US Army Corps
of Engineers®
Buffalo District

FINAL

SAMPLING AND ANALYSIS PLAN

VOLUME 1 - FIELD SAMPLING PLAN

SEAWAY SITE - AREAS A, B and C

TONAWANDA, NEW YORK

JULY 2001

200.1e

Seaway_04.02_0012_a

COMMITMENT TO IMPLEMENT THE SEAWAY SITE CHARACTERIZATION SAMPLING AND ANALYSIS PLAN

[redacted]

[redacted] 7/27/01

[redacted]

SAIC Program Manager

[redacted] [redacted] [redacted]

[redacted] [redacted] [redacted]

[redacted] [redacted] Date

COMMITMENT TO IMPLEMENT THE SEAWAY SITE CHARACTERIZATION

SAMPLING AND ANALYSIS PLAN

VOLUME 1 – FIELD SAMPLING PLAN

[redacted] [redacted] Date

SAIC Program Manager

[redacted] 7/30/01

Date

SAIC Project Manager

[redacted] 7/31/01

Date

SAIC Technical Manager

[redacted] [redacted] [redacted]

[redacted]

COMMITMENT TO IMPLEMENT THE SEAWAY SITE CHARACTERIZATION SAMPLING AND ANALYSIS PLAN

VOLUME 1 – FIELD SAMPLING PLAN

[redacted] [redacted] Date

SAIC Program Manager

[redacted] [redacted] Date

SAIC Project Manager

[redacted] [redacted] Date

SAIC Technical Manager

[redacted] 2001

Date

SAIC QA Manager

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

FIGURES

TABLES

TABLE OF CONTENTS (Continued)

ATTACHMENTS

LIST OF ACRONYMS AND SYMBOLS

AEC	Atomic Energy Commission
ASTM	American Society for Testing and Materials
BOD	biologic oxygen demand
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	Chain of Custody
CQC	chemical quality control
CQCR	Chemical Quality Control Representative
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
DQCRs	Daily Quality Control Reports
EE/CA	Engineering Evaluation/Cost Analysis
EPA	U.S. Environmental Protection Agency
FCR	Field Change Request
FSA	Feasibility Study Addendum
FSP	Field Sampling Plan
FUSRAP	Formerly Utilized Sites Remedial Action Program
HTRW CX	USACE Hazardous Toxic and Radioactive Waste Center of Expertise
IATA	International Air Transportation Association
IDW	investigation-derived waste
KPA	Kinetic Phosphorescence Analysis
LIMS	Laboratory Information Management System
MED	Manhattan Engineer District
NCR	Nonconformance Report
NYSDEC	New York State Department of Environmental Conservation
PARC	Precision, Accuracy, Representativeness and Completeness
PP	Proposed Plan
PPE	Personal Protective Equipment
ROD	Record-of-Decision
QA/QC	quality assurance/quality control
QAPP	Quality Assurance Project Plan
SAP	Sampling and Analysis Plan
SC	Site Characterization
SOP	Standard Operating Procedures
SVOCs	semi volatile organic compound
TCLP	Toxicity Characteristic Leaching Procedure
TOC	total organic carbon
USACE	United States Army Corps of Engineers
USCS	Unified Soil Classification System
VOCs	volatile organic compounds
WET	Waste Extraction Test
WL	working levels

1.0 INTRODUCTION

This Sampling and Analysis Plan (SAP) has been prepared for limited site characterization activities at the Formerly Utilized Sites Remedial Action Program (FUSRAP) site known as the Seaway Site, Areas A, B and C, located in Tonawanda, New York. The SAP has been developed in accordance with the United States Army Corps of Engineers (USACE) guidance document *Requirements for the Preparation of Sampling and Analysis Plans*, EM 200-1-3, September 1994 (USACE 1994).

This portion of the SAP is designated the Field Sampling Plan (FSP). The scope of the FSP is to define, to the extent practical, methods and procedures for field sampling activities and management of investigation-derived waste (IDW) that are required as part of the limited site characterization activities. Topics addressed within the scope of the FSP include field activities, sample management/documentation, sample packaging and shipping, IDW management, field quality control procedures and reporting, and corrective action procedures related to sample collection and field measurements.

1.1 LOCATION OF THE SEAWAY SITE

The Seaway Site is located in Tonawanda, NY, north of Buffalo, as shown in Figure 1-1, and is between two other FUSRAP sites, Ashland 1 and Ashland 2, as shown in Figure 1-2. The property comprises about 100 acres referred to as the Seaway Industrial Park. It is owned by the Sands Mobile Park Corporation, successor by merger to the Seaway Industrial Park Development Company, Inc. and since the late 1980's was operated as a landfill by Browning-Ferris Industries, Inc. (BFI) through its subsidiary, Niagara Landfill, Inc, which occupies most of the Seaway Site. The FUSRAP sites, Areas A, B and C, are shown in Figure 1-3. The landfill ceased operations in 1993 and most of the landfill, excluding Areas A, B and C have been capped, as shown in Figure 1-4, in accordance with requirements of the New York State Department of Environmental Conservation (NYSDEC). Approximately 89 acres of the Seaway property have been used for landfilling. The original topography of the Seaway property has been drastically altered by the landfill, which rises to an elevation of approximately 120 feet above the surrounding area in the portions of the landfill that have been filled to finished grade and capped.

In 1983, a clay cutoff wall and leachate collection system was constructed at the landfill. The design approved by the NYSDEC required that the cutoff wall have a permeability of 1×10^{-7} centimeters per second (cm/s) or less over a width of 2 ft. The depth of the cutoff wall as constructed varied with site conditions and ranged from 6 to 24 feet below the ground surface. The wall was keyed into the underlying clay strata a minimum of 2 feet and the thickness of the wall is 30 to 36 inches (CH2M Hill 1984). The location of the cutoff wall is shown in Figure 1-4

The leachate collection pipe system installed at the landfill in 1983 consists of 6-inch diameter perforated pipe installed inside the clay cutoff wall in a gravel/crushed stone trench surrounded by filter fabric. The perimeter leachate collection pipes drain to low spots in the system, on the east and west sides of the landfill. Leachate collected at these locations is pumped northerly to high points in the system, with flow continuing northerly by gravity to a metering manhole located on the northern portion of the landfill property and then by gravity to the Town of Tonawanda municipal wastewater collection system at a manhole on River Road (USACE 2000a).

1.1.1 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 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 Remedial Investigation (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 a thinner layer of material (0 to 10 feet thick) (BNI 1993).

1.1.2 Previous Investigations

Numerous studies have been conducted at the Seaway Site and documented. There were three key documents associated with the original Proposed Plan prepared by the DOE (DOE 1993a), which address the Seaway Site.

These documents are:

- the RI report (BNI 1993) which describes the nature and extent of areas with elevated levels of radionuclides;

- the Baseline Risk Assessment (BRA) (DOE 1993b) which assesses the risks to public health and the environment posed by the site; and

- the Feasibility Study (FS) (DOE 1993c) which describes how the cleanup options discussed in the original Proposed Plan (DOE 1993a) were developed and evaluated.

A document prepared by DOE in 1997 developed a site-specific guideline for cleanup of radioactive contamination at the Ashland 1, Ashland 2, and Seaway sites for use in decision-making on cleanup of these properties (DOE 1997). USACE evaluated and considered this guideline in developing and assessing remedial alternatives for Seaway Areas A, B and C. In developing and evaluating the remedial alternatives for Seaway Areas A, B, and C, USACE has also taken into consideration the 1992 Town of Tonawanda Waterfront Development Plan, which describes the intended future use for the vicinity of the Seaway Site (Ernst and Young 1992).

The more recently prepared USACE documents, which address the Seaway Site, are:

- To supplement the information available in 1993, USACE conducted additional investigations in Seaway Areas A, B and C in 1998. These investigations included a gamma walkover survey of Areas A, B and C and a limited surface and subsurface investigation in Areas B and C, including the analyses of 44 soil samples for the presence of radionuclides. The findings of these investigations are reported in two documents, *Gamma Walkover Survey of the Seaway Landfill, Tonawanda, New York* (USACE 1998b) and *Additional Surface Characterization of Areas B and C at the Seaway Site* (USACE 1999a).

- USACE reassessed the volume estimates of radioactively contaminated material present in Seaway Areas A, B and C, considering the estimates available in the 1993 FS and PP, subsequent estimates by DOE and the new information obtained during 1998 USACE investigations. The reassessment also uses three-dimensional modeling techniques in refining the estimates of the location and in-situ volumes of radioactively contaminated material. The findings of the reassessment are detailed in *Technical Memorandum: Synopsis of Volume Calculations for Seaway Site Areas A, B and C, Tonawanda, New York* (USACE 1999b).

- USACE also re-evaluated the risks posed by the presence of radioactively contaminated material in Seaway Areas A, B and C. The findings of these re-evaluations are provided in the document entitled *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, Revision 2 (USACE 2000b). This document incorporates findings of investigations conducted by USACE in 1998 (USACE 1999a), the updated estimates of contaminated volumes in Areas A, B and C (USACE 1999b) and also addresses refinements in the alternatives now being considered for Seaway Site remediation.

- USACE estimated the potential air quality impacts of radon in landfill gas from Areas A, B and C. These estimates were used in assessing remedial alternatives involving capping Areas A, B and C, if landfill gas collection and flaring or passive landfill gas venting is necessary. The findings of this assessment are detailed in *Technical Memorandum: Estimates of Air Quality Impacts of Radon in Landfill Gas, Seaway Site, Areas A, B and C, Tonawanda, New York* (USACE 2000c).

- USACE performed an evaluation of the 10 CFR Appendix A, Criterion 6(6), which included the calculation of surface and subsurface benchmark doses, the derivation of non-radium concentrations that would produce the benchmark dose, and an evaluation of hypothetical residual concentrations assuming Criterion 6(6) were selected as an ARAR for the Seaway Site. The results of the evaluation are contained in *Technical Memorandum: Application of 10 CFR Part 40, Appendix A, Criterion 6(6) and Derivation of Benchmark Doses for the Seaway Landfill Areas, A, B, and C, Tonawanda, New York* (USACE 2000d).

1.2 PURPOSE

The work to be conducted under this FSP will provide additional limited characterization of Areas A, B and C and to supplement the information already available from the RI and other previous investigations. The investigation is to: (1) aide in better estimating the volume of material in Areas B and C that may need to be remediated to allow for more accurate estimating in the Proposed Plan, (2) provide a better understanding of how much, if any, of the excavated material, particularly in Area A, may need to be managed and disposed of as a mixed waste for providing more accurate cost estimates in the Proposed Plan, and (3) assess the potential impacts of landfill materials in and around the MED material on the mobility of the MED material and the possible subsequent impacts to the groundwater.

Contaminants associated with MED/AEC activities for this project consist of radionuclides generated during uranium processing activities at the former Linde site between 1942 – 1948 and subsequently placed in the landfill as discussed earlier. Contaminants of concern at the Seaway Site are primarily uranium-238 (U-238), thorium-230 (Th-230), and radium-226 (Ra-226). Based on the historical use of the Seaway Site, chemical, and possibly radiological, contaminants unrelated to MED/AEC activities are also present at the Site, but may only be remediated if mixed with MED/AEC constituents.

1.3 SCOPE AND OBJECTIVES

Area A

The key question that this field effort is seeking to address for Area A is:

1. What percentage of material, if any, excavated from Area A would need to be managed as a mixed waste as a result of other landfill materials present?

Since the MED material was mostly placed on the surface over existing refuse, there would be little opportunity for the residues to be mixed with other refuse in those areas, thus minimizing the likelihood of hazardous wastes being present in residues excavated from those areas. There were, however, a few areas where refuse and/or fill material were placed over the residues placed in Area A as evidenced by the boring logs completed during the RI. Chemical data is needed from Area A to assist in better estimating how much of the radiologically-contaminated material excavated from Area A would possibly contain chemical wastes that would have to be managed as hazardous waste, thus resulting in mixed waste.

Areas B and C

The key questions that this field effort is seeking to address for Areas B and C are:

1. What is a more accurate volume estimate of the MED residues in Areas B and C for use in evaluating the various alternatives?
   a. Were the isolated piles of residue noted by ORNL during their 1978 survey left relatively intact thus resulting in a much smaller volume than is currently being used?
   b. Were the isolated piles of residue noted by ORNL during their 1978 survey spread over a large area thus resulting in volumes similar to what is currently being used?
2. What impact would any landfill materials in and around the MED residues have on the mobility of these residues?
3. Would any chemicals in and around the MED residues result in any excavated materials being required to be managed as a mixed waste?

The primary objectives would be first to locate the piles of residues placed in these areas, as indicated in the ORNL survey conducted in 1978, and identify the extent of the contamination, and then to identify any chemical constituents in the areas due to other refuse placed there that could affect the waste disposal characteristics of any material removed for disposal and/or could possibly effect future leachability of the residues.

1.3.1 Summary of Field Activities

The primary area of focus for this investigation is in Areas B and C, with limited efforts in Area A. The field activities that will take place are described below:

1. Correlation Study Effort

A correlation study will be conducted at the onset of the field effort. The objective of this effort is to establish a bounding correlation between in-hole gamma logging results and low-end concentrations that would be used as a decision point on whether there is or is not any MED-related residues present that must be addressed. The approach for obtaining the data to do this correlation is to place borings in known areas of MED-related residues, place a boring in an area where MED materials are not present, and place all borings in the same manner as will be done throughout Areas B and C. The bounding correlation results between soil sample results and in-hole gamma logging results will be used in delineating the extent of contamination in Areas B and C. The study will involve the placement of two borings in Area A where known contamination exists and one adjacent to Area B where no MED-related material was placed. One of the two placed in Area A will be placed in an area where aerial photos indicate that fly ash may have been placed in the area so as to provide a correlation to non-MED materials that may be present and have similar radionuclides. The other boring in Area A will be placed where RI borings indicate the presence of fill material above and below the MED-related residues. The boring adjacent to Area B will provide a correlation with the in-hole gamma log results to the landfill materials in Areas B and C. The location of these borings are shown in Figure 1-5.

Approximately five (5) samples will be collected from each of the two borings placed in Area A and three (3) from the boring placed adjacent to Area B. The number of samples may be more, dependent on field results, but should not exceed twenty (20). The sample intervals and locations will be dependent on the in-hole gamma logging results as well. Where elevated readings are obtained with the in-hole gamma logging instrument, those areas should be sampled and analyzed. Selected areas with minimal to no activity should also be sampled and analyzed to assess what the possible soil concentrations are that the in-hole gamma logging device can detect and whether a more sensitive device is needed. All samples will be, at a minimum, subjected to the following radionuclide analyses:

- Gamma spectrometry analysis (to quantify gamma-emitting radionuclides such as Ra-226 and Ac-227); and
- Alpha spectrometry analysis (to quantify uranium and thorium isotopes).

Also see Table 2-1 in Section 2 for a detailed list of radionuclides and analytical methods.

The results will then be used to establish a lower bounding correlation between field gamma results and radionuclide concentration levels that would distinguish whether MED-related residues are present or not. The associated in-hole gamma logging results will then be used as the unit of measure in determining the extent of contamination in Areas B and C.

2. Determine Extent of Contamination in Areas B and C (Phase I)

The aerial extent of the MED-related materials in Areas B and C will be established by placing a series of 4-inch, or larger, boreholes, lined with PVC pipe throughout Areas B and C. All borings used in this field effort will be constructed in the same manner. A drilling rig, at this time assumed to be a Rotosonic drill rig, will be used to bore a hole 4 inches or larger and then a 4-inch PVC pipe placed in the hole prior to performing the in-hole gamma logging.

