US Army Corps of Engineers®
Buffalo District

**FINAL**

# SITE SAFETY AND HEALTH PLAN

## SEAWAY SITE, AREAS A, B AND C

## TONAWANDA, NEW YORK

**JULY 2001**

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**COMMITMENT TO IMPLEMENT THE SEAWAY SITE CHARACTERIZATION SITE SAFETY AND HEALTH PLAN**

[redacted] 7/27/01

[redacted] Date

SAIC Program Manager

[redacted] [redacted] Date

SAIC Project Manager

[redacted] [redacted] Date

SAIC Technical Manager

[redacted], [redacted] Date

CIH (#4213) SAIC Health and Safety Manager

**COMMITMENT TO IMPLEMENT THE SEAWAY SITE CHARACTERIZATION SITE SAFETY AND HEALTH PLAN**

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# SITE SAFETY AND HEALTH PLAN
# SEAWAY SITE, AREAS A, B AND C
# TONAWANDA, NEW YORK

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## LIST OF ACRONYMS

| | |
|---|---|
| ACGIH | American Council of Government Industrial Hygienists |
| AEC | Atomic Energy Commission |
| ALARA | As Low As Reasonably Achievable |
| CDE | Committed Dose Equivalent |
| CFR | Code of Federal Regulations |
| CPR | cardiopulmonary resuscitation |
| $cm^2$ | square centimeters |
| DAC | derived air concentration |
| dBA | Decibels (Audible) |
| DDE | Deep-Dose Equivalent |
| DOE | Department of Energy |
| dpm | disintegration's per minute |
| EC&HS | Environmental Compliance and Health and Safety (program) |
| EEMG | Engineering and Environmental Management Group |
| EOD | Explosive Ordnance Disposal |
| EPA | U.S. Environmental Protection Agency |
| FP | flash point |
| GFCI | ground fault circuit interrupter |
| ha | hectare |
| HTRW | hazardous, toxic, and radioactive waste |
| IDLH | immediately dangerous to life and health |
| IP | ionization potential |
| km | kilometer |
| kV | kilovolt |
| LEL | lower explosive limit |
| m | meter |
| MCL | maximum contaminant level |
| MED | Manhattan Engineer District |
| mg/L | milligram per liter |
| mi | mile |
| MSDSs | Material Safety Data Sheets |
| NIOSH | National Institute of Occupational Safety and Health |
| OEW | Ordnance and Explosive Waste |
| OJT | on-the-job training |
| OSHA | Occupational Safety and Health Administration |
| pCi/g | picocurie per gram |
| PEL | permissible exposure limit |
| PID | photoionization detector |
| PPE | personal protective equipment |
| PVC | polyvinyl chloride |
| RA | Restricted Area |
| RCRA | Resource Conservation and Recovery Act |
| rem | Roentgen-equivalent Man |
| RFI | RCRA Facility Investigation |

## List of Acronyms (continued)

| | |
|---|---|
| RSO | Radiation Safety Officer |
| SAIC | Science Applications International Corporation |
| SSHO | Site Safety and Health Officer |
| SSHP | Site Safety and Health Plan |
| STEL | short-term exposure limit |
| TLD | thermoluminescent dosimeter |
| TLV | threshold limit value |
| TPH | total petroleum hydrocarbons |
| TWA | time-weighted average |
| U | uranium |
| USACE | United States Army Corps of Engineers |
| VOC | volatile organic compound |
| VP | vapor pressure |

# 1. INTRODUCTION

## 1.1 GENERAL

Science Applications International Corporation (SAIC) maintains a corporate Environmental Compliance and Health and Safety (EC&HS) program intended to ensure safe operation and regulatory compliance. SAIC's EC&HS program document, together with site safety and health plans (SSHP), present the requirements for safely performing field work.

This SSHP sets forth the basic procedures required to protect SAIC and subcontractor personnel involved in the field phase of this project. It also establishes practices to protect the public and the immediate environment from hazards caused by this work. SAIC personnel and subcontractors are required to review this plan prior to onsite project participation. SAIC subcontractors are further required to verify that the hazard controls contained in this plan are sufficient to protect their employees, and if not, to supplement this plan with additional and sufficient controls. In addition, subcontractor personnel are required to submit certifications relating to their training and medical monitoring to SAIC to assure compliance with these requirements as detailed in this SSHP. Standard procedures will be used to minimize the potential for personnel injury or illness. These will include site-specific training, routine inspections, visual and instrument surveillance for hazards, and enforcement of the health and safety requirements by project management.

This document is designed to satisfy the requirements of Appendix B to ER 385-1-92, "Safety and Occupational Health Document Requirements for Hazardous, Toxic, and Radioactive Waste (HTRW) and Ordnance and Explosive Waste (OEW) Activities," the requirements of EM-385-1-1, "U.S. Army Corps of Engineers Safety and Health Requirements Manual," relevant Occupational Safety and Health Administration (OSHA) regulations, and the SAIC EC&HS Manual.

This SSHP is included as an attachment to the project Work Instruction/Work Plans. In cases where required information is contained in the Work Instruction/Work Plans, this information will be referenced rather than repeated in this SSHP. See the Work Instruction/Work Plans for detailed site descriptions, site maps, etc. Both the applicable Work Instruction/Work Plans and this SSHP must be present onsite during field work.

Field work is proposed for the Seaway Site, Areas A, B and C. Field tasks to be performed by SAIC and its subcontractors may include:

- civil surveying;
- external gamma exposure rate survey;
- drilling using Rotosonic drilling technology;
- collection of soil samples from Rotosonic drill holes;
- conduct downhole gamma logging; and
- equipment decontamination.

The primary hazards posed by the planned tasks are possible contact with previously landfilled waste material, exposure to radioactive contaminants, airborne dust, and physical hazards associated with the Rotosonic drilling operation and the work environment.

This project will be performed in Level D and Level D+ personal protective equipment (PPE) unless one of several action levels specified in the plan are exceeded or the potential for increased risk becomes apparent during the field activities. Protective procedures, including protective clothing, will be upgraded as necessary by the Site Safety and Health Officer (SSHO) based on established action levels or judgment. Changes will be documented with SSHP addenda, field change orders, radiation safety permits, or equivalent.

EM-385-1-1 requires specific items of information to be included in a Project Accident Prevention Plan. Table 1.1 gives the locations of these specific items within SAIC's program documents and this SSHP.

**Table 1.1 SSHP Accident Prevention Plan Information**

| Requirement | Location of Information |
|---|---|
| Signature sheet | SSHP, inside front cover |
| Background information | SSHP front cover and introduction |
| Statement of safety and health policy | EC&HS Program Document |
| Responsibilities and lines of authority | SSHP Section 3 |
| Subcontractors and suppliers | SSHP Section 3 |
| Training | EC&HS Proc. 20, SSHP Section 4 |
| Safety and health inspections | SSHP Section 3.5 |
| Safety and health expectations, incentive programs, and Compliance | EC&HS Policy Statement, EC&HS Program Implementation Guide C.2 - Discipline |
| Accident reporting | EC&HS Proc. 4 & 6, SSHP Sections 3.3, 3.4, 3.5, and 11 |
| Medical support | SSHP Section 11 |
| Personal protective equipment | SSHP Section 5 |
| Emergency response | SSHP Section 11 |
| Contingency plans | SSHP Section 11 |
| Job cleanup and safe access | SSHP Section 8.1 |
| Public safety requirements | SSHP Sections Introduction, 8, and 11 |
| Local requirements | None |
| Prevention of alcohol/drug abuse on the job | Policy A18, Drug and Substance Abuse |
| Hazard Communication | EC&HS Procedure 8 and SSHP Sections 4 and 8.11 |

## 1.2 SITE DESCRIPTION

### 1.2.1 Overview of Manhattan Engineer District (MED) Contamination in Tonawanda, New York

From 1942 to 1946, portions of the Linde Site (currently Praxair) in the Town of Tonawanda, New York, were used for separation of uranium ores. These processing activities, conducted under a Manhattan Engineer District (MED) contract, resulted in elevated levels of radionuclides in portions of the property and buildings. Subsequent disposal and relocation of processing wastes from the Linde Site resulted in elevated levels of radionuclides at four nearby properties in the Town of

Tonawanda: the Ashland 1 property, the Seaway property, the Ashland 2 property, and the Town of Tonawanda Landfill. This investigation addresses MED-related contamination at the Seaway Site in Areas A, B and C.

### 1.2.2 Seaway Site Overview

The Seaway Site property comprises about 100 acres referred to as the Seaway Industrial Park (BNI 1993). It is owned by the Sands Mobile Park Corporation, successor by merger to the Seaway Industrial Park Development Company, Inc. and since the late 1980s was operated as a landfill by BFI through its subsidiary, Niagara Landfill, Inc. Approximately 89 acres of the Seaway property have been used for landfilling.

A report prepared by Wehran Engineering in 1979 (Wehran 1979) indicates that wastes were accepted at the Niagara Landfill from 1930 to 1979. According to the Wehran 1979 report, the wastes described in Table 1-2 were accepted at the landfill from a number of industrial generators. A review of the list of waste disposed of until 1979 indicates that hazardous substances were placed in the landfill that could fail the RCRA hazardous waste characteristics tests for several of the D listed wastes, including metals, organics, acids, and others. The NYSDEC has classified the Niagara Landfill as an inactive hazardous waste disposal site and has reported that confirmed hazardous waste disposal at the site includes unknown quantities of printing inks and solvents (NYSDCE 1998a). A further description of the status of the Niagara Landfill as an inactive hazardous waste disposal site is provided in Section 2.5.2.2. The list also indicates that there are other likely sources of radiological materials similar to the MED-related radionuclides (i.e., uranium, radium, and thorium). These sources would include, for example, fly ash and waste oils that contain naturally occurring radionuclides.

Files available in the NYSDEC Region 9 office in Buffalo, indicate that Niagara Landfill, Inc. filed an Application for Approval to Operate a Solid Waste Management Facility with NYSDEC on July 20, 1979. The application was submitted in accordance with Part 360, Title 6, of the Official Compilation of Codes, Rules and Regulations of the State of New York (6 NYCRR Part 360). The application listed the following:

| | |
|---|---|
| Type of waste accepted: | municipal, commercial, industrial, and construction solid wastes from communities within 6 to 8 miles of the site. |
| Wastes not accepted: | hazardous wastes, liquids, sewage sludges, insecticides, whole tires, trees, and explosives. |
| Operations: | Existing sanitary landfill operation. The processes and components include solid waste deposition, compaction, and cover material placement, as required for a sanitary landfill operation. |

As detailed in the 1993 RI and FS, waste residues produced during uranium processing at Linde from 1944 to 1946 were deposited at the Haist property, now referred to as Ashland 1. Records indicate that approximately 8,000 tons of these residues, principally low-grade uranium ore tailings, were spread over two-thirds of the Ashland 1 property. During construction of a bermed area for

**Table 1-2**

**Industrial Waste Reported to Have Been Disposed of at the Niagara Landfill From 1930 to 1979**

| Generators | Waste Description | Quantities | Time Period |
|---|---|---|---|
| Western Electric | (1) Misc. paper products | 441 tons per year | 1967-1977 |
| | (2) PVC plastic | 550 tons per year | |
| | (3) Misc. plastic | 154 tons per year | |
| | (4) Rubber | 2.2 tons per year | |
| | (5) Restaurant waste | 73.5 tons per year | |
| | (6) Fly ash | 1,000 tons per year | |
| | (7) spent cleaning solvents | 130,000 gal. per year | |
| | (8) Waste oils | 66 gallons | |
| | (9) Drummage and pallets | 750 tons | |
| | (10) Continental enamel | 1,000 gallons | |
| Carborundum Co. (Coated Abrasives) | (1) Wood, paper, rags, abrasive grain & scrap sandpaper | 2,500 tons per year | 1948-1972 |
| | (2) Incinerator ash & solidified resins | 5 tons per year | 1948-1972 |
| | (3) Floor sweepings & waste filler including calcium carbonate & clay | 30 tons per year | 1948-1972 |
| Ford Motor Co. (Stamping Plant) | Garbage and rubbish | | 1972 |
| Chevrolet Forge Plant | Pit sludge (steel sealer, graphite, oil resin & sodium carbonate | | 1975-1979 |
| Chevrolet Metal Casting Plant | (1) Waste sand (clay, insoluble metal compounds, trace oil, resins & corn flour | | 1971-1975, 1975-1979 |
| | (2) Sand slurry | | 1971-1975 |
| Chevrolet Motor Plant | (1) Fly ash | | 1970-1975 |
| | (2) Pit sludge | | 1970-1975 |
| Trico Products | General solid bulk refuse | | 1960-1979 |
| Union Carbide/Linde | Misc. trash | | 1966-1979 |
| FMC | Yard trash, floor sweepings, scrap perbonate & misc. garbage, lauroyl peroxide | | 1962-1979 |
| Pennwalt | Sludge | | 1976-1978 |
| Bernal Foam Products | (1) Scrap polyurethane foam toluene | 5 tons per year | 1975-1979 |
| | (2) Diisocyanate (a liquid drummed) | 1 ton per year | 1975-1979 |
| | (3) Mixture of polyether, polyol, chloroethene & catalysts | 10 tons per year | 1975-1979 |
| | (4) Misc. wood & paper rubbish | | 1975-1979 |
| Allied Chemical Specialty Chemical Division (plastics) | Scrap & chlorinated polyethylene, trash, wood, garbage, ceramic saddle packing & catalyst | 1,000 cubic yds per year | 1960-1977 |
| Allied Chemical Specialty Chemical Division (dye plant) | Pretreatment sludge, filter sludges containing organics, colors & metals & liquid still bottoms | <10,000 tons | 1968-1974 |
| Allied Chemical Semet-Solvay Division | Plant scrap | 1,248 tons per year | 1930-1978 |
| DuPont (Tonawanda) | Dry "Corian" wastes, "Vexar" netting & "Tedlar" | 1,300 tons | 1974-1976 |
| Spaulding Fibre | Scrap vulcanized fibre, vulcanized fibre sheet & thermosetting plastic & trimmings | | 1969-1974 |
| Hooker (Durez) | Rubbish (paper, wood & cardboard) | 500 tons | early 1970's |
| F.N. Burt | Waste paperboard, waste cellophane, waste gold leaf, scrap wood, waste plastic garbage. Waste adhesive (animal glue, polyvinyl, acetate, dextrins), waste cans & metal | | |

**Note:** The information reported in this table was taken from the May 1979 Wheran Engineering Corporation report entitled *Hydrogeological Investigation, Seaway Industrial Park Sanitary Landfill, Tonawanda, Erie County, New York.* (Wheran, 1979)

two petroleum tanks and a drainage ditch on the Ashland 1 property in 1974, radioactively contaminated residues from Ashland 1 were transported to Seaway and Ashland 2 for disposal. Disposal at Seaway was in four (4) areas referred to as Areas A, B, C and D.

Figure 1-1 shows the location of the Ashland 1, Ashland 2 and Seaway properties and the approximate locations of Seaway Areas A, B, C and D. Ashland 1, Ashland 2 and Seaway Area D are being remediated in accordance with the plan for the Ashland Sites (USACE 1997) (USACE 1998a). The locations of Areas A, B and C shown in Figure 1-1 are from a 1976 survey conducted by Oak Ridge National Laboratory (ORNL) (ORNL 1978).

The RI (BNI 1993) reports that approximately 6,000 cubic yards (cy) of low grade uranium ore tailings from Ashland 1 were disposed of on Seaway Areas A, B and C in 1974. Since 1974, portions of the residues (in Areas B and C and part of Area A) have been buried under refuse and fill material. NYSDEC requested that BFI refrain from depositing any additional refuse in Area A. Area D contamination was reported to result from inadvertent spreading of contamination from soil-moving operations at Ashland 1, construction of a bentonite wall around Seaway, and shaping of a drainage ditch in the area (BNI 1993).

