/REAGENTS:

- 9.1 Methanol, CH₃OH, Pesticide quality or equivalent demonstrated to be free of analytes.
- 9.2 Surrogate Standards (4-Bromofluorobenzene, Dibromofluoromethane and Toluene-d₈).

10 QUALITY CONTROL:

10.1 Ambient Blank:

10.1.1 The collection of an ambient blank is not required when sampling is performed using the methanol extraction/preservation technique. It will be optional at the discretion of the site investigative team, or it will be required on a site-specific basis if previous elevated analytical results are suspected due to contamination from the sampling environment.

10.1.2 If ambient blanks are employed, the frequency of collection should be one (1) per day.

10.2 Field Blank:

10.2.1 A field blank is a QA/QC sample, which will determine potential contamination from the sampling equipment used to collect and transfer samples from the point of collection to the sample container.

10.2.2 A field blank is not required when sampling with the methanol extraction/preservation technique.

10.2.3 If it is required due to suspected cross-contamination from the sampling equipment, it is sampled in the following manner. Analyte free water is poured from one sample container, over each piece of sampling equipment required for sample collection and into a separate set of identical sample containers.

CATEGORY: Sample Handling

TITLE: Field Sampling/Methanol Extraction

10.2.4 Additional information on field blanks can be found in the NJDEP Field Sampling Procedures Manual, August 2005.

10.3 Trip Blank:

10.3.1 A trip blank is a QA/QC sample which will determine additional sources of contamination that may potentially influence the samples. The source of the contamination may be from the lab, sample bottles or during shipment.

10.3.2 A trip blank is required when sampling with the methanol extraction/preservation technique. It is required due to potential cross-contamination from sample shipment or from handling at the laboratory.

10.3.3 The trip blank is prepared at the same time and in the same manner as the sample containers. It must accompany the sample containers to the field and back to the laboratory along with the collected samples for analysis. It must remain sealed at all times until it is analyzed at the laboratory.

10.3.4 The frequency of collection for the trip blank must be at a rate of one (1) per sample shipment.

10.4 Field Duplicate:

10.4.1 Perform duplicate samples at a rate of five (5) percent, 1 per 20 samples.

10.4.2 Duplicates must be obtained from the same location and soil type to minimize location as a potential source of variation in the analytical results. Separate core samples should be obtained for the sample and the duplicate sample.

11 CALIBRATION:

11.1 Calibration of the scale is checked if the scale is suspect of being out of calibration. This is accomplished by using certified scale weights on the scale in question to check its accuracy.

12 PROCEDURE:

12.1 Soil sample collection for volatile organics must be performed with the use of a decontaminated small diameter-coring device. A modified 10-30 mL disposable syringe or commercially available small diameter tube/plunger sampler is acceptable. The small diameter-coring device must be capable of collecting the required amount of sample from large diameter core samplers (split spoons, etc.) or from freshly exposed soils. Refer to SOP SAM-0203 for the preparation of soil sample jars for methanol volatile analysis.

12.2 If a modified disposable syringe is used, it can be prepared in-house by cutting off the injection tip. Depending upon the construction of the syringe, small air vents must be cut into the plunger or the rubber tip and the retaining post must be removed. These alterations to the plunger will prevent air from being forced through or around the soil plug during sub coring and sample extrusion.

12.3 The small diameter core sampler must be capable of delivering the sample directly into the sample container. The outer diameter of the core sampler must be smaller

CATEGORY: Sample Handling

TITLE: Field Sampling/Methanol Extraction

than the inner diameter of the sample container to avoid loss of sample and ease the soil transfer process. The sample from the small diameter core cannot be transferred to a secondary container such as another sample bottle, zip lock bag, aluminum foil, etc. prior to placement into the sample container with the methanol preservation.

- 12.4 Use a small electronic balance or manual scale for measuring the weight of the soil in the syringe. The scale must be calibrated before use, and intermittently the calibration should be checked during the sampling day to ensure the accuracy of the weight measurements.
- 12.5 Tare and weigh the small diameter core sampler.
- 12.6 Once the sampling interval has been selected, trim off the surface soils of the sample interval to expose a fresh soil surface. The loss of volatile organics from the surface soils will occur if the soil has been exposed for a short period of time (during screening, etc.). The removal of the surface soils can be accomplished by scraping the soil surface using a decontaminated spatula or trowel. The sampling procedure must commence immediately once a fresh soil surface has been exposed.
- 12.7 Using a decontaminated coring device, collect 10 grams, plus or minus 2 grams (8-12 grams) of sample (wet weight). Wipe the outside of the sub-coring device to remove any adherent soil. The plunger of the coring device can be pulled back or completely removed allowing the open barrel of the sub-core to be inserted straight into the soil, on an angle or multiple insertions can be performed to obtain the required sample weight.
- 12.8 Quickly weigh the sample while it is contained in the small diameter core sampler. Excess soil can be removed from the coring device by extruding a small portion of the core and cleaning away with a decontaminated trowel or spatula. If the soil weight is below the limit, obtain additional sample. Reweigh after each addition or removal of the sample to the sub core until the target weight is attained (8-12 grams). Analytical results from a sample exceeding the weight maximums and minimums may be rejected and thus require resampling.
- 12.9 When sampling soils of similar textures and water content, sample weight can be estimated based on the volume of previously weighed samples from sampling or practice core sampling to determine sample weights.
- 12.10 Immediately open the sample container and slowly extrude the soil core into the preweighed and prenumbered sample container supplied by the laboratory performing the analysis. Avoid splashing the methanol out of the sample container. Do not insert the small diameter-coring device into the mouth of the small diameter sample containers (40 mL or 60 mL VOA vials) or immerse the small diameter soil-coring device into the methanol.
- 12.11 Ensure that the threads on the sample container and cap are free of soil particles. Use a clean brush or paper towel to remove the particles off the threads. The presence of soil particles compromises the seal of the container resulting in the loss of methanol, which may invalidate the sample.

CATEGORY: Sample Handling

TITLE: Field Sampling/Methanol Extraction

- 12.12 Secure the lid of the sample container. Gently swirl the samples to mix and break up the soil aggregate until the soil is covered with methanol. Do not shake.
- 12.13 Do not attach any additional adhesive backed labels or tape to the sample containers. Record the sample numbers on the containers. Avoid covering laboratory identification numbers. Labels with wire or rubber band attachments may be used provided they can be removed easily for sample weighing. Record the laboratory and field identification numbers on the chain of custody and field notes.
- 12.14 The laboratory performing the analysis will determine the actual weight of the soil when the sample is returned to the lab. All samples must be returned to the lab no later than 48 hours after sample collection.
- 12.15 Do not use or submit samples for analysis if any methanol has spilled from a sample container during shipment to the site or during sampling. Extra sample containers can be made available by the laboratory in case of accidental spillage of methanol in the field.
- 12.16 After sample collection, immediately return the containers to an iced cooler in an upright position. Sample containers can be placed in separate zip lock bags to protect other containers in case of leakage during transport. The laboratory sample number or field identification number may be placed on the bag and cross-referenced on the chain of custody. Do not place additional adhesive backed labels or tape on the sample containers. If any methanol is lost from a sample container upon arrival at the laboratory, the sample is invalid and resampling must be performed.
- 12.17 Moisture Determination:
- 12.17.1 To report the sample results on a dry weight basis, collect one duplicate sample (not preserved with methanol) from each sample location. Tightly seal the container to prevent the loss of soil moisture. This sample does not require weighing. It is taken for percent solids analysis and a 2 ounce container is sufficient. One 2 ounce jar is collected for each methanol sample taken including duplicates.
- 12.17.2 Weigh a 10 gram portion of the sample in a tared crucible.
- 12.17.3 Dry the sample overnight at 103-105 degrees C. Allow to cool in a desiccator before reweighing.
- 12.17.4 Determine percent dry weight by the following formula:
$$\% \text{ dry weight} = \frac{\text{g of dry sample}}{\text{g of sample}} \times 100$$
- 12.17.5 Calculate the sample concentration on a dry weight basis.