The first set of borings will be placed at nine (9) biased locations (2 in Area B and 7 in Area C) where aerial photos illustrate the residue piles were located (see Figure 1-5). The maximum depth of each boring will be the topographic elevation at the time the residues were placed in the area plus an additional five (5) feet, or to native clay, to account for possible minor errors in elevation reading. Additional borings would then be placed based on the results from the biased boring locations. The Field Team, consisting of representatives from USACE, NYSDEC, USEPA and other stakeholders, will assess the results in the field. USACE will consider input from NYSDEC, USEPA and other stakeholders present in the field in determining the location of additional borings These additional borings are assumed to be placed in a linear manner at ~40-meter intervals along the perimeter of the North/North-East perimeter of Area C, at ~20-meter intervals along the Southern perimeter of Area C and around the remaining perimeter of Area C. All perimeter borings will be placed ~5 meters in from the designated boundaries. This placement approach is illustrated in Figure 1-5. Modifications to the location of the borings will be dependent on two major factors. The first factor is the ability of the drill rig to get to the proposed location and operate safely. If a proposed location is inaccessible, then the Field Team will identify an alternate location. The second factor is based on the results from the previous borings and whether some of the proposed locations need to be relocated. An in-hole gamma log will be completed for each boring to assess whether there are any areas exceeding the bounding correlation results from above, thus indicating the presence of elevated radiological materials.

To assess whether any of this material may be located near or under the closed portion of the landfill, a series of boreholes will be placed in a linear manner at ~20-meter intervals between Areas B and C and the closed portion of the landfill as illustrated in Figure 1-5. If an elevated area is found, additional borings may be located at ~10-meter intervals around the elevated boring location as illustrated in Figure 1-5 if determined to be necessary by the Field Team after review of all other data from other borings in the area. A boring between the elevated boring location and the closed portion of the landfill will only be placed if space allows without disturbance of the cap. If elevated readings are found in any of these additional borings, then additional borings may be placed around them as discussed above until the Field Team is confident that the extent of the contamination is understood.

Upon completion of all field activities, the PVC pipe will be removed from the boreholes and bentonite pellets placed back into the hole. Removed PVC piping will be steam cleaned to remove soil and the piping managed as a solid waste with the decontamination water falling to the ground as discussed in Section 5.0. If removal is not possible, then the PVC pipe will be ground-in-place prior to filling with the pellets. IDW soil (non-radiological) will be placed back into the same hole from which it was removed. Radiological IDW will be managed as discussed in Section 5.0.

3. <u>Determine Nature of Contamination (Phase II)</u>

The results from the boring efforts (Phase I) discussed above will provide a much better definition of the extent of the contamination in Areas B and C than what is present today. The nature of the contaminants will be assessed using the core material from the biased boring locations in Areas B and C as well as the Area A bias borings (see Figure 1-5). For the borings in Area C, the analyses of the core material will be limited to the first five (5) biased borings that have an in-hole gamma reading indicating the presence of MED-related residues. For Area B, the analyses will be performed for both borings. The following analyses will also be done on the core material from all of the borings completed in Area A.

A. All cores removed from biased sample locations and Area A will be prepared in the field for future TCLP analysis, if necessary;
B. If a particular boring has an elevated gamma reading, then the prepared samples for the core from that boring, up to a maximum of five borings for Area C, will be shipped to the lab for the following analyses:
    a. TCLP on one-foot composite of material above the area containing the radiological material with the composite including some of the radiological area.
    b. TCLP on one-foot composite of material below the area containing the radiological material with the composite including some of the radiological area.
    c. Radiological analysis of a six-inch sample of the radiological material, if possible, otherwise the largest sample possible up to six inches. The radiological analyses will be the same as those identified above for the correlation efforts.
    d. TCLP on the 6-inch samples of the radiological material with an isotopic analysis (U, Th, Ra) performed on the TCLP solution to assist in determining leachability of the radiological materials under simulated landfill conditions.
C. If, using an OVA meter, there is an elevated reading when any of the Area A or Areas B and C biased boring cores are scanned, then a composite from that area, for up to five areas in total for all of the biased borings, will be shipped for analysis of semi-volatiles, PCBs, and volatiles to provide data needed for assessment of worker protection during any remediation efforts.
D. For any core materials shipped offsite for analyses, additional analyses will be performed beyond the radiological and TCLP data to provide additional information necessary for assessing the suitability for disposal of the waste at a licensed disposal facility.

The above data from the biased boring locations in Areas B and C and the borings in Area A will form the basis for understanding the nature of the radiological materials present in the landfill.

1.3.2 Data Quality Objective Summary

Data Quality Objectives (DQOs) for this project are summarized in Table 1-1, below. These DQOs were developed based on the scope approved by the TPP (Attachment A) and discussed earlier in this section.

1.4 Reporting of Results

The results from this investigation will be documented in a technical memorandum and issued by the USACE. These results will supplement previous investigations results and will be integrated into the FSA and PP for the Seaway Site. The technical memorandum will include, at a minimum, the analytical results, the field logs, drilling logs, down-hole gamma log results, figure(s) showing where the borings were placed, and summarization of the results. The final technical memorandum will be added to the administrative record.

Table 1-1
Data Quality Objectives

Data to be Collected	Intended Data Use(s)	Data Need Requirements	Appropriate Sampling and Analysis Methods
Soil Samples – • Ra, Th, U • Ra, Th, U (TCLP) • TCLP constituents • Soil pH • Reactivity (cyanide and sulfide) • moisture content (acceptability for disposal)	*Project objective(s) satisfied.* Determine leachability of MED-related materials and any impacts of other landfill chemicals in and around the MED-related materials. (Nature) Determine acceptability for disposal at licensed disposal facilities. (Nature)	*Data user perspective(s):* Risk Compliance Remedy *Contaminant or characteristic of interest identified:* Ra, Th, U, Leachability (TCLP), free liquids, reactivity, *Media of interest identified;* Subsurface Soil *Required sampling areas or locations and depths identified;* MED material, interval above, and interval below MED material at the Biased locations *Number of samples required* Up to 20 *Reference concentration of interest or other performance criteria* Method Limit	*Sampling Method* Hand – remove from boring material retrieved by the Rotosonic drilling *Analytical Method* Per EPA laboratory methods: Full characteristic TCLP (32 organics, 8 RCRA metals, and copper and zinc) Ra-226 – Gamma Spec Th, U – Alpha Spec Isotopic on TCLP leachate Paint Filter Test Reactivity for cyanide and sulfide Soil pH Modified TCLP - Use TCLP procedure substituting acid solution with pH similar to pH of landfill leachate - Isotopic on TCLP leachate

Data to be Collected	Intended Data Use(s)	Data Need Requirements	Appropriate Sampling and Analysis Methods
Soil Samples – • Ra, Th, U • TCLP constituents • Ra, Th, U (TCLP)	*Project objective(s) satisfied.* Correlation study results for use with gamma logging efforts. (Extent) Hazardous nature of materials in Area A.	*Data user perspective(s):* Risk Compliance Remedy *Contaminant or characteristic of interest identified:* Ra, Th, U associated with gamma logging results for various intervals, TCLP *Media of interest identified;* Subsurface Soil *Required sampling areas or locations and depths identified;* MED material, interval above, and interval below MED material at locations in Area A as well as one location outside of Areas A, B and C. *Number of samples required* Up to 20 *Reference concentration of interest or other performance criteria* Method Limit	*Sampling Method* Hand – remove from boring material retrieved by the Rotosonic drilling *Analytical Method* Per EPA laboratory methods: TCLP Ra-226 – Gamma Spec Th, U – Alpha Spec Isotopic on TCLP leachate

Data to be Collected	Intended Data Use(s)	Data Need Requirements	Appropriate Sampling and Analysis Methods
Gamma Logging Results – Measured counts per second	*Project objective(s) satisfied.* Determine extent of contamination in Areas B and C. (Extent)	*Data user perspective(s):* Risk Compliance Remedy *Contaminant or characteristic of interest identified:* Ra, Th, U *Media of interest identified;* Subsurface Soil *Required sampling areas or locations and depths identified;* Every boring in Areas B and C. Correlation Borings. *Number of samples required* Minimum one-foot intervals for all borings placed in Areas B and C. *Reference concentration of interest or other performance criteria* NA	*Sampling Method* Down Hole Gamma Logging *Analytical Method* NA

Data to be Collected	Intended Data Use(s)	Data Need Requirements	Appropriate Sampling and Analysis Methods
Waste Characteristics (If required)	*Project objective(s) satisfied.* Dispose of waste materials offsite (if required)	*Data user perspective(s):* Remedy *Contaminant or characteristic of interest identified:* Soil/Water – waste parameters *Media of interest identified;* Waste *Required sampling areas or locations and depths identified;* N/A – collected waste materials *Number of samples required* To be determined by waste facility license (if required) *Reference concentration of interest or other performance criteria* To be determined by waste facility license (if required)	*Sampling Method* Fractionation, Storage Tank or drum sampling (water) *Analytical Method* Standard EPA protocols.

Data to be Collected	Intended Data Use(s)	Data Need Requirements	Appropriate Sampling and Analysis Methods
Physical Survey of sample locations	*Project objective(s) satisfied.* Locate sample locations and elevations	*Data user perspective(s):* Compliance Remedy *Contaminant or characteristic of interest identified:* N/A *Media of interest identified;* N/A *Required sampling areas or locations and depths identified;* N/A *Number of samples required* N/A *Reference concentration of interest or other performance criteria* N/A	*Sampling Method* Physical Survey *Analytical Method* N/A

2.0 FIELD ACTIVITIES

2.1 OVERVIEW

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

- civil surveying;
- drilling of boreholes with a drill rig;
- collection of soil samples;
- downhole gamma logging; and
- equipment decontamination.

Fieldwork will generally be performed in the following sequence:

1. pre-deployment activities (training, coordination, etc.);
2. identify one reference location outside Seaway Area B;
3. complete boring, collect soil samples and perform gamma logging;
4. identify five biased boring locations in Seaway Area A;
5. complete borings, collect soil samples and perform gamma logging;
6. complete correlation study between Area A and the reference area gamma logging and soil data – identify field action level;
7. identify two biased boring locations in Seaway Area B and seven biased boring locations in Seaway Area C;
8. complete borings, collect soil samples (as necessary) and perform gamma logging;
9. delineate Areas B and C using a series of borings with gamma logging

2.2 Soil Boring

2.2.1 Sampling Plan

2.2.1.1 Sample Locations

Soil borings will be collected from multiple locations within Area A, Areas B and C, and a reference area in the vicinity of Area B. Boring activities will include the collection of a soil core, soil samples from certain 6-inch intervals, and gamma logging the length of the borehole. A study will be conducted to correlate gamma logging results with analytical data from the soil samples collected from Area A and the reference area. Results from the correlation study will be used to guide the efforts in Areas B and C. Specific activities are described in more detail below and in the following subsections.

Because correlation study data will be used as a basis for comparison for all other data, it will be critical that data from all locations be collected in the same manner. Specifically, soil samples from all locations will be collected in the same general manner and subjected to the same analyses. Gamma logs from all locations will be performed and documented in the same manner. All samples will be submitted to the laboratory for TCLP analysis and the quantification of radionuclide constituents as presented in Table 2-1.

Reference Boring

One correlation study boring location will be identified adjacent to Area B for collecting soil samples and gamma logging data. The location will be selected from an area considered not impacted by MED-related residues or other radiological wastes such as fly ash. Data collected from this boring will represent background or reference levels for the rest of the field effort. That is, these reference levels will be used to establish baseline detector responses (for the gamma logging equipment) and soil concentrations against which all other data will be compared. This reference boring will serve as one of the three correlation study borings.

The boring should extend 8 to 10 feet below the ground surface, will be logged using gamma logging equipment, and will be sampled at three 6-inch intervals. Sample intervals will be selected by the field team so as to represent the range of radiation levels throughout the length of the boring. (The field team should note that radiation levels will likely decline with depth as the ground itself will provide shielding from cosmic radiation. This decline should not flatly be interpreted as a reduction of radiation levels originating from the soil matrix.) The boring location selection process will be based on best professional judgement and historical data.

Area A

Five boring locations will be identified in Area A to target three distinct contaminant profiles. The profile for four borings (three biased borings and a correlation study boring) will include a lens of MED-related residues. Ideally, these borings will extend through at least a foot of non-MED-related fill material, through a lens of MED-related residues, and then through at least another foot of non-MED-related materials. The profile for the fifth boring (a correlation study boring) will include a layer of fly ash contaminated soil under a layer of fill material (based on a review of aerial photographs). The purpose of the data collected from this location will be to provide information about non-MED-related radiological contamination that may be encountered in the study area.

All borings should extend 8 to 10 feet below the ground surface, will be logged using gamma logging equipment, and will be sampled at as many as five 6-inch intervals. Up to four of these samples should be collected from the MED-related (or fly ash) residues. Sample intervals will be selected by the field team so as to represent the range of radiation levels from the radiologically contaminated portions of the boring. The remaining sample(s) will be collected at the interfaces between MED-related residues and backfill materials. Samples from each interface will ideally contain a mixture of 1-to-3 parts MED-related residues to 5-to-3 parts backfill materials (totaling 6 parts). For the lens boring, a sample will be collected at the interface both above and below the MED-related residues.

Two additional surface soil samples will be collected from locations that are not covered by backfill material (i.e., the MED-related residues are located at the surface as evidenced by the gamma walkover results of 1998).

Table 2-1. Analyses for Soil Samples Obtained from Seaway Site

Soil Samples	Analytical Parameter[a]	Test Method[b]	Field Samples by Area	Field Duplicate Samples	MS/MSD Samples	Rinsate Samples[c]	Trip Blanks	Total Samples	USACE QA Split Samples
All Samples	Ac-227, Am-241, Co-60, Cs-137, K-40, Pa-231, Ra-226, Ra-228, U-235 and U-238	Gamma Spectroscopy[d]	Area A: 29 Areas B/C: 21 Reference: 3	6	3	2	-	64	6
All Samples	Isotopic thorium (Th-228, Th-230 and Th-232)	Alpha Spectroscopy	Area A: 29 Areas B/C: 21 Reference: 3	6	3	2	-	64	6
All Samples	Isotopic uranium (U-234, U-235 and U-238)	Alpha Spectroscopy	Area A: 29 Areas B/C: 21 Reference: 3	6	3	2	-	64	6
All Samples	VOCs, SVOCs, pesticides, herbicides, metals and radionuclides	TCLP	Area A: 19 Areas B/C: 21 Reference: 3	5	3	2	-	53	5
All Samples	Radionuclides	TCLP modified[e]	Areas B/C: 21[f]	3	2	2	-	28	3

(a) – Am-241, Co-60, Cs-137 and K-40 are not site-related contaminants but are included given that these radionuclides are present in background, or have been identified in the local environment.

(b) – Gamma spectroscopy is a single analysis regardless of the number of analytes. For example, a single sample is required to quantify all gamma-emitting radionuclides. Each isotopic analysis is a separate analysis. Specifically, isotopic uranium analysis is separate from isotopic thorium is separate from gamma spectrometry.

(c) – Rinsate results are not used to adjust the analytical results but are a quality assurance measure for making sure that decontamination is working.

(d) – The analytical method for Ra-226 will be negotiated with the analytical laboratory. Radon emanation is preferred, but gamma spectrometry, alpha counting, or some other methods may be approved by USACE

(e) – TCLP modified is the same as the standard TCLP procedure except that the acidity of the TCLP solution will be consistent with pH at the landfill. Additionally, only radionuclides will be analyzed.