Seaway was characterized for the presence of radioactive contamination several times prior to the remedial investigations conducted at the Site in 1988-1991. From these initial surveys in 1976, 1981 and 1986, it was reported that active operation of the landfill altered the physical conditions of the property and that the locations of radioactive contamination varied from time to time (BNI 1993). Based on comparisons of topographic maps of the landfill in 1976 and 1986, it was estimated that Areas B and C had been covered with up to 40 feet (ft) of fill material and refuse and that approximately 40 percent of Area A had been covered with a similar, but thinner layer of material (0 to 10 feet thick) (BNI 1993).

First-phase and second phase remedial investigations at Seaway were conducted from January 1988 through April 1988, October 1988 through March 1989, and from November 1990 through May 1991. Because landfill material covered Areas B and C to a depth up to 40 feet, soil samples for those areas could not be collected (BNI 1993).

Area A is approximately 9 acres in size and Areas B and C together comprise approximately 3 acres.

### 1.2.3 Site History

In 1943, when commercial operations began at the Linde property, efforts were also underway to identify a disposal site for waste residues produced during uranium processing at the Linde property. In 1943, MED leased a 10-acre tract known as the Haist property, now called Ashland 1, to serve as a disposal site for the uranium ore processing residues. In 1944, MED purchased the Haist property. Residues were deposited at Ashland 1 from 1944 to 1946 and consisted primarily of low-grade ore tailings. Records indicate that approximately 8,000 tons of residues were spread over roughly two-thirds of the property. In 1960, after environmental testing indicated the site met standards at the time for release, the property was transferred to the Ashland Oil Company, a

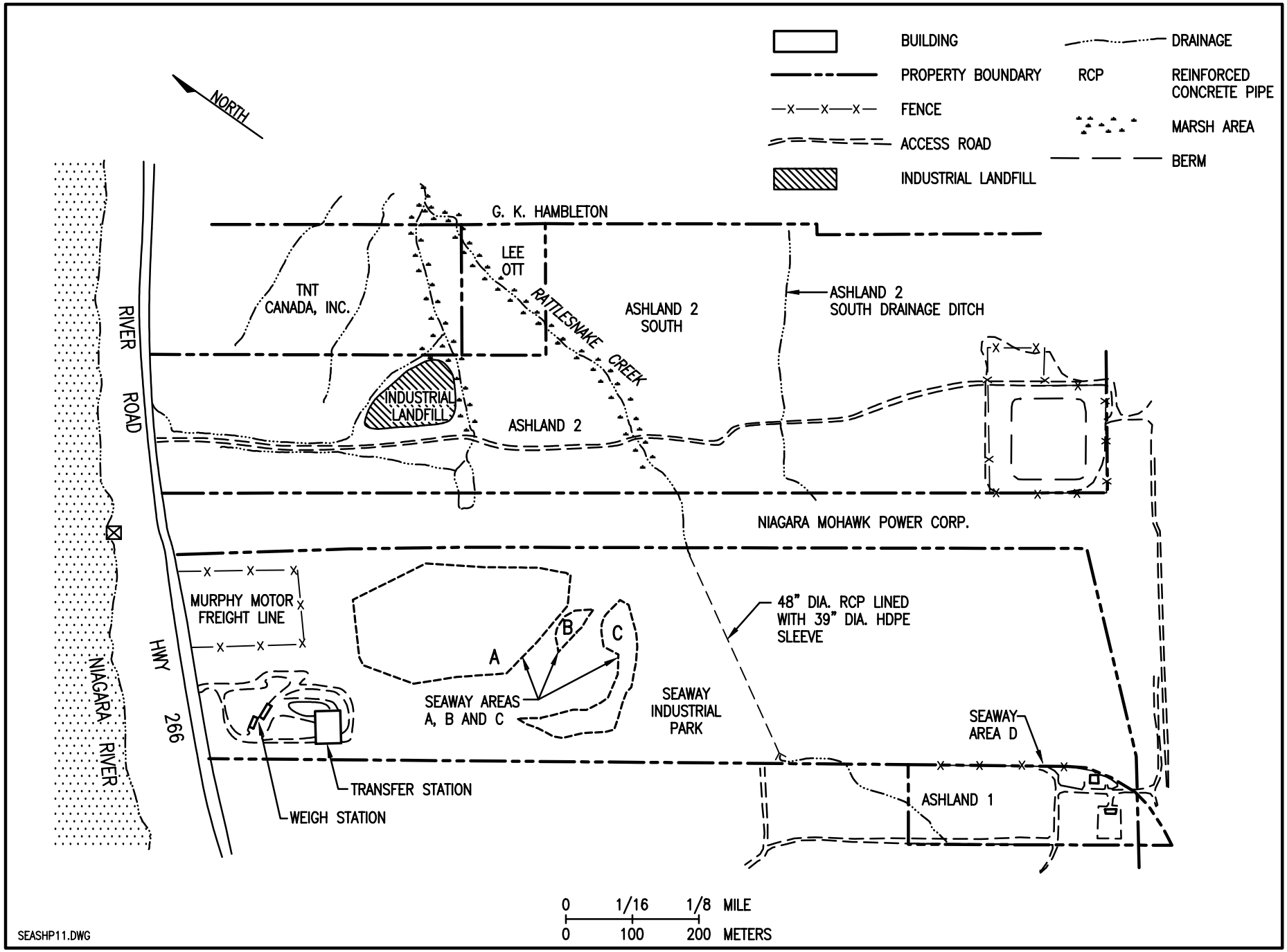


FIGURE 1-1
LOCATION DETAILS - SEAWAY PROPERTIES

Division of Ashland Petroleum, Inc. (Ashland Oil Company), and has been used as part of this company's oil refinery activities since that time.

In 1974, Ashland Oil Company constructed a bermed area for two petroleum product storage tanks and a drainage ditch on the Ashland 1 property. The majority of the soil removed during construction of the bermed area and drainage ditch was transported by Ashland Oil Company to Seaway and Ashland 2 for disposal. The storage tanks were removed by Ashland Oil Company in 1989.

The RI (BNI 1993) reports that approximately 6,000 cubic yards (cy) of low grade uranium ore tailings from Ashland 1 were disposed of on Seaway Areas A, B and C in 1974. Since 1974, portions of the residues (in Areas B and C and part of Area A) have been buried under refuse and fill material (BNI 1993).

Based on comparisons of topographic maps of the landfill in 1976 and 1986, it was estimated that Areas B and C had been covered with up to 40 feet (ft) of fill material and refuse and that approximately 40 percent of Area A had been covered with a similar, but thinner layer of material (0 to 10 feet thick) (BNI 1993).

### 1.2.4 Previous Investigations

#### 1.2.4.1 Site Contamination Information Available in 1993

In the 1976 survey conducted by ORNL (ORNL 1978) at Seaway, 60 soil samples were collected in Areas A, B and C, typically to a depth of about 2 ft, with some samples collected to a depth of 6.5 ft. Maximum radium-226 (Ra-226) and uranium-238 (U-238) concentrations in Area A were reported to be 50.8 and 63 pCi/g, respectively. In Area B, maximum Ra-226 and U-238 were reported as 92.6 and 102 pCi/g, respectively (BNI 1993). Also noted in the 1976 survey was that the radiological contamination in Areas B and C was limited to small isolated piles of residue (BNI 1993). A 1981 survey by Ford Bacon Davis Utah, Inc. (FBDU) (FBDU 1981) generally showed agreement with 1976 results, indicating that most of the radioactive contamination in Areas A, B and C was within the top 1 to 3 ft of depth of soil as the topography existed at that time.

Between the 1976 and 1981 surveys, Area A was apparently stable, but radioactively contaminated material in Area C had washed down the slopes to the south. In 1988, a walkover gamma scan indicated that Area A had been disturbed by placement and shaping of landfill material and radioactive material had moved toward the Niagara Mohawk property (BNI 1993). Areas B and C could not be found by surface scanning (BNI 1993). It is possible that material formerly placed in small isolated piles in Areas B and C was subsequently spread and/or used as cover material in the B and C areas. As described in Section 1.2.3, a comparison of 1976 and 1986 topography showed Areas B and C to be covered with landfill material and about 40 percent of Area A was covered.

The results of soil sampling conducted during the second phase of the remedial investigation in Area A showed Th-230 to be the principal radioactive contaminant in Area A, with the highest concentration reported at 880 pCi/g. Radioactive contamination was encountered primarily in the shallow soils of Area A in surveys conducted prior to the remedial investigations initiated in 1988.

### 1.2.4.2 Findings of USACE Investigations Conducted at Seaway in 1998

At the time the 1993 DOE FS and PP were prepared, sufficient characterization data were available to allow acceptable estimates of contamination and remediation volumes for Seaway Area A where most of the contamination is present. Only limited information was available for Areas B and C.

To refine the contaminated volume estimates and supplement the data available for the assessment of risks associated with Seaway contamination, USACE conducted additional investigations in Seaway Areas B and C in 1998. Gamma walkover surveys conducted in the Spring and in December, 1998 revealed only background surface radioactivity in most of Areas B and C. However, two isolated locations surveyed in Area C, and one location in Area B, showed evidence of elevated radioactivity at the surface.

In December 1998, soil samples were collected at and in the vicinity of the locations in Areas B and C where elevated gamma radiation was detected during the gamma walkover surveys. The purpose of the investigation was to determine whether MED-related radiological contamination was present at locations showing elevated gamma radiation. In addition, random soil samples were collected at six locations in Areas B and C. A total of 18 Geoprobe soil borings were completed, 71 soil samples and one rock sample were collected and 44 samples were analyzed for the presence of Uranium-234 (U-234), Uranium-235 (U-235), U-238, Th-230, Thorium-232 (Th-232), Ra-226, Protactinium-231 (Pr-231), and Actinium-227 (Ac-227). The December 1998 sampling locations are shown in Figure 1-2.

**Findings - Area B**

The results of analyses of 16 soil samples from Area B were compared to the cleanup guideline of 40 pCi/g Th-230 adopted by USACE for cleanup of Ashland 1 including Seaway Area D and Ashland 2 (DOE 1997). None of the soil samples from Area B showed Th-230 levels exceeding the 40 pCi/g guideline concentration. The highest concentration of Th-230 detected in soil samples from Area B was 2.41 pCi/g. A rock was found approximately 4 to 6 inches beneath the ground surface at the location in Area B where elevated gamma radiation was detected during the gamma walkover survey. Analysis of a sample of this rock showed Th-230 at 196 pCi/g, Ra-226 at 76 pCi/g, U-238 at 260 pCi/g, U-235 at 6 pCi/g, U-234 at 260 pCi/g and Th-232 at 145 pCi/g. The rock appeared to be a natural piece of rock, not technologically enhanced or MED-related residue.

**Findings - Area C**

The results of analyses of 27 soil samples from Area C were compared to the 40 pCi/g Th-230 guideline concentration. The comparison showed Th-230 concentrations exceeding 40 pCi/g at 3 locations in the western portion of Area C. These samples, taken at approximately 2 to 4 feet below the ground surface, showed Th-230 at 411.6 pCi/g, 236.2 pCi/g, and 181.9 pCi/g and Ra-226 in these samples was detected at 10.93 pCi/g, 7.97 pCi/g and 4.93 pCi/g, respectively. Elevated gamma radiation was detected at the location of these samples during the gamma walkover survey. The locations of the soil samples showing Th-230 exceeding the cleanup guideline are noted in Figure 1-2.

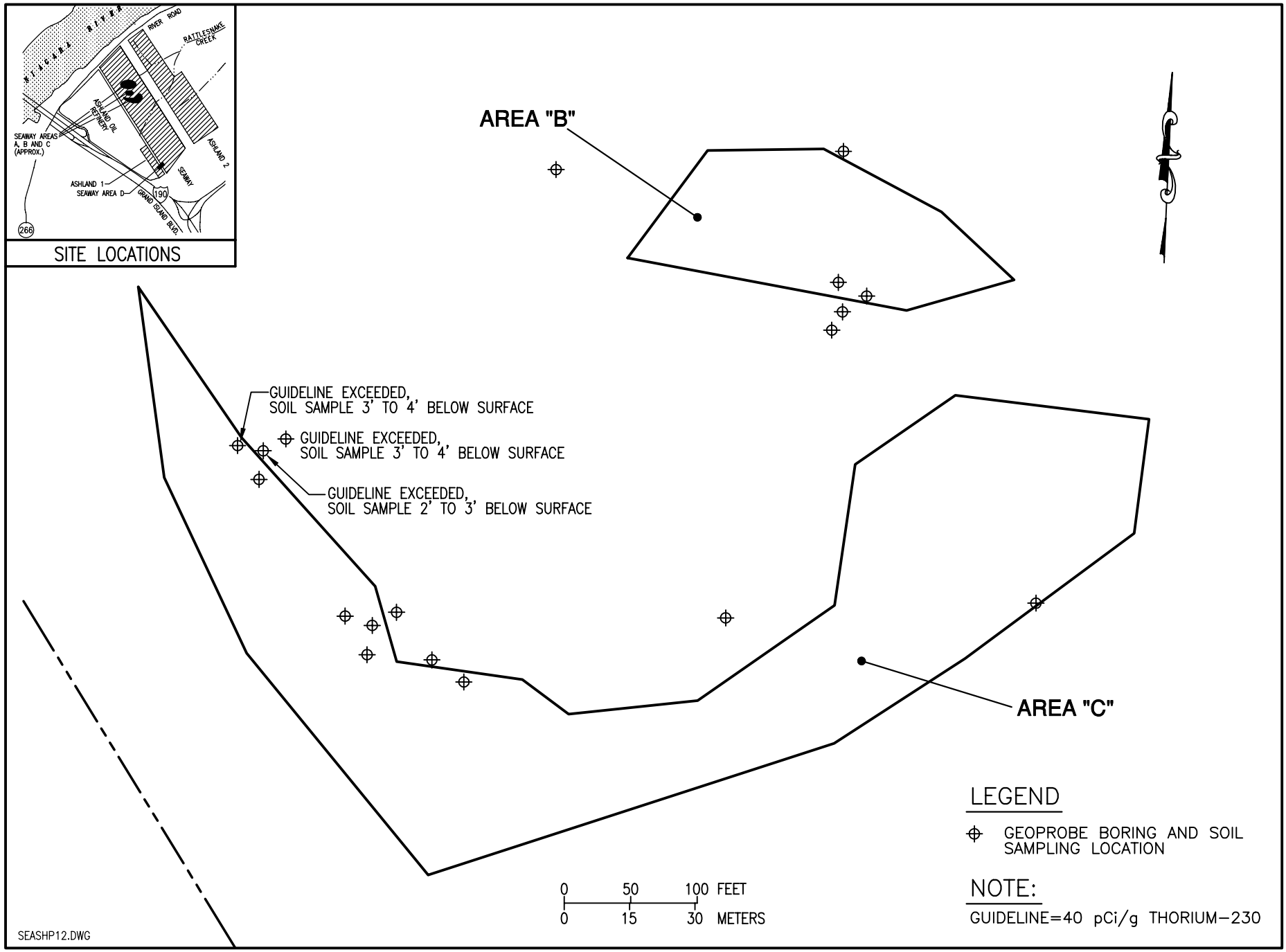


FIGURE 1-2
SAMPLING LOCATIONS DECEMBER 1998
INVESTIGATION SEAWAY AREAS B AND C

**Subsurface Conditions and Summary of the 1998 Investigation**

During the investigation subsurface material encountered included clay, silt and gravel used as cover material, and refuse. Refuse encountered included wood, brick, newspaper, fabric, plastics, and glass. Refusal or refuse was encountered at depths of 4 feet or less at 7 of the 12 sampling locations in Area C.