13 POLLUTION PREVENTION:

- 13.1 For pollution prevention, please refer to SOP No. SAM-0222.

14 WASTE MANAGEMENT:

- 14.1 For sample disposal, please refer to SOP No. SAM-0220.

STANDARD OPERATING PROCEDURE

SOP No.: SAM-0207

Revision No.: 3

Date Revised: 04/12/06

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CATEGORY: Sample Handling

TITLE: Field Sampling/Methanol Extraction

STANDARD OPERATING PROCEDURE

SOP No.: SAM-0220

Revision No.: 3

Date Revised: 10/04/05

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CATEGORY: Sample Handling

TITLE: Hazardous Waste Disposal Procedures

- 1 PURPOSE: To document the procedures for the disposal of hazardous waste generated by the laboratory.
- 2 RESPONSIBILITY: It is the responsibility of designated laboratory personnel who have been properly trained and instructed in the disposal of various waste streams.
- 3 SAMPLE COLLECTION, PRESERVATION AND HANDLING:
 - 3.1 For sample collection, preservation and handling, please refer to SOP No. SAM-0200.
- 4 REFERENCES:
 - 4.1 Hazardous Waste Identification, Collection, Storage and Disposal Procedures at Fort Monmouth, January 1996.
 - 4.2 Standard Methods for the Examination of Water and Wastewater, 19th Edition.
 - 4.3 US Army Corps of Engineers, February 2001, Shell for Analytical Chemistry Requirements, EM 200-1-3.
 - 4.4 EPA QA/G-6 Guidance for Preparing Standard Operating Procedures (SOPs), March 2001.
- 5 SUMMARY:
 - 5.1 There is a satellite accumulation area located outside of building 174.
 - 5.1.1 The accumulation area contains six 55-gallon drums.
 - 5.2 There is one 55-gallon drum located in the back room of building 174 for soils.
 - 5.3 A variety of smaller satellite containers are located throughout buildings 173 and 174.
 - 5.4 All working waste containers must be emptied into these satellite containers on a daily basis.
- 6 SAFETY:
 - 6.1 For safety, please refer to CTSC Fort Monmouth, NJ Health and Safety Plan (HASP).
 - 6.2 At a minimum, all laboratory personnel shall wear goggles, lab coats and gloves when disposing of hazardous waste.

Prepared By:_____	Date:_____
Laboratory Director:_____	Date:_____
QA/QC Manager:_____	Date:_____

CATEGORY: Sample Handling

TITLE: Hazardous Waste Disposal Procedures

7 PROCEDURE:

- 7.1 There is only one satellite container per waste stream located at the laboratory.
 - 7.1.1 This does not include daily accumulation containers.
- 7.2 All containers must be labeled in indelible ink with the words ***“Hazardous Waste”*** and the name of the waste.
- 7.3 Container labels must be visible and the date the accumulation began must be included on the label.
- 7.4 There is a satellite container for vials. This container holds anything that comes in a vial (Extracts, standards, surrogates, etc.).
- 7.5 Except during filling or emptying, the containers must be securely closed.
- 7.6 When the quantity of waste reaches its maximum accumulation or the container becomes full, a final date will be written on the label.
- 7.7 The laboratory will notify the Hazardous Waste Disposal Officer within 24 hour after the container becomes full.
- 7.8 The Hazardous Waste Officer will pick up the full container and provide a suitable replacement container within 48 hour of notification.
- 7.9 If a satellite container becomes damaged, the laboratory will contact the Hazardous Waste Officer immediately to obtain a replacement.

8 POLLUTION PREVENTION:

- 8.1 For pollution prevention, please refer to SOP SAM-0222.

9 TABLES AND DIAGRAMS:

CATEGORY: Sample Handling

TITLE: Hazardous Waste Disposal Procedures

Table I**Satellite Containers**

WASTE	LOCATION	TYPE
Halogenated	Outside Bldg. 174	55-gallon polypropylene
Acetonitrile/Methanol/ Water	Outside Bldg. 174	55-gallon polypropylene
Methylene Chloride/Water	Outside Bldg. 174	55-gallon polypropylene
Soil/Filter	Outside Bldg. 174	55-gallon metal
Acid/No Metals	Outside Bldg. 174	55-gallon polypropylene
Acid with Metals	Outside Bldg. 174	55-gallon polypropylene
Soil/No Solvent	Back Bldg. 174	55-gallon metal
Non-Halogenated	Back Bldg. 174	2-gallon polypropylene
Caustic	Bldg. 173 Wet Lab	2-gallon polypropylene
Phenols	Bldg. 173 Wet Lab	2-gallon polypropylene
Waste Fixer	Bldg. 173 Wet Lab	2-gallon polypropylene
Sulfide with Acid	Bldg. 173 Wet Lab	2-gallon polypropylene
Cyanide	Bldg. 173 Wet Lab	2-gallon polypropylene
Pyridine/Cyanide	Bldg. 173 Wet Lab	2-gallon polypropylene
Acid with Mercury	Bldg. 173 Wet Lab	2-gallon polypropylene
Developer Waste	Bldg. 173 Wet Lab	2-gallon polypropylene
Perchlorate Waste	Bldg. 173 Wet Lab	2-gallon polypropylene
Methanol	Bldg. 173 VOA Lab	2.5-gallon metal
Vials	Bldg. 174 Extraction Lab	5-gallon metal

STANDARD OPERATING PROCEDURE

SOP No.: SAM-0205

Revision No.: 3

Date Revised: 1/20/2006

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CATEGORY: Sample Handling

TITLE: Monitor Well Sampling for IRP sites at Fort Monmouth

1 PURPOSE:

1.1 To document current procedures for monitoring well sampling.

2 RESPONSIBILITY:

2.1 Designated field samplers who have been properly trained and instructed in NJDEP field sampling procedures and protocol.

3 SAMPLE COLLECTION, PRESERVATION AND HANDLING:

3.1 For sample collection, preservation and handling, please refer to SOP No. SAM-200.

4 REFERENCES:

4.1 Field Sampling Procedures Manual, August 2005. New Jersey Department of Environmental Protection.

4.2 NJDEP Field Analysis Manual, July 1994.

4.3 On the World Wide Web: www.state.nj.us/dep or www.state.nj.us/dep/srp.

4.4 Lab SOP: SAM-0200, SAM-0202, OQC-0302.

5 SUMMARY:

5.1 The procedures, materials, and equipment describe the recommended methods for sampling monitoring wells. Necessary equipment, calibrations, calculations and appropriate QA/QC procedures are also included. These procedures are to be followed by all personnel involved with the sampling and purging of wells at Fort Monmouth. Persons following this SOP are recommended to also refer to the NJDEP Field Sampling Procedures Manual, August 2005.