(f) – These test will only be performed for samples where the results from the standard TCLP test show elevated levels of radiological materials in the locations.

Areas B and C

The primary objectives at Areas B and C are to identify MED-related residue piles, to define the lateral extent of contamination, and to define the chemical characteristics of residues. Area B and Area C borings will be classified as either biased (to locate residue piles) or systematic (to define lateral boundaries). Samples will be collected from biased borings only with a maximum of 20 samples from Areas B and C combined. All boreholes (biased and systematic) will be gamma logged.

As many as nine (9) biased boring locations will be identified in Areas B and C (2 in Area B and 7 in Area C). The biased borings will target areas where topographical maps indicate the presence of small piles (as deposited by dump trucks, typically 4-to-5 feet high prior to compaction and/or spreading). The borings should extent 8 to 10 feet below the pile surface, will be logged using gamma logging equipment, and will be sampled from up to three 6-inch intervals. Sample intervals will be selected by the field team so as to represent the range of radiation levels throughout the length of the boring and may be limited by boring so as not to exceed a total of 20 samples for Areas B and C combined.

Systematic borings will be distributed along the boundaries of Areas B and C. Ideally, these samples will be located about 10 to 15 feet inside the respective perimeters and will be spaced from 65 to 130 feet (20 to 40 meters) apart. The specific locations may be adjusted based on the results from the biased borings. However, the initial intent is to space systematic borings as follows (note that Area C is shaped like a crescent moon that is concave on the north side):

- at 65-ft (20-m) intervals along the perimeter Area B;
- at 65-ft (20-m) intervals along the southern arc of the Area C perimeter; and
- at 130-ft (40-m) intervals along the northern arc of the Area C perimeter.

The systematic boring frequency may be adjusted depending on the information gained throughout the effort. Additional borings may be required to define lateral extent, or fewer borings may be required where there is no evidence of the existence of MED-related residues. Adjustments may also be required where safety is a concern (e.g., slope too steep for drill rig) or where the integrity of the existing landfill cap is at risk.

2.2.2 Procedures

SAIC's Health Physics Procedures Manual and Standard Operating Procedures (SOPs) for the various components of the characterization activities are incorporated by reference. The Health Physics Procedure Manual and SOPs address sampling, operation and quality control of radiation monitoring equipment, conducting radiological surveys, equipment decontamination, cleaning and decontaminating sample containers and field equipment, chain-of-custody, sample packaging and shipping, field measurements, and field changes. Relevant SOPs are listed below:

FTP-400	Equipment Decontamination
FTP-405	Cleaning and Decontaminating Sample Containers and Sampling Equipment
FTP-550	Soil Sampling Using a Spade or a Scoop

FTP-605	Chain-of-Custody
FTP-650	Labeling, Packaging and Shipping of Environmental Field Samples
FTP-655	Chemical Analysis
FTP-750	Field Measurement Procedures: Organic Vapor Detection
FTP-752	Field Measurement Procedures: Combustible Gas Detection
FTP-755	Field Measurement Procedures: Screening for Volatile Organic Compounds
FTP-1200	Field Quality Control
N/A	Detailed Operating Procedure – Borehole Geophysical Survey (Modified for downhole gamma logging)

Quality Assurance (QA) activities and procedures to be implemented during the characterization efforts are addressed in the Quality Assurance Project Plan (QAPP).

2.2.2.1 Field Measurement Procedures and Criteria

Rotosonic drilling will be accomplished with a truck-mounted Superdrill 150 drill rig, or similar. The Rotosonic boreholes will be drilled and cored by simultaneously advancing two lines of drill pipe, a 4-inch inside diameter inner core barrel and a 6-inch inside diameter outer drive casing. A drill bit consisting of a hardened steel ring with tungsten carbide inserts will be fastened to both the inner core barrel and the outer drive casing. This allows the core barrel and casing to be advanced as a single unit. After drilling a 15- or 20-foot interval, the outer casing is held in place within the boring while the inner core barrel is removed. A 4-inch diameter continuous core of soil or landfill material will be extruded from the core barrel, sealed in a plastic sleeve, and laid out on a working tray for field screening, visual description, and sampling. The process is repeated by adding successive 15- or 20-foot lengths of casing and drill pipe until the bottom of the boring or desired depth is reached.

Each of the core samples will be screened in the field for organic vapors and radiological activity. After retrieving a core sample and laying it on the work tray, a small slit is made in the plastic sleeve encasing the sample at 2-foot intervals. The probe tip of a Photovac Micro Tip photoionization detector (PID) will be inserted into the slits and the organic vapor content recorded. After recording the organic vapor measurements, the entire plastic sleeve will be cut open and the entire core scanned with an Eberline Model E-600 Digital Survey Instrument and a SHP-380 probe, or equivalent. Radiation levels will also be recorded for each extracted core sample (for health and safety purposes) and down each borehole (to locate intervals with elevated radionuclide concentrations). These radiation levels will be compared to the local background measurements collected and recorded at each coring location. Also see below under the "field Measurements" subheading.

The core samples obtained by the Rotosonic drilling method will be described based on visual inspection. The descriptions will include characteristics such as grain size, Unified Soil Classification System (USCS) criteria, color, moisture content, and other pertinent field observations. Descriptive logs of the soil borings will be developed. Samples will be collected from the soil cores and homogenized.

Soils samples designated for VOC analyses will be collected and preserved in Encore® samplers. The samples will be obtained by peeling away the outer ½-inch layer from the appropriate 1-foot core interval, quickly pressing the sampler into the soil core at several places within the sample interval, and sealing the sampler with the airtight cap provided by the manufacturer. The sampler will be enclosed in a re-sealable waterproof pouch, labeled, and placed on ice to await processing and shipment to the laboratory. If contamination is identified, by either visual examination or field screening, in a relatively thin discrete zone within the selected sample interval, the VOC sample will be collected from only that discrete zone instead of the entire 1-foot interval.

Field Measurements

Radiological field measurements to be performed during drilling will be limited to scanning the extracted core for gross activity and down-hole gamma logging. Scanning of the core will be performed using a calibrated, response checked hand-held radiation detector [e.g., a shielded Geiger-Mueller or a 2-inch by 2-inch (2×2) NaI detector]. Extracted cores will be scanned at a source to detector distance of approximately 1 inch and at a rate not exceeding 2 inches per second. A reading will be recorded where readings exceeding the detector-specific threshold, or minimum detectable, values (e.g., 2000 cpm above background for the 2x2) are measured. The extracted core will not be rotated.

Down-hole gamma logging will be performed using a 2×2 NaI detector. A four-inch diameter boring is required for this equipment. The general procedure outlined in "Detailed Operating Procedure – Borehole Geophysical Survey" will be followed, with the equipment being switched to a 2×2 NaI detector. At a minimum, a gamma reading will be recorded every one-foot interval and wherever a sample is collected.

Health and safety monitoring will also be conducted. This monitoring will be primarily for volatiles and methane and will include VOC (using an HNu/PID), and O_2, LEL, H_2S (using a multi-gas meter), and radiation levels (e.g., using an alpha/beta scintillator).

A description of the calibration requirements and performance checks for the field instruments to be used for field measurements is presented in the Seaway QAPP.

Boring Logs

Each boring log will fully describe the subsurface environment and the procedures used to gain that description. All borings will be recorded in the field by the site geologist on Engineer (ENG) Form 5056-R and 5056A-R (Figure 2-2). A scale of 1.0 inch on the log equaling 1.0 foot of soil boring will be used during soil boring log preparation. A copy of the soil boring log will be submitted to the USACE project manager as soon as drilling is completed and the log has been photocopied; the original soil boring log will be maintained with the project file. Original soil boring logs will be of sufficient legibility and contrast so as to provide comparable quality in reproduction and will be recorded directly in the field without transcribing from a field book or other document.

All boring logs generated during drilling will routinely contain the following information (also see Table 2-2):

- Unique boring number and location denoted on a sketch map as part of the log.
- Depths or heights recorded in feet and decimal fractions thereof (tenths of feet).
- Field estimates of soil classification in accordance with the Annual Book of American Society for Testing and Materials (ASTM) Standards, Volume 04.08, D 2488 (ASTM 1995) prepared in the field at the time of sampling by the site geologist.
- Full description of each soil sample collected, including the parameters noted in Table 2-2 and visual numeric estimates of secondary soil constituents and quantitative definitions of description terms (i.e., trace, some, several, etc.) recorded on the log.
- Description of drilling equipment, including such information as probe-drive sampler size (inner and outer diameter), compressor type, rig manufacturer, and model.
- Any special problems encountered during drilling and their resolution.
- Dates and times for the start and completion of the soil boring along with notation by depth for drill crew shifts and individual days.
- Each sequential boundary between various soil types and individual lithologies.
- The depth of first-encountered free water along with the method of determination and any subsequent distinct water level(s) encountered thereafter. Before proceeding, the first encountered water will be allowed to partially stabilize (5 to 10 minutes) and will be recorded along with the time between measurements. Note that if water-rotary drilling methods are used, this information will not be available.
- Interval by depth for each core collected, including the length of core, length of core recovery, down pressure, start and finish time of run, zones of core loss, and the sampler type and size (diameter and length).
- Total depth of drilling and sampling.
- Results of field scanning for gamma activity for each sample and results of screening (i.e., VOCs, LEL, O_2, H_2S) at each location (prior to and immediately following sample collection). Notation will include interval sampled, corresponding screening results, and key to the specific instrument used to obtain readings. A general note will be made on the log indicating the manufacturer, model, serial number, and calibration information for each instrument used.

- Definition of any special abbreviations used at the first occurrence of their usage.

Note that not all borings will have soil sampling conducted. Soil will be characterized based on soil borings.

Table 2-2. Summary of Soil Parameters to be Recorded on Soil Boring Logs

Classification
Depositional environment and formation, if known
ASTM D 2488 group symbol
Secondary components and estimated percentages
Color (using Munsell or GSA Rock Color Chart). Give both narrative and numerical description and note which chart was used.
Plasticity (cohesive soil)
Consistency (cohesive soil)
Density (noncohesive soil)
Moisture content in relative terms
Structure and orientation
Grain angularity
Downhole Gamma Results

2.2.2.2 Sample Collection for Laboratory Analyses

After retrieval, the soil core will be placed on a table covered by clean plastic sheeting. Cores will be removed from the core barrel (if a core barrel is used), measured and examined.

Samples will be collected from certain sample intervals as described in Section 2.2.1.1 of this FSP. Immediately after preparing the samples and completing of container label information, each sample container will be placed into a sealable plastic bag and then placed into an ice-filled cooler to ensure preservation. Each sample will be analyzed for the constituents listed in Table 2-1.

2.2.2.3 Field Quality Control Sampling Procedures

Duplicate QC samples and QA split samples will be collected in association with the collection of soil samples. Duplicate and split soil samples will be derived as described in Section 2.2.2.2 of this FSP.

2.2.2.4 Field Decontamination

Decontamination of drilling equipment used for the collection of soil core samples and PVC piping used in the borings will be conducted at the location where the boring is performed. All decontamination liquids will be allowed to fall to the surface since there are no drainages off the site and all liquid discharges from the site are collected by the leachate collection system and discharged through an NPDES permitted discharge point. The procedure for decontamination of the drill rig will be as follows:

- Remove caked soil material from the exterior of tooling using a rod and/or brush.
- Steam clean interior and exterior of equipment with approved water, using a brush where steam cleaning is not sufficient to remove all soil material.
- Rinse thoroughly with approved potable water.
- Allow equipment to air dry as long as possible.
- Place equipment, if possible, on clean plastic if immediate use is anticipated, or wrap in plastic to prevent contamination if longer-term storage is required.

Downhole and nondedicated sampling equipment will be decontaminated after each use during soil boring interval sampling. The procedure for decontamination of sampling equipment will be as follows:

- Coring tools will be rinsed clean between core runs and steam cleaned between boring locations.
- Wash with approved water and phosphate-free detergent using various types of brushes required to remove particulate matter and surface films.
- Rinse thoroughly with approved potable water.
- Rinse thoroughly with ASTM Type I or equivalent water.
- Allow equipment to air dry as long as possible.
- Place equipment on clean plastic if immediate use is anticipated, or wrap in plastic or aluminum foil to prevent contamination if longer-term storage is required.
- Following decontamination of drilling, downhole and nondedicated sampling equipment, each piece of equipment will be scanned by a radiation technician using hand-held instrumentation to confirm the level of alpha radiation contamination on the equipment.

2.2.3 Parameters of Concern/Analytical Protocols and PARC

As discussed in Section 2.2, the parameters to be addressed, at a minimum, during laboratory analysis of soil samples collected from soil borings are as follows: thorium-228/230/232, uranium-234/235/238, radium-226/228, actinium-227, and protactinium-231. Table 2-1 contains the complete list of analytes. The analytical protocols to be used for chemical analysis of soil samples are discussed in the QAPP. The precision, accuracy, representativeness, and completeness (PARC) criteria for soil sample analytical results are also discussed in the QAPP.

2.2.4 Sample Containers, Preservation, and Holding Times

Information regarding sample containers, preservation techniques, and holding times for rock/soil samples collected for chemical analysis during drilling is presented in the QAPP. All containers used for soil samples will be provided by contracted laboratories.

2.2.5 Sample Management

Information regarding the management of soil samples, including sample storage, packaging, shipment, field documentation, sample labeling, identification, traceability, chain-of-custody, and IDW management, is presented in Sections 3.0 through 8.0 of this FSP.

2.3 CIVIL SURVEYING

The base coordinate system for the characterization work is NY State Plane, referenced to the North American Datum, 1983. All data produced by this characterization effort will be delivered in NY State Plane. Elevation data (e.g., ground surface elevations) will be in feet above mean sea level and will be referenced to the National Geodetic Vertical Datum, 1929 Adjustment. Depth data (e.g., depth to water table measurements, or depth to samples) will be in feet below a known elevation reference point.

Survey monuments will be established at key locations across the site to facilitate the establishment of local grids and the implementation of spatial accuracy quality assurance/quality control (QA/QC) techniques. These monuments may be based on established site features (i.e., building corners, large rocks, trees, etc.) or may be introduced. All monuments will be appropriately marked in the field so that they are readily identifiable, will be tagged with their name and NY State Plane location, and will have their positions in NY State Plane recorded electronically. The subcontractor responsible for the civil survey will provide the project with a hard-copy report and an electronic copy of the civil survey.

In certain instances (i.e., nonintrusive geophysical surveys and gamma walkover-over surveys), it may be advantageous to work with local coordinate systems. In the event that local coordinate systems are used, these local coordinate systems will be tied to at least three established monuments and the final data deliverables will be transformed into the NY State Plane requirement.

The base level of accuracy for all mapping work at the site is 0.1 ft for horizontal coordinates and 0.1 ft for general vertical measurements. If methodologies are used to determine locations that cannot guarantee a locational error of less than 0.1 ft horizontally or 0.1 ft vertically, these data will be accompanied by an estimate of the maximum and average error expected from the methodology used to generate the data. Examples of methodologies likely to be used at the site that fall into this category are Global Positioning Systems (GPS), hand-held survey instruments, and chaining techniques. In the case of all data sets collected for the Site that involves spatial coordinates, data set-specific QA/QC techniques will be employed that can identify and eliminate egregious locational errors. Examples of these techniques include visual reviews of mapped data, the use of monument recovery as QA/QC controls, and the use of survey closure techniques.