No elevated radiological contamination was detected in the samples from random locations in Areas B and C. At the location in Area B where elevated gamma radiation was detected during the gamma walkover survey, the elevated gamma radiation is attributed to a rock, 4 to 6 inches below the ground surface. A sample of this rock showed elevated concentrations of Th-230 and other radionuclides (as described earlier in Section 1.2.4.2, Findings – Area B). In Area C, elevated levels of radionuclides were detected in soil samples 2 to 4 feet below the ground surface at one of the locations showing elevated gamma radiation during the walkover survey.

The approximate locations of radioactive contamination in Seaway Areas A, B and C are shown in Figure 1-2, based on information currently available, including the 1998 USACE investigations.

The contamination areas shown in Figure 1-2 are described in detail in the USACE 1999 Technical Memorandum on calculating the volumes of contamination at the Seaway Site (USACE 1999b).

**Contaminants of Concern, Seaway Areas A, B and C**

As described in detail in the USACE technical memorandum on modeling risks at the Seaway Site, Areas A, B and C (USACE 2000a), five (5) sources of radiological contamination data were used in assessing radiological risks in Seaway Areas A, B and C. These data included results of radiological characterization by ORNL in 1976 (ORNL 1978), FBDU in 1981 (FBDU 1981), investigations for the RI (BNI 1993), investigations by USACE in 1998 (USACE 1999a), and USACE estimates of contamination volumes (USACE 1999b). Using these sources of radiological data and, where necessary, estimates in cases where data were not consistently available, a statistical analysis was performed on the data to determine the maximum, minimum, mean and upper 95 percent (%) confidence level ($UCL_{95}$) on the mean concentrations for each radionuclide for Area A and for Areas B and C. The $UCL_{95}$ represents a radionuclide concentration that exceeds the mean concentration of a randomly drawn set of samples 95% of the time.

The background concentrations for each radionuclide were subtracted from the $UCL_{95}$ concentrations and the resulting concentrations were used in the assessment of radiological risks. In the assessment, the radionuclides with $UCL_{95}$ concentrations above background at one or more locations or depths in Areas A, B and C include: U-238, U-234, Th-230, and Ra-226 from the U-238 decay series; and U-235, Pr-231, and Ac-227 from the U-235 decay series; and Th-232.

The radionuclides from the U-238 decay series and the radionuclides from U-235 decay series are considered to be MED-related. The Th-232 is not considered to be MED-related. In the assessment of radiological risks, all of these radionuclides, including Th-232 are considered.

Because the Niagara Landfill has been used for waste disposal for many years, a wide range of chemical contaminants are expected to exist in the filled areas. No chemical characterization of the

solid waste landfill area was performed for non-radiological contaminants in the landfill area since they are assumed to be present. As shown in Table 1-2, waste reported to have been disposed at the landfill ranges from garbage to fly ash to industrial sludges, solvents, and wastes. USACE will not remediate any radioactive or chemical contamination that is not MED-related or is not mixed or commingled with MED-related contamination. Any MED-related materials commingled with chemical hazardous substances could possibly be considered a radioactive mixed waste should the hazardous substance fail the RCRA hazardous waste characteristic tests.

## 2. HAZARD/RISK ANALYSIS

The purpose of this site task hazard analysis is to identify and assess potential hazards that may be encountered by site personnel and to prescribe required controls. Table 2.1 is a checklist of common hazards that may be posed by this type of project. It includes negative declarations for hazards that will not be encountered.

Because surface and subsurface soils at the Seaway Site may be contaminated with radioisotopes, there is some potential for exposure to ionizing radiation. Site tasks also present a variety of possible physical hazards, with drilling and soil sampling operations offering the greatest potential for significant injury. Physical hazards include falling, entanglement with equipment, uneven ground, drill rig operations, explosion, fire, heavy lifting/moving, noise, and inclement weather. Chemical hazards will also be present from landfilled chemicals or breakdown products. The most important of these is probably landfill decomposition gas, which may form flammable mixtures in air. If additional tasks or significant hazards are encountered during the work, this document will be modified by addendum or field change order to include the additional information.

**Table 2.1 Hazards Inventory**

| Yes | No | Hazard |
|---|---|---|
| X | | Biological hazards (bees, ticks, wasps, poison ivy) |
| | X | Confined space entry (Potential for entry) |
| | X | Drowning |
| X | | Electrical shock |
| | X | Excavation entry (Excavations will not be entered) |
| X | | Exposure to chemicals |
| X | | Fire |
| | X | Unexploded ordnance |
| X | | Heavy equipment |
| X | | Noise |
| X | | Rotary drilling operations |
| X | | Hoisting and rigging equipment |
| X | | Steep slopes/uneven terrain |
| X | | Radiation or radioactive contamination |
| X | | Temperature extremes |
| X | | Lifting |
| X | | Falls from elevated surfaces |
| X | | Landfill gases |
| X | | Surface Hazards such as exposed re-bar, metal, glass, concrete, uneven ground, and steep slopes. |

## 2.1 TASK-SPECIFIC HAZARD ANALYSIS

Table 2.2 presents task-specific hazards, task-specific hazard analyses, relevant hazard controls, and required monitoring, if appropriate, for all of the planned site tasks. The hazard analyses are derived through a qualitative risk assessment process using a matrix of probability codes and severity codes. The probability codes are identified as high (likely to occur immediately), moderate (probably will occur in time), low (possibly will occur in time), and very low (unlikely to occur).

## Table 2.2 Hazards Analysis

| Safety and Health Hazards | Probability/ Severity | Controls | Monitoring |
|---|---|---|---|
| **Soil Boring and Sampling Using Rotosonic Drill Rig** | | | |
| General safety hazards (moving equipment, lifting, slips, falls) | Low/low | Level D PPE (see Section 5.0) plus hardhat, buddy system. No employees under lifted loads. Exclusion zone around rig, only necessary and experienced personnel within exclusion zone, two functional kill switches or operating control requiring positive action from operator "deadman's switch", functional back-up alarm, drill rig operating manual on-site, lifts of >50 lbs. will be performed by two or more personnel or using mechanical assistance, extensive heavy lifting will require additional lifting training. Care will be taken to clear immediate work area of ice/snow or to place sand/salt to reduce slipping hazard. HAZWOPER 40-hour training, standard procedures (see Chapter 8). | Daily site safety inspections<br>Weekly drill rig inspections |
| Steep slope/uneven terrain | High/high | Travel route will be surveyed on foot before moving rig. Equipment will be set up on stable ground. Hydraulic outriggers will be extended and secured before drilling operations commence. Cribbing will be used as necessary. | Travel routes will be inspected by Drill Supervisor, SSHO and Field Manager. Rig will be moved up/down slope as much as practical rather than along slope. Buddy system will be used while mobilizing. |
| Noise | High/moderate | Hearing protection within 25 feet of rig, unless site-specific monitoring indicates noise <85 dBA | Daily safety inspections |
| Fire (fuels) | Low/low | Fuel and flammables stored in safety cans with flame arresters<br>Fire extinguisher (serviced annually and inspected monthly) in each fuel use area<br>Fire extinguisher rated ≥20B 25 to 75 feet from flammables storage<br>No ignition sources in fuel storage areas<br>Fuel storage areas (if any) marked with "No Smoking or Open Flame" signs<br>Bonding (metal to metal contact) during pouring<br>Gasoline powered equipment shut down during fueling. | Daily safety inspections |

| Safety and Health Hazards | Probability/ Severity | Controls | Monitoring |
|---|---|---|---|
| Exposure to chemicals (see Table 2.3) | Low/moderate | PPE (Level D) including nitrile or PVC gloves for contact with potentially contaminated material.<br>Medical clearance for HAZWOPER work<br>Minimal contact, wash face and hands prior to taking anything by mouth. OVA/ PID/ LEL Monitoring | PID or equivalent and other sampling as appropriate |
| Radiological hazards (See Table 2.3) | Refer to Appendix A – Radiation Protection Plan | | |
| Temperature extremes | Moderate/ moderate | Administrative controls (see Section 8.14)<br>Heated break area if temperature is below 32 $^{o}$F<br>No work if temperature is below -29 $^{o}$F<br>If impermeable clothing is worn, (1) a mandatory work/rest cycle will be implemented as specified in Section 8.14; (2) workers will be notified of their responsibility to take unscheduled breaks, if needed. | Temperature measurements at least twice a day; heart rate monitoring if personnel wear impermeable clothing |
| Biological hazards (bees, ticks, Lyme disease, wasps, snakes) | Moderate/ moderate | PPE (boots, work clothes).<br>Insect repellant on boots and pants and elsewhere, as necessary.<br>Pant legs tucked into boots or otherwise closed to minimize tick entry.<br>Inspect for ticks during the day and at the end of each work day. | Visual survey |
| Exposure to landfill gases | Moderate/ moderate | HAZWOPER 40-hour training, no ignition sources in restricted area | LEL PID/Hnu $H_2S$ and $O_2$ readings as appropriate |
| Electric shock | Very low/moderate | Identification and clearance of overhead and underground utilities (See Section 8.0) | Visual of all work areas<br>Digging clearance from local utilities |
| **Equipment decontamination (hot water washing, soap and water washing, isopropyl alcohol washing)** | | | |
| General equipment decontamination hazards (hot water, slips, falls, equipment handling) | Very low/ very low | Level D modified PPE (see Section 5.0) | Daily site safety inspections |
| Steam/hot water | Low/low | Level D+ PPE including Face shield, heavy duty PVC or similar gloves<br>Saranax suit, rain suit, or splash apron optional (when operating steam washer) | Daily site safety inspections |
| Noise (spray washer and generator) | Moderate/ moderate | Hearing protection within 25 feet when washer is operating unless equipment-specific sound level measurements indicate noise <85 dBA | Daily site safety inspections |

| Safety and Health Hazards | Probability/ Severity | Controls | Monitoring |
|---|---|---|---|
| Fire (isopropanol and gasoline) | Very low/low | Fuel and flammables stored in safety cans with flame arresters<br>Fire extinguisher (serviced annually and inspected monthly) in each fuel use area<br>Fire extinguisher rated ≥20B 25 to 75 feet from flammables storage<br>No ignition sources in fuel storage areas<br>Fuel storage areas (if any) marked with "No Smoking or Open Flame" signs<br>Bonding (metal to metal contact) during pouring<br>Gasoline powered equipment shut down during fueling | None |
| Exposure to chemicals (see Table 2.3) | Very low/low | Level D modified PPE including nitrile or PVC gloves for contact with potentially contaminated materials<br>Medical clearance for HAZWOPER work<br>Wash face and hands prior to taking anything by mouth | Daily site safety inspections |
| Exposure to radioactive materials (See Table 2.3) – | Refer to Appendix A – Radiation Protection Plan, protection requirements identified in the PRR will meet or exceed the protection needed for this work activity. | | |
| Temperature extremes | Moderate/ moderate | Administrative controls (see Section 8.14)<br>Heated break area if temperature is below 32 oF<br>No work if temperature is below -29 oF<br>If impermeable clothing is worn, (1) a mandatory work/rest cycle will be implemented as specified in Section 8.14; (2) workers will be notified of their responsibility to take unscheduled breaks, if needed. | Temperature measurements at least twice a day; heart rate monitoring if personnel wear impermeable clothing |
| Exposure to landfill gases | Moderate/ moderate | HAZWOPER 40-hour training, no ignition sources in restricted area | LEL PID/Hnu $H_2S$ and $O_2$ readings as appropriate |
| Electrical shock | Low/moderate | GFCI for electrical hand tools | Daily site safety inspections as appropriate |
| **Visual surveying, radiological measurements, geophysical surveying, civil surveying, other non-intrusive tasks at ground level** | | | |
| General safety hazards | Very low/very low | Level D PPE (see Section 5.0). Buddy system. Site-specific training, HAZWOPER 40-hour training | Daily safety inspections |

| Safety and Health Hazards | Probability/ Severity | Controls | Monitoring |
|---|---|---|---|
| Biological hazards (bees, ticks, Lyme disease, wasps, snakes) | Moderate/ moderate | PPE (boots, work clothes).<br>Insect repellant on boots and pants and elsewhere, as necessary.<br>Pant legs tucked into boots or otherwise closed to minimize tick entry.<br>Inspect for ticks during the day and at the end of each work day. | Visual survey |
| Exposure to chemicals (see Table 2.3) | Very low/very low | Level D PPE including nitrile or PVC gloves for contact with potentially contaminated materials<br>Medical clearance for HAZWOPER work<br>Wash face and hands prior to taking anything by mouth | Daily site safety inspections |
| Exposure to radioactive materials (See Table 2.3) | Refer to Appendix A – Radiation Protection Plan, protection requirements identified in the PRR will meet or exceed the protection needed for this work activity. | | |
| Temperature extremes | Moderate/ moderate | Administrative controls (see Section 8.14)<br>Heated break area if temperature is below 32 $^{o}$F<br>No work if temperature is below -29 $^{o}$F<br>If impermeable clothing is worn, (1) a mandatory work/rest cycle will be implemented as specified in Section 8.14; (2) workers will be notified of their responsibility to take unscheduled breaks, if needed. | Temperature measurements at least twice a day; heart rate monitoring if personnel wear impermeable clothing |
| Exposure to landfill gases | Moderate/ moderate | HAZWOPER 40-hour training, no ignition sources in restricted area | LEL PID/Hnu $H_2S$ and $O_2$ readings as appropriate |

GFCI = ground fault circuit interrupter
PID = photoionization detector
PPE = personal protective equipment
PVC = polyvinyl chloride
APR = air purifying respirator
CGI = combustible gas indicator
LEL = Lower Explosive Limit
$H_2S$ = Hydrogen Sulfide
DAC = derived air concentration
OVA = organic vapor analyzer

The severity codes are high (injuries/illnesses involving permanent total disability or death), moderate (injuries/illnesses with permanent partial disability or temporary total disability), low (injuries/illnesses resulting in temporary, reversible conditions with period of disability of less than 3 months), and very low (injuries/illnesses with no discernible effects or reversible adverse effects requiring only minor treatment).

The primary activities to be carried out at the Seaway Site include:

- civil surveying;
- external gamma exposure rate survey;
- collection of soil samples from Rotosonic drill holes;
- downhole gamma surveying; and
- equipment decontamination.

These activities present a potential for exposure to chemical and radiological contaminants, as well as a variety of physical hazards.

## 2.2 POTENTIAL EXPOSURES

Information on the significant suspected contaminants and chemical tools that will be used for the project is contained in Table 2.3. Note that this list does not include all the contaminants that have been detected. Only those contaminants with relatively low exposure limits and that are present in relatively great concentrations have been listed in Table 2.3. If additional contaminants or chemical tools that pose new or significantly greater hazards are identified prior to, or during, site activities, they will be provided as an addendum to this document.