6 SAFETY:

6.1 For safety, please refer to CTSC Fort Monmouth, NJ Health and Safety Plan (HASP).

7 EQUIPMENT AND MATERIALS:

7.1 Equipment:

7.1.1 Dissolved oxygen meter

Prepared By:_____	Date:_____
Laboratory Director:_____	Date:_____
QA/QC Manager:_____	Date:_____

CATEGORY: Sample Handling

TITLE: Monitor Well Sampling for IRP sites at Fort Monmouth

- 7.1.2 HNU photo ionizer
- 7.1.3 Conductivity/pH/temperature meter
- 7.1.4 Peristaltic well pumps
- 7.1.5 Pump heads and power cables
- 7.1.6 Water level meter
- 7.1.7 Oil/water interface probe
- 7.1.8 Submersible well pumps
- 7.1.9 Various batteries
- 7.1.10 Buckets
- 7.1.11 Miscellaneous tools, i.e. screwdriver, well wrench, etc.
- 7.1.12 A multi-parameter water quality meter may be used as long as it measures:
Conductivity, pH, Temperature, and Dissolved Oxygen.

7.2 Materials:

- 7.2.1 Thick wall silicone tubing ¼ inch diameter
- 7.2.2 Polyethylene (food grade) tubing ¼ inch diameter
- 7.2.3 12 inch single sample 1 check stop Teflon disposable bailers
- 7.2.4 Mason string

8 STANDARDS/REAGENTS:

- 8.1 Buffer solutions, calibration gases, decontamination materials, and acids for preservation.
 - 8.1.1 Buffer solutions:
 - 8.1.1.1 7.00 standard buffer solution
 - 8.1.1.2 10.00 standard buffer solution
 - 8.1.1.3 4.00 standard buffer solution
 - 8.1.2 Distilled and deionized water
 - 8.1.3 Alconox
 - 8.1.4 10 % nitric acid rinse (trace metal or higher grade HNO₃ diluted with distilled/deionized (ATSM Type II) H₂O).
 - 8.1.5 Acetone (pesticide grade).
 - 8.1.6 Pure nitrogen 100-ppm Isobutylene cal gas.
(Refer to NJDEP Field Sampling Procedure Manual Table 2-1 Aqueous Sampling Equipment Decontamination (Lab and Field) for further information).
- 8.2 Acids/materials used in preserving samples:
 - 8.2.1 Nitric acid 69.0-70.0%
 - 8.2.2 Sulfuric acid 50% (w/w) solution
 - 8.2.3 Hydrochloric acid (trace metal grade)
- 8.3 Ice for keeping samples at <4 degrees Celsius

CATEGORY: Sample Handling

TITLE: Monitor Well Sampling for IRP sites at Fort Monmouth

9 QUALITY CONTROL:

- 9.1 The following QA/QC requirements are established in order to maintain sample integrity. The prime objective is to prevent sample contamination from other sources and ensure potential contaminant concentrations remain stable from sample collection to complete analysis. Refer to the NJDEP Field Sampling Procedures Manual Appendix 2-1 Analytical Methodology Reference Charts, Pp. 35-61. Also refer to SAM-0200 Sample Containers, Preservation and Holding Times.
- 9.2 Sample Containers: Before sample collection can begin consideration must be given as to what type of container will be used to transport and store samples. The lab provides containers based upon requested methodologies. Selection is based on the matrix, potential contaminants, analytical methods, and lab's internal QA/QC requirements. They should be selected upon review of the following:
 - 9.2.1 Reactivity of container material with sample. Glass is recommended for hazardous material samples since it is chemically inert to most substances. Plastics may be used when analytes of interest or sample characteristics dictate use instead of glass.
 - 9.2.2 Volume of the container. The volume of sample needed is dictated by the analytical method and the matrix of the sample. The lab will supply bottles that allow for sufficient volumes of sample matrix to be collected.
 - 9.2.3 Color of container. Whenever possible, amber glass is used to prevent photo degradation. If not available, samples should be kept protected from light. One exception is the 40 ml clear glass VOA vials used for VOA aqueous analysis.
 - 9.2.4 Container closures. All containers utilized have a leak-proof seal and are constructed out of material inert with respect to sampled materials. The closure may also be separated by a closure liner that is inert to sample material.
 - 9.2.5 Decontamination of containers and chain of custody. Sample containers are laboratory cleaned or purchased as lab cleaned. Bottles being shipped are accompanied by a chain of custody in a cooler with a custody seal. Custody must accompany containers to field, during collection, back to lab, and during analysis. This helps to assure no tampering or contamination from outside sources occurs.
- 9.3 Storage and transport. Care is taken to avoid contamination. Clean transport and storage environments are observed. Sample or bottle storage is never near solvents, gasoline, or other equipment that is a potential source of contamination. Samples and chain of custody are secured in coolers for transport, with said chain of custody in with bottles or in the hands of authorized personnel. Also, a temperature blank is included in each cooler to measure the temperature of samples on ice in coolers (ideally a constant 4 degrees Celsius).

CATEGORY: Sample Handling

TITLE: Monitor Well Sampling for IRP sites at Fort Monmouth

9.4 Tubing decontamination: ASTM drinking water grade polyethylene tubing is used and discarded after each use. Avoid pump and tubing contact with ground surface. All tubing is rinsed/wiped with distilled and deionized water to remove any possible residual materials on it before entering well.

9.5 QA/QC samples: These samples are intended to provide control over the collection of measurements, and subsequent validation, review, and interpretation of analytical data. A trip blank is used for volatile organics and its purpose is to measure possible cross contamination of samples in transit and at a site. It is **never** opened and travels to the site or sites **with** empty sample bottles and back **with** samples. They may also indicate poor cleaning. Like wise, a field blank is used to determine a control on the equipment handling, preparation, storage and shipment. It travels with the samples and is representative of shipment effects on sample quality. By being opened in the field, transferred over a cleaned sampling device, the blank is indicative of ambient and equipment conditions that may affect quality of associated samples. It also serves as an additional check on possible sources of contamination. Blank water is demonstrated analyte free, and is from the same common source and physical locale in lab.

9.5.1 Aqueous matrix QA/QC blank requirements:

9.5.1.1 Field blanks: They are preserved/analyzed for all the same parameters as samples collected that day. They may be required in order to detect cross contamination from ambient air during a potable sampling if known sources are within proximity or monitoring equipment indicates their presence as background. Field blanks must also be taken once every day during sampling.

9.5.1.2 Trip blanks: Consists of a set of bottles each filled at the lab with analyte free water. They accompany the bottles both to and from each site. They are never opened in field. They are also returned in the same bottles they were sent out in. At minimum, a trip blank must be analyzed for volatile organics. Inclusion of additional parameters is at the discretion of the NJDEP. Trip blanks and the samples they accompany are not held on site more than 2 calendar days. A trip blank is included in each sample shipment or trip to field, not to exceed 2 consecutive field days.

9.5.2 Additional QA/QC samples:

9.5.2.1 Duplicate samples: Collection of a duplicate provides for evaluation of lab performance by comparing the analytical data of two samples from the same location. They are included 1 for every 20 samples (5% or 1 a day/site) and submitted as blind samples. They are obtained by alternately filling sample bottles from the same source/device for each parameter. VOA samples are from the same bailer and are the first set of bottles filled.

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9.5.2.2 Matrix spike/Matrix spike duplicate analyses or MS/MSD sample: The lab is supplied with triple volume in order to perform matrix spike and matrix spike duplicates. This does not include trip or field blanks. They should occur every case of field samples, every 20-field samples or each 14-day calendar period in which a site is being worked at and samples collected.

9.6 Sample preservation: The laboratory staff based upon analytical requirements preserves the sample bottles. Please refer to SAM-0200 Sample Containers, Preservation, and Holding Times SOP and also NJDEP Field Sampling Procedures Manual Appendix 2-1 Analytical Methodology reference Charts, Pp. 35-61.