3.0 SAMPLE CHAIN-OF-CUSTODY/DOCUMENTATION

3.1 FIELD LOGBOOKS

All information pertinent to site characterization including field instrument calibration data, will be recorded in field logbooks. The logbooks will be bound and the pages will be consecutively numbered. Entries in the logbooks will be made in black waterproof ink and will include, at a minimum, a description of all activities, individuals involved in site characterization activities, date and time of drilling and sampling, weather conditions, any problems encountered, and all field measurements. Lot numbers, manufacturer names, and expiration dates of standard solutions used for field instrument calibration will be recorded in the field logbooks. A summary of each day's activities will also be recorded in the logbooks.

Sufficient information will be recorded in the logbooks to permit reconstruction of all site characterization activities conducted. Information recorded on other project documents will not be repeated in the logbooks except in summary form where determined necessary. All field logbooks will be kept in the possession of the Field Manager, or in a secure place when not being utilized during fieldwork. Upon completion of the field activities, all logbooks will become part of the final project evidence file. The title page of each logbook will be labeled with the following information:

- logbook title (e.g., Seaway Areas A, B and C Investigations),
- project name (e.g., Seaway Site, Areas A, B and C, USACE – Buffalo District FUSRAP Project),
- USACE contract number and project delivery order number,
- start date for field activities recorded in the logbook, and
- end date for field activities recorded in the logbook.

Entries recorded in logbooks will include, but not be limited to, the following information:

- Name and title of author, date, and times of arrival at and departure from the work site.
- Purpose of the site characterization activity.
- Name and address of the field contact(s).
- Names and responsibilities of field crew members.
- Names and titles of any site visitors.
- Type, matrix, and containerization method for IDW generated.
- Sample collection method.
- Number and volume of sample(s) collected.
- Location, description, and log of sampling point photographs.
- References for all maps and photographs of the sampling site(s).
- Information regarding sampling changes, scheduling modifications, and change orders.

- Information regarding site characterization decisions not recorded by other mechanisms.
- Information regarding access agreements, if applicable.
- Details of the sampling location, including a sketch map illustrating the sampling location.
- Date and time of sample collection, and name of collector.
- Field observations.
- Types of field instruments used and purpose of use, including calibration methods and results.
- Any field measurements made (e.g., radiological activity and landfill gas).
- Sample identification number(s).
- Identification of QA/QC samples.
- Information from containers, labels of reagents used, deionized and organic-free water used, etc.
- Sampling type and methodology, including distinction between grab and composite samples.
- Sample preservation methods.
- Sample distribution and transportation (e.g., name and address of the laboratory and courier).
- Name and address of the government QA laboratory for the project and the associated project Laboratory Information Management System (LIMS) number.
- Sample documentation information including
  - chain-of-custody (COC) record numbers,
  - description of the number of shipping containers packaged (including contained COC records) and the shipping method employed (noting applicable tracking numbers).
- Decontamination procedures.
- IDW documentation information including
  - types of containers/drums;
  - contents, type, and approximate volume of waste;
  - type of contamination and predicted level of contamination based on available information.
- Summary of daily task (including costs where appropriate) and documentation on any cost or scope or work changes required by field conditions.
- Signature and date entered by personnel responsible for observations recorded.

3.2 PHOTOGRAPHS

For each photograph taken during the project, the following items will be noted in the field logbook:

- date and time,
- photographer (name and signature),
- site name,

- aspect and description of the subject taken, and
- film roll number, if applicable, and sequential number of the photograph.

Photographs taken to document sampling points will include two or more permanent reference points within the photograph to facilitate relocating the point at a later date. In addition to the information recorded in the field logbook, one or more site photograph reference maps will be prepared as required.

3.3 SAMPLE NUMBERING SYSTEM

A unique sample numbering scheme will be used to identify each sample designated for laboratory analysis. The purpose of this numbering scheme is to provide a tracking system for the retrieval of analytical and field data on each sample. Sample identification numbers will be used on all sample labels or tags, field data sheets and/or logbooks, COC records, and all other applicable documentation used during the project.

The sample numbering scheme used for field samples will also be used for duplicate samples so that these types of samples will not be discernible by the laboratory. Other field QC samples; however, will be numbered so that they can be readily identified. A summary of the sample-numbering scheme to be used for the project is presented in Table 3-1.

Table 3-1 Sample Numbering Scheme for the Seaway Site

Sample Identification: XXX-AAAmmNNNNnnnz	
XXX = Site Designator	Site designators used for the project will be as follows: Seaway Site = SEA
AAA = Project Designator	The Project Designator used for this project will be COR – Correlation Study ARA – Area A Data ARB – Area B Data ARC – Area C Data
mm = Sample Media	<u>Examples</u> Soil Sample = SS Gamma Log = GL Quality Control = QC
NNNN = Sample Number	The Field Manager will maintain a listing of four digit station identifiers and correlate them to specific sampling/station locations. Numbers from 0 to 8999 indicate regular samples. Numbers from 9001 to 9999 indicate duplicates.

nnn = Sample Interval	Examples 002 = 0 to 2 foot sample interval 004 = 2 to 4 foot sample interval 006 = 4 to 6 foot sample interval 068 = 66 to 68 foot sample interval 106 = 104 to 106 foot sample interval
z = Sample Type*	Examples 0 = Regular 1 = Duplicate 2 = Split 3 = Trip Blank 4 = Equipment Rinsate 5 = Site Source Water Blank

* Sample type should not be shown on the COC sent to the laboratory. This will maintain the "blind" status of the field duplicates.

3.4 SAMPLE DOCUMENTATION

3.4.1 Sample Labels

Labels will be affixed to all sample containers during sampling activities. Information will be recorded on each sample container label at the time of sample collection. The information to be recorded on the labels will be as follows:

- contractor name,
- sample identification number,
- site name and sampling station number,
- analysis to be performed,
- type of chemical preservative present in container,
- date and time of sample collection, and
- sampler's name and initials.

3.4.2 Sample Field Sheets and/or Logbook

Each field team will have a field logbook that will contain, at a minimum; a table of contents, task team activity log sheets, and sample log sheets or other applicable sheets depending on the logbook activity. Each field logbook will consist of bound forms that have been devised based on the FSP and QAPP. The logbooks will be completed by the field personnel during sampling or other field activities. The sample log/field sheets will contain the following information:

- project name or identification,
- names and affiliations of sample collector,
- instrument measurements,

- sample identification numbers,
- date and time of sample collection,
- method of sample collection and deviations from the sample procedure, and
- analyses required, and
- location referencing measurements

The sample field/log sheet will also act as the field COC form for each sample collected until the samples are transferred to the laboratory COC form for shipment.

3.4.3 COC Records

COC procedures implemented for the project will provide documentation of the handling of each sample from the time of collection until completion of laboratory analysis. The COC form serves as a legal record of possession of the sample. A sample is considered to be under custody if one or more of the following criteria are met:

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

Custody will be documented throughout the project field sampling activities by the COC form initiated for each day during which samples are collected. This record will accompany the samples from the site to the laboratory and will be returned to the laboratory coordinator with the final analytical report. All personnel with sample custody responsibilities will be required to sign, date, and note the time on the COC form when relinquishing samples from their immediate custody (except in the case where samples are placed into designated secure areas for temporary storage prior to shipment). Bills of lading or airbills will be used as custody documentation during times when the samples are being shipped from the site to the laboratory, and they will be retained as part of the permanent sample custody documentation.

COC forms will be used to document the integrity of all samples collected. To maintain a record of sample collection, transfer between personnel, shipment, and receipt by the laboratory, COC forms will be filled out for sample sets as determined appropriate during the course of field work. An example of the COC form to be used for the project is illustrated in the Seaway Site, Areas A, B and C, QAPP.

The following information will be recorded on all COC forms:

- sample number (for each sample in shipment);
- collection date and time (for each sample in shipment);
- number of containers for each sample;

- sample description (i.e., environmental medium);
- analyses required for each sample;
- sample preservation technique(s);
- COC or shipment number;
- USACE LIMS number (only on COC records for government QA sample shipments);
- shipping address of the laboratory;
- date, time, method of shipment, courier, and airbill number; and
- spaces to be signed as custody is transferred between individuals.

The individual responsible for shipping of the samples from the field to the laboratory will be responsible for completing the COC form and noting the date and time of shipment. The individual will be trained in U.S. Department of Transportation (DOT) procedures (per 49 CFR 192.704). This individual will also inspect the form for completeness and accuracy. In addition, this individual is responsible for determining the shipping classification for samples under DOT HM126F. After the form has been inspected and determined to be satisfactorily completed, the responsible individual will sign, date, and note the time of transfer on the form. For commercial couriers, the COC form will be placed in a sealable plastic bag and placed inside the cooler used for sample transport after the field copy of the form has been detached. For laboratory couriers, the COC form will be placed in a sealable plastic bag on the top of the cooler for the courier to accept custody. All shipments shall be in accordance with 49 CFR 171-177. The field copy of the form will be appropriately filed and kept at the site for the duration of the site activities.

In addition to the COC form, COC seals will also be placed on each cooler used for sample transport. These seals will consist of a tamper-proof adhesive material placed across the lid and body of the coolers in such a manner that if the cooler is opened the seals will be broken. The COC seals will be used to ensure that no sample tampering occurs between the time the samples are placed into the coolers and the time the coolers are opened for analysis at the laboratory. Cooler custody seals will be signed and dated by the individual responsible for completing the COC form contained within the cooler.

3.4.4 Receipt of Sample Forms

The contracted laboratory will document the receipt of environmental samples by accepting custody of the samples from the approved shipping company. In addition, the contracted laboratory will document the condition of the environmental samples upon receipt as outlined in Section 4.0 of this FSP.

3.4.5 Cooler Receipt Checklist

The condition of shipping coolers and enclosed sample containers will be documented upon receipt at the analytical laboratory. This documentation will be accomplished using the cooler receipt checklist presented in the Seaway Site, Areas A, B and C, QAPP.

One of these checklists will be placed either into each shipping cooler along with the completed COC form or provided to the laboratory at the start of the project. A copy of the checklist will be faxed to the project manager immediately after it has been completed at the laboratory. The original completed checklist will be transmitted with the final analytical results from the laboratory.

3.5 DOCUMENTATION PROCEDURES

The tracking procedure to be utilized for documentation of all samples collected during the project will involve the following series of steps:

- Collect and place samples into laboratory sample containers, as defined in Section 4.0.
- Complete sample container label information, as defined in Section 3.4.1.
- Complete sample documentation information in the field logbook, as defined in Section 3.1.
- Complete project and sampling information sections of the COC form(s), as defined in Section 3.4.3, for all samples to be transported in a single cooler.
- Complete the airbill for the cooler to be shipped.
- Perform a completeness and accuracy check of the COC form(s).
- Complete the sample relinquishment section of the COC form(s) as defined in Section 3.4.3 and place the form(s) into or on the cooler.
- Place COC seals on the exterior of the cooler as defined in Section 3.4.3.
- Package and ship the cooler to the laboratory as defined in Section 4.0.
- Receive cooler at the laboratory, inspect contents, and transmit via fax of contained COC form(s), and cooler receipt form(s) as defined in Section 3.4.4.
- Transmit original COC form(s) with final analytical results from laboratory.

3.6 CORRECTIONS TO DOCUMENTATION

All original information and data in field logbooks, on sample labels, on COC forms, and on any other project-related documentation will be recorded in black waterproof ink and in a completely legible manner. Errors made on any accountable document will be corrected by crossing out the error and entering the correct information or data. Any error discovered on a document will be corrected by the individual responsible for the entry. Erroneous information or data will be corrected in a manner that will not obliterate the original entry, and all corrections will be initialed and dated by the individual responsible for the entry.

4.0 SAMPLE PACKAGING AND SHIPPING

4.1 SAMPLE PACKAGING

Sample containers will be packaged in thermally insulated rigid-body coolers. Sample packaging and shipping will be conducted in accordance with applicable DOT specifications. Packaging and shipping procedures to be utilized for all samples collected during the project will include the following:

- Sample containers will be adequately identified with sample labels placed onto each container.
- All bottles, except VOC sample containers, will be taped shut with electrical tape.
- Samples containing radioactive materials will be surveyed for the level of external activity to determine appropriate packaging and shipping requirements (see Section 4.2 for samples classified as radioactive materials).
- Each sample bottle will be placed into a separate plastic bag that will then be sealed. As much air as possible will be squeezed from the sample container bags before sealing.
- All of the sample containers will be placed upright in the shipping coolers. Ice is not required for coolers containing samples for radiological analyses. Before initial placement of samples into a rigid-body cooler, the cooler drain plug will be taped shut for both the inside and outside, and the cooler will be lined with a large plastic bag.
- Inert packing material will be placed into the cooler, if required, to prevent shifting of the sample containers during transport.
- All required laboratory paperwork, including the COC form(s), will be placed inside a plastic bag and taped to the inside of the cooler lid. If a laboratory provided courier is used, the paperwork may be attached to the outside of the cooler to facilitate exchange of sample custody.
- Upon completion of the packing process, the cooler lid will be closed and two signed/dated custody seals will be placed on the cooler, one across the front and one across the side.
- Rigid-body coolers will be sealed by applying strapping tape directly to the cooler body.
- The airbill for the shipment will be completed and attached to the top of the shipping box/cooler, which will then be transferred to the courier for delivery to the laboratory.

The checklist presented in Table 4-1 will be used by the individual responsible for packaging environmental samples to verify completeness of sample shipment preparations. In addition, the laboratory will document the condition of the environmental samples upon receipt. This documentation will be accomplished using the cooler receipt checklist discussed in Section 3.4.5.

Table 4-1 Sample Packaging Checklist

SAMPLE PACKAGING CHECKLIST
ATTN: Failure to properly handle or document the project sample could jeopardize the usability of the sample results and ultimately the project objectives. Prior to sending this cooler to the analytical laboratory at the address indicated on the chain-of-custody form, please check the following items; • Is the project clearly identified on the chain-of-custody form (including the USACE delivery order number)? • Are all enclosed sample containers clearly labeled with waterproof (permanent) ink? • Are the required analyses indicated on the bottle labels and chain-of-custody form? • Does the information on the chain-of-custody form match the information on the sample container labels? • Has the chain-of-custody form been packed into a plastic bag and attached to the inside of the cooler lid? • Have the samples been properly preserved, if necessary (acid or base cooling to 4° C)? • Is the client information, including point of contact and telephone number, complete on the chain-of-custody form? • Is there sufficient ice, if necessary (double bagged in sealable plastic bags) in the cooler to ensure preservation of the samples during shipment?

4.2 ADDITIONAL REQUIREMENTS FOR SAMPLES CLASSIFIED AS RADIOACTIVE MATERIALS

Transportation of radioactive materials is regulated by the International Air Transportation Association (IATA) and by DOT. Overnight shippers (e.g., Federal Express) typically ship by air and follow IATA regulations (IATA 1998), while overland transport is governed by DOT regulations promulgated in 49 CFR Chapter I. Samples generated during project activities will be transported in accordance with procedures that ensure compliance with regulatory requirements. Historical data and processing information indicates that no Seaway FUSRAP sample will contain fissile material.