## Table 2.3 Potential Exposures

| Chemical | TLV, PEL, STEL, IDLH or DAC[a] | Health Effects/ Potential Hazards[b] | Chemical and Physical Properties[b] | Exposure Route(s)[b] |
|---|---|---|---|---|
| Liquinox (used for decontamination) | TLV/TWA: NA | May cause local irritation to mucus membranes | Aqueous liquid, odorless, nonflammable | Ingestion, Contact |
| Landfill Decomposition Gas, Incorporating Methane | NA | Simple asphyxiant (insufficient oxygen to breathe). May form flammable mixture with air. | Colorless Gas; VP:>760 MM; IP:12.51eV | Methane is physiologically inert. Other components may be hazardous |
| Protactinium 231 | DAC: 6E-13 µCi/ml | Cancer | Solid; VP: NA; FP: NA | Inhalation, Ingestion, Contact |
| Thorium 230 | DAC: 3E-12 µCi/ml | Cancer | Solid; VP: NA; FP: NA | Inhalation, Ingestion, Contact |
| Thorium 232 | DAC: 5E-13 µCi/ml | Cancer | Solid; VP: NA; FP: NA | Inhalation, Ingestion, Contact |
| Actinium 227 | DAC: 2E-13 µCi/ml | Cancer | Solid; VP: NA; FP: NA | Inhalation, Ingestion, Contact |
| Radium 226 | DAC: 3E-10 µCi/ml | Cancer | Solid; VP: NA; FP: NA | Inhalation, Ingestion, Contact |
| Uranium 238 | TLV: 0.2 $mg/m^3$; A1<br>DAC: 2E-11 µCi/ml | Cancer<br>Kidney damage | Solid; VP: NA; FP: NA | Inhalation, Ingestion, Contact |
| Uranium 234 | TLV: 0.2 $mg/m^3$; A1<br>DAC: 2E-11 µCi/ml | Cancer<br>Kidney damage | Solid; VP: NA; FP: NA | Inhalation, Ingestion, Contact |
| Uranium 235 | TLV: 0.2 $mg/m^3$; A1<br>DAC: 2E-11 µCi/ml | Cancer<br>Kidney damage | Solid; VP: NA; FP: NA | Inhalation, Ingestion, Contact |

[a] From 1999 Threshold Limit Values, NIOSH Pocket Guide to Chemical Hazards, or 10 CFR 20, Appendix B.
[b] From NIOSH Pocket Guide to Chemical Hazards.

FP = flash point
IDLH = immediately dangerous to life or health
IP = ionization potential
NA = not available
DAC = Derived Air Concentration (DAC) – the concentration of a given radionuclide in air which, if breathed by reference man for a working year of 2,000 hours under conditions of light work (inhalation rate of $1.2m^3$ of air per hour), results in an intake of one annual limit on intake (ALI).

NIOSH = National Institute of Occupational Safety and Health
PEL = permissible exposure limit
STEL = Short-term exposure limit
TLV = threshold limit value
TWA = time-weighted average
VP = vapor pressure
A1 = confined human carcinogen
A2 = animal carcinogen

# 3. STAFF ORGANIZATION, QUALIFICATIONS, AND RESPONSIBILITIES

This section presents the lines of authority, responsibilities, and communication procedures concerning site safety and health and emergency response. It includes key SAIC and subcontractor personnel. All field work will be under the supervision of the SAIC Field Manager. The SAIC Field Manager will oversee normal and emergency work and will perform any required emergency notification. Table 3.1 identifies the individuals who will fill key roles for the project field activities.

**Table 3.1 Staff Organization**

| Position | [redacted] |
|---|---|
| USACE Project Manager | |
| USACE Project Engineer | |
| Program Manager | |
| Health and Safety Manager | |
| Radiation Safety Officer | |
| Project Health Physicist | |
| Task Manager | |
| SAIC Field Manager/Site Safety and Health Officer | |
| SAIC Site Radiation Project Manager/Health Physics Technician | |

## 3.1 SAIC PROGRAM MANAGER

The SAIC Program Manager is responsible for ensuring conformance with SAIC Corporate, SAIC Engineering and Environmental Management Group (EEMG), and USACE policies and procedures. Specific responsibilities of the Program Manager include:

- coordinating with USACE personnel;
- ensuring that project managers satisfy SAIC and USACE health and safety requirements;
- ensuring that project staff implement the project SSHP; and
- ensuring that projects have the necessary resources to operate safely.

## 3.2 SAIC HEALTH AND SAFETY MANAGER

The SAIC Health and Safety Manager manages the EEMG health and safety program. This includes establishing health and safety policies and procedures, supporting project and office activities, and verifying safe work practices and conditions. The SAIC Health and Safety Manager is certified in the comprehensive practice of industrial hygiene by the American Board of Industrial Hygiene, is certified as a safety professional by the Board of Certified Safety Professionals, and has more than fifteen years of hazardous waste experience. The specific responsibilities of the Health and Safety Manager include:

- conducting site-specific training;
- conducting on-site audits at least once per month during field work;
- coordinating with USACE health and safety personnel;
- reviewing and approving SSHPs;
- approving downgrades in PPE or protective procedures;
- reviewing monitoring data;
- reviewing accident reports; and
- recommending changes to engineering controls, work practices, and PPE.

## 3.3 TASK MANAGER

The SAIC Task Manager is responsible for overall project execution. The responsibilities of the Task Manager include:

- coordinating with USACE personnel, including reporting accidents and incidents to the USACE Project Manager immediately and submitting written reports within two working days;
- ensuring implementation of the project SSHP;
- maintaining auditable project documentation of all required records;
- ensuring that a qualified SSHO is designated; and
- maintaining a current copy of the project SSHP.

## 3.4 RADIATION SAFETY OFFICER (RSO)

The Radiation Safety Officer (RSO) is responsible for confirming that Radiation safety procedures designed to protect personnel are maintained throughout any field activities conducted for the project. Specific responsibilities include:

- providing or reviewing radiation portions of SSHP;
- conducting site training and audits as needed;
- assessing radiological exposure measurements; and
- ensuring compliance with EM-385-1-1 and other federal and state regulations through guidance in SAIC EEMG Health Physics procedures and program oversight.

## 3.5 PROJECT HEALTH PHYSICIST

The SAIC Project Health Physicist is responsible for providing technical direction and support to the project related to human health issues, dose assessments and radiological data needs and interpretations. Specific responsibilities include:

- developing risk methodologies;
- providing or reviewing portions of the SSHP;
- providing or reviewing the radiological data requirements and sampling methodology; and
- developing responses to radiological issues associated with the Seaway Site, Areas A, B and C.

## 3.6 SAIC FIELD MANAGER

The SAIC Field Manager will oversee the field activities associated with the project and will be responsible for site accessibility, safety, and quality assurance. He/she is responsible for enforcing the field requirements of this SSHP. Specific responsibilities of the Field Manager are listed below:

- enforcing compliance with the project SSHP;
- coordinating on-site operations, including subcontractor activities;
- ensuring that subcontractors follow the requirements of this SSHP;
- coordinating and controlling any emergency response actions;
- ensuring that at least two persons currently certified in first aid/cardiopulmonary resuscitation (CPR) are on site during site operations;
- performing (or ensuring) a daily safety inspection and documenting the inspection on the daily safety inspection form attached; and
- maintaining current copies of the project SSHP, and the SAIC EC&HS Manual on site.

## 3.7 SAIC SITE SAFETY AND HEALTH OFFICER

The SAIC SSHO is responsible for making health and safety decisions, for specific health and safety activities, and for verifying the effectiveness of the health and safety program. The SSHO's qualifications include, at a minimum, current HAZWOPER training, HAZWOPER Supervisor training, experience with similar projects, knowledge of and understanding of the project SSHP, and the ability to use the required monitoring equipment. The SSHO will coordinate with the RSO on matters that involve, or might involve, health physics issues. The SSHO has primary responsibility for the following:

- implementing and verifying compliance with this SSHP and reporting to the Field Manager, Task Manager, and Health and Safety Manager any deviations from anticipated conditions;
- conducting and documenting daily safety inspections;
- completing the health and safety debrief in EC&HS Procedure 20;
- documenting deficiencies identified in the daily inspections and responsible parties, procedures, and timetables for correction;
- stopping work or upgrading protective measures (including protective clothing) if uncontrolled health and safety hazards are encountered. Indications of uncontrolled health and safety hazards include monitoring instrument readings in excess of the established action limits, encountering liquids other than water, soil staining suggestive of unexpectedly high concentrations of nonvolatile contaminants, etc. The SSHO must also authorize resumption of work following correction of the adverse condition(s);
- ensuring that site personnel have access to this plan and are aware of its provisions;
- conducting a site-specific pre-entry health and safety briefing covering potential chemical and physical hazards, safe work practices, and emergency procedures;
- maintaining on-site auditable documentation of
  - Material Safety Data Sheets (MSDSs) for applicable materials utilized at the site,
  - training for site workers and visitors,

  - calibration/maintenance of field instruments such as photoionization detectors (PID), combustible gas indicators, radiation monitoring equipment, etc.,
  - environmental and personal exposure monitoring results,
  - notification of accidents/incidents,
  - reports of any chemical overexposure or excessive levels,
  - notification of employees of chemical exposure data, and
  - medical surveillance;
- confirming that all on-site personnel have received the training listed in the Training Requirements section (Section 4.0) of this SSHP;
- issuing respirators, as necessary, and ensuring that all respirator users have received medical clearance within the last year, have been properly trained, and have been successfully fitted for respiratory protection;
- verifying that the project SSHP's emergency points of contact are correct;
- ensuring that all monitoring equipment is operating according to the manufacturer's specifications and performing field checks of instrument calibration;
- ensuring monitoring for potential on-site exposures is conducted in accordance with this SSHP;
- updating the project SSHP (field changes) to ensure that it adequately identifies all tasks and significant hazards at the site and notifying project personnel and the SAIC Health and Safety Manager of changes;
- investigating accidents and near accidents and reporting (in concert with Field Manager) same to Task Manager and Health and Safety Manager;
- conducting daily "tailgate" safety briefings; and
- controlling visitor access to the exclusion zone.

## 3.8 SITE RADIATION PROJECT MANAGER/HEALTH PHYSICS TECHNICIAN

Health physics technicians are responsible for verifying that radiological control practices are being implemented and stopping work if controls are insufficient. HP technicians will be trained to at least the requirements at EM-385-1-1 Section 6. Specific duties include:

- performing entry and exit surveys of equipment;
- performing or verifying surveys of personnel leaving controlled areas;
- performing radiological surveys, as needed;
- observing work in controlled areas to verify compliance with radiological controls;
- DAC-hr tracking;
- performing tasks as required by SAIC EEMG radiation safety procedures;
- ensuring compliance with EM-385-1-1 and other federal and state regulations by implementing SAIC EEMG Health Physics procedures; and
- notifying the RSO of procedural deviations and radiological incidents and deficiencies.

## 4. TRAINING

Personnel who participate in field activities associated with this project are subject to the training requirements presented in Table 4.1. Field activities include all the tasks specified in Section 2.0 of this plan as well as any other unspecified tasks that take place within the exclusion zones, contamination reduction zones, or support zone of the site. Examples of such other tasks include conveying sampling equipment to field crews, observing field crews, transporting samples within the confines of the site, etc. Activities such as driving or walking on paved roads that are not within potentially contaminated areas, paperwork or meetings inside routinely occupied (safe) buildings, and paperwork and similar activities inside office trailers are not field activities and are not subject to these training requirements. Casual visitors, such as package deliverers, who access only the office or staging areas of the support zone are not subject to these training requirements.

**Table 4.1 Training Requirements**

| Training | Worker | Supervisor | Site visitor[(a)] |
|---|---|---|---|
| Hazardous Waste Safety (40 hour, 3 day OJT) | U | U | U |
| Hazardous Waste Safety Annual Refresher (8 hour) | U | U | U |
| Hazardous Waste Safety Supervisors Training (8 hour) | X | U | X |
| General Hazard Communication Training (Contained in 40-hour and 8-hour courses) | U | U | U |
| Respiratory Protection Training (required only if respirators are worn; contained in 40-hour course) | U | U | U |
| Hearing Conservation Training (for workers in hearing conservation program; contained in 40-hour and 8-hour courses) | U | U | U |
| Radiation Worker Training | U | U | X |
| Site Worker Training | U | U | X |
| Site Specific Hazard Communication (contained in pre-entry briefing) | U | U | X |
| Safety Briefing (daily and whenever conditions or tasks change) | U | U | X |
| Site Visitor Training | X | X | U |
| First Aid/CPR (Standard Red Cross or Equivalent) | ³2 workers | X | X |

**Key:**

U =Required
X =Not required
OJT =on-the-job training
(a) =only site visitors entering exclusion or controlled areas at the Site

### 4.1 OFF-SITE TRAINING

The 40-hour Hazardous Waste Site Worker course is required for activities in the exclusion (contamination) zone, contamination reduction (buffer) zone, and for any activity that poses a potential to encounter hazards associated with hazardous waste. Three days of relevant field experience is required in conjunction with this training.

The 8-hour Hazardous Waste Safety Refresher course is required annually to maintain currency in the 40-hour course.

The Hazardous Waste Safety Supervisors Training is required for personnel who directly supervise hazardous waste site workers. This is an 8-hour course that must be taken once. Note that the 40-hour course is a prerequisite.

General Hazard Communication Training is required for all site workers. This training must communicate the risks and protective measures for chemicals and radionuclides that employees may encounter. This requirement is met by taking the 40-hour Hazardous Waste Site Worker course, annual refreshers, and site-specific training.

Respiratory Protection Training is required for all individuals who wear respirators. This requirement is met by taking the 40-hour Hazardous Waste Site Worker course, annual refreshers, and site-specific training.

Hearing Conservation Training is required on an annual basis by 29 CFR 1910.95 for all employees enrolled in a hearing conservation program. This will include all employees exposed to occupational noise in excess of 85 dBA on a time weighted average. This refresher training is provided as part of the Hazardous Waste Safety Refresher course.

## 4.2 SITE WORKER TRAINING

Personnel on site must have received the site-specific safety training. Two versions of this training will be used. The site worker version will contain full information on site hazards, hazard controls, and emergency procedures. A shortened version will be used for visitors who will be on site for short times and who will not do hands-on work. This shortened version will contain the hazard information that is directly relevant to the purpose of the visit. Signatures of those attending and the type of briefing must be entered in project documentation before site access will be granted. The site-specific training will include the following site-specific information, as appropriate:

- Seaway Site site-specific training;
- overview of site hazards and conditions;
- names of site health and safety personnel and alternates;
- contents of the project SSHP;
- hazards and symptoms of contaminant exposure (chemical and radiological);
- hazards and symptoms of chemicals used onsite;
- physical hazards in the workplace;
- location and availability of written hazard communication program;
- site and task PPE (including purpose, donning, doffing, proper use);
- safe work practices to minimize risks;
- safe use of engineering controls and equipment;
- medical surveillance requirements;
- site control measures;
- reporting requirements for spills and emergencies;

- decontamination procedures to prevent the spread of chemical and radiological contamination;
- contingency plans (communications, phone numbers, emergency exits, assembly point, etc.);
- hearing conservation (for noisy work if worker does not have documented hearing conservation training)
- spill containment procedures (reporting, clean-up methods, etc.); and
- emergency equipment locations and use (fire extinguishers, spill kits, etc.).

Safety briefings will be held daily and when conditions or tasks change. These briefings will be conducted by the SSHO and/or Field Manager and will be attended by all site workers and supervisors. These briefings will address site-specific safety issues and will be used as an opportunity to refresh workers on specific procedures and to address new hazards and controls.

Site workers scheduled to perform field activities as defined in section 4.0 will undergo Radiation Worker Training. Successful completion of the Radiation Worker Training provides the necessary knowledge to safely work in all areas where field activities will be performed, and provides the qualifications necessary to become a Radiation Worker. Radiation Worker Training will be conducted by the Site Radiation Project Manager.

## 4.3 SITE VISITOR TRAINING

All site visitors will receive Site Visitor Training and will be escorted at all times. Site visitors, who plan on entering exclusion areas, or controlled areas, will also receive a briefing specific to hazards and controls associated with their intended site duties from the SSHO and/or Field Manager. These site visitors will be escorted by qualified personnel when in a controlled area to assure that the individual will not be exposed to hazards for which he/she has not received training.