10 CALIBRATION:

10.1 All instruments used for field readings are calibrated before each day of use. The use of pH meters must start out with a calibration using buffer solution standards to check or calibrate accuracy. HNU's are calibrated with a known calibration gas. Dissolved oxygen meters are checked against a Winkler method test weekly. All calibrations for a given days use are recorded in the log provided for each instrument. Refer to equipment directions for calibration instruction. Like wise, specific conductivity meters are checked against standards regularly. Cooler thermometers are calibrated against a NIST traceable thermometer annually.

11 PROCEDURE:

11.1 The following articles document the procedures for sampling monitor wells. They are to be used as a guide by trained personnel in conjunction with the NJDEP Field Sampling Procedures Manual.

11.1.1 Proper bottle selection: Please refer to QA/QC section 9.

11.1.2 Equipment: Please refer to Equipment section 7.

11.1.3 Before purge activities: Certain instruments and meters are calibrated before use. Also, certain measurements and calculations are obtained before any purge activity can occur. The following is a list of information/data/steps required before purging and pertinent information recorded in logbooks or on well sheets: Date, time and weather conditions: Date and time are needed for holding time, and general record keeping. Weather conditions may affect ambient conditions at a particular site, so are therefore recorded. Tidal influences may also be included here, if wells are in a tidal area.

11.1.4 Well number and permit number: These are to be prominently displayed on the outside of the well according to NJDEP regulations for well construction. They also help to identify a particular well more exactly at a site.

11.1.5 Meter and instrument calibrations: Any meter utilized in the course of site sampling activities should be calibrated at this time, and then findings recorded

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in logbooks. Refer to section 10 and appropriate instrument/meter calibration directions.

11.1.6 PID or FID, HNU reading. This is taken from the wells inner casing immediately after the cap is removed, and the findings are recorded.

11.1.7 Free product check: Using ORS meter for interfaces, the presence or absence of product is determined. Thickness is measured and also recorded.

11.1.7.1 Light Non-Aqueous Phase Liquids (LNAPLs) and Dense Non-Aqueous Phase Liquids (DNAPLs): Measurement of thickness of DNAPLs and LNAPLs must be performed prior to purging wells. An interface probe may be used (ORS meter). Each layer of LNAPLs are sampled and analyzed for chemical and physical parameters. Sampling is by using a bottom filling bailer, lowered through LNAPL layer but not significantly down into next phase. DNAPLs are sampled using a dual check valve bailer or bladder pump. Both are then tested for chemical and physical properties. If both are present, it may be necessary to purge well of one casing volume of water prior to sampling DNAPL provided layer is not disturbed. This is done by setting a submersible pump or suction lift pump several feet above the DNAPL.

11.2 Dissolved oxygen, pH, temperature, and specific conductivity: Readings should be obtained and recorded on well sheets.

11.3 Total depth of well and depth to water: These readings are taken using a depth meter. Total depth of well, depth to water, and depth to screen are measured from the top of the inner casing or surveyor's mark. All are recorded on well sheets.

11.4 Calculations: Calculations are then done as stated in section 12.

11.5 Purging: When pre-purge activities are complete, the purging of the well can begin. This includes pre-entry to the well and pump setup.

11.6 Field Blank Sample: At this time the field blank is sampled. A new bailer is opened from its sealed package and then the field blank water is run over the bailer or sample equipment and collected into proper sample containers in the correct order.

11.7 Pre-entry to well: Before the tubing (refer to materials section) is inserted into the well, it must be wiped down and rinsed with DI water. Then inserted into the well leaving at maximum six feet of distance below water surface. Tubing is then lowered as depth drops, or as needed.

11.8 Pump setup: The peristaltic pump is then setup with its connection to battery and purging begun. Evacuation rate should not exceed that of well development, and total volume purged should not exceed 5 times the amount of standing water. Discharge water must be in compliance with those stated in section 13. Please refer to the NJDEP Field Sampling Procedures Manual as well.

11.9 After Purge: When purging is complete, the pump is removed and tubing is disposed of properly. Data in section 11.1 is then taken and recorded.

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- 11.10 Pump removal: Using peristaltic pumps, the tubing is removed from the well at end of purge while pump still running. Tubing is then disposed of. The pump can then be shut down and decontaminated for next use as needed.
- 11.11 The following data must be recorded on well sheet: Start and end time of purge, purge method and purge rate. Total volume purged, dissolved oxygen, pH, temperature, and specific conductivity readings.
- 11.12 Ground water sampling: Following well evacuation procedures, groundwater sampling can begin. This is immediately after purge, not lapsing more than 2 hours afterwards. When multiple wells are being sampled, the least contaminated should be done first in order of ascending contamination. Sampling is done by using a bottom filling Teflon bailer, dedicated to that particular sampling event. The bailer is lowered slowly into the water until its submerged, and then slowly retrieved. Sample is then carefully transferred to sample containers. The first full bailer of water is used for sampling, it may not be discarded.

Sample order: Samples are collected in the following order:

- volatile organics (VOA)
- purgeable organic carbons (POC)
- purgeable organic halogens (POX)
- total organic halogens (TOX)
- total organic carbon (TOC)
- base neutrals/acid extractables
- TPHC/oil and grease
- PCB's/pesticides
- total metals
- dissolved metals
- phenols, cyanide
- sulfate and chloride
- turbidity
- nitrate and ammonia,
- preserved inorganics
- radionuclides
- non-preserved inorganics
- bacteria.

This order must be followed

- 11.13 Duplicates and matrix spikes/matrix spike duplicates: These samples are taken in the same order and at the same time as samples. Refer to sections 9.5.2 and 11.12.

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11.14 After sampling: The following data is recorded on the well sheets: Start and end time of sampling, dissolved oxygen, pH, temperature, specific conductivity, and sampling method.

12 CALCULATIONS:

12.1 Four calculations must be done while in the field. The calculations are as follows: linear feet of water (height of water), the volume to be purged, the volume purged not to be exceeded, and purge rate.

12.1.1 Linear feet of water: This is calculated by knowing the total depth of the well and subtracting the depth to water measured by a depth meter. These two numbers should be measured to within .01 feet. Through this calculation, the linear feet of water is determined.

Equation: (Total well depth – Depth to water = linear feet of water)

12.1.2 Volume to be purged and volume not to be exceeded: The second calculation is to determine the minimum volume to be purged from a well before sampling. Utilizing the linear feet of water and then multiplying it by the volume per foot for the proper diameter casing (see Figure 1 below) equals the amount of water in casing. By multiplying the amount of water within a casing by 3 equals the total minimum volume to be purged. It should be noted here that the amount purged should not exceed 5x the amount of standing water in a well.

Equation:

linear ft of water x volume per ft well diameter = amount of water in casing)

then,

(amount of water in casing x 3 = minimum volume to be purged)

Equation:

(amount of water in casing x 5 = total volume **not** to be exceeded)

Figure 1: Capacity of Common Casing Diameters

Casing Diameter (ft.)

Gallons/linear foot

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2 inch (0.1667)	0.1632
4 inch (0.3333)	0.6528
6 inch (0.5000)	1.4688
8 inch (0.6667)	2.6112
10 inch (0.8333)	4.0800
12 inch (1.0000)	5.8752

12.1.3 Purge rate: The purge rate is determined by calculating the length of time it takes for the pump to fill a 1-gallon bucket with water. The time is multiplied by the minimum volume to be purged. The gallons being purged is then divided by this number (which also happens to be the length of time the purge will take in minutes) which equals the gallons per minute or purge rate.