Radiological samples will be shipped in accordance with the following, or equivalent, specifications:

- Each bagged sample container will be placed upright into a cooler.
- The cooler will have its drain plug taped shut inside and out.
- Inert packaging material will be placed in the cooler to prevent shifting during transport.
- All required laboratory paperwork, including the COC form(s), will be placed inside a plastic bag and taped to the inside of the cooler lid. If a laboratory - provided courier is used, the paperwork may be attached to the outside of the cooler to facilitate exchange of sample custody.
- Rigid-body coolers will be sealed by applying strapping tape directly to the cooler body.
- Upon completion of the packing process, the cooler lid will be closed and two signed/dated custody seals will be placed on the cooler, one across the front and one across the side.
- The cooler will be surveyed for radiation and contamination in accordance with SAIC Health Physics Procedures Manual to ensure the package meets the requirements for limited quantity as found in 49 CFR.
- A notice must be enclosed on the outside of the cooler that includes the name of the consignor and the statement "This package conforms to the conditions and limitations specified in 49 CFR 173.421 for radioactive material, excepted package - limited quantity of material, UN2910." The outside of the inner packaging or, if there is no inner packaging, the outside of the package itself, must be labeled “Radioactive.”
- The airbill for the shipment will be completed and attached to the top of the shipping box/cooler, which will then be transferred to the courier for delivery to the laboratory. Dangerous goods airbills will be used for the shipment.
- The following labels will be placed on the cooler:
  - Arrows indicating “This Way Up,”
  - Appropriate hazard class label, and
  - “Cargo Aircraft Only,” if applicable.

- The airbill for the shipment will be completed and attached to the top of the shipping box/cooler, which will then be transferred to the courier for delivery to the laboratory. Dangerous goods airbills will be used for the shipment.

4.3 SAMPLE SHIPPING

All environmental samples collected during the project will be shipped no later than 48 to 72 hours after the time of collection. The latter time of 72 hours may be necessary if the samples are collected on a Friday and have to be shipped on a Monday via commercial courier. During the time period between collection and shipment, all samples will be stored in a secure area. All coolers containing environmental samples will be shipped overnight to the laboratory by Federal Express, similar courier, or laboratory courier. Due to holding time limitations, the contractor will discourage shipping samples on Fridays unless it is absolutely necessary and the laboratory has assured the contractor that personnel will be present on Saturdays to receive and effect any necessary processing within the holding time.

5.0 INVESTIGATION-DERIVED WASTE

USACE-Buffalo District is conducting activities, which generate environmental media, in support of FUSRAP under CERCLA. This media generally consists of soil, sludge, water, and spent personal protective equipment (PPE), resulting from drilling operations, sampling activities, remedial actions, and associated site activities. When accumulated, the media must be managed appropriately to minimize the risk to human health and the environment while adhering to applicable regulatory requirements. The objective of this section is to establish specific management practices for the handling and subsequent disposition of this media.

5.1 INTRODUCTION

IDW includes all materials generated during project performance that cannot be effectively reused, recycled, or decontaminated in the field. IDW consists of material that could potentially pose a risk to human health and the environment (e.g., sampling and decontamination wastes) and materials that have little potential to pose risk to human health and the environment (e.g., sanitary solid wastes). Two types of IDW will be generated during the implementation of field activities: indigenous and non-indigenous. The types of indigenous IDW expected to be generated during the site characterization activities at the Seaway FUSRAP site include subsurface and surface soils, drill fluids, trash, cuttings from landfill coring activities, and possible leachate encountered in borings. The types of non-indigenous IDW expected to be generated include PVC piping used in the borings, compactable and miscellaneous trash including PPE. When accumulated, the media must be managed appropriately to minimize the exposure to human health and the environment while adhering to applicable regulatory requirements.

5.2 IDW COLLECTION AND CONTAINERIZATION

All radiologically-contaminated soil (i.e., soil from an area of the removed core which, when scanned, exceeds twice the background reading associated with the scanning of the reference core) wastes generated during site characterization activities will be drummed at the sampling location and transported to a temporary, onsite staging area. Non radiologically-contaminated soil will be placed back into the hole from which it came and borehole water waste will be discharged onto the site in the area it was removed.

All decontaminated PVC piping removed from the bore holes will be staged in a designated area and placed on a sheet of plastic until completion of the project. At that time, the PVC piping will be transported to Ashland 1 to be managed be USACE as a solid waste.

Used PPE and sanitary waste that are noncontaminated will be placed in trash bags at the point of generation. These bags of sanitary PPE and waste will be collected in lined, sanitary trash cans with lids. PPE and sanitary waste visibly contaminated will be placed in a new 55-gallon DOT Specification 17C open-top drum at the point of generation. The drummed wastes will then be transported to the staging area and temporarily stored in accordance with requirements defined in Section 5.4 until the waste is transferred for final disposal. Prior to the placement of any PPE into trash bags or drums, the PPE will be torn/cut in such a manner as to render it unusable.

5.3 IDW CONTAINER LABELING

Waste storage drums will be labeled to ensure proper management of the contained wastes. Labels will be applied adjacent to, but not covering, the container's seam to allow for inspection of the seam. Labels will not be placed on top of the container lid. If a container is not actively being used for waste accumulation, an "Empty" label will be affixed to the container and the container will be stored inverted. The following procedure will be used to label waste storage drums.

- Two labels will be placed opposite each other on the upper one-third of each drum.
- Each label will be placed on a smooth part of the drum and will not be affixed across drum bungs, seams, ridges, or dents.
- Information to be recorded on each label will include the following:
  - drum number,
  - contents,
  - sample location number and any other specific generation location identifier,
  - project name and site identification,
  - generation date(s), and
  - responsible USACE district, Buffalo District.

5.4 IDW FIELD STAGING

The staging area for the project wastes will be located near or within the radiological-controlled area and/or as approved by the Client (USACE - Buffalo District). The location of the storage area will be coordinated with the property owner. If the staging area is located outside the radiological-controlled area, then it will be transferred inside the radiological-controlled area after field activities have been completed. The staging areas will be flagged or roped off and applicable warning signs will be posted as needed. The IDW drums will be placed on top of wooden pallets. If required, materials identified as hazardous wastes will be transported to an approved storage area designated by the USACE-Buffalo District and/or other responsible party, as applicable. All waste containers will be inspected to ensure container integrity and handled in a manner that is protective of human health and the environment.

IDW, excluding PPE, generated during site activities that requires off-site disposal (radiological and mixed wastes) will be stored at the Seaway Site in Area A and will be disposed of properly when remedial actions are implemented for Seaway. The PPE IDW will be transported to Ashland 1 for proper management.

5.5 IDW SAMPLING/DISPOSAL

Investigative Derived Waste (IDW) generated during the field investigations that are radiologically contaminated will be collected and containerized, as discussed in Section 5.2. All generated IDW will be characterized and labeled in accordance with all applicable regulations and stored on-site in Area A until USACE performs remedial actions at the site, at which time the IDW will be disposed of properly. In addition, all laws and regulations applying to the transportation, processing, treatment, storage and/or disposal of wastes off-site will be complied in accordance with the USACE document *Off-site Disposal of Materials from the Formerly Utilized Sites Remedial Action Program, EC 200-1-3* (USACE 1999c), should the material be shipped off-site for disposal.

Should USACE decide to ship the radiological IDW off-site for disposal prior to site remediation, the sampling and disposal of the IDW could be addressed as follows:

- SAIC will coordinate with the Treatment, Storage and Disposal (TSD) contractor to develop an analyte list and sampling strategy for characterization of the contents of the containerized IDW (i.e., waste disposal characterization).
- SAIC will also coordinate with the TSD subcontractor to identify potential disposal facilities. SAIC will contact the regulatory permitting agency for the disposal facilities identified by the TSD contractor.
- The permitting agency(s) will be contacted to obtain information on the permit status of the disposal facilities.
- SAIC will prepare a letter report for submittal to the USACE that presents recommendations for sampling and analytical requirements. The letter report will also identify the proposed disposal facility. USACE approval of the recommendation presented in the letter report will be required prior to implementing the sampling and analysis or disposing of the IDW.
- Upon receipt of the analytical data, SAIC will prepare the Waste Profile Sheets for the containerized material. The waste profile sheets will be submitted to USACE review and approval/signature.
- The TSD subcontractor will draft the manifest(s) and land disposal restriction notification(s)/certification(s) (LDRs) based on the USACE approved Waste Profile Sheets. The manifest(s) and LDR(s) will be reviewed by SAIC and forwarded to the USACE for review and final approval/signature.

If USACE decides to remove the radiological IDW prior to future remedial actions at the site, the removal for disposal of IDW generated should occur after all field efforts are completed. The USACE will be the generator of the IDW and will be responsible for signing any required manifests and/or bills of lading associated with the transportation and disposal of the IDW.

The transport contractor will be required to have an emergency plan in place prior to transporting the material.

6.0 CONTRACTOR CHEMICAL/RADIOLOGICAL QUALITY CONTROL PROGRAM

The Contractor Chemical/Radiological Quality Control (CCQC) program to be utilized by the contractor for the project will consist of three phases. The three CCQC phases will be the preparatory phase, the initial phase, and the follow-up phase, all of which will be performed by the contractor whether or not a USACE-Buffalo District representative is present.

6.1 PREPARATORY PHASE

The preparatory phase of the CCQC program will be conducted by the contractor chemical/radiological quality control (CQC) representative, in conjunction with contractor and subcontractor field personnel, prior to beginning each definable feature of work. A summary of all activities performed during each preparatory phase meeting will be documented by the CQC representative in a meeting minutes record.

Each preparatory phase meeting will address the following:

- Review of all pertinent sections of the project SAP in order to ensure that all field personnel are cognizant of the overall project data quality objectives, specific project activities to be accomplished, and specific sampling and analysis requirements.
- Review of calibration procedures for all instruments to be used for measurement of field parameters.
- Physical examination of all materials and equipment required to accomplish the specific project activities.
- Review of equipment decontamination procedures in accordance with project FSP requirements.
- Review of how each sample type is to be collected, containerized, documented, and packaged.
- Review of proper IDW management and documentation.
- Review of the procedure for completing all required information to be recorded on sample custody forms, and discussion of the project sample numbering system. Completed examples of a COC form, sample container label, and IDW drum label will be provided to the field personnel for reference.
- Review/discussion of any other activities to be performed as deemed necessary by the CQC representative.
- Examination of the work area(s) to ascertain if all preliminary work is complete.
- Review of preparatory phase field equipment and support materials checklists.

6.2 INITIAL PHASE

The initial phase of the CCQC program will be conducted by the CQC representative and will include the following:

- Oversight of drilling and/or sampling activities and review of this work to ensure compliance with project DQOs.
- Inspection of individual sample labels and COC forms for accuracy, completeness, and consistency.
- Inspection of sample packaging and shipping activities.
- Observation, verification, and documentation of initial and ongoing field instrument calibration.
- Inspection of field logbooks and other field records/sketches to ensure that all pertinent data are recorded in accordance with delivery order requirements.
- Inspection of the QA sample match-up table to ensure that all samples collected during each day are documented properly.

6.3 FOLLOW-UP PHASE

The follow-up phase of the CCQC program will be conducted by the CQC representative and will involve performance of the various activities noted for the initial phase on a daily basis until completion of the particular definable feature of work. It will also involve ensuring that appropriate corrective actions have been taken for any deficiencies found during the initial phase.

7.0 DAILY QUALITY CONTROL REPORTS

During the field activities performed for the project, the contractor will prepare Daily Quality Control Reports (DQCRs), which will be signed and dated by the contractor CQC representative. An example of the DQCR format to be used by the contractor is illustrated in Figure 14-1 of the Seaway Site, Areas A, B and C, QAPP.

These reports will be submitted to the USACE-Buffalo District project manager on a weekly basis. The contents of each DQCR, which are defined in Section 14.1 of the Seaway Site, Areas A, B and C, QAPP, will include a summary of activities performed at the project site, weather information at the time of sampling, results of measurements made with field instruments, results of CQC activities performed including field instrument calibrations, departures from the approved SAP and its attachments, problems encountered during field activities, and any instructions received from government personnel. Any deviations that may affect the project data quality objectives will be immediately conveyed to the USACE-Buffalo District project manager. The following will be attached to each DQCR as appropriate:

- the QA sample table that matches up primary and QA/QC samples collected,
- a summary of field-generated analytical results, and
- any other project-related forms utilized.

8.0 CORRECTIVE ACTIONS

8.1 SAMPLE COLLECTION AND FIELD MEASUREMENTS

Corrective actions will be implemented in the event that a discrepancy is discovered by field personnel, laboratory personnel, and/or during a field or desk audit. The initial responsibility for monitoring the quality of field activities and measurements lies with the field personnel. These personnel are responsible for following QA/QC procedures, while the contractor CQC representative is responsible for verifying that the procedures are being followed. This verification requires that the contractor CQC representative assess the correctness of the field methods and the ability of the field team to meet the QA objectives and to make a subjective assessment of the impact that a procedure has on the field objective and resulting data quality.

If a field problem occurs that might jeopardize the integrity of the project, cause a QA objective not to be met, or affect data quality, the first action taken will be an assessment of the severity of the problem by the contractor CQC representative. If the problem is determined to be minor, the contractor CQC representative will initiate an appropriate corrective action, which will be recorded in the field logbook and in a Field Change Request (FCR) form. An example of the FCR form is provided in the Seaway Site, Areas A, B and C, QAPP. However, if the problem is determined to be significant or subject to recurrence, the Contractor CQC representative will initiate a Nonconformance Report (NCR) that will be submitted to the contractor QA/QC officer. An example of the NCR form is provided in the Seaway Site, Areas A, B and C, QAPP. The contractor QA/QC officer will then propose and implement an appropriate corrective action as documented on the NCR.

The contractor QA/QC officer will be responsible for ensuring that corrective action for nonconformance's are initiated by:

- evaluating all reported nonconformance's,
- controlling additional work on nonconforming items,
- determining disposition or action to be taken,
- maintaining a log of nonconformance,
- reviewing NCRs and corrective actions taken, and
- ensuring that NCRs are included in the project evidence file.

If appropriate, the contractor CQC representative or the QA/QC officer will ensure that no additional work that depends on the nonconforming activity or instrument is performed until corrective actions are implemented.

8.2 LABORATORY ANALYSES

Specific action items and requirements for corrective action related to laboratory analyses and data are discussed in the Seaway Site, Areas A, B and C, QAPP.

8.3 FIELD VARIANCE SYSTEM

Procedures cannot fully encompass all conditions encountered during a field investigation. Variances from the operating procedures, field sampling plan, and/or safety and health plan may occur. All variances that occur during the project activities will be documented within a FCR or NCR and will be noted in the appropriate field logbooks. If a variance is anticipated (e.g., because of a change in the field instrumentation), the applicable procedure will be modified and the change noted in the field logbooks. Field changes fall into three categories: (1) routine, (2) urgent, and (3) emergency.

Routine field changes are those that do not affect the objectives of the FSP and may be approved by the contractor field manager by noting the change in the appropriate field logbook. Urgent or emergency field changes are those that could affect the field sampling objectives, project schedule, or compliance with health and safety requirements. At a minimum, these types of field changes must be approved by the contractor project manager and the USACE project manager prior to implementation.

9.0 LABORATORY QUALIFICATIONS

The radiological laboratory support for the site characterization program will be designated by the contractor based on the laboratories' capacities and capabilities. The selected subcontract laboratory will be validated by the USACE Hazardous, Toxic, and Radioactive Waste (HTRW) Center of Expertise (CX). In addition, for material targeted for offsite disposal , the laboratory utilized for analysis of this material will be certified by the state where the disposal facility is located. The current targeted analytical laboratories for support to the environmental program include [Laboratories to support this project have not been selected yet]. A summary of the testing methods to be used for specific radiological analyses is presented in the Seaway Site, Areas A, B and C, QAPP. The specific analyses to be performed on the various environmental media collected during sampling activities are discussed in Section 2.0 of this FSP.