## 4.4 DOCUMENTATION

Documentation of the required training will be maintained in the on-site project files. This documentation will include copies of 40-hour, 8-hour refresher, and supervisor training certificates, copies of first aid/CPR certificates, and records showing the topics covered, trainer, and signatures of those attending on-site training.

# 5. PERSONAL PROTECTIVE EQUIPMENT

PPE for site tasks is based on potential site-specific physical, radiological, and chemical hazards. In cases where multiple hazards are present, a combination of protective equipment will be selected so that adequate protection is provided for each hazard. This section emphasizes the programmatic requirements for PPE. For task-specific equipment section 2.0, the Hazard/Risk Analysis section of this SSHP. In accordance with USACE requirements, two complete sets of PPE will be maintained by SAIC on site for use by government personnel during site visits.

## 5.1 PPE PROGRAM

SAIC's PPE program is controlled by EC&HS Procedures 13, 20, and 29 CFR 1910, Subpart I, Personal Protective Equipment and EM-385-1-1 Section 5. The level of protection and types of materials selected for a particular task are based on the following:

- potential for exposure because of work being done;
- route of exposure;
- measured or anticipated concentration in the medium of concern;
- toxicity, reactivity, or other measure of adverse effect; and
- physical hazards such as falling objects, flying projectiles, etc.

In situations where the type of contaminant, and probability of contact are not known, the appropriate protection is selected based on the professional judgment of the EEMG Health and Safety Manager until the hazards are further evaluated.

The SSHO may raise or lower the level of PPE worn by the teams, depending upon the site-specific hazards encountered in the field. Prior to lowering the level of PPE, the Project Manager, Field Manager and the Health and Safety Manager will be contacted/consulted and the results documented. If site conditions are such that the level of PPE is insufficient or work must be stopped, the SSHO will take appropriate action immediately and the appropriate personnel (see above) will be contacted afterwards. Criteria indicating a possible need for reassessment of the PPE selection include the following:

- commencement of an unplanned work phase (hazard not previously assessed);
- working in unplanned temperature extremes;
- evidence of contamination such as discolored soil or elevated instrument readings near the soil;
- exceeding the action limits of chemical or radiological hazards; or
- changing the work scope so that the degree of contact with contaminants changes.

Should respiratory protection (Level C) become necessary SAIC EC&HS Procedure 9, Respiratory Protection, will be implemented. As a minimum, this will require that respirator users have current fit tests and medical clearance for respirator use. Workers will wear only the type and size for which they have been fitted. The SSHO will provide site specific respirator training to ensure that workers understand proper respirator use.

## 5.2 TYPES OF EQUIPMENT

This section presents the types of protective clothing that may be used for the project. Requirements for task-specific levels of protective clothing are presented in the Hazards Analysis Table (Table 2.2) of this SSHP. Levels of protection that will be used to protect against chemical, radiological and physical hazards at this site include:

- Level C Protective Equipment
  - full-face respirator and air purifying cartridges capable of filtering out radionuclides
  - hooded chemical-resistant clothing (Tyvek® or equivalent) with all openings taped
  - two pair chemical-resistant gloves (nitrile and exam gloves)
  - safety boots
  - hearing protection (if necessary)
  - shoe covers
  - hard hat (if overhead hazards are present)

- Level D+ Protective Equipment
  - Tyvek® or equivalent coveralls - pants taped closed over boots
  - latex, nitrile or polyvinyl chloride (PVC) gloves - taped closed over coverall sleeves
  - safety boots
  - hearing protection (if necessary)
  - disposable boot covers
  - hard hat (if overhead hazards are present)
  - safety glasses with side shields
  - splash goggles or face shield (if splash hazard for eye or face/skin is present)
  - disposable booties, if required

- Level D Protective Equipment
  - coveralls/field clothes
  - safety boots
  - safety glasses with side shields
  - hearing protection (if necessary)
  - hard hat (if overhead hazards are present)
  - latex, nitrile or PVC gloves if contaminated materials are handled
  - leather or similar work gloves if sharp or abrasive materials are handled
  - disposable booties.

## 5.3 CLEANING, STORAGE, AND PROGRAM VERIFICATION

If site tasks require the use of protective clothing, disposable clothing will be used. Used disposable PPE will be damaged to preclude any reuse. Unused protective clothing will be stored in clean staging areas until needed. The SSHO will verify that the PPE in use is appropriate and is being used properly.

## 6. MEDICAL SURVEILLANCE

All employees performing on-site work will be enrolled in a medical surveillance program to meet the requirements of 29 CFR 1910.120(f), 1910.134, 1910.20 and SAIC EC&HS Procedures 12 (Medical Surveillance) and 20 (Hazardous Waste) to assess and monitor workers' health and fitness for employment in this field. Employees are provided with summaries of medical examination results following each examination and are provided more detailed information upon written request. Documentation of medical clearance will be maintained onsite during the project.

The frequency of employee medical exams shall be as follows:

- once every 12 months for each employee covered unless the attending physician believes a shorter or longer interval (not to exceed 2 years) is appropriate;

- at termination of employment or reassignment to an area where the employee would not be covered, if the employee has performed field work since his/her last examination and has not had an examination within the last 6 months; and

- as soon as possible upon notification by an employee that he/she has developed signs or symptoms indicating possible overexposure to hazardous substances or health hazards, or that the employee has been injured or exposed above the permissible exposure limit (PEL) or published exposure levels in an emergency situation.

## 7. EXPOSURE MONITORING

Assessment of employee exposures will be performed, as appropriate, to ensure that exposures do not exceed acceptable levels. Action levels, with appropriate actions, have been established for this monitoring. In addition to the specified monitoring, the SSHO may perform, or require, additional monitoring such as organic vapor monitoring in the equipment decontamination area, personnel exposure sampling for specific chemicals, etc. The deployment of monitoring equipment will depend on the activities being conducted and the potential exposures. All personal exposure monitoring records will be maintained in accordance with 29 CFR 1910.20. The minimum project-specific monitoring requirements and action levels are presented in Table 7.1.

Although overexposure to airborne organic contaminants is very unlikely, air monitoring will be conducted using a photoionization detector (10.2 eV) or flame ionization detector, or equivalent instrument. Although not all volatile organic chemicals can be detected in this fashion, many potential site contaminants can be detected and will serve as indicators of contamination. If breathing zone concentrations of total organic vapors exceed 5 ppm for more than 5 minutes, the activity will be stopped and the SSHO will notify the Field Manager, Task Manager, and Health and Safety Manager. Following assessment of the situation, appropriate actions will be taken. These may include identification of the airborne contaminant(s), measures to reduce airborne concentrations, and consideration of the use of respiratory protection. If breathing zone readings decrease to less than the action levels (5 ppm for total organic vapors), the activity will be resumed without respiratory protection. The instrument used to monitor for organic vapors will be calibrated daily, using the technique specified by the manufacturer.

Air monitoring for combustible gasses and oxygen will be conducted using a combination combustible gas indicator if site conditions suggest the potential for flammable concentrations of solvents or other airborne gasses or vapors. Indications of such potential include elevated (>100 ppm) total organic concentrations at the source (borehole) or indication that methane may be present such as in a landfill or buried organic material. This monitoring will be conducted close to the source (2-12" from borehole) to reflect worst-case conditions. If used, the combustible gas indicator will be calibrated daily using the technique set forth by the manufacturer. Backup instrumentation will be maintained on-site in case primary instrumentation fails.

Monitoring for ionizing radiation, radiological contamination, and airborne radioactivity will be conducted in accordance with the Radiation Protection Plan, Appendix A.

Site perimeter or off-site monitoring and sampling may be conducted if conditions indicate the potential for significant off-site exposure.

SAIC has conducted noise monitoring of standard types of site equipment at previous projects and has established basic hearing protection requirements. Drill rigs, portable drilling devices, and generators will be assumed to generate sound levels in excess of 85 dBA (requiring hearing protection) unless site-specific sound level measurements are conducted and indicate otherwise. If used, sound level meters will be calibrated daily (each day of use).

## Table 7.1 Monitoring Requirements and Action Limits

| Hazard or Measured Parameter | Area | Interval | Limit | Action | Tasks |
|---|---|---|---|---|---|
| Airborne organics with 10.2 eV PID or equivalent | Breathing zone (2-3 feet from source or 14 inches in front of employee's shoulder) | At least once every 30 minutes during intrusive activities; continuously during elevated readings | <5 ppm<br><br>>5 ppm | Level D<br><br>Withdraw and evaluate<br>-identify contaminants<br>-notify Project Manager and H&S Manager<br>-implement control measures, potentially including Level C PPE | Drilling (Rotosonic), other intrusive tasks |
| Flammability and oxygen concentration with combustible gas indicator | At borehole and any area where flammable gases are suspected | Continuously during intrusive activities | <10% LEL<br><br>>10% LEL<br><19.5% $O_2$ | Continue and evaluate source<br><br>Withdraw and allow area to ventilate for a minimum of 30 minutes; notify Project Manager and H&S Manager | Drilling (Rotosonic) |
| Temperature | In or near work area | At least twice daily to record approximate lowest and highest temperatures | >70°F<br><40°F | Administrative controls (See Section 8.14) | All tasks |
| Noise | Exclusion zone around drilling, equipment decontamination zone around generator | Note that this monitoring is optional, if monitoring is not performed, the areas will be assumed to exceed 85 dBA | ≥85 dBA, 8-hr. TWA | Require the use of hearing protection | Drilling (Rotosonic), generator use |
| Radiological – Details on monitoring requirements and action limits for radiological contaminants are provided in Appendix A – Radiation Protection Plan | | | | | |

LEL = lower explosive limit
TBD = to be determined
PEL = permissible exposure limit
TLV = threshold limit value
TWA = time-weighted average

# 8. STANDARD OPERATING SAFETY PROCEDURES

This section presents those general safety rules that apply to all operations performed by SAIC and its subcontractors. These requirements are generic in the sense that they apply to all projects. Therefore, there may be portions of this section that do not apply to this specific project. The provisions of the plan are mandatory for all on-site employees subcontractors and visitors. This includes employees engaged in initial site reconnaissance, preliminary field investigations, mobilization, project operations, and demobilization.

## 8.1 SITE RULES

The following rules apply to all site activities:

- The OSHA poster #2203 will be prominently displayed on site, if site activities will be continuous for more than two weeks.

- Daily safety briefings ("tailgate") will be conducted by the Field Manager and/or SSHO to inform personnel of new hazards or procedures.

- The SSHO, project personnel, and management personnel are responsible to suspend/stop work and require all personnel to evacuate the affected area if any of the following situations occur:

  - inadequate health and safety precautions on the part of any on-site personnel and
  - potential significant environmental insult as a result of planned activities.

- Personnel will perform only those tasks that they believe they can do safely.

- Personnel will notify the SSHO of any medical conditions (e.g., allergy to bee stings, diabetes, pregnancy) that require special consideration.

- Personnel will maintain proper workplace housekeeping to minimize the potential for trips and other accidents.

- Contact with potentially contaminated substances will be avoided. Site personnel in the exclusion zone will avoid walking through puddles, pools, mud, kneeling on the ground, and placing equipment on the ground.

- Spills will be prevented to the greatest extent possible. In the event that a spill occurs, the material will be contained, cleaned up, and reported as necessary (see Sections 8.10 and 11.0).

- Eating, drinking, smoking, chewing gum, or tobacco and other practices that increase the probability of hand-to-mouth transfer are prohibited in contaminated and potentially contaminated areas.

- Workers will wash their hands and faces upon leaving the work area and prior to eating or drinking.

- All injuries and accidents requiring more than first aid will be reported to the SSHO, Task Manager, Project Manager, EEMG Health and Safety Manager, and USACE.

- All on-site workers will abide by a buddy system. Members of a buddy team will maintain verbal or visual contact.

## 8.2 PERMIT REQUIREMENTS

SAIC will obtain or coordinate with USACE as appropriate, to obtain all permits necessary for the safe execution of this project. At a minimum, all activities such as digging or drilling will be preceded by an investigation and coordination with the site owner to preclude encountering sub-surface utilities and clearance.

## 8.3 DRUM/CONTAINER HANDLING

No drums of unknown material will be addressed as part of this project. Any drums used for the project will meet Department of Transportation and 10 CFR 20 requirements and will be labeled to comply with applicable U.S. Environmental Protection Agency (EPA) requirements. The discovery of plastic or metal drums of any size requires immediate notification to USACE.

## 8.4 CONFINED SPACE ENTRY

Any confined space entry will be performed in conformance with the requirements of SAIC EC&HS Procedure 10, 29 CFR 1910.146, and EM-385-1-1, Section 6I. No confined space entry work is anticipated as part of this project.

## 8.5 SOURCES OF IGNITION, FIRE PROTECTION

This work will be performed in conformance with EM-385-1-1, Section 9.

- Sources of ignition will be kept at least 15 meters from flammables storage areas.

- Flammables storage areas will be posted with signs indicating “No smoking or open flame.”

- At least one fire extinguisher with a rating of not less than 20-B will be kept 8 to 23 meters from all flammables storage areas.

- An approved flammables cabinet (if necessary) will be used to store 25 or more gallons of flammable liquid.

- Flammable liquids (other than decontamination solvents) will be kept in safety containers with flame arresters.

## 8.6 ELECTRICAL SAFETY

This work will be conducted in conformance with 29 CFR 1910, Subpart S and EM-385-1-1, Section 11.

- All portable electrical equipment will be double insulated or grounded and connected through a ground fault circuit interrupter.

- Conductive materials (drill rigs) will be kept clear of energized power lines. The following minimum distances will be observed; 0-50 kV - 10 feet; 51-100 kV - 12 feet; 101-200 kV - 15 feet; 201-300 kV - 20 feet; 301-500 kV - 25 feet; 501-750 kV - 35 feet; 750-1000 kV - 45 feet.

## 8.7 MACHINE GUARDING

All equipment will be operated with all guards provided by the manufacturer and in compliance with 29 CFR 1910, Subpart O and EM-385-1-1 Section 16.B. If any guarding must be removed for servicing, the equipment will be disabled to preclude movement or release of energy.

## 8.8 LOCKOUT/TAGOUT

All potentially hazardous servicing or equipment repair will be governed by the SAIC EC&HS Procedure 11, Lock Out/Tag Out, and 29 CFR 1910.147.

## 8.9 FALL PROTECTION

Work areas with the potential for a fall of 4 feet or more will be provided with fall protection in compliance with EM-385-1-1 Section 21.A.15. This fall protection will consist of guardrails or personal fall protection. Personal fall protection will be used if necessary for drilling personnel to climb the rig.

## 8.10 HAZARD COMMUNICATION

Hazard communication will be governed by SAIC EC&HS Procedure 8, Hazard Communication, 29 CFR 1910.1200, and EM-385-1-1 Section 8. At a minimum, the following steps will be taken.

- All hazardous chemicals used as part of this effort on site will be labeled to comply with the hazard communication standard as follows:
  - clear labeling as to the contents,
  - the appropriate hazard warning, and
  - the name and address of the manufacturer.

- MSDSs will be available on site for all hazardous chemicals used as part of this effort

- Site-specific training will include the hazards posed by site chemicals, protective measures, and emergency procedures, including reporting requirements in the event of releases/spills.

- Copies of MSDSs for all hazardous chemicals (chemicals brought on site) will be maintained in the work area. MSDSs will be available to all employees for review during each work shift.

