ecology and environment, inc.

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International Specialists in the Environment

March 10, 1993

Maureen O'Mara
U.S. Environmental Protection Agency
Emergency Response Section, HSE-5J
77 West Jackson Blvd.
Chicago, Illinois 60604

RECEIVED
JUL 23 1993
EMERG & REMEDIAL RESPONSE SECTION
BUR OF SOLID & HAZRD WASTE

Re: Oconomowoc Electroplating Soil Excavation
Ashippun, Wisconsin
TDD#: T05-9210-061
PAN#: EWI0033FBA

Dear Ms. O'Mara:

The Ecology and Environment, Inc. (E & E) Technical Assistance Team (TAT) monitored soil excavation activities at the Oconomowoc Electroplating site located in Ashippun, Wisconsin. Soil excavation was conducted in support of removal activities under direction of the United States Environmental Protection Agency (U.S. EPA). Soil was removed from contaminated areas identified during a previously completed TAT Extent of Contamination (EOC) study and in a state Remedial Investigation/Feasibility Study (RI/FS) report for the site.

Excavation of contaminated soil occurred on the following dates: October 21-23; October 26; and October 28-31, 1992. Personnel from the Emergency Response Cleanup Services (ERCS) contractor, International Technologies Corporation (I.T. Corp.) completed the actual soil excavation and stockpiling activities. U.S. EPA On-Scene Coordinators (OSCs) Charles Gebien and Thomas Basso were onsite during removal and stockpiling of contaminated soil.

Sampling actions occurring during the excavation activities were conducted in accordance with the attached TAT-prepared Quality Assurance Sampling Plan (QASP) developed for and approved by the U.S. EPA. Soil samples selected for submittal for confirmatory laboratory analyses were analyzed for total arsenic, cadmium, chromium, copper, cyanide, lead, nickel, and zinc with the exception of one sample, which was analyzed for total cyanide only. Analyses were performed by Precision Analytical Laboratory of Milwaukee, Wisconsin. Coordination of analytical services was provided by I.T. Corp. personnel. All samples were decontaminated, labelled, and packaged in accordance with the QASP and standard E & E guidelines.

The EOC study identified three areas in which contaminant concentrations exceeded the soil clean-up levels specified in the RI/FS and subsequent U.S. EPA Record of Decision for the site. Two of the areas, along the trenches and pits previously located in the Main, West, and Chrome Destruct Rooms, were adjacent to each other and were excavated as one pit. Soil in this area was excavated to a depth of approximately 3 feet below grade at the north edge and to approximately 4 feet below grade at the south edge of this area. Figure 1 identifies locations and final depths of all excavation areas at the site.

The third area identified in the EOC study was located at the east edge of the site and extending outside the existing fenceline. This area was previously indicated as being the location of a "landfill." Similar to the first area, soil was removed to a depth of approximately 4 feet. Laterally, excavation continued until visual indications of the disposal area (drum parts, metal debris, discolored waste material, etc.) were no longer observable. A larger area than originally identified was encountered during the actual excavation. Several small vats, numerous drum pieces and miscellaneous metal debris, as well as one large steel vat were removed during the excavation in this area.

At this point, both excavation pits were sampled to determine if sufficient soil had been removed to achieve the specified clean-up levels. Approximately 50 samples were collected from these two areas and screened for the presence of cadmium, chromium, copper, nickel, and zinc with a portable X-Ray Fluorescence (XRF) unit on October 23, 1992. Results of the XRF screening indicated that additional soil needed to be removed in two areas, one in each excavation pit. An additional foot of soil was excavated in each of these two areas.

Samples from each of the two excavation pits were subsequently collected for confirmatory laboratory analyses. The pits were divided into discrete sections, and composite samples were collected from within each section (see Figure 2). A total of six soil samples were collected and submitted for laboratory analysis on October 26, 1992.