10.0 REFERENCES

ASTM 1995. ASTM Standards, Volume 04.08, D 2488

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

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

Ernst and Young 1992. *Waterfront Region Master Plan, Town of Tonawanda*, Washington, D.C., September

IATA 1998. International Air Transportation Association (IATA) regulations

Science Applications International Corporation. *Health Physics Procedures Manual, Revision 1, prepared for SAIC/EEMG*, last updated January 19, 2001.

USACE 1994. *Requirements for the Preparation of Sampling and Analysis Plans, EM 200-1-3*, September.

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

U.S. Army Corps of Engineers (USACE) 1998a. *Record of Decision for the Ashland 1 (including Seaway Area D) and Ashland 2 Sites, Tonawanda, New York.* April

U.S. Army Corps of Engineers (USACE) 1998b. *Gamma Walkover Survey of Seaway Landfill, Tonawanda, New York. November.* September

U.S. Army Corps of Engineers (USACE) 1999a. *Additional Surface Characterization of Areas B, and C at the Seaway Site.* March

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) 1999c. Off-site Disposal of Materials from the Formerly Utilized Sites Remedial Action Program, EC 200-1-3

U.S. Army Corps of Engineers (USACE) 2000a. *Addendum to the Feasibility Study for the Seaway Site, Areas A, B and C.* June. Draft.

U.S. Army Corps of Engineers (USACE) 2000b. *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. Army Corps of Engineers (USACE) 2000c. *Technical Memorandum: Estimates of Air Quality Impacts of Radon in Landfill Gas, Seaway Site, Areas A, B and C.* June

U.S. Army Corps of Engineers (USACE) 2000d. *Technical Memorandum: Application of 10 CFR Part 40, Appendix A, Criterion 6(6) and Derivation of Benchmark Doses for the Seaway Landfill Areas A, B, and C, Tonawanda, New York.* June

U.S. Army Corps of Engineers (USACE) 2000e. *Proposed Plan for the Seaway Site, Areas A, B and C.* June. Draft.

U.S. Department of Energy (DOE) 1993a. *Proposed Plan for the Tonawanda Site, Tonawanda, New York.* May

U.S. Department of Energy (DOE) 1993b. *Baseline Risk Assessment for the Tonawanda Site.* DOE/OR-21950-003. August

U.S. Department of Energy (DOE) 1993c. *Feasibility Study for the Tonawanda Site. DOE/OR/21950-234, Oak Ridge, TN.* November

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

Science Application International Corporation (SAIC) Procedures

FTP-400	Equipment Decontamination
FTP-405	Cleaning and Decontaminating Sample Containers and Sampling Equipment
FTP-604	Chain-of-Custody
FTP-650	Labeling, Packaging and Shipping of Environmental Field Samples
FTP-655	Chemical Analysis
FTP-750	Field Measurement Procedures: Organic Vapor Detection
FTP-752	Field Measurement Procedures: Combustible Gas Detection
FTP-755	Field Measurement Procedures: Screening for Volatile Organic Compounds
FTP-880	Field Measurement Procedures: pH, Temperature, Salinity and Conductivity (This procedure may be used for redox potential also – Utilize Horiba U-22 or equivalent as the instrumentation)
FTP-910	Field Measurement Procedures: Turbidity
FTP-955	Field Measurement Procedures: Dissolved Oxygen
FTP-1200	Field Quality Control

FIGURES

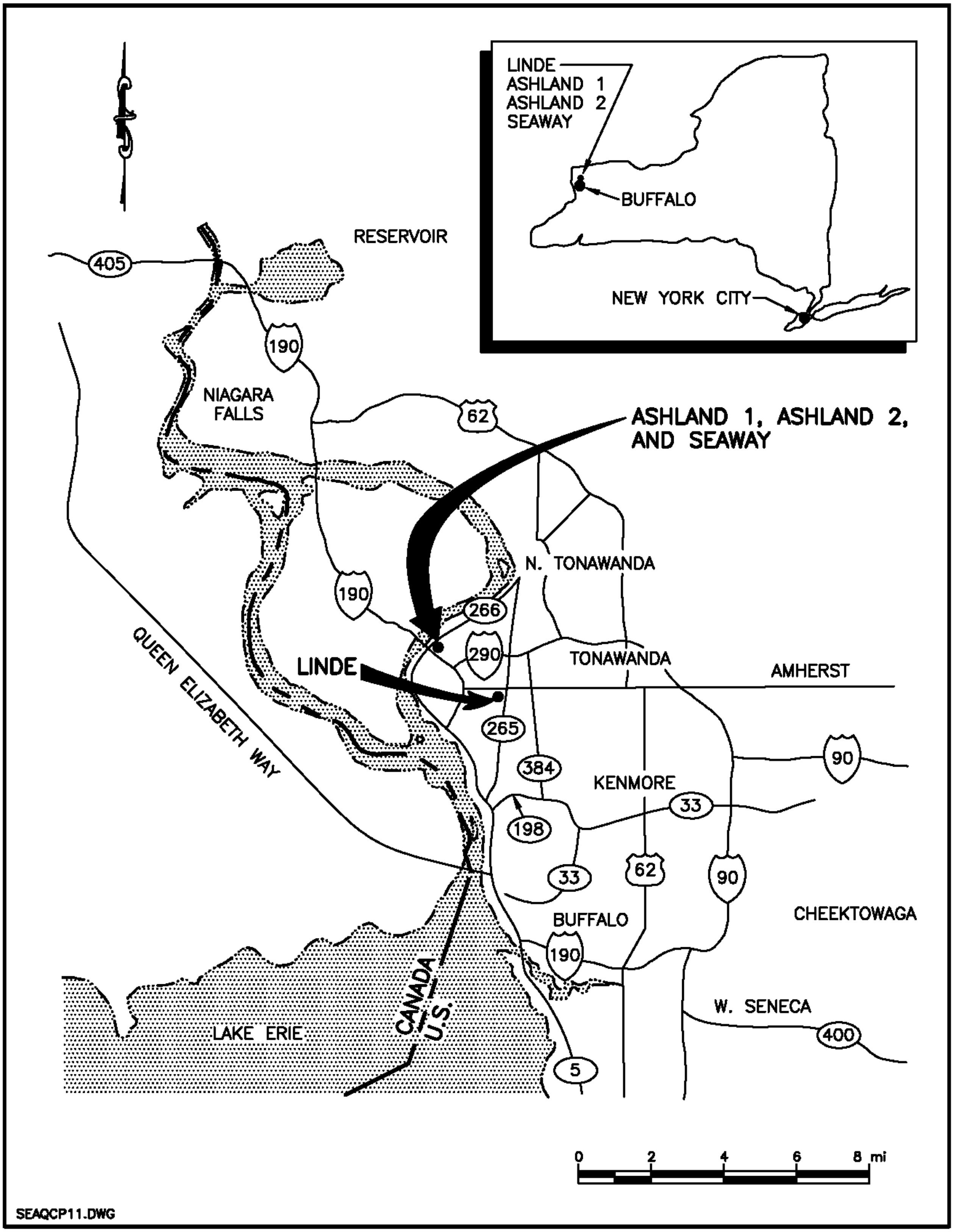
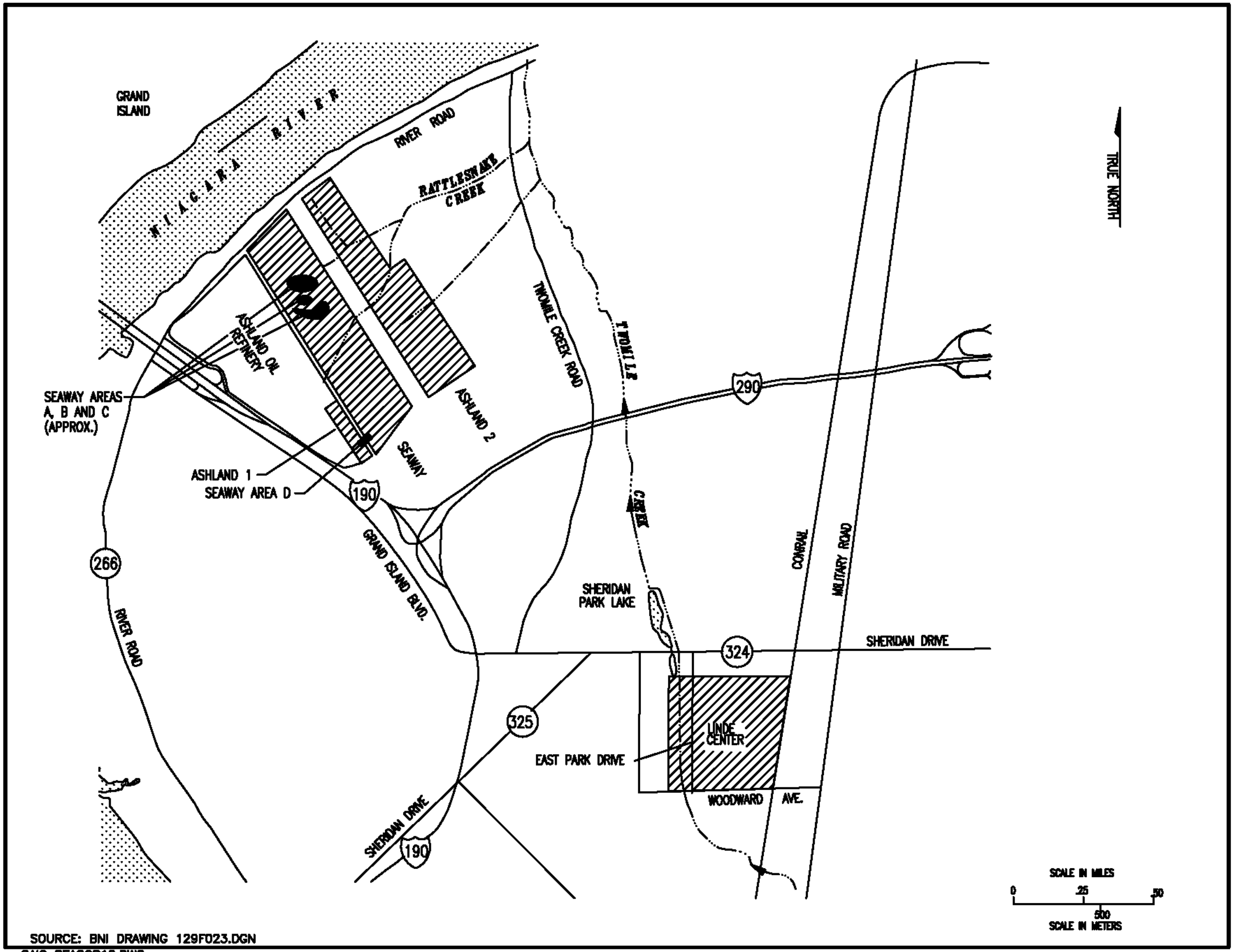