## 8.11 ILLUMINATION

Most site field work will be conducted during daylight hours (no earlier than 15 minutes after sunrise and no later than 15 minutes before sunset) and natural illumination will be used. Field work to be conducted during non-daylight hours will be specifically identified in the hazard assessment table. Work conducted in buildings will be illuminated to meet the following minimums stated in 29 CFR 1910.120; stairs and ladders 10 foot-candles, offices 50 foot-candles, and first aid areas 30 foot-candles.

## 8.12 SANITATION

- Means for washing hands and faces prior to eating will be provided at the work site.

- Potable drinking water will be provided in labeled, sanitary dispensers.

## 8.13 DRILL RIG OPERATIONS

### 8.13.1 General Drilling Practices

- Operating manuals will be present on site for each type of drill rig in use.

- Drill rigs will have at least two functional kill switches or operating control requiring positive action from operator "deadman's switch" one for the operator and one for the operator's helper. These switches will be confirmed to be functional in the presence of the Field Manager, and the results recorded in the Field Manager's logbook, each day that the rig is used.

- Drill rigs will have functional backup alarms.

- Drill rigs will be inspected daily by the operator and this inspection will be confirmed by the SSHO. This inspection will address; structural damage, loose bolts and nuts, chain drive tension, loose or missing guards, fluid leaks, hoses, pressure gauges and pressure relief values.

- Only the operator, operator's helper, and personnel who have a critical need will be allowed near moving parts of the drill rig.

- Drill sites will be verified free of underground utilities by clearing each site with local utilities or appropriate base personnel prior to beginning drilling.

- Drill rig mounted fire fighting equipment will not be tampered with and will not be removed for other than the intended fire-fighting purposes or for servicing.

- Drill crews and personnel who work near the drilling rig will be trained in the location and use of the kill switches.

- No loose clothing, loose jewelry, loose long hair permitted near the drilling rig while in operation.

- If lubrication fittings are not accessible with guards in place, machinery will be stopped and disabled (locked out or ignition key removed) for oiling and greasing.

- Work areas and walkways will not be obstructed.

- Prior to drilling the area at the rear of the rig will be cleared of any items such as chains, shovels, etc., that might become entangled with the drilling equipment.

- The rig derrick (mast) will not be raised unless the area is free of overhead obstructions and far enough from power lines (see Electrical Safety, Section 8.6).

- The derrick will not be raised until the rig has been blocked, leveled, and chocked.

- The discharge of drilling fluids will be contained in a tub or channeled away from the work area to prevent the ponding of water and slip hazards.

### 8.13.2 Hoisting Operations

- Rigging equipment for material handling will be checked prior to use on each work shift and as often as necessary to ensure it is safe. Defective rigging will be removed from service.

- A hoisting line with a load imposed will not be permitted to be in direct contact with any derrick member or stationary equipment, unless it has been specifically designed for line contact.

- Workers will stand clear of the borehole or well bore when any wire line device is being run.

- Loads will not be lifted over workers. Personnel will not stand near, step over, or go under a cable or line that is under tension.

- When hoisting loads, a positive latching device shall be used to secure the load and rigging.

## 8.14 COLD/HEAT STRESS

Critical factors in preventing cold stress disorders are adequate clothing and staying dry. The SSHO and Field Manager will ensure the capability to quickly move individuals who become wet to a sheltered, warm area. The following specific steps will be taken [adapted from American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values booklet].

- If ambient temperatures are less than 40°F, site training will include prevention of cold injury, cold injury symptoms, and cold injury first aid.
- A heated break area will be provided if ambient temperatures are less than 32°F.
- As a minimum, breaks will be taken in a warm area every 120 minutes if ambient temperatures are less than 32°F.
- Workers will be allowed to take unscheduled breaks, if needed, in a warm area.
- No outdoor work will be performed if the equivalent chill temperature (temperature combined with the effect of wind) is less than -29°F.

Important factors in preventing heat stress induced illnesses are acclimatization, consumption of copious quantities of fluids, and appropriate work/rest cycles. General controls will consist of making fluids readily available, use of the buddy system, and taking scheduled and unscheduled breaks in temperature controlled areas as necessary. The following specific steps will be taken to reduce the potential for heat stress induced illness.

- An initial work rest cycle will be established for employees wearing impermeable clothing based on the air temperature. The length of each work period will be as follows (From NIOSH/OSHA/USCG/EPA; Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities).

| **Temperature °F** | **work period** |
|---|---|
| 72.5 to 77.5°F | 120 minutes |
| 77.5 to 82.5°F | 90 minutes |
| 82.5 to 87.5°F | 60 minutes |
| 87.5 to 90°F | 30 minutes |
| ≥90°F | 15 minutes. |

## 8.15 IONIZING RADIATION

All work involving ionizing radiation will be performed in compliance with SAIC EC&HS and EEMG procedures and USACE EM-385-1-1 Section 06.E. The site radiation safety program provides for: the radiological safety of workers, public, and environment; controlling distribution and releases of radioactive material; and maintaining occupational radiation exposure to individuals within the limits of 10 CFR 20, U.S. Army Corps of Engineers

Regulation EM-385-1-1, Section 06.E, “Ionizing Radiation”, and at levels As Low As Reasonably Achievable (ALARA). Implementation of this program is discussed in the Radiation Protection Plan, Appendix A.

## 9. SITE CONTROL MEASURES

The SSHO/Radiation Safety Officer (RSO) will be responsible for establishing the site control zones, as necessary, around SAIC controlled areas that present physical and/or chemical hazards. Implementation of the site control zones will help to minimize the number of employees potentially exposed and to minimize the potential for the spread of contamination. The SSHO/RSO will monitor the implementation of the required site control work rules and will report any deviations from prescribed practice to the Field Manager or stop work, as appropriate. A log will be kept of all personnel visiting, entering or working on site. The log will include the date, name, agency or company, time in and out, and PPE.

Site control zones will be established in a number of locations over the site. The exact locations will vary depending on site conditions; therefore, it is not possible to predetermine the size or exact locations of site control zones. SAIC will attempt to exclude all unauthorized personnel (members of the public, etc.) from exclusion and contamination reduction zones. If unauthorized personnel enter an SAIC controlled area and refuse to leave, work will be stopped and the USACE Technical Manager will be notified. Authorized visitors will be required to show proof of current training and medical surveillance.

### 9.1 EXCLUSION ZONE

The exclusion zone (Restricted Area) is the area where the greatest potential exists for exposure to contamination or physical hazards. Personnel access to the exclusion zone will be limited to authorized SAIC and subcontractor individuals, USACE personnel, and Seaway personnel, on an as needed basis. The periphery of the exclusion zone will be identified by barricade tape or rope suspended above the ground. An entry and exit checkpoint will be visually defined to regulate the flow of personnel and equipment. The entry and exit checkpoint will be delineated with barricade tape or ropes. The number of people and equipment in the exclusion zone will be minimized to control physical hazards and the spread of contamination. At a minimum, exclusion zones will be established around tasks or areas that pose a potential for the spread of contamination or injury to personnel. Such areas include each drilling site.

The following standard rules will apply to all entry into the exclusion zone.

- The SSHO or Field Manager must approve (and log) entry into the exclusion zone.
- All personnel entering the exclusion zone will wear the prescribed level of protective clothing.
- All items and related paraphernalia intended to be placed on the face or in the mouth (cigarettes, lighters, matches, chewing tobacco, food, cosmetics, etc.) are prohibited in the exclusion zone.
- All personnel in the exclusion zone will follow the buddy system.

Exclusion zones will be established around drilling sites, and all activities where contamination is a potential hazard. At a minimum, the exclusion zone for drilling operations will be at least equal to the mast height in radius so that no part of an overturned drill rig will fall outside the zone. Note that the exclusion zone is intended to protect personnel who are not involved with the task. Objects, such as stored unoccupied vehicles or the walls of buildings may occur within the exclusion zones. Building entrances or windows that occur within the exclusion zone will be locked or, at a minimum, marked to preclude use.

## 9.2 CONTAMINATION REDUCTION ZONE

A contamination reduction zone or restricted area may be established, as necessary, outside the exclusion zone to provide a transition from and a buffer between the exclusion zone and the support zone. An entry and exit checkpoint will be visually defined at the periphery of the zone to regulate the flow of personnel and equipment. The entry and exit checkpoint and the perimeter of the zone will be delineated with the use of traffic cones, ropes/barricade tape, or signs.

All personnel entering the contamination reduction zone or restricted area will wear the prescribed level of protective clothing required for that zone. All items intended to be placed on the face or in the mouth (e.g., cigarettes, chewing tobacco, food, cosmetics, etc.) are prohibited. Doffing of protective clothing and personnel decontamination will occur in the contamination reduction zones.

## 9.2 SUPPORT ZONE

The support zone is the clean and relatively safe area surrounding the exclusion and contamination reduction zones. Entry requirements for the support zone consist of the general requirements (training, medical surveillance) for on-site work. Note that the support zone is limited to the areas associated with this project and does not generally include areas such as office trailers, roads and buildings accessible to facility personnel or the public and not directly involved in on-site project activities. Primary functions of the support zone are:

- staging area for clean equipment and supplies and

- location for support services [e.g., office trailers, laboratory trailers, eating area(s), toilet facilities, parking, visitor area(s), etc.].

## 9.3 SITE COMMUNICATION

The field project will be equipped with a cellular phone.

## 10. PERSONAL HYGIENE AND DECONTAMINATION

A system of procedures will be used to control the spread of contamination from the exclusion zone (Restricted Area) and to ensure that workers are sufficiently free of contamination to preclude adverse health effects. PPE doffing and personnel decontamination are part of this system. The SSHO will ensure the construction of a decontamination station, as necessary, instruct personnel on its proper use, and verify that personnel follow the appropriate steps. This section presents basic requirements for personnel decontamination keyed to the level of protection. These requirements may be modified by the SSHO if improvements are needed. See the Hazards Analysis section for task-specific PPE.

IDW that is potentially contaminated with radioactive material will not be surveyed for unconditional release from the Site. Materials and wastes that are potentially contaminated with radioactive material, including hazardous wastes/material, will be placed in containers, labeled in accordance with applicable regulations, and stored in Area A at the Seaway Site awaiting disposal by the USACE during future remedial actions at the Seaway Site. A log of waste generated during Site activities will be maintained to identify all wastes with the log submitted to the USACE upon completion of Site activities.

### 10.1 LEVEL D PROTECTION DOFFING/DECONTAMINATION

**Station 1:** Equipment drop

Place potentially contaminated equipment in a designated area.

**Station 2:** Removal of disposable gloves and boot covers (if worn)

Deposit disposable gloves and boot covers in a designated container. Note that this step is necessary only if gloves and boot covers are in use.

**Station 3:** Frisk

Perform radiological survey of hands, shoes, and any other areas that may have become contaminated. Any personal contamination will be removed with tape, moistened towel, or soap and water.

**Station 4:** Field wash

Wash face and hands prior to taking anything by mouth. This may be done with soap and water or disposable disinfectant towels.

### 10.2 LEVEL D+ PROTECTION DOFFING/DECONTAMINATION

**Station 1:** Equipment drop

Place potentially contaminated equipment in a designated area.

**Station 2:** Tape removal

Remove all tape (if used) from outer clothing and place in appropriate waste container.

**Station 3:** Boot covers, outer disposable garment, and gloves removal

Carefully remove boot covers, outer contamination-resistant garment, and gloves.

**Station 4:** Frisk

Perform radiological survey of hands, bottoms of shoes, and any other areas that may have become contaminated. Any personal contamination will be removed with tape, moistened towel, or soap and water.

**Station 5:** Field wash

Wash hands and face prior to eating, drinking, smoking, etc. This step may be accomplished with soap and water or disposable disinfectant wipes.

## 10.3 LEVEL C PROTECTION DOFFING/DECONTAMINATION

**Station 1:** Equipment drop

Place potentially contaminated equipment in a designated area.

**Station 2:** Segregated equipment drop

Deposit equipment used on site (tools, sampling devices, containers, monitoring instruments, clipboards, etc.) on plastic sheets or in different containers with plastic liners. Segregation of the equipment at the drop site reduces the possibility of cross-contamination.

**Station 3:** Outer boot and glove removal

Remove tape from outer boots and outer gloves. Remove outer boot covers and outer gloves. Deposit gloves and boot covers in plastic trash bags.

**Station 4:** Cartridge change

If a worker requires exchange of respirator cartridge(s), a safety representative may exchange the cartridge(s) at the exit to the contaminated area.

**Station 5:** Disposable outer garment removal

Remove disposable outer garment, deposit in a plastic trash bag, and dispose in accordance with the project Work Plan.

**Station 6:** Respiratory protection and disposable inner glove removal

The respirator is the next-to-last item for removal. The cartridges/canisters are placed in a plastic trash bag and disposed of in accordance with the project Work Plan. The respirator is placed in a plastic bag dedicated for used respirators only. Remove disposable inner gloves last and deposit them in a plastic trash bag, in accordance with the project Work Plan.

**Station 7:** Frisk

Perform radiological survey of hands, shoes, and any other areas that may have become contaminated. Any personal contamination will be removed with tape, moistened towel, or soap and water.

**Station 8:** Field wash

Wash hands and face prior to eating, drinking, smoking, etc. This step may be accomplished with soap and water or disposable disinfectant wipes.

## 10.4 EQUIPMENT DECONTAMINATION

Sampling and related equipment will be decontaminated to a level sufficient to prevent cross-contamination of subsequent samples. This stringent requirement assures that decontaminated sampling equipment is sufficiently clean from a personnel contact perspective. Larger pieces of equipment, such as drill rigs, will be decontaminated with pressurized hot water/steam. The following description of the sampling equipment decontamination process is intended to provide only a general overview.

Steps will be taken to assure that the transporting of sampling equipment does not spread contamination to previously uncontaminated areas. Sampling and related equipment will be screened for contamination prior to being transported. Any equipment that is deemed to be heavily contaminated will be decontaminated in the immediate area of the sample collection, or will be wrapped in plastic during transit.

# 11. EMERGENCY PROCEDURES AND EQUIPMENT

The Field Manager will remain in charge of all SAIC and subcontractor personnel during emergency activities. The Field Manager will perform emergency notification of emergency medical services, fire department, SAIC Task Manager, SAIC Health and Safety Manager, etc. The field manager will also escort or assign an escort to offsite emergency responders. In order to minimize the potential for accidents and injuries, daily safety and health inspections will be conducted by the Field Manager or SSHO. If an emergency occurs, the Field Manager, the SSHO, and the field team will participate in a briefing to discuss the event, identify the causes, identify corrective measures, and evaluate the responses.

In the event of an accident or incident, the Field Manager or SAIC Task Manager will notify the USACE Project Manager immediately according to the requirements of EM-385-1-1.

All accidents will be investigated and reported within 24 hours as specified in EM-385-1-1. The Accident Report (ENG Form 3394) will be completed and submitted to the USACE District Safety Officer at the following address:

U.S. Army Corps of Engineers
Buffalo District
Environmental Analysis
Keith Hall
1776 Niagara Street
Buffalo, NY 140207-3198
716-879-4406

All personnel working on site will be trained in the requirements of this section. This will include recognizing emergencies, reporting emergencies to the Field Manager or SSHO, and responding to emergencies. Employees will also be informed of any changes in potential emergencies or response plans.

## 11.1 POTENTIAL EMERGENCIES

Credible potential emergencies for this project include fires, minor chemical spills, and personnel injury.

### 11.1.1 Fires

Small quantities of flammable solvents (typically less than 5 gallons), gasoline, and diesel fuel will be present on site. In the event of a fire, the local fire department will be notified immediately. If it is safe to do so, on-site personnel will attempt to extinguish the fire with the available fire extinguishers and isolate any nearby flammable materials. If there is any doubt about the safety of extinguishing the fire, site personnel will evacuate the area. The supervisor or knowledgeable employee will provide the fire department with relevant information when they arrive.