Equation:

$(\text{time} \times \text{minimum volume to be purged}) = \text{length of purge in minutes}$

then,

$(\text{minimum volume to be purged} / \text{length of purge in minutes}) = \text{gallons per minute or the purge rate}$

13 POLLUTION PREVENTION:

13.1 For pollution prevention, please refer to SOP No. SAM-0222.

14 WASTE MANAGEMENT:

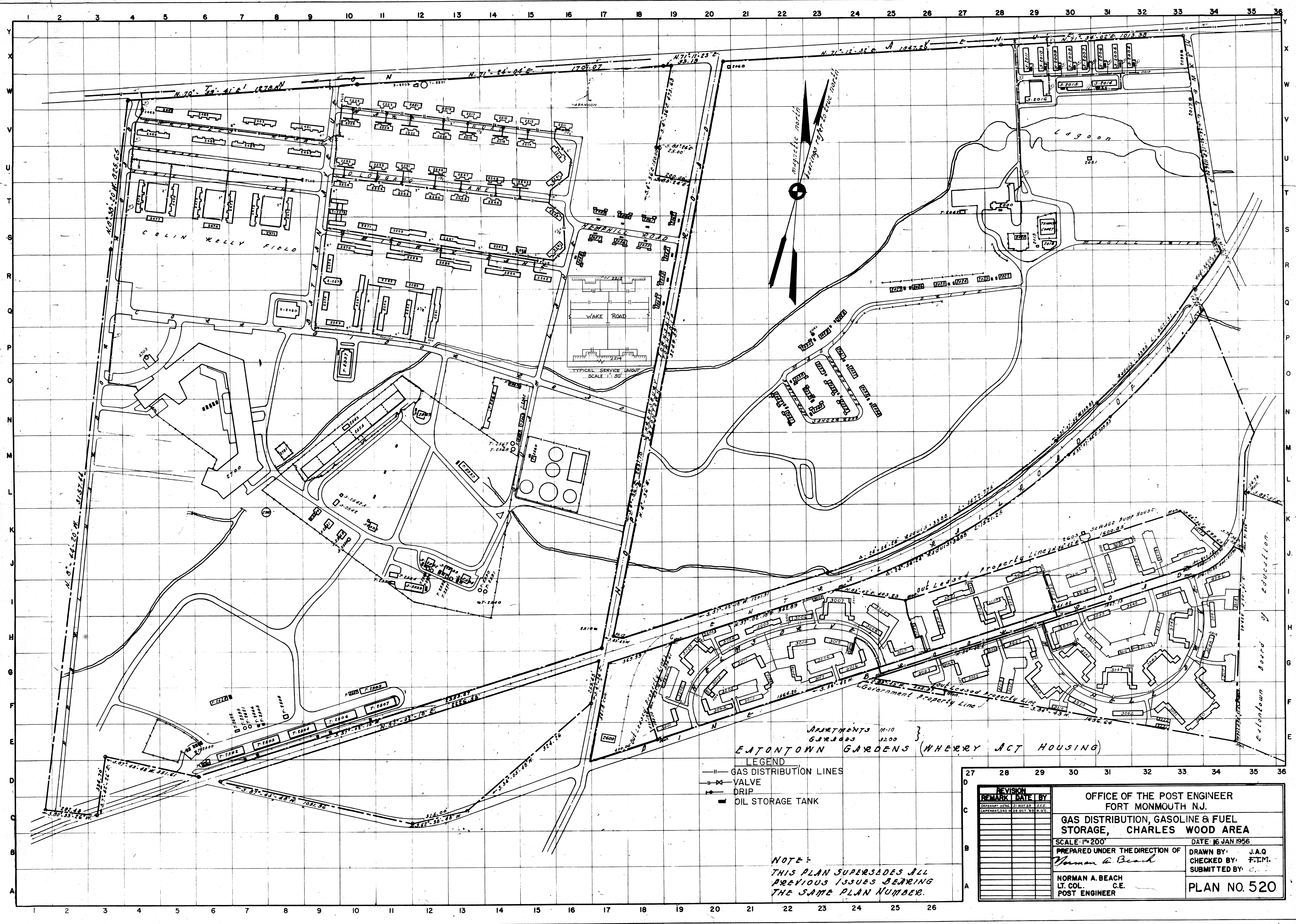
14.1 For sample disposal, please refer to SOP No. SAM-0220.

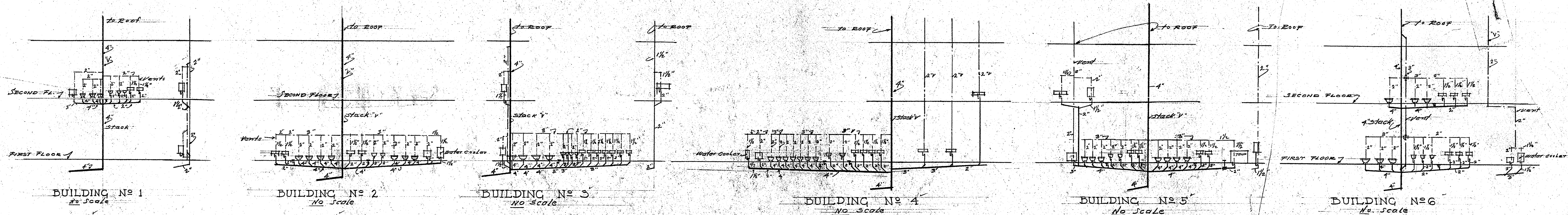
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Sources:

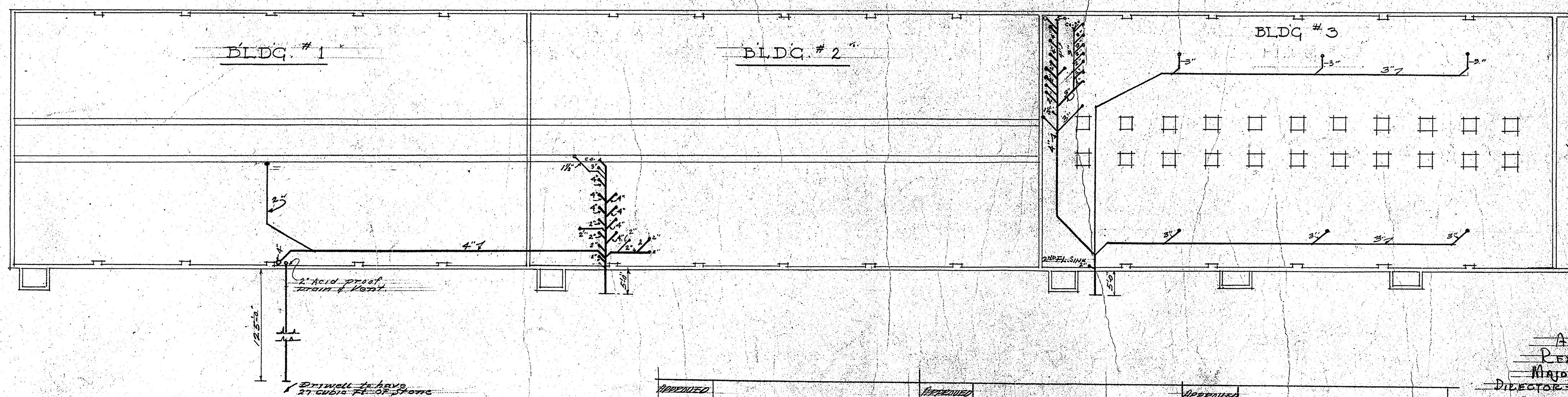
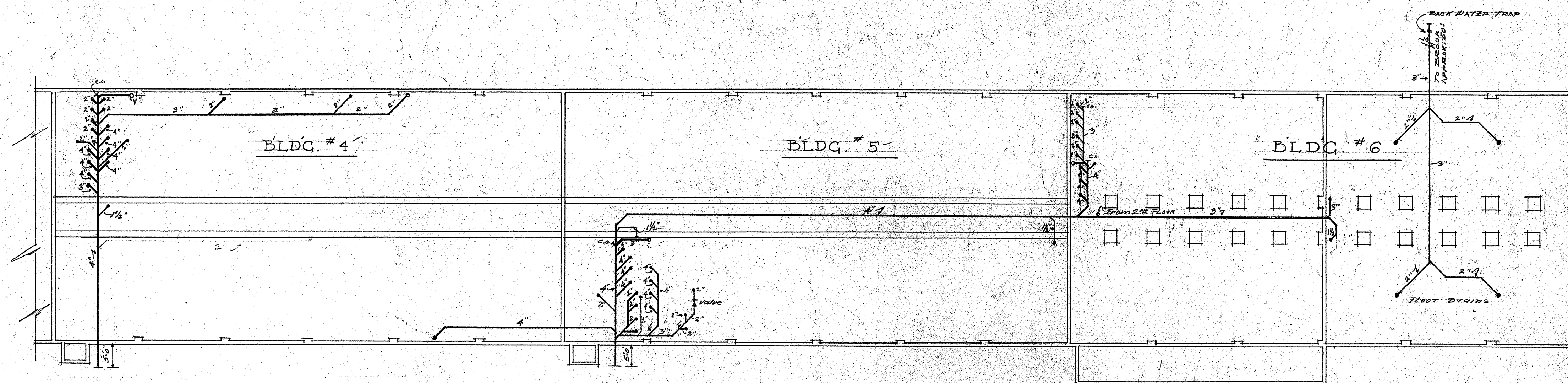
Environmental Research, Inc., 1993. Aerial Photographic Site Analysis, Evans Area, Charles Wood Area, Fort Monmouth, New Jersey. December 1993.