FIGURE 1-1
LOCATION OF THE TOWN OF TONAWANDA, NEW YORK AND
ASHLAND 1, ASHLAND 2, SEAWAY AND LINDE SITES



SAIC SEAQCP12.DWG

FIGURE 1–2
LOCATIONS OF THE ASHLAND 1, ASHLAND 2, SEAWAY AND LINDE SITES

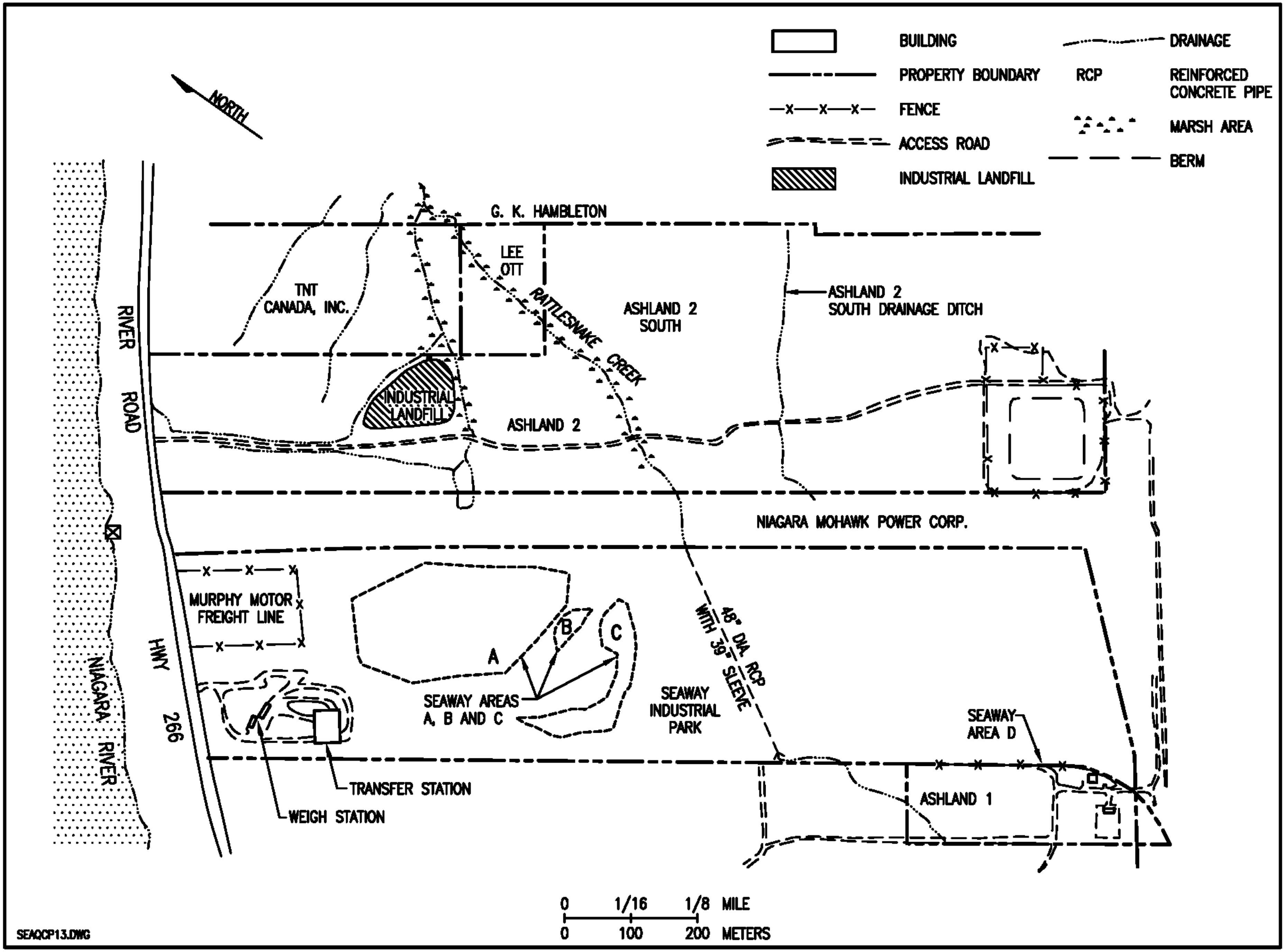


FIGURE 1-3
LOCATION DETAILS - SEAWAY SITE

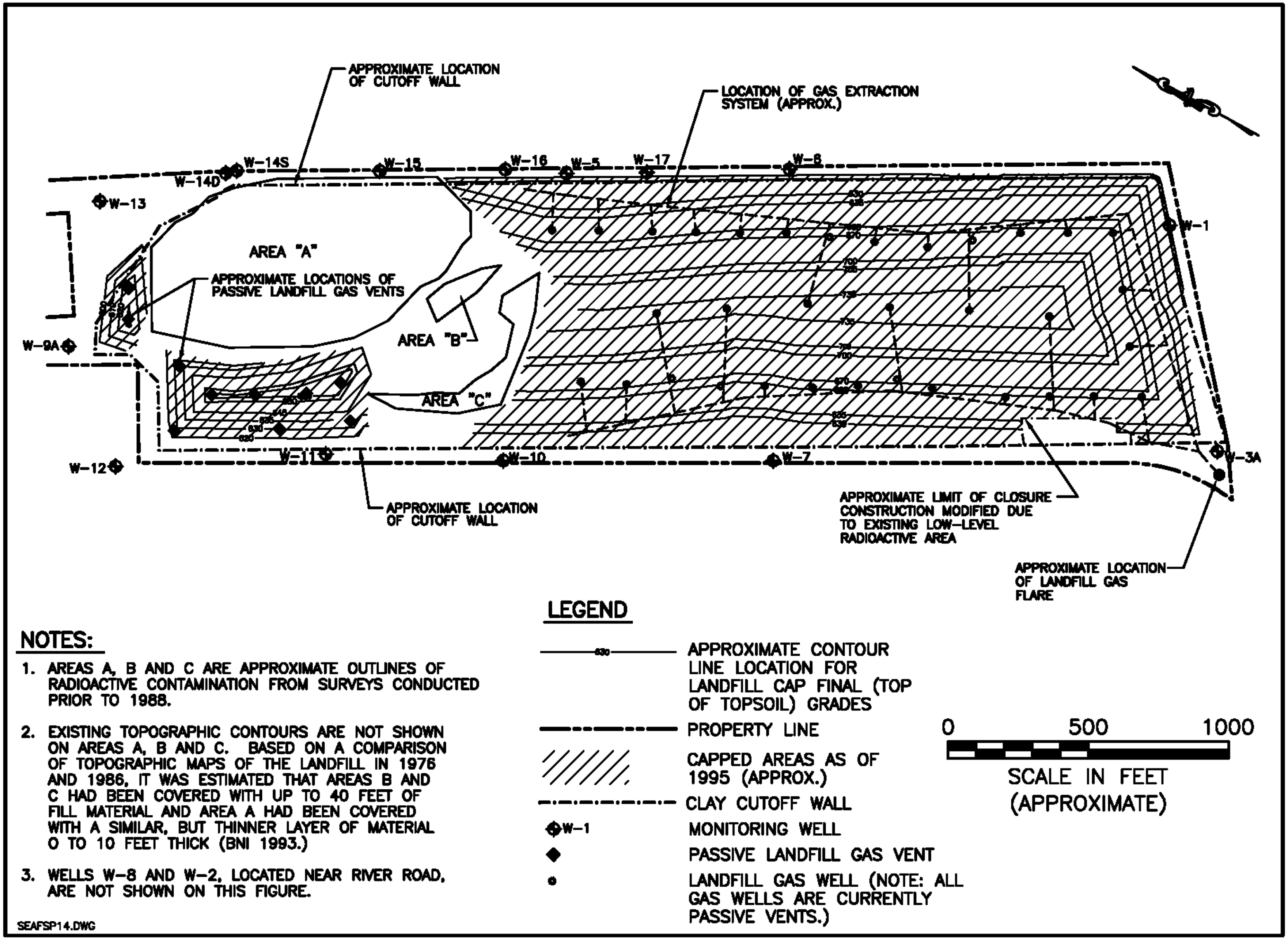


FIGURE 1-4

NIAGARA LANDFILL CLOSURE CONDITIONS

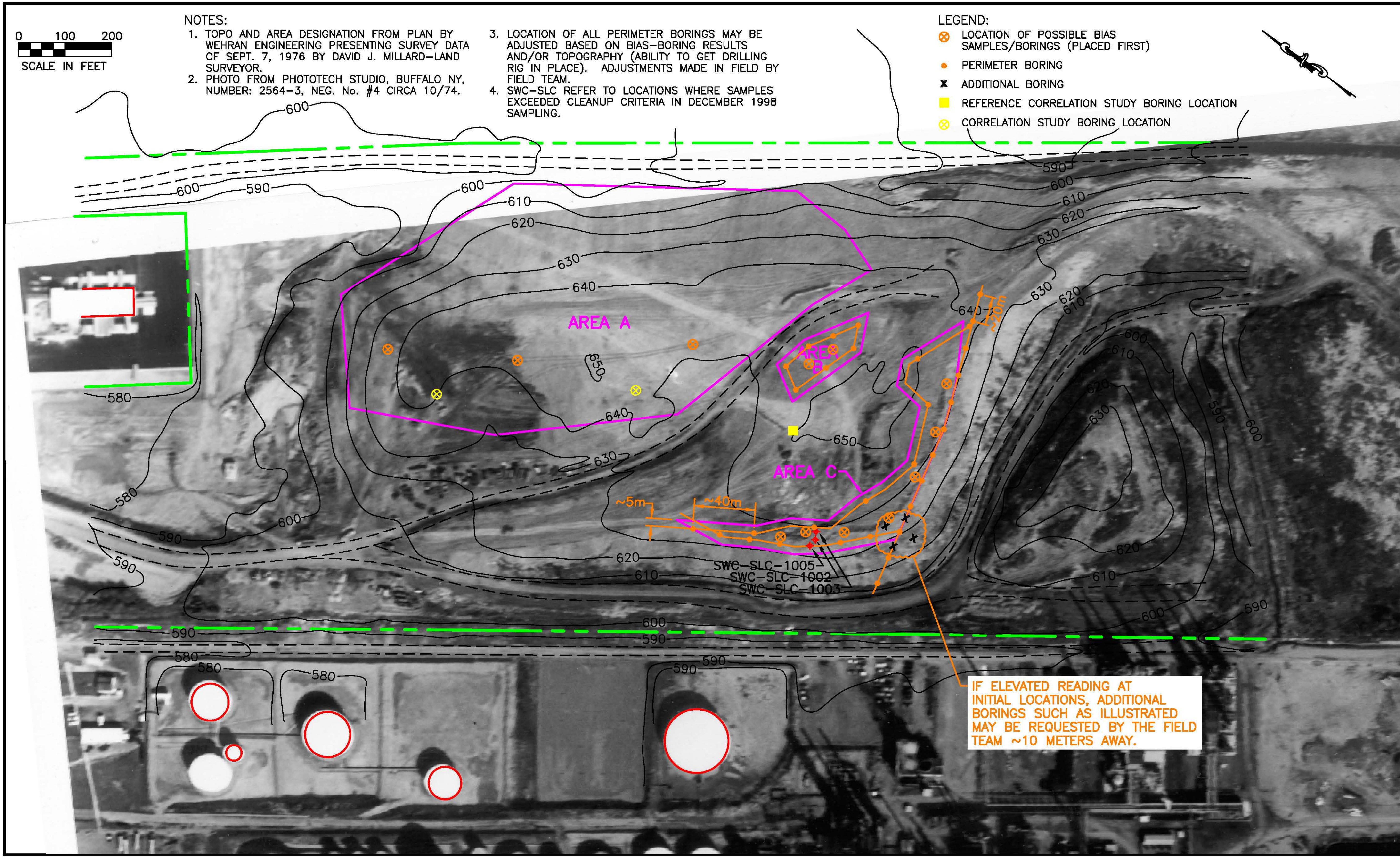


FIGURE 1–5
SEAWAY LANDFILL – 1974 CONDITIONS AND PROPOSED BORING LOCATIONS

HTRW DRILLING LOG

HTRW DRILLING LOG	DISTRICT	HOLE NUMBER
1. COMPANY NAME	2. DRILL SUBCONTRACTOR	SHEET OF SHEETS

3. PROJECT	4. LOCATION
5. NAME OF DRILLER	6. MANUFACTURERS DESIGNATION OF DRILL
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT	8. HOLE LOCATION
	9. SURFACE ELEVATION
	10. DATE STARTED / 11. DATE COMPLETED
12. OVERBURDEN THICKNESS	15. DEPTH GROUNDWATER ENCOUNTERED
13. DEPTH DRILLED INTO ROCK	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED
14. TOTAL DEPTH OF HOLE	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES			
20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR		

LOCATION SKETCH/COMMENTS SCALE:

PROJECT	HOLE NO.

ENG FORM 5056-R, AUG 94 (Proponent: CECW-EG)

Figure 2-2 Engineer Forms 5056-R and 5056 A-R for Borehole Logging

HTRW DRILLING LOG

HOLE NUMBER		
PROJECT	INSPECTOR	SHEET

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO. (E)	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)

Figure 2-2 (continued)

ATTACHMENT A

SCOPING DOCUMENT
FOR
ADDITIONAL SEAWAY SITE, AREAS A, B AND C CHARACTERIZATION

PURPOSE

Additional characterization has been determined to be necessary for the Seaway Sites, particularly Areas B and C. The results of the additional characterization will provide for more accurate assessment of the various alternatives by removing uncertainties associated with the nature and extent of the contamination in Areas B and C. Limited additional data is also needed from Area A to assess what percentage, if any, of waste from that area would have to be managed as a hazardous waste as well as a radiological waste. This document outlines a technical approach to close current data gaps in the understanding of the contamination present in the FUSRAP areas of the Seaway Site.

APPROACH

Seaway Area A

Chemical data is needed from Area A to assist in better estimating how much of the radiologically-contaminated material excavated from Area A would possibly contain chemical wastes that would have to be managed as a hazardous waste. Since the material was mostly placed on the surface over existing refuse, there would be little opportunity for the residues to be mixed with other refuse in those areas, thus minimizing the likelihood of hazardous wastes being present in residues excavated from those areas. There were, however, a few areas where refuse and/or fill material were placed over the residues placed in Area A as evidenced by the boring logs completed during the RI investigation. Borings would be placed at five (5) locations where the RI boring logs indicated that there was fill material above the MED-related residues. Two of these borings will be used for the correlation study discussed in the following section. One of these two correlation borings will be located, as best as possible, in an area where MED-related material and possibly coal fly ash are collocated. The five borings will each be sampled at a one (1) foot interval in the area above where the MED-related material is located and at a 1-foot interval in the area below the MED-material, each to contain some of the MED material itself at the interface. For each boring, the MED material will also be sampled separately with a minimum 6-inch sample, where possible. All samples will be analyzed using TCLP to determine if there are any chemical constituents present that would have to be managed as a characteristic hazardous waste. Two (2) additional soil samples will be taken in the area where there is no evidence of fill material over the residues to confirm, using TCLP, that the residues in these areas do not exhibit hazardous waste characteristics and whether there is any material just below the MED-related material that, when excavated with the MED-related material, would exhibit hazardous waste characteristics.

Seaway Areas B and C

The primary objectives would be first to locate the piles of residues placed in these areas, as indicated in the ORNL survey conducted in 1978, and identify the extent of the contamination, and then to identify any chemical constituents in the areas due to other refuse placed there that could affect the waste disposal characteristics of any material removed for disposal and/or could possible effect future leachability of the residues. Some bounding assumptions are:

1. The material is located at or above the topographic elevation at the time they were placed in these areas,
2. The material would be in a layer no thicker than 4 to 5 feet since they were piles placed there from trucks and such piles are typically 4 to 5 feet high, before any compaction or spreading,
3. Background values for in-hole gamma logging will be established using a boring adjacent to Area B where sampling has illustrated that no MED-related materials are in the top eight (8) feet,
4. A correlation between in-hole gamma logging results and the presence of MED-related materials will be set using one or more borings in Area A where the material is known to be located, and

5. That if the in-hole gamma log reading is less than or equal to the equivalent of 2x gamma activity associated with the soil background correlation concentrations, then the conclusion is that there is no MED-related material present of any concern.

Correlation Effort

A correlation study will be conducted at the onset of the field effort. The objective of this effort is to establish a bounding correlation between in-hole gamma logging results and low-end concentrations that would be used as a decision point on whether there is or is not any MED-related residues present that must be addressed. The approach for obtaining the data to do this correlation is to place borings in known areas of MED-related residues, place a boring in an area where MED materials are not present, and place all borings in the same manner as will be done throughout Areas B and C. The bounding correlation results between soil sample results and in-hole gamma logging results will be used in delineating the extent of contamination in Areas B and C. The study will involve the placement of two borings in Area A where known contamination exists and one adjacent to Area B where no MED-related material was placed. One of the two placed in Area A will be placed in an area where aerial photos indicate that fly ash may have been placed in the area so as to provide a correlation to non-MED materials that may be present and have similar radionuclides. The other boring in Area A will be placed where RI borings indicate the presence of fill material above and below the MED-related residues. The boring adjacent to Area B will provide a correlation with the in-hole gamma log results to the landfill materials in the area of Areas B and C.

Approximately five (5) samples will be collected from each of the two borings placed in Area A and three (3) from the boring placed adjacent to Area B. The number of samples may be more, dependent on field results, but should not exceed twenty (20). The sample intervals and locations will be dependent on the in-hole gamma logging results as well. Where elevated readings are obtained, those areas should be sampled and analyzed. Selected areas with minimal to no activity should also be sampled and analyzed to assess what the possible soil concentrations are that the in-hole gamma logging device can detect and whether a more sensitive device is needed. All samples will be, at a minimum, subjected to the following radionuclide analyses:

1. Gamma Spec
2. Report all positive radionuclide values
3. At a minimum, report isotopic Uranium, Thorium, Radium, Actinium, and Protactinium

The results will then be used to establish a lower bounding correlation between field gamma results and radionuclide concentration levels that would represent whether MED-related residues are present or not. The associated in-hole gamma logging results will then be used as the unit of measure in determining the extent of contamination in Areas B and C.

Determining Extent of Contamination (Phase I)

The aerial extent of the MED-related materials in Areas B and C will be established by placing a series of 4-inch, or larger, boreholes, lined with PVC pipe throughout Areas B and C. All borings used in this field effort will be constructed in the same manner. A drilling rig, at this time assumed to be a roto-sonic drill rig, will be used to bore a hole 4 inches or larger and then a 4-inch PVC pipe placed in the hole prior to performing the in-hole gamma logging.

The first set of borings will be placed at nine (9) biased locations (2 in Area B and 7 in Area C) where aerial photos illustrate where the residue piles were thought to be placed. The maximum depth of each boring will be the topographic elevation at the time the residues were placed in the area plus an additional five (5) feet, or to native clay, to account for possible minor errors in elevation reading. Additional borings would then be placed based on the results from the biased boring locations. The Field Team, consisting of representatives from USACE, SAIC, and the regulators, will assess the results in the field and decide the placement of the additional borings. These additional borings are assumed to be placed in a linear manner at ~40-meter intervals along the perimeter of the North/North-East perimeter of Area C, at ~20-meter intervals along the Southern perimeter of Area C and around the remaining perimeter of Area C. All perimeter borings will be placed ~5 meters in from the designated boundaries. This placement approach is illustrated in Figure 2. Modifications to the location of the borings will be dependent on two major factors. The first factor is the ability of the drilling rig to get to the proposed location and operate safely. If a proposed location is inaccessible, then the Field Team will identify an alternate location. The second factor is based on the results from the previous borings and whether some of the proposed locations need to be relocated. An in-hole gamma log will be completed for each boring to assess whether there are any areas exceeding the bounding correlation results from above, thus indicating the presence of elevated radiological materials.

To assess whether any of this material may be located near or under the closed portion of the landfill, a series of boreholes will be placed in a linear manner at ~20-meter intervals between Areas B and C and the closed portion of the landfill as illustrated in Figure 1. If an elevated area is found, additional borings may be located at ~10-meter intervals around the elevated boring location as illustrated in Figure 1 if determined to be necessary by the Field Team after review of all other data from other borings in the area. A boring between the elevated boring location and the closed portion of the landfill will only be placed if space allows without disturbance of the cap. If elevated readings are found in any of these additional borings, then additional borings may be placed around them as discussed above until the Field Team is confident that the extent of the contamination is understood.