### 11.1.2 Spills

Potential spills include releases of fuels, lubricants, hydraulic fluids, and decontamination solvents. In the event of a spill or leak, the employee making the discovery will immediately notify the SSHO and/or the Field Manager. The Field Manager will determine whether the leak poses an environmental risk or will exceed the capacity of on-site personnel and equipment. In the unlikely event that there is a probability that the spill will extend beyond the immediate area, result in an environmental insult, or exceed the capabilities of the on-site personnel, the Field Manager will inform the local fire department and hazardous materials response team. If this is not the case, the on-site spill kit will be used to clean up the spill.

### 11.1.3 Medical Emergencies

Field crews will use a variety of equipment that could cause injuries. In the event of a medical emergency, the Field Manager will notify the local emergency medical service immediately. Personnel with serious injuries will be stabilized onsite pending arrival of emergency medical service personnel. At least one first aid/CPR-trained individual will be on site at all times and these personnel will provide first aid pending release of the injured person to emergency medical staff. Contaminated injured personnel will be decontaminated to the extent feasible. Personnel with minor injuries will follow normal decontamination procedures. Personnel with serious injuries will be decontaminated, if necessary, by disrobing and wrapping in a blanket. Decontamination may be bypassed in the event of life-threatening injuries or illnesses.

## 11.2 EMERGENCY PHONE NUMBERS

Listed below are emergency groups and their telephone numbers. A telephone will be present in the field and available for use.

| | |
|---|---|
| Poison Control Center | 800-682-9211 |
| Ambulance | 911 |
| Fire Dept. | 911 |
| Kenmore Mercy Hospital | 716-447-6100 |
| EEMG Health and Safety Manager (Steve Davis) | 865-481-4755 |
| SAIC Engineering, Inc. | 508-946-3500 |

Kenmore Mercy Hospital in Tonawanda will be used for any required medical services. Medical emergencies will be handled by contacting onsite emergency services and waiting for ambulance to arrive. The following directions to the hospital may be used for non-emergency services. From facility, left onto River Road; left onto Grand Island Blvd.; then onto Sheridan Drive; right onto Elmwood Ave.; two blocks on right.

These telephone numbers will be posted on site. Prior to initiating on-site work the SSHO will post a map showing the hospital and directions to the hospital. A map is presented in Appendix C of this SSHP.

## 11.3 EMERGENCY ALERTING

Each team will have a means for generating an audible alarm, which will consist of a compressed gas horn or vehicle horn. These devices will be used to signal to other project personnel in the event of accidents or emergencies. Short blasts (less than 1/2 second) of the horn will be used to request assistance, while extended blasts (more than 2 seconds) will signal an evacuation. The SSHO will contact personnel in adjacent areas, such as Ashland 1, to ensure coordination of emergency signals and notification.

## 11.4 EVACUATION

The SSHO or Field Manager will designate the evacuation routes and an assembly area. All employees will be familiar with the evacuation routes and assembly area. Refer to the project Work Plan for site maps.

## 11.5 EMERGENCY EQUIPMENT

Several items of emergency equipment will be maintained at the work site. Any incident that is not clearly controllable by personnel wearing standard site clothing plus protective gloves and using the listed equipment will require reevaluation by the SSHO. If the SSHO does not feel that on-site personnel can safely control the emergency with the available equipment, the crew will use alternate approaches such as allowing a small fire to burn out or evacuating the site. The required emergency equipment includes:

- 16-unit first aid kit indoors or in weatherproof container, inspected weekly;
- compressed gas horns or vehicle horn;
- fifteen minute emergency eye wash to meet American National Standards Institute standard;
- fire extinguisher(s) (at least 20-B) 8 to 23 meters (25 feet to 75 feet) from outside flammables storage (or use) area;
- one, 5-pound ABC fire extinguisher in each work vehicle;
- basic spill kit suitable to handle small spills of decontamination fluids, hydraulic fluid, or fuels and containing sorbent pads, tubes, and nitrile or similar gloves; and
- telephone and/or portable radios.

## 12. LOGS, REPORTS, AND RECORD KEEPING

A system of reports and logs will be used to document activities related to site Health and Safety. These reports will include injuries, accidents, near accidents, interpretations of the SSHP or regulations, interactions with auditors/regulators/USACE personnel, and any off-normal events.

- Employee/visitor log book.
- Accident and injury reports for all accidents other than first aid cases.
- Training certificates.
- Logbooks detailing site training, topics covered, names and signatures of participants and trainer, general site activities, site workers, H&S problems, and problem resolutions.
- Medical clearance forms.
- Daily safety inspection logs will contain the dates of inspections, identity of the person doing the inspection, the examined areas/activities/equipment, any deficiencies, and any corrective actions taken.
- Related procedures such as equipment and personal decontamination.
- Equipment maintenance logs will contain the dates and types of routine maintenance performed on site equipment.
- Environmental and personal exposure monitoring/sampling results will be maintained in a log that will contain monitoring data, location and time of monitoring, types of work being done, calibration records, and the identities of personnel performing monitoring.
- The health and safety debrief form contained in EC&HS Procedure 20 will be completed by the SSHO at the completion of the project and submitted to the H&S Manager.
- Health Physics radiological survey forms, air sample forms, and dosimetry forms.

Examples of reporting forms to be used for the project are included in Appendix B of this SSHP.

## 13. REFERENCES

American Conference of Governmental Industrial Hygienists 1998. *Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices.*

BNI (Bechtel National Incorporated) 1993. *Remedial Investigation for the Tonawanda Site.* DOE/OR21949-300, Oak Ridge, TN.

BNI 1995. Bechtel National, Incorporated. Town of Tonawanda Landfill Contaminated Waste Volume Estimate. October 1995.

CH2M Hill 1984. *Environmental Improvements, Seaway Industrial Park Sanitary Landfill, Tonawanda, New York, Final Construction Report.* January.

Code of Federal Regulations - 29 CFR 1910 and 1926, Occupational Safety and Health Administration (OSHA)

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Ford, Bacon and Davis Utah (FBDU) 1981. *Preliminary Engineering and Environmental Evaluation of the Remedial Action Alternatives for the Seaway Industrial Park, Tonawanda, New York* Report No. 409-312. December

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U.S. Army Corps of Engineers (USACE) 1997. *Proposed Plan for Ashland 1 and Ashland 2 Sites, Tonawanda, New York.* November

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U.S. Army Corps of Engineers (USACE) 1999b. *Technical Memorandum: Synopsis of Volume Calculations for Seaway Site Areas A, B, and C, Tonawanda, New York.* March

U.S. Army Corps of Engineers (USACE) 2000a. *Technical Memorandum: Modeling of Radiological Risks From Residual Radioactive Materials Following Implementation of Remedial Alternatives For Seaway Landfill Areas A, B, and C, Tonawanda, New York, Rev. 2.* June

U.S. Department of Energy (DOE) 1997. *Radionuclide Cleanup Guideline Derivation for Ashland 1, Ashland 2 and Seaway, Tonawanda, New York.* September

Science Applications International Corporation (SAIC) Procedures

EC&HS Procedure 4, Accident Reporting
EC&HS Procedure 6, OSHA Recordkeeping and Reporting
EC&HS Procedure 8, Hazard Communication and Hazardous Chemical Control
EC&HS Procedure 9, Respiratory Protection Program
EC&HS Procedure 10, Confined Space Entry
EC&HS Procedure 11, Lock Out/Tag Out
EC&HS Procedure 12, Medical Surveillance
EC&HS Procedure 13, Personal Protective Equipment
EC&HS Procedure 15, Hearing Conservation and Noise Control
EC&HS Procedure 20, Hazardous Waste Operations

# APPENDIX A

# RADIATION PROTECTION PLAN

# Radiation Protection Plan

# For Remedial Investigation Field Activities

# At the Seaway Site, Tonawanda, N.Y.

**Certified Health Physicist Review of**

**Radiation Protection Plan**

[redacted] 3/20/01

Date

**CONTENTS**

## 1.0 Radiological Plan Overview

This document describes the Health Physics Plan that provides for the radiological safety of the SAIC field team during the United States Corps of Engineers (USACE) Remedial Investigation (RI) field activities at the Seaway Site in Tonawanda N.Y.. This plan has been designed to comply with the following direct and referenced radiation safety guidance documents that apply to FUSRAP work:

1) USACE EM 385-1-1, *Safety and Health Requirements Manual*
2) USACE ER 385-1-80, *Ionizing Radiation Protection*
3) USACE ER 385-1-2, Appendix B, *Safety and Health Document Requirements for HTRW and OEW Activities*
4) 10 CFR 19, *Notices, Instructions, and Reports to Workers, Inspections*
5) 10 CFR 20, *Standards for Protection Against Radiation*

`The following SAIC EEMG STL procedures will be utilized during field activities; HP-004, *Quality Control of Radiation Monitoring Equipment*, HP-108, *Operation of Portable Radiation Survey Instruments*, and HP-405, *Radiological Surveys*. Procedural guidance that is not applicable is noted in Appendix RPP-C, *Procedural Applicability*. Signed copies of these approved procedures are available at SAIC Central Records, Oak Ridge, TN.

A Lead Health Physics Technician (LHPT) will be onsite during all work activities including mobilization and demobilization. Health Physics field responsibilities will be delegated to the (RSO approved) LHPT.

SAIC makes the following commitment regarding radiation exposure: *Individual and collective radiation exposures to on-site workers and the public will be kept below regulatory limits and As Low as Reasonably Achievable (ALARA).* It is anticipated that no individual will exceed the 100 mrem USACE Total Effective Dose Equivalent (TEDE) ALARA limit during this field project.

## 2.0 Radiological Hazards

The radiological (MED) contaminants at the Seaway Site are residues (originally) from uranium ore processing conducted at the Linde (now Praxair) property. Source term information has been taken from USACE Technical Memorandum *Remodeling of Radiological Risks From Residual Radioactive Materials Following Implementation of Remedial Alternatives for Seaway Landfill Areas A, B, and C* (SAIC June 2000).

The most conservative set of radionuclide Exposure Point Concentrations (EPCs), which were derived from analytical data, are presented in the following table:

Table RPP-1, *Seaway Radiological Contaminants*

| Radionuclide | EPC (pCi/g) | Radionuclide | EPC (pCi/g) |
|---|---|---|---|
| Ac-227 | 15 | Th-230 | 280 |
| Pa-231 | 15 | U-234 | 12 |
| Pb-210 | 14 | U-238 | 12 |
| Ra-226 | 14 | Total | 362 |

Only radionuclides greater than 1 pCi/g are included in Table RPP-1. The Th-230 concentration is not in equilibrium with the uranium decay series radionuclides because uranium was removed from the ore during processing at the Linde Site. All Manhattan Engineer District (MED) material has been either mixed with clean fill, or covered by refuse since placement in the landfill. Exposure pathways for field personnel include direct exposure, ingestion, and inhalation from extracted soil, and direct gamma exposure from the landfill. From a radiological perspective, the primary hazard associated with sampling will be the inhalation of Th-230 during soil extraction.

**3.0 Anticipated Dose for Field Personnel during Sampling Activity**

Dose from the Seaway Site has previously been modeled for various scenarios in the Technical Memorandum referenced above. All modeling was performed using Resrad™ version 5.82 (April 1998). Of the modeled scenarios, the most conservative is the Remediation Worker Scenario (RWS), because the individual is removing uncovered MED material. The RWS model is conservative, because samplers are only exposed to Th-230 when in the proximity of soil samples extracted from the landfill.

In the RWS, modeled individuals will receive 27 mrem during 1,056 hours of work in Area "A", and 21 mrem during 490 hours of work in Areas "B" and "C". Therefore, the modeled (internal and external) dose rate is .026 mrem/hr in Area "A", and .043 mrem/hr in Areas "B" and "C".

The duration of sampling work at the Seaway Site has been conservatively estimated at 30 days, working 10-hour days (300 hours). If a sampler were to work for 300 hours, spending equal time in Areas "A" and "B+C", dose can be calculated as:

(150 hours)(.026 mrem/hr) + (150 hours)(.043 mrem/hr) = 10 mrem

Therefore the Field Team is (conservatively) estimated to receive 10 mrem each during sampling activities at Seaway. An Activity Hazard Analysis has been prepared for radiological contaminants and is presented in Appendix RPP-A.

**4.0 Radworker Training**

Because individual dose during sampling activities is not expected to exceed 100 mrem, 10 CFR 19 does not require radworker training. However, each individual not currently (annual) radworker trained will receive radworker training so that the spread of contamination can be minimized, and doses can be kept ALARA.

Radworker training will include instruction in the following aspects of radiological safety: health effects of ionizing radiation, exposure limits (including those for pregnant workers), use of dosimetry and instruments, effects of radiation on the embryo/fetus, employee rights and responsibilities, site contaminants, required monitoring, and exposure control methods.

**5.0 Radiological Field Monitoring**

Monitoring for ionizing radiation, radiological contamination, and airborne radioactivity will be conducted to verify that individual exposures are kept below the USACE ALARA limit of 100 mrem, and to prevent the spread of contamination. Monitoring reports will not be sent to site workers, unless an individual's exposure at the site exceeds 100 mrem.

Monitoring requirements and action levels for radiological hazards are presented in Appendix RPP-B.

**6.0 Internal Monitoring**

USACE EM-385-1-1 section 06.E.05 states that bioassay is necessary if an individual has a potential to receive an internal dose greater that 0.5 rem per year. NRC Regulatory Guide 8.7 also references this monitoring requirement at 10% of the annual limit. In addition, NRC Regulatory Guide 8.7 states that previous dose received at other facilities during the year need not be considered. 0.5 rem is equivalent to 200 DAC-hours. Post-job bioassay measurements will be performed to validate air sample results if any individual exceeds 10% of the required level, or 20 DAC-hours.

In order to verify the concentration of radioactive materials in air, air sampling will be conducted during soil sampling activities. Particulate airborne contaminants will be sampled in the breathing zone of the individual with the highest potential of inhaling radioactive material (as determined by the LHPT).

Air samples will be analyzed for gross alpha using a Ludlum 2929/43-10-1, or equivalent. The gross alpha air sample concentration will be compared against the 10 CFR 20 Appendix B Th-230 (conservative isotope) Derived Air Concentration (DAC) value. Although not expected, respiratory protection will be implemented if, based on air sample data, any individual is likely to receive in excess of 12 DAC/hrs (10 CFR 20.1701) in any one week.

**7.0 External Monitoring**

Area and sample dose rates will be verified during the performance of work. Because of the very low dose rates anticipated (<0.2 mrem/hr), an energy compensated GM μR meter, which detects exposure in the μR range, will be used (Bicron or equivalent).

As an extra precaution, field personnel external dose will be verified using Thermoluminesent dosimeters (TLD's). Each site worker subject to this health and safety plan will wear a TLD while onsite. Dosimetry will be stored with a control badge in a dosimetry receptacle, when not in use. All dosimetry, including the control badge, will be collected and evaluated after field activities are complete.

**8.0 Equipment Contamination Monitoring**

Survey(s) for total and removable contamination will be conducted on the drill rig(s) prior to, and following intrusive activities. The drill rig(s) will also be surveyed for removable contamination daily, prior to release from the site. Sampling equipment will be monitored for total contamination upon extraction from the sample media. This survey will be the primary mechanism to ensure that contamination is not spread during intrusive activities. This procedure will also be used to identify any tools and equipment that have come in contact with (potential) radioactive material. Sampling probes, tools and equipment that came in contact with potentially radioactive material will be monitored for total and removable contamination upon removal from the immediate work area.