Analytical results for these six soil samples (SV1 through SV6) are summarized in Table 1. Comparison of the analytical data with the RI/FS specified clean-up levels indicated the need for additional soil removal in both the "landfill" area (SV6) and an isolated area in the main excavation pit (SV3). Both locations were further excavated down to a yellow clay layer, which was reached at approximately 5 feet below grade in the main pit and at 8-10 feet below grade in the "landfill" area. Previous XRF screening and analytical sampling from the EOC study had indicated that contamination had not penetrated this clay layer.

ZT1OCOFIG1E

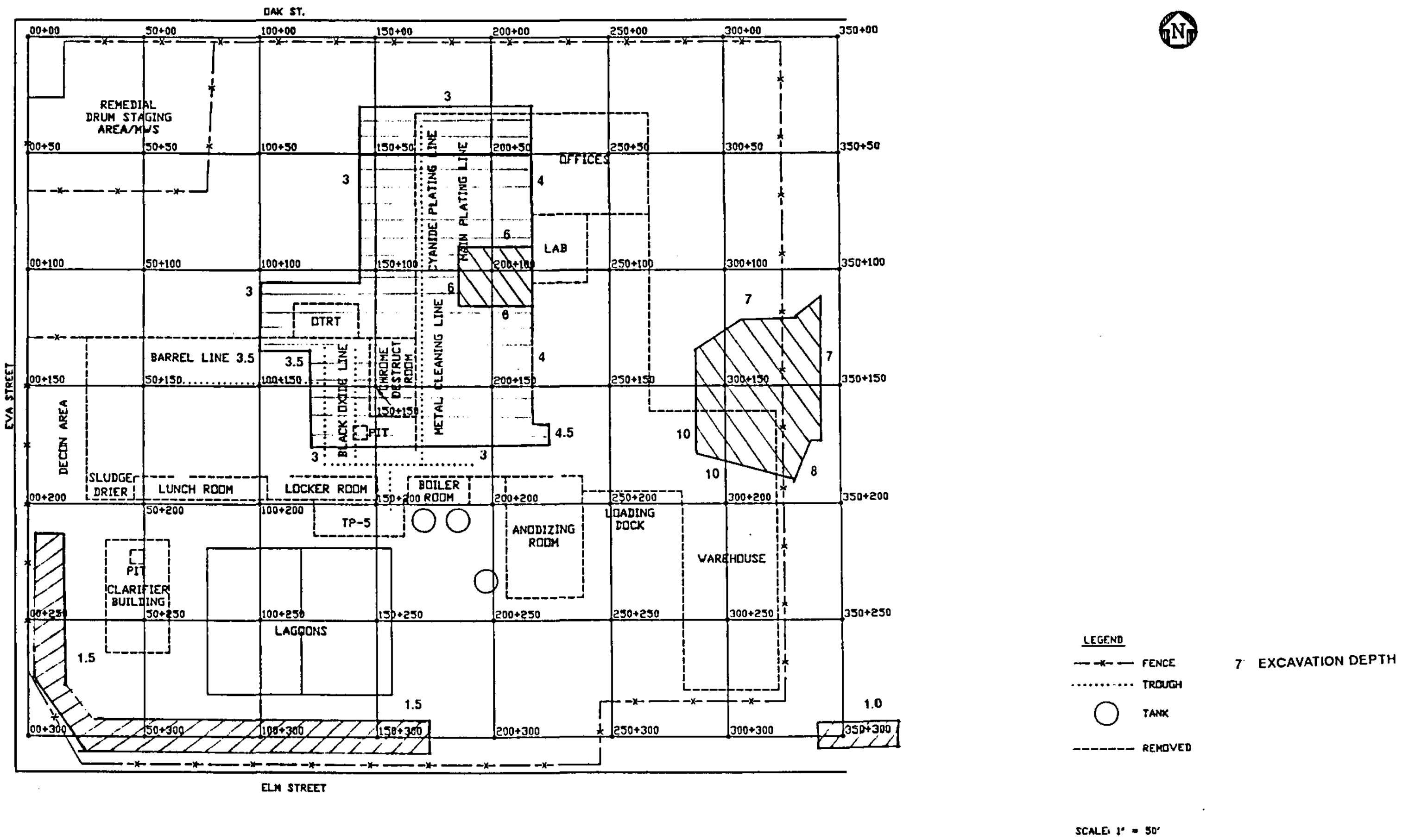

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FIGURE 1E

SITE MAP W/ GRID
OCONOMOWOC ELECTRIC
OCONOMOWOC, WI.