USEPA, 1985. Installation Assessment Relook Program, Working Document, Fort Monmouth Complex, Long Branch, New Jersey. September 1985.





DIAGRAMMATIC PLUMBING SECTIONS
Not drawn to scale



REVISION "A"
FLOOR DRAINS AND PLUMBING
FIXTURES ADDED
REVISION "B"
ADDITION OF 2 WATER COOLERS
IN BLDG. # ONE

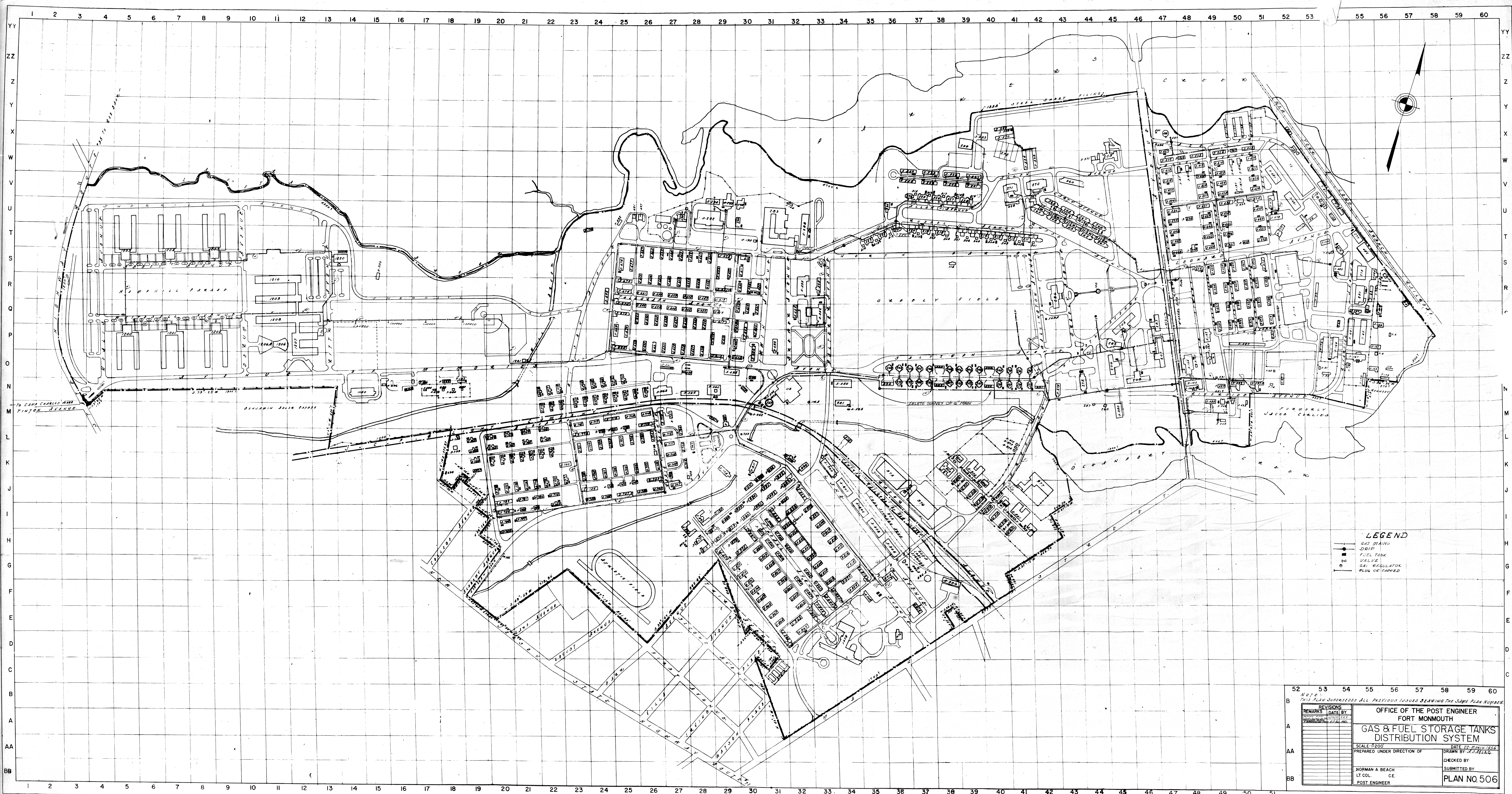
JOHN T. ROWLAND
ARCHITECT-ENGINEER

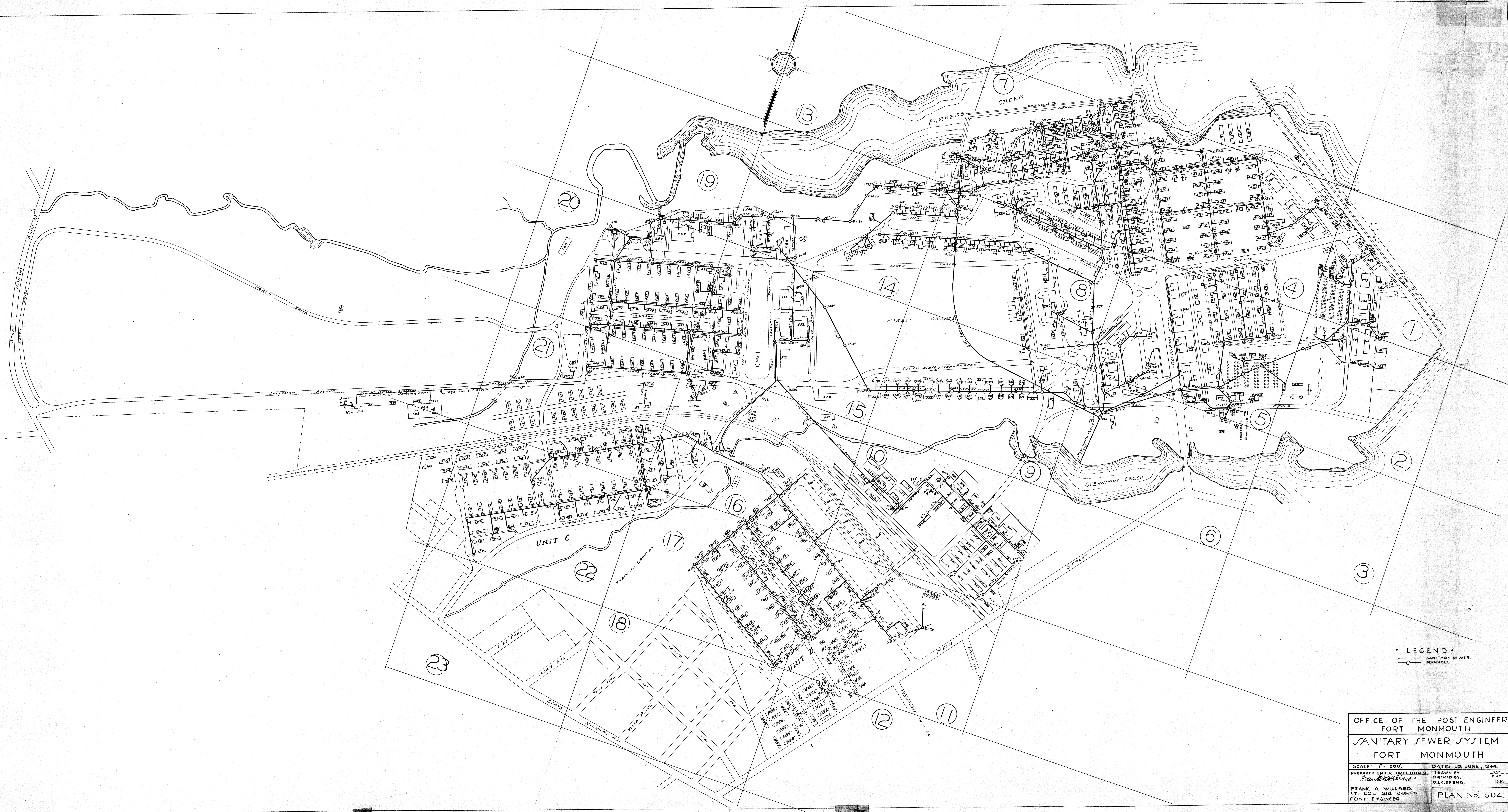
SCALE	CONSTRUCTION DIVISION
1/8" = 1'-0"	OFFICE OF THE QUARTERMASTER GENERAL
REVISIONS	EATONTOWN AREA
A 10-27-41	FORT MONMOUTH, N.J.
B 11-4-41	FIELD LABORATORY
	ALL BUILDINGS
	PLUMBING LAYOUT & SECTIONS
DRAWN BY	DATE
SWM	Sept. 26, 1941
TRACED BY	PLAN NUMBER