Equipment survey results will be compared to the surficial contamination limit of 20 dpm/100 $cm^2$ removable alpha, and 100 dpm/100$cm^2$ total alpha (fixed and removable), in accordance with Regulatory Guide 1.86 guidance (using Th-230 as the contaminant).

Any tools or equipment with alpha contamination exceeding the acceptable surface contamination limits will be managed as contaminated material. Contaminated material and equipment will be either decontaminated or containerized for disposal, under the direct supervision of the LHPT.

Personnel and equipment total contamination surveys will be performed with an alpha scintillation detector coupled with a ratemeter (Ludlum 2221/43-89 or equivalent). Each frisker will have a current annual calibration and will be response checked each day prior to use with a Thorium-230 source. Frisker source

checks will be performed in accordance with HP-004, *Quality Control of Radiation Monitoring Equipment,* and will be documented on HP-004 Attachment 7, *Count Rate Meter Source Test Log*, or equivalent.

Smears will be evaluated for gross alpha by a scintillation detector coupled with a scaler (Ludlum 2229/43-10 or equivalent). The counter will have a current annual calibration and will be checked each day prior to use with a Thorium-230 source. Quality control checks will be performed in accordance with HP-004, *Quality Control of Radiation Monitoring Equipment,* and will be documented on HP-004 Attachment 10, *Lab Instrumentation QC Data Sheet,* or equivalent.

Equipment decontamination surveys will be documented for each piece of equipment released from the Site. Copies of these surveys will be provided to USACE upon completion of all field activities.

**9.0 Personnel Contamination Monitoring**

All on-site workers who have the potential to handle radioactive material will be monitored for total contamination periodically, and upon exit of an exclusion zone. Monitoring will be performed with a frisker under the direct supervision of a HP technician. Personnel will be considered contaminated if total activity at 1/4" from the skin or clothing is equal to, or in excess of 300 dpm/100 $cm^2$ alpha (at a frisk rate not to exceed 1" per second).

If personnel contamination is detected, the affected area will be decontaminated with soap and water under the direct supervision of the HP technician, and the nature and extent of the contamination event will be documented.

**10.0 Investigation Derived Waste**

Investigation derived waste (IDW) may include decontamination fluids or personal protective equipment (PPE). Used PPE and decontamination fluids will be contained, labeled as "radioactive material" with information concerning its contents, date of generation, and dose rate.

PVC well liners will be surveyed upon extraction, and released (or decontaminated) based on the contamination levels found on the exterior of the liners. Per the work plan, unused sample media will be returned to its point of origin.

**11.0 Shipment of Samples**

Per Department of Transportation (DOT) regulations, radioactive material exceeding 2 nCi/g must be shipped as radioactive material (RAM). As presented in Table RPP-1, the concentration of radioactive material in soil is not expected to exceed 362 pCi/g (.362 nCi/g). Therefore, unless activity in excess of 2 nCi/g is suspected, samples will not be shipped as radioactive material. However, each sample cooler (shipping package) will be surveyed for radiation and contamination, and any container exceeding site release criteria or 0.5 mrem/hr (contact) will not be shipped.

**12.0 Radioactive Source Accountability and Control**

Radioactive sources will be received and shipped as 49 CFR limited quantities. Only (NRC license) exempt radioactive check sources will be used at the site. Radioactive sources will be controlled when not in use. The source container will be labeled with a "Radioactive Material" label. Each source will be accounted for during morning response check activities. In the event of a missing source, the USACE Contact and RSO will be notified.

**13.0 Posting and Labeling**

Due to both the limited times in any one location, and the low specific activity of the material, work areas will not be radiologically posted. However, intrusive activities will be designated as an exclusion area, and will be monitored by a Health Physics Technician who will prevent unauthorized entry into the work area.

**14.0 Contaminated Injury Protocols**

All non-life threatening injured personnel will be frisked, and contaminated personnel will be decontaminated prior to release.

In the event a potentially contaminated person with life threatening injuries is transported off-site for medical treatment, the person will be frisked while waiting for an ambulance. In no case will frisking or decontamination delay medical care.

In the event of a potentially contaminated person with life threatening injuries:

The hospital will be notified that a potentially radioactively contaminated person is being sent, and that a radiation protection expert will arrive with him/her. The USACE will be contacted as soon as possible. The LHPT will follow the ambulance to the hospital with survey equipment.

The LHPT will not interfere with medical care, but will control the ambulance, path to the emergency room, and emergency room as necessary.

All potentially contaminated medical personnel will be frisked when the emergency has passed. All equipment that came in contact with the contaminated person, as well as the ambulance and emergency room/transfer path will be surveyed and decontaminated as necessary. All contact trash will be labeled with a radioactive material and biohazard label (as applicable), and returned to the site.

**Health Physics Plan Reference Materials**

1. 10 CFR 20, *Standards for Protection Against Radiation*
2. USACE ER 385-1-80, *Ionizing Radiation Protection*
3. USACE EM 385-1-1, *Safety and Health Requirements Manual*
4. ANSI N323-1978, *Radiation Protection Instrumentation Test and Calibration*
5. 10 CFR 19 *Notices, Instructions, and Reports to Workers*
6. 49 CFR, Subtitle B, Chapter I, Subchapter C, Parts 171 through 178, *Hazardous Materials Regulations*
7. USACE Technical Memorandum, *Remodeling of Radiological Risks From Residual Radioactive Materials Following Implementation of Remedial Alternatives for Seaway Landfill Areas A, B, and C* (SAIC June 2000)
8. USACE ER 385-1-2, Appendix B, *Safety and Health Document Requirements for HTRW and OEW Activities*

# Appendix RPP-A

## Radiological Activity Hazard Analysis

| Safety and Health Hazards | Probability / Severity | Controls | Monitoring |
|---|---|---|---|
| **SAMPLING** | | | |
| External Exposure | Low / very low | Medical clearance for HAZWOPER work<br><br>If area dose rates are measurable limit the time in the area. For samples, increase distance and provide shielding, as practical (ALARA). | Dose rate survey of work area prior to work.<br><br>TLD |
| Internal Exposure | Moderate/ very low | Keep sample cuttings wet to minimize airborne exposure. Containerize or cover potentially contaminated material.<br><br>Medical clearance for HAZWOPER work<br><br>Do not eat, drink, smoke, or chew in sampling area or prior to successful frisk.<br><br>Don't touch face when handling potentially contaminated material.<br><br>Respiratory protection if engineering controls are not adequate.<br><br>Exclusion zone around contaminated areas. | Lapel air sample during intrusive activities. |
| Skin Contamination | Moderate/very low | PPE Modified level D. Tyvek (or equivalent) suits, nitrile (or equivalent) gloves, disposable shoe covers.<br><br>Exclusion zone around contaminated areas. | Frisk upon exiting a potentially contaminated area (exclusion zone). |

# Appendix RPP-B

## Monitoring Requirements and Action Limits

| Hazard or Measured Parameter | Area | Interval | Limit | Action | Tasks |
|---|---|---|---|---|---|
| Radiological total (fixed and removable) contamination with a alpha sensitive plastic scintillation count rate system. | Sampling locations, when personnel handle potentially contaminated materials, when equipment is removed from potentially contaminated areas. | Upon extraction from soil, intermittently, and upon exit from the exclusion area. | Equipment must be less than the surficial contamination limit of 100 dpm/100cm$^2$ (alpha). Personnel must be < 300 dpm/100cm$^2$. | Remove by decontamination and resurvey. Notify RSO. If personnel contamination, notify Project Manager, CHP, and H&S Manager. Additional controls may include changes to PPE, decontamination procedures, control as radioactive material, or engineering controls | All onsite tasks |
| Removable surface contamination determined by smearing a surface of 100cm$^2$, and counting the smear with an alpha sensitive plastic scintillation count rate system.. | All equipment and items that came in contact with potentially contaminated material. | Intermittently prior to exiting the immediate sampling area. | Equipment must be less than the surficial contamination limit of 20 dpm/100cm$^2$ removable (alpha). | Remove by decontamination and resurvey. Notify RSO. Additional controls may include wrapping the item prior to use, decontamination procedures, controlling the items as radioactive material, or engineering controls | All onsite tasks |
| Sampling for airborne radioactive particulates. | Breathing zone of selected employees. | Full shift sampling on selected personnel with the highest potential of inhaling radioactive material during intrusive work. | 12 DAC/week | Notify RSO, Project Manager, CHP, and H&S Manager. Additional controls may include engineering controls or respiratory protection. | Sampling activities |

# Appendix RPP-C

## Seaway Site Procedural Applicability

| **Procedure** | **Applicability** |
|---|---|
| SAIC EEMG STL HP-004, *Quality Control of Radiation Monitoring Equipment* | Entire content applicable, except:<br>1. Gamma Spec. System QC section is not applicable, there will not be a gamma spec in use.<br>2. Instrument calibrations will be documented on forms provided by the contractor performing the calibrations.<br>3. A deficient instrument report will not be generated for detector mylar window light leak.<br>Forms: All except Attachments 11,12,13. Forms may be combined if all recorded information is present. |
| SAIC EEMG STL HP-108, *Operation of Portable Radiation Survey Instruments* | Entire content applicable, except:<br>1. Signing out the instrument is not necessary at a small field site.<br>Forms: N/A |
| SAIC EEMG STL HP-405, *Radiological Surveys* | The following content is applicable:<br>2. Performance of Beta/Gamma radiation surveys.<br>3. Performance of smear surveys.<br>4. Airborne particulate sampling.<br>5. Documentation of radiation, contamination, and airborne surveys.<br><br>Forms: Attachments 1,2,3,4,5 (or equivalent) |

# APPENDIX B

# REPORTING FORMS

**EQUIPMENT CALIBRATION**

**PROJECT NAME:** **PROJECT NO:**

| IDENTIFIER | DESCRIPTION | BACKGROUND READING | PRE | ADJUSTMENT (IF NEEDED) | POST | NAME | DATE |
|---|---|---|---|---|---|---|---|
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**HEALTH AND SAFETY MONITORING LOG**

**PROJECT NAME:** **PROJECT NO:**

| | | RESULTS | | | | |
|---|---|---|---|---|---|---|
| DATE | INSTRUMENT/NO. | BZ | AREA | TIME | REMARKS | NAME |
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**TAILGATE SAFETY MEETING LOG**

**PROJECT NAME:** **PROJECT NO:**

DATE: M Tu W Th F Sa Su TIME:

WEATHER:

WORKING CONDITIONS:

PPE:

ITEMS DISCUSSED:

THE FOLLOWING INDIVIDUALS ATTENDED THE DAILY TAILGATE SAFETY MEETING (SIGNATURES)

| | | |
|---|---|---|
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SITE SAFETY AND HEALTH OFFICER

**DAILY SAFETY INSPECTION**

**PROJECT:** **Page ___ of 3**

| **Date** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | |
| **Response (Use Y, N, or NA)** | | | | | | | | | | **ITEM** |
| | | | | | | | | | | Daily safety briefing conducted? |
| | | | | | | | | | | Emergency numbers and route to hospital posted? |
| | | | | | | | | | | SSHP on site, available to employees, and complete? |
| | | | | | | | | | | Required exposure monitoring conducted and documented? |
| | | | | | | | | | | Monitoring instruments (PID, OVA, CGI) calibrated daily against known standard and documented? |
| | | | | | | | | | | Sixteen-unit first aid kit available and inspected weekly? |
| | | | | | | | | | | Personnel wearing PPE required by SSHP for fieldwork (at least safety shoes or boots, safety glasses with side shields, and nitrile or similar gloves to handle potentially contaminated material)? |
| | | | | | | | | | | Personnel using buddy system (maintaining visual or verbal contact and able to render aid)? |
| | | | | | | | | | | If temperature >70° F: heat stress training conducted, cool fluids available, pulse rates of personnel wearing Tyvek being monitored, work/rest cycle in SSHP being followed? |
| | | | | | | | | | | If temperature <40° F: cold stress training conducted, controls in SSHP implemented? |
| | | | | | | | | | | Personnel using appropriate biological hazard controls (see SSHP)? |
| | | | | | | | | | | Drill rig operating manual on site? |
| | | | | | | | | | | Drill rigs inspected weekly and documented? |
| | | | | | | | | | | Personnel near drill rig or other overhead hazards wearing hardhats? |
| | | | | | | | | | | Each of two drill rig kill switches tested daily? |
| | | | | | | | | | | Employees excluded from under lifted loads? |
| | | | | | | | | | | Unnecessary personnel excluded from hazardous areas, specifically near intrusive investigations? |

| DAILY SAFETY INSPECTION | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **PROJECT:** **Page ___ of 3** | | | | | | | | | | |
| **Date** | | | | | | | | | | |
| | | | | | | | | | | |
| **Response (Use Y, N, or NA)** | | | | | | | | | | **ITEM** |
| | | | | | | | | | | |
| | | | | | | | | | | Radius of exclusion zone around drill rig at least equal to mast height? |
| | | | | | | | | | | Personnel wearing hearing protection when within 2 feet of drill rigs, generators, or other noisy equipment? |
| | | | | | | | | | | Containers of flammable liquids closed and labeled properly? |
| | | | | | | | | | | Fully charged fire extinguisher available 25 to 75 feet from flammables storage area and inspected monthly? |
| | | | | | | | | | | Personnel exiting potentially contaminated areas washing hands and face before eating? |
| | | | | | | | | | | Personnel using steam washer wearing faceshield, hearing protection, heavy duty waterproof gloves, Saranax7, or rainsuit? |
| | | | | | | | | | | Portable electrical equipment double-insulated or plugged to a GFCI? |
| | | | | | | | | | | Electrical wiring covered by insulation or enclosure? |
| | | | | | | | | | | Three-wire, UL-approved extension cords used? |
| | | | | | | | | | | Housekeeping adequate (walkways clear of loose, sharp, or dangerous objects and trip hazards; work areas clear of objects that might fall on employees)? |
| | | | | | | | | | | Walking/working surfaces safe (not slippery, no unguarded holes, no trip hazards)? |
| | | | | | | | | | | Confined-space entry (entry into trenches deeper than 4 feet) performed according to SSHP and EC&HS Procedure 10? |
| | | | | | | | | | | Excavations deeper than 5 feet shored or sloped (if personnel will enter) and in compliance with SSHP? |
| | | | | | | | | | | Moving (rotating) machinery guarded to prevent employee contact? |
| | | | | | | | | | | Fall protection provided for work at elevations greater than 4 feet? |

**DAILY SAFETY INSPECTION**

**PROJECT:** **Page ___ of 3**

| **Date** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | |
| **Response (Use Y, N, or NA)** | | | | | | | | | | **ITEM** |
| | | | | | | | | | | MSDSs for hazardous materials on site? |
| | | | | | | | | | | If work is conducted in areas open to hunting (and during season), high visibility vests and other alerting systems such as lights, noise devices (radios) in use? |
| | | | | | | | | | | Fifteen-minute eyewash (accessible and full) within 100 feet of areas where corrosive sample preservatives are poured? |
| | | | | | | | | | | Potable and nonpotable water labeled? |
| | | | | | | | | | | Chainsaws have anti-kickback protection? Personnel wearing cut resistant gloves, protective chaps? |
| | | | | | | | | | | Visitor access controlled? |
| | | | | | | | | | | Site hazards and controls consistent with SSHP? |
| | | | | | | | | | | Site hazard controls appropriate and sufficient? |

Actions taken to correct or control any "N" responses:

Name Signature Date

# APPENDIX C

# HOSPITAL LOCATION MAP

# Hospital Location Map