ZT1OCOFIG1E

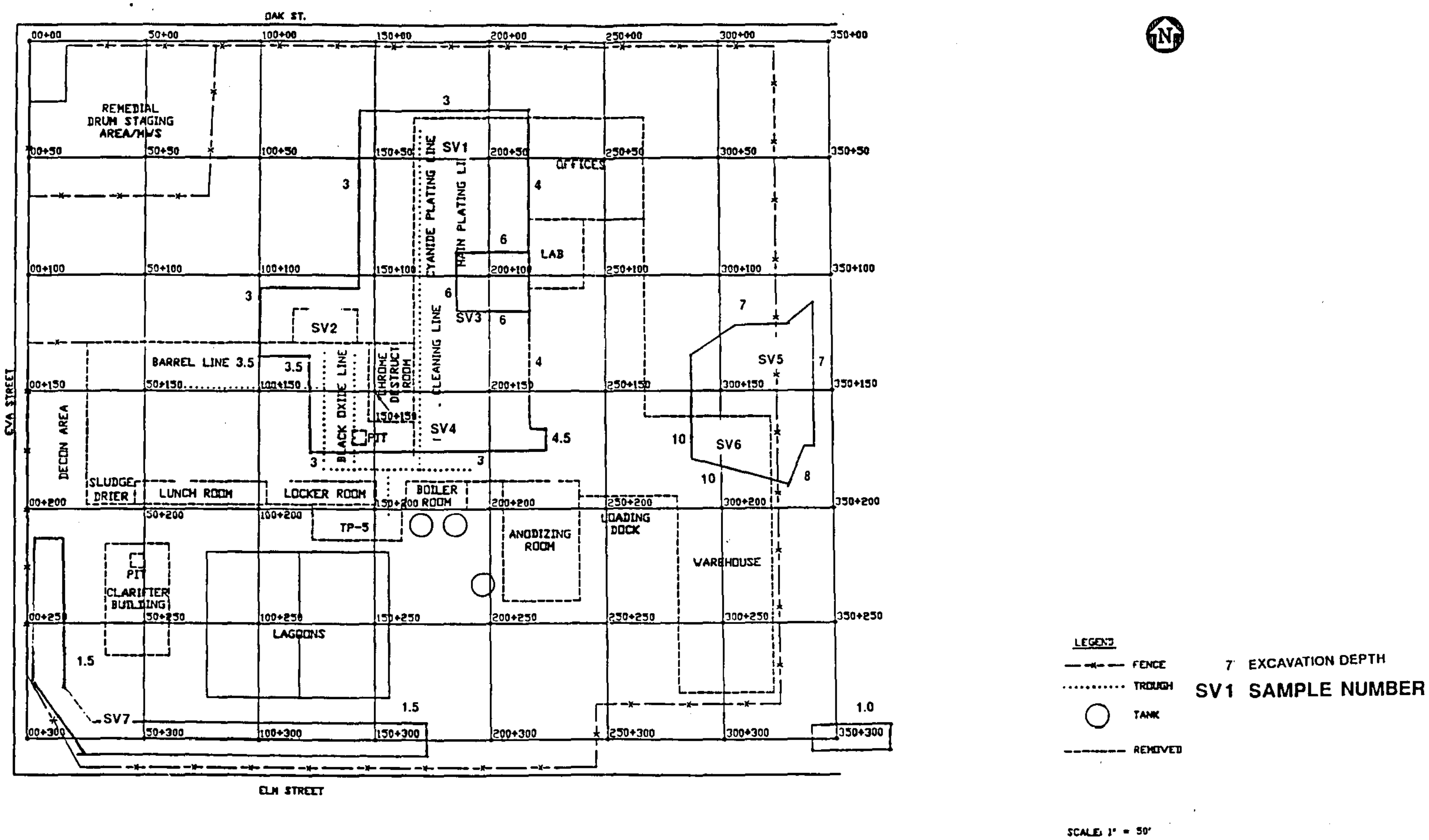

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FIGURE 2 SITE MAP W/ GRID
OCONOMOWOC ELECTRIC
OCONOMOWOC, WI.