Upon completion of all field activities, the PVC pipe will be removed from the bore holes and bentonite pellets placed back into the hole. If removal is not possible, then the PVC pipe will be ground-in-place prior to filling with the pellets. All IDW (non-radiological) will be placed in the same area (Area B or Area C) from which it was removed and covered with 2 feet of soil.

Determining Nature of Contamination (Phase II)

The results from the boring efforts (Phase I) discussed above will provide a much better definition of the extent of the contamination in Areas B and C than what is present today. The nature of the contaminants will be assessed using the core material from the bias boring locations in Areas B and C as well as the Area A borings. For the borings in Area C, the analyses of the core material will be limited to the first five (5) biased borings that have an in-hole gamma reading indicating the presence of MED-related residues. For Area B, the analyses will be performed for both borings. The following analyses will also be done on the core material from all of the borings completed in Area A.

1. All cores removed from biased sample locations and Area A will be prepared in the field for future TCLP analysis, if necessary;
2. If a particular boring has an elevated gamma reading, then the prepared samples for the core from that boring, up to a maximum of five borings for Area C, will be shipped to the lab for the following analyses:
    a. TCLP on one-foot composite of material above the area containing the radiological material with the composite including some of the radiological area.
    b. TCLP on one-foot composite of material below the area containing the radiological material with the composite including some of the radiological area.
    c. Radiological analysis of a six-inch sample of the radiological material, if possible, otherwise the largest sample possible up to six inches. The radiological analyses will be the same as those identified above for the correlation efforts.
    d. TCLP on the 6-inch samples of the radiological material with an isotopic analysis (U, Th, Ra) performed on the TCLP solution to assist in determining solubility of the radiological materials under simulated landfill conditions.
3. If, using an OVA meter, there is an elevated reading when any of the Area A or Areas B and C bias boring cores are scanned, then a composite from that area, for up to five areas in total for all of the bias borings, will be shipped for analysis of semi-volatiles, PCBs, and volatiles to provide data needed for assessment of worker protection during any remediation efforts.
4. For any core materials shipped offsite for analyses, additional analyses beyond radiological and TCLP may be requested based on the completion of a thorough review of all data required by various waste disposal facilities so that that data can be collected during this field effort. Any additional analyses will be identified in the Sampling Plan for this effort.

The above data from the bias boring locations in Areas B and C and the borings in Area A will form the basis for understanding the nature of the radiological materials present in the landfill.

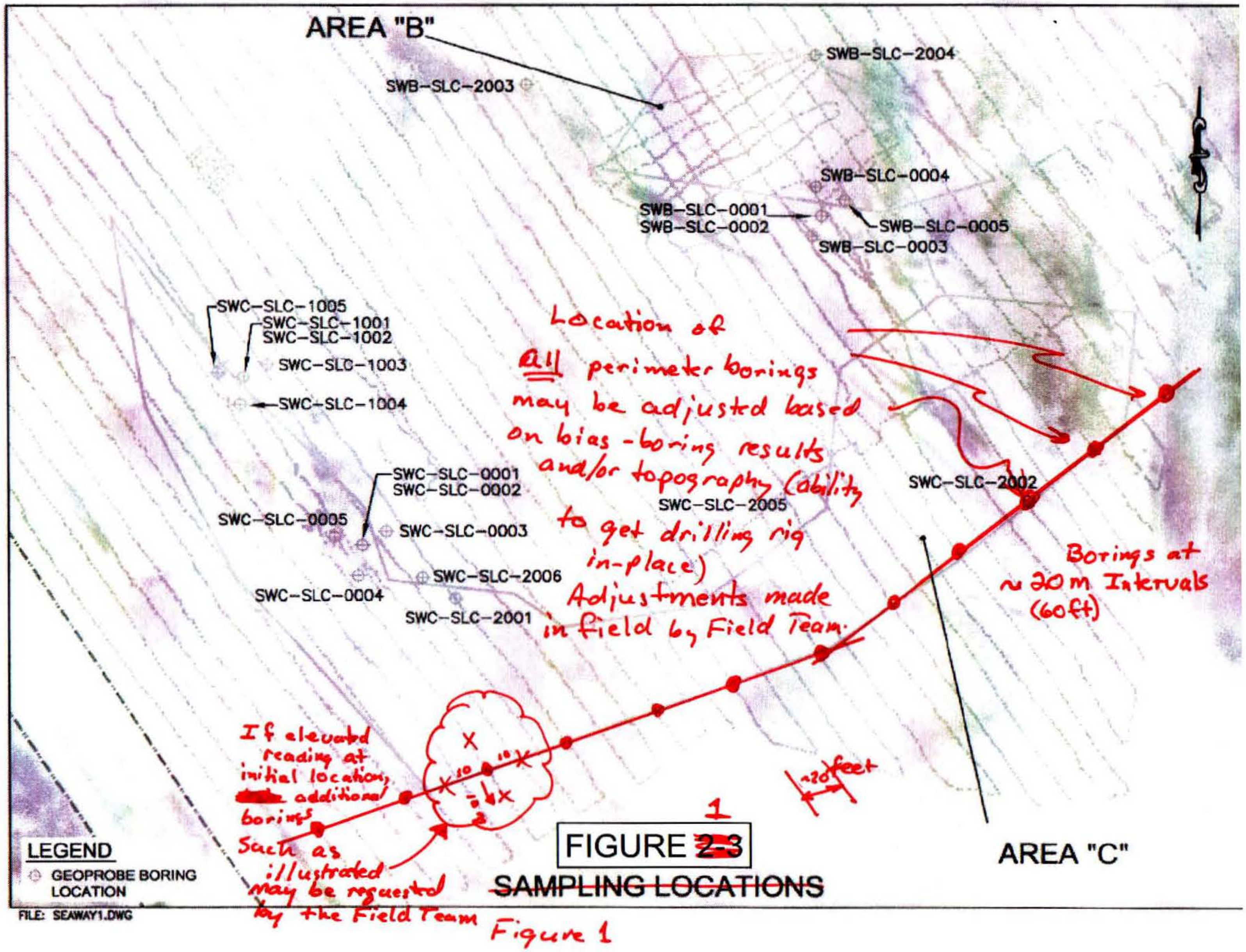


Figure 1: Location of Borings Between Areas B and C and the Closed Portion of the Landfill

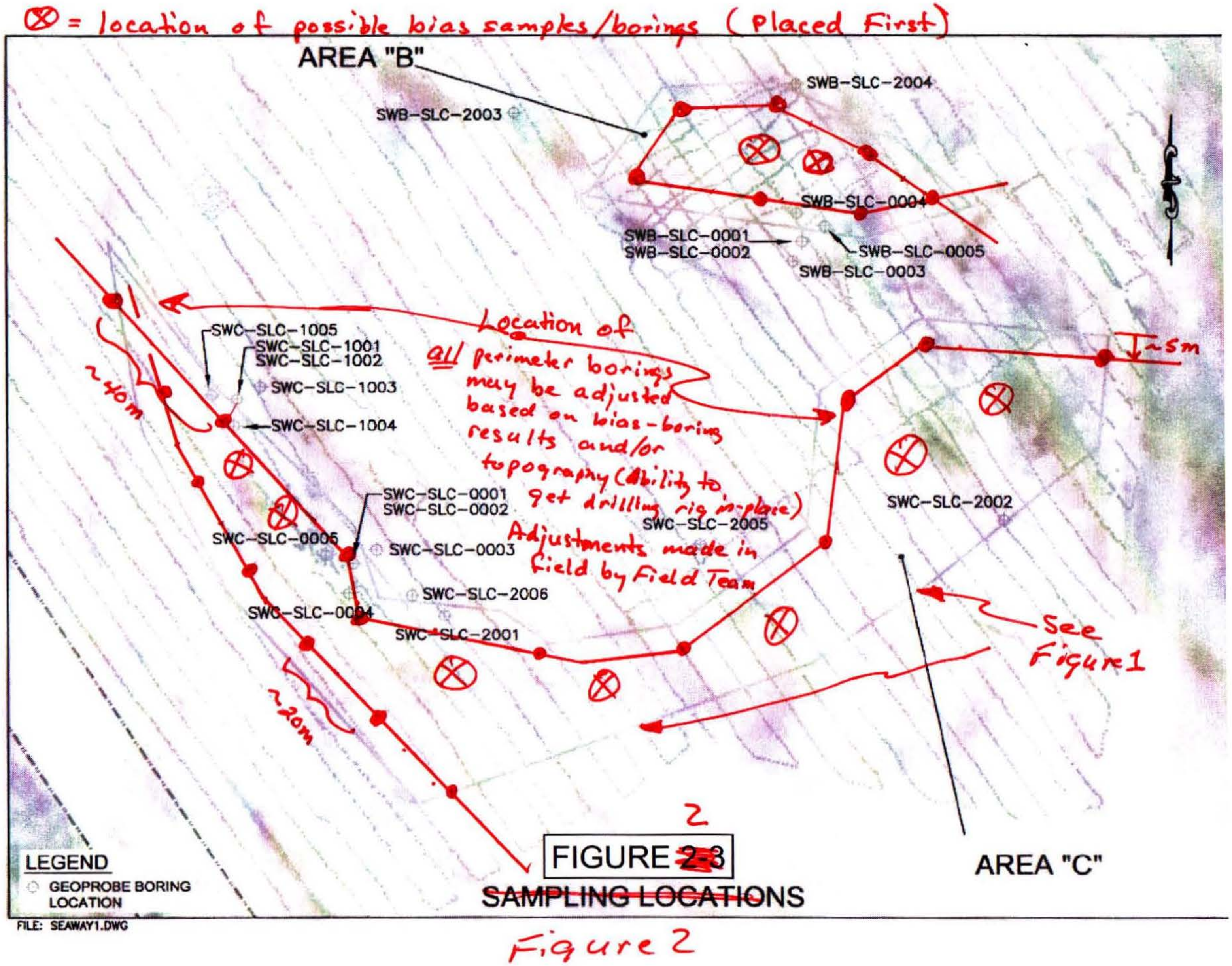


Figure 2: Location of Borings Around Perimeter of Areas B and C and Possible Biased Boring Locations

ATTACHMENT B

DRILL RIG OPERATIONAL CHECKLIST

Site Name:______________________________

Rig Model:____________________________Manufacturer:________________________________

Serial Number:_____________________Rig Owner:___________________________________

Inspection Performed by:____

(Driller's Signature) (Date)

Checklist Reviewed and Emergency Shutdown Observed by:____

(Signature) (Date)

Place an X in each appropriate ( )

1.0 GENERAL

1.1 Check all safety devices which are part of drill rig and which can be verified (see note). Is (are all) device(s) intact and operating as designed?

Emergency Interrupt System

A.	Kill Switch 1	Yes ( ) No ( ) NA ( )
B.	Kill Switch 2	Yes ( ) No ( ) NA ( )
C.	Kill Switch 3	Yes ( ) No ( ) NA ( )
D.	Kill Switch 4	Yes ( ) No ( ) NA ( )
E.	Kill Switch 5	Yes ( ) No ( ) NA ( )
F.	Other______________________________	Yes ( ) No ( ) NA ( )
G.	Other______________________________	Yes ( ) No ( ) NA ( )
H.	Other______________________________	Yes ( ) No ( ) NA ( )

Note: All safety devices (not otherwise listed in this checklist) should be identified for each drill rig at the beginning of each project and subsequently checked at each inspection. Testing of all safety devices must be observed by health and safety personnel. List only safety devices which can be checked without disassembly or without rendering the device ineffective. This checklist does not cover United States Department of Transportation requirements.

1.2 Is the proper type and capacity of fire extinguisher(s) present, properly charged, and inspected? Yes ( ) No ( ) NA ( )

1.3 Is rig properly grounded? Yes ( ) No ( ) NA ( )

1.4 Are rig and mast a safe distance from electrical lines? Yes ( ) No ( ) NA ( )

1.5 Can mast be raised without encountering overhead obstructions? Yes ( ) No ( ) NA ( )

1.6 Have spill prevention materials been placed under rig (i.e., plastic sheeting)? Yes ( ) No ( ) NA ( )

1.7 Is a spill kit present? Yes ( ) No ( ) NA ( )

1.8 Is the safe operating zone/exclusion zone posted (minimum radius at least equal to height of raised drill mast)? Yes ( ) No ( ) NA ( )

1.9 Do all modifications made to the drill rig permit it to operate in a safe manner and allow the drill to operate within the manufacturer's specifications? Yes ( ) No ( ) NA ( )

1.10 Are moving parts (excluding cathead and other moving parts normally used during operations) properly guarded? Yes ( ) No ( ) NA ( )

1.11 Are all exhaust pipes, which would come in contact with personnel during normal operation properly guarded? Yes ( ) No ( ) NA ( )

1.12 Are tank(s) and lines free of leakage? Yes ( ) No ( ) NA ( )

1.13 Are all normal or manufacturer-recommended maintenance activities or schedules performed at the required frequency? Yes ( ) No ( ) NA ( )

1.14 Are walking and standing surfaces, steps, rungs, etc., free of excess grease, oil, or mud which could create a hazard? Yes ( ) No ( ) NA ( )

2.0 CONTROL MECHANISMS

Are all control mechanisms and gauges on the drill rig functional and free of oil, grease, and ice (checked while running)? Yes ( ) No ( ) NA ( )

3.0 HYDRAULICS AND PNEUMATICS

Note: The mast should be lowered during the completion of this section to allow inspection of portions of the lifting mechanisms normally out of reach during operation.

3.1 Do all hydraulic reservoirs exhibit proper fluid levels? Yes ( ) No ( ) NA ( )

3.2 Are hydraulic and/or pneumatic systems in good condition and functioning correctly (checked while running)? Yes ( ) No ( ) NA ( )

4.0 LIFTING MECHANISMS

Note: The mast should be lowered during the completion of this section to allow inspection of portions of the lifting mechanisms normally out of reach during operation.

4.1 Have all wires, ropes, cables, and lines that are kinked, worn, corroded, cracked, bent, crushed, frayed, stretched, birdcaged, or otherwise damaged been replaced and the defective equipment removed from the site? Yes ( ) No ( ) NA ( )

4.2 Have all wires, ropes, cables, and lines been wrapped around winch drums without excessive pinching or binding? Yes ( ) No ( ) NA ( )

4.3 Are all pulleys undamaged and functional? Yes ( ) No ( ) NA ( )

4.4 Are all clips, clamps, clevises, hooks, and other hardware used to rig wires, ropes, cables, or lines undamaged and attached properly? Yes ( ) No ( ) NA ( )

4.5 Do all eyes formed in wires, ropes, cables, or lines attached to the rig use a thimble to retain the shape of the eye? Yes ( ) No ( ) NA ( )

4.6 Do all hooks having functioning safety gates/latches? Yes ( ) No ( ) NA ( )

5.0 NONCONFORMING ITEMS

5.1 When did the last operation checklist inspection take place for this drill rig at this site?

Date:____________________

5.2 Have any nonconforming items been carried over from the last inspection? List any such items and dates or original nonconformance.

A.____

Date:____________________

B.____

Date:____________________

C.____

Date:____________________

D.____

Date:____________________

Any nonconforming items must be documented in the following remarks section and reported to the field operations manager for the project prior to operating the drill ring. Reference all remarks to the item numbers noted above.

Remarks:

____

____

____

____