SWM	6148
	1633

Approved for
Pex V.D. Cooper
Major, Signal Corps
Director, Signal Corps Laboratories
W.B. Connelley
1st Lieut. Signal Corps

DATE	APPROVED	DATE	APPROVED	DATE	APPROVED
	COMMANDING GENERAL FORT MONMOUTH, N.J.				COMMANDING GENERAL 2ND CORPS, AREA

Plumbing Draft X 4





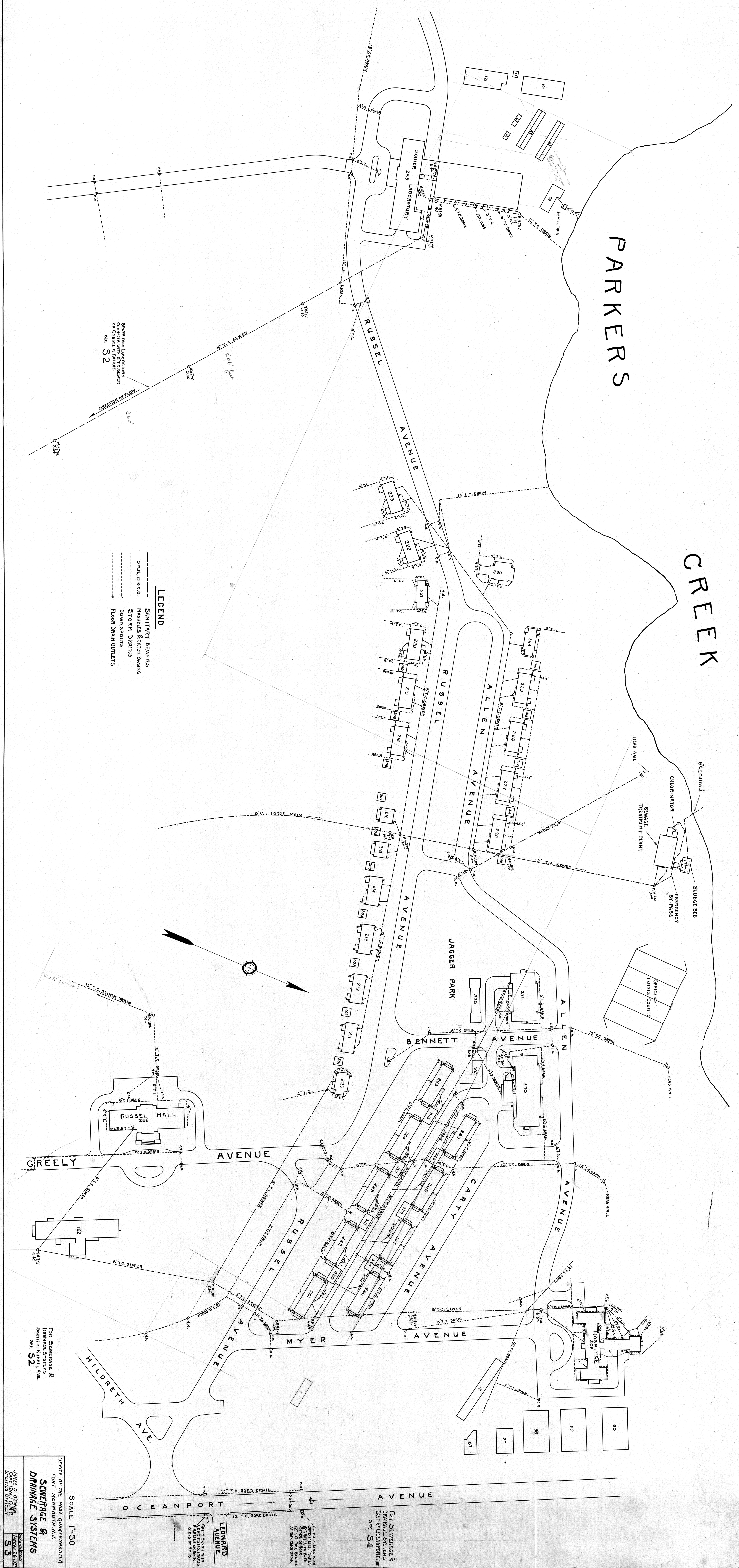
LEGEND
— SANITARY SEWER
○ MANHOLE

OFFICE OF THE POST ENGINEER.
FORT MONMOUTH
SANITARY SEWER SYSTEM
FORT MONMOUTH

SCALE: 1" = 100'	DATE: 30, JUNE, 1944.
PREPARED UNDER DIRECTION OF <i>Frank A. Willard</i>	DRAWN BY: <i>SAY</i>
FRANK A. WILLARD, LT. COL., SIG. CORPS, POST ENGINEER	CHECKED BY: <i>B.K.</i> O.I.C. OF ENG.
	PLAN No. 504.