Table 1
Confirmation Soil Samples

Analyte	Clean-up Level*	SV1	SV2	SV3	SV4	SV5	SV6
Arsenic	47	1.9	1.4	3.1	2.0	1.3	2.6
Cadmium	500	11	0.87	6.0	66	35	420
Chromium	1200	29	250	58	610	93	1700
Copper	1500	100	45	140	88	96	920
Cyanide	90	<0.1	7.8	120	7.3	7.5	24
Lead	300	11	7.7	9.3	11	14	1700
Nickel	2500	140	410	400	130	110	850
Zinc	4500	620	670	1000	470	310	1900

Results reported in mg/kg (ppm).
Samples analyzed by Precision Analytical Laboratory, Milwaukee, Wisconsin.
* Clean-up levels established by U.S. EPA Record of Decision for the Oconomowoc Electroplating Company, Inc. Site, Ashippun, Wisconsin, September 20, 1990.

On October 29, 1992, additional composite samples were collected for laboratory analyses from the two areas in which further excavation was completed (refer to Figure 2 for sample locations). Results for these two samples (SV3-A and SV6-A) are summarized in Table 2. Sample SV3-A was only analyzed for total cyanide since only this compound exceeded the clean-up level in the original sampling.

Previous sampling completed in conjunction with the RI/FS resulted in the identification of several areas outside the on-site building, which contained contamination levels exceeding the clean-up levels. These areas were located primarily along drainage ditches on the north, west, and south sides of the site. Soil was removed from the south and west drainage ditches to a depth of 1-1.5 feet, as indicated on Figure 1. Sample SV7 (refer to Table 2 for analytical results) was a composite soil sample collected on October 29, 1992, from the drainage ditch at the southwest corner of the site after excavation (see Figure 2 for sample location). Soil removal was not completed in the north drainage ditch, as well as in the north portion of the west drainage ditch due to the presence of buried utility lines. As an additional note, analytical results contained in the RI/FS report identifying the north drainage ditch as an area of concern, did not appear to exceed the specified clean-up levels. Therefore, soil in this area may not require future excavation.

A live natural gas line was encountered during excavation along the drainage ditch at the west side of the site. According to representatives from Wisconsin Natural Gas, this line supplies residences located southwest of the site. Although no other live lines are present within the fenced portion of the site, this line remains active. Caution should be exercised should future excavation be required in this area.

Once laboratory analyses indicated that the clean-up levels had been reached within the excavated areas, each pit was backfilled with a purchased mix of sand, gravel, and rip-rap. All excavated areas were backfilled with this material with the exception of the west drainage ditch. This area was not backfilled to allow repair of the gas line by Wisconsin Natural Gas.

Excavated soil was shipped for treatment and disposal to Peoria Disposal Company in Peoria, Illinois and to Envirosafe Services of Ohio in Oregon, Ohio. A total of 76 truckloads (1,750 tons) of soil was transported to these facilities. The remaining soil was stockpiled at the northeast corner of the facility. Approximately 1,400 to 1,500 cubic yards of soil remains in the stockpile for future disposal. Prior to leaving the site, the stockpile was covered with black, 6-mil PVC sheeting.