PARKERS

CREEK



SCALE 1"=50'

OFFICE OF THE POST QUARTERMASTER
FORT MONMOUTH, N.J.

SEWERAGE &
DRAINAGE SYSTEMS

FOR SEWERAGE &
DRAINAGE SYSTEMS
EAST OF OCEANPORT AVE.
SEE S4

FOR SEWERAGE &
DRAINAGE SYSTEMS
SOUTH OF RUSSELL AVE.
SEE S2

FOR SEWERAGE &
DRAINAGE SYSTEMS
WEST OF OCEANPORT AVE.
SEE S3

SELECT HISTORIC AERIAL PHOTOGRAPHS:

Sources:

Environmental Research, Inc., 1993. Aerial Photographic Site Analysis, Evans Area, Charles Wood Area, Fort Monmouth, New Jersey. December 1993.

USEPA, 1985. Installation Assessment Relook Program, Working Document, Fort Monmouth Complex, Long Branch, New Jersey. September 1985.

E-NJ-05

✓

December 1993

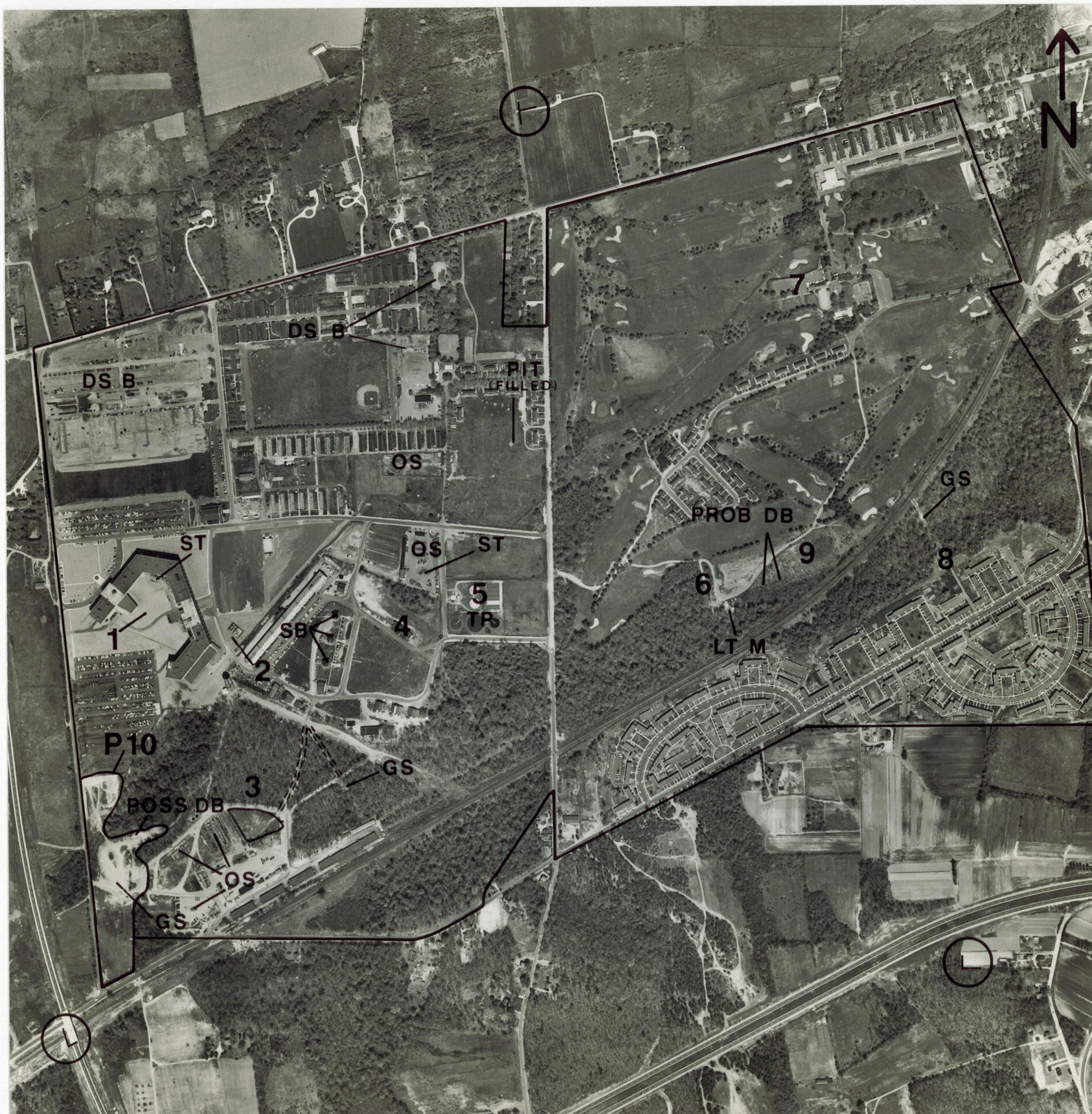
ERI-02-001-93

ERI Aerial Photographic Site Analysis

Evans Area Charles Wood Area Fort Monmouth, New Jersey

Prepared for
**United States Army
Environmental Center**





- LEGEND**
- B - Building
 - C - Containers
 - CA - Cleared Area
 - DB - Debris
 - DG - Disturbed Ground
 - DK - Dark-Toned
 - DP - Depression
 - DS - Dismantled
 - EX - Excavation
 - FA - Filled Area
 - GR - Graded Area
 - GS - Ground Scar
 - LT - Light-Toned
 - LQ - Liquid
 - M - Material
 - OS - Open Storage
 - OW - Open Water
 - RV - Revegetated
 - SB - Storage Bin
 - ST - Stain
 - TP - Treatment Plant
 - W - Wetland
- ===== - Access Road
 - > - Drainage
 - > - Channelized
 - > - Natural
 - - Feature Boundary

FIGURE 13
CHARLES WOOD AREA

MAY 2, 1957

APPROX. SCALE 1:9,150



- LEGEND**
- B - Building
 - C - Containers
 - CA - Cleared Area
 - DB - Debris
 - DG - Disturbed Ground
 - DK - Dark-Toned
 - DP - Depression
 - DS - Dismantled
 - EX - Excavation
 - FA - Filled Area
 - GR - Graded Area
 - GS - Ground Scar
 - LT - Light-Toned
 - LQ - Liquid
 - M - Material
 - OS - Open Storage
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 - RV - Revegetated
 - SB - Storage Bin
 - ST - Stain
 - TP - Treatment Plant
 - W - Wetland
- ===== - Access Road
 - > - Drainage
 - > - Channelized
 -> - Natural
 - - Feature Boundary

FIGURE 12
CHARLES WOOD AREA

SEPTEMBER 19, 1947

APPROX. SCALE 1:9,250



Installation Assessment Relook Program Working Document

**FORT MONMOUTH COMPLEX
LONG BRANCH, NEW JERSEY
85X-11 SEPTEMBER 1985**

**EPIC File Copy
Do Not Remove**

**prepared for
U.S. Army Toxic and Hazardous
Materials Agency
Under Interagency Agreement
No. RW-21930148-01-8**



FIGURE 3
 FORT MONMOUTH
 MAIN POST

SEPTEMBER 19, 1947

APPROX SCALE 1:15,000



FIGURE 7
 FORT MONMOUTH
 MAIN POST

DECEMBER 6, 1969

APPROX SCALE 1" = 100'



FIGURE 8
 FORT MONMOUTH
 MAIN POST

MARCH 13, 1974

APPROX SCALE 1:11,000