Table 2
Confirmation Soil Samples

Analyte	Clean-up Level*	SV3-A	SV6-A	SV7
Arsenic	47	NA	3.3	2.2
Cadmium	500	NA	27	0.78
Chromium	1200	NA	37	9.7
Copper	1500	NA	52	56
Cyanide	90	0.68	1.3	13
Lead	300	NA	12	62
Nickel	2500	NA	69	24
Zinc	4500	NA	120	80

NA indicates Not Analyzed.
Results reported in mg/kg (ppm).
Samples analyzed by Precision Analytical Laboratory, Milwaukee, Wisconsin.
* Clean-up levels established by U.S. EPA Record of Decision for the Oconomowoc Electroplating Company, Inc. Site, Ashippun, Wisconsin, September 20, 1990.

Should you have any additional questions or comments, or desire more information, please feel free to contact me at the above address and telephone number.

Sincerely,

Karen M Spangler

Karen M. Spangler

cc: RPM Thomas Williams

Attachment

ATTACHMENT

Quality Assurance Sampling Plan

Sampling QA/QC Work Plan

Oconomowoc Electroplating

Prepared by
Ecology & Environment, Inc.

EPA Project No.: EWI0033FAA
Contractor Work Order No.:
EPA Contract No.: ZT1051

Approvals

Ecology & Environment, Inc.		U.S. EPA	
Karen M Spangler	4/14/92	Maureen O'Mara	4/15/92
Karen Spangler Task Leader	Date	Maureen O'Mara On-Scene Coordinator	Date
	4/15/92		
Tom Kouris Project Manager	Date		

1.0 BACKGROUND

The [suspected] contamination is a result of:

Contamination on-site primarily occurred due to historical mis-handling of wastes on-site. Vats and tanks were deteriorated and observed to be leaking. Pits and troughs throughout much of the building provided a transport route for contamination throughout the building. In addition, pit walls have deteriorated, allowing groundwater to flow into and through the pits, potentially transporting contaminants. It is unknown whether contaminants may have been dumped directly onto soil at the site, or whether wastes were ever buried on-site.

The following information is known about the site:

The site is located in the city of Ashippun in the county of Dodge in the state of Wisconsin. The nearest residents are located within 200.0 feet of the site, in a west direction. Other residents or significant environments in proximity to this site are located 200 feet due south of the site.

It is a Metal Plating facility on 5 acres which had been operating for 40 years and has been abandoned since 1991.

The types of material(s) utilized by this facility were:

acids
bases
inorganics
organics

The volume(s) of contaminated materials to be addressed are:

The volume of contaminated material remaining on-site is unknown. All wastes will have been properly disposed at the time this study is completed. The extent and volume of contaminated soil on-site is unknown at this time.

The contaminants of concern are:

The primary contaminants of concern at the site are metals such as chromium, nickel, cadmium, and zinc. Additionally, cyanide has also been detected on-site. Small amounts of organic contamination have also been detected on-site.

The basis of this information may be found in:

Historical information on the operations of the site have been obtained from personnel previously employed at the facility, as well as from state and local file information. Additional information was obtained from U.S. EPA reports and files.

2.0 DATA USE OBJECTIVES

The objective of this project/sampling event is to determine:

the presence of contamination
the extent of contamination
the magnitude of contamination

For the purpose of:

Site characterization

The data will be evaluated against:

Federal/State Action Levels

Soil clean-up levels as specified in the RI/FS are:

Arsenic	47	mg/kg
Lead	300	mg/kg
Cadmium	500	mg/kg
Nickel	2500	mg/kg
Copper	1500	mg/kg
Chromium	1200	mg/kg
Zinc	4500	mg/kg
Cyanide (total)	90	mg/kg
1,1-Dichloroethane	0.070	mg/kg
Trichloroethylene	0.80	mg/kg
Toluene	0.075	mg/kg
1,1,1-Trichloroethane	0.21	mg/kg

3.0 QUALITY ASSURANCE OBJECTIVES

As identified in Sections 1.0 and 2.0 the objective of this project/event applies to the following parameters:

Parameters	Matrix	Intended Use Of Data	QA Objective
Metals	Soil	Site Characterization	QA-1
Metals	Soil	Site Characterization	QA-2

4.0 APPROACH AND SAMPLING METHODOLOGIES

4.1 Sampling Equipment

The following equipment will be utilized to obtain environmental samples from the respective media/matrix:

Parameter/Matrix	Sampling Equipment	Fabrication	Dedicated
Metals in Soil	Soil Coring Device	carbon steel	No

Decontamination Steps

1 Physical removal
2 Non-phosphate detergent wash
3 Distilled/deionized water rinse

Parameter/Matrix	Sampling Equipment	Fabrication	Dedicated
Metals in Soil	Trowel	stainless steel	No

Decontamination Steps

1 Physical removal
2 Non-phosphate detergent wash
3 Distilled/deionized water rinse

4.2 Sampling Design

The sampling design is depicted on the attached Sample Location Map (Figure 4-1) and is based on the following rationale:

The site will be gridded into 50 by 50 foot grid squares prior to collection of samples.

Grid squares will be decreased to 25 by 25 foot squares in areas of concern, near potential migration pathways, and near the building foundation.

A systematic random sampling approach will be utilized for sample location determination.

Samples will be collected at the surface, and at depths of 3, 6, and 10 feet at each location.

Following sample screening, additional samples will be collected as needed to define source areas and hot spots.

Samples will be field screened using the XRF (portable X-Ray Fluorescence) for levels of the following metals: cadmium, chromium, nickel, lead, copper, and zinc.

At a minimum, 10% of the screened samples will be submitted to a laboratory for confirmatory analysis.

Approximately 15 to 20 samples will be collected initially, prior to the start of this project. These samples will be homogenized and split, with 1 portion of each sample being submitted to a laboratory for analysis for total cadmium, chromium, zinc, nickel, lead, and copper by Atomic Absorption. The remaining portion will be screened by the XRF upon receipt of the analytical results and used to construct a model to more closely represent the results.

Sample locations for the initial modelling of site characteristics will be chosen using the XRF unit in its screening mode. This will provide a gross determination in the field of the levels of contaminants, allowing the selection of samples which represent the full range of concentrations on-site. This should provide a representative set of results to use for construction of the model.

All samples collected will be field tested for cyanide concentrations using the EM Quant test kits. Field test results will be compared with subsequent analytical results to determine if a comparable relationship exists.

Samples will also be screened in the field for organic vapors using an Organic Vapor Analyzer (OVA).

Field screening for arsenic will not be conducted. It is assumed that the occurrence of this contaminant will mimic those of the other metals presumed to be present at the site.

4.3 Standard Operating Procedures

4.3.1 Sample Documentation

All sample documents must be completed legibly, in ink. Any corrections or revisions must be made by lining through the incorrect entry and by initialling the error.

FIELD LOG BOOK

The Field Log Book is essentially a descriptive notebook detailing site activities and observations so that an accurate account of field procedures can be reconstructed in the writer's absence. All entries should be dated and signed by the individuals making the entries, and should include (at a minimum) the following:

1. Site name and project number.
2. Name(s) of personnel on-site.
3. Dates and times of all entries (military time preferred).
4. Descriptions of all site activities, including site entry and exit times.
5. Noteworthy events and discussions.
6. Weather conditions.
7. Site observations.
8. Identification and description of samples and locations.
9. Subcontractor information and names of on-site personnel.
10. Date and time of sample collections, along with chain-of-custody information.
11. Record of photographs.

12. Site sketches.

A separate logbook will be maintained on-site to provide documentation of XRF screening results and cyanide test kit screening results. These logbooks will follow a similar format in style and content as described above.

SAMPLE LABELS

Sample labels must clearly identify the particular sample, and should include the following:

1. Site name and number.
2. Time sample was taken.
3. Sample preservation.
4. Initial of sampler(s).

Optional, but pertinent, information:

1. Analysis requested.
2. Sample location.

Sample labels must be securely affixed to the sample container. Tie-on labels can be used if properly secured.

CHAIN OF CUSTODY RECORD

A Chain of Custody record must be maintained from the time the sample is taken to its final disposition. Every transfer of custody must be noted and signed for, and a copy of this record kept by each individual who has signed. When samples (or groups of samples) are not under direct control of the individual responsible for them, they must be stored in a locked container sealed with a Chain of Custody seal.

The Chain of Custody record should include (at a minimum) the following:

1. Sample identification number.
2. Sample information.
3. Sample location.
4. Sample date.
5. Name(s) and signature(s) of sampler(s).
6. Signature(s) off any individual(s) with control over samples.

CHAIN OF CUSTODY SEALS

Chain of Custody Seals demonstrate that a sample container has not been tampered with, or opened. The individual in possession of the sample(s) must sign and date the seal, affixing it in such a manner that the container cannot be opened without breaking the seal. The name of this individual, along with a description of the sample packaging, must be noted in the Field Logbook.

4.3.2 Sampling SOP's

Soil Sampling

Collection of samples from near-surface soil will be accomplished with tools such as spades, shovels, and scoops. Surface debris will be removed to the required depth with this equipment, then a stainless steel scoop can be used to collect the sample. This method can be used in most soil types but is limited to sampling near surface areas. The use of a flat, pointed mason trowel to cut a block of the desired soil can be helpful when undisturbed profiles are required. A stainless steel scoop or lab spoon will suffice in most other applications.

Sampling at depth will be accomplished with augers and thin-walled tube samplers. This system consists of an auger, a series of extensions, a "T" handle, and a thin-wall tube sampler. The auger is used to bore a hole to desired sampling depth, and is then withdrawn. The auger tip is then replaced with a tube core sampler, lowered down the bore hole,and driven into the soil at the completion depth. The core is then withdrawn and the sample collected.

Several augers are available. These include: bucket type, continuous flight (screw), and posthole augers. Bucket types are better for direct sample recovery as they provide a large volume of sample in a short time. A continuous flight (screw) auger will be utilized to obtain the depths needed at each sample location. However, a bucket auger will be used for sample collection once the depth has been reached.

Dedicated samplers are impractical due to the large number of soil samples required. In this case, samplers will be cleaned in the field using the decontamination procedure described elsewhere in Section 4.0.

4.3.3 Sample Handling and Shipment

Each of the sample bottles will be sealed and labeled according to the following protocol. Caps will be secured with custody seals. Bottle labels will contain all required information including sample number, time and date of collection, analysis requested, and preservative used. Sealed bottles will be placed in large metal or plastic coolers, and padded with an absorbent material such as vermiculite.

All sample documents will be affixed to the underside of each cooler lid. The lid will be sealed and affixed on at least two sides with EPA custody seals so that any sign of tampering is easily visible.

4.4 Schedule of Activities

Table 1: Proposed Schedule of Work

Activity	Start Date	End Date
Inital collection of samples for use in model	05/21/92	05/21/92
Set-up of site grid & model construction	06/01/92	06/01/92
Sampling from grid locations	06/02/92	06/09/92
Resampling of selected areas	06/10/92	06/12/92

5.0 PROJECT ORGANIZATION AND RESPONSIBILITES

The EPA On-Scene Coordinator (OSC), Maureen O'Mara, will provide overall direction to Ecology & Environment, Inc. staff concerning project sampling needs, objectives and schedule.

The Ecology & Environment, Inc. Task Leader, Karen Spangler, is the primary point of contact with the EPA On-Scene Coordinator. The Task Leader is responsible for the development and completion of the Sampling QA/QC Plan, project team organization, and supervision of all project tasks, including reporting and deliverables.

The Ecology & Environment, Inc. Site QC Coordinator, Karen Spangler, is responsible for ensuring field adherence to the

Sampling QA/QC Plan and recording any deviations. The Site QC Coordinator is also the primary project team contact with the lab.

The following sampling personnel will work on this project:

Personnel	Responsibility
Karen Spangler	Project Manager
Richard Boelter	XRF Operator
TBD 2	Sample Collection
TBD	Sample Collection
Maureen O'Mara	OSC

The following laboratories will be providing the following analyses:

Lab Name / Location	Lab Type	Parameters
To Be Determined	To Be Determined	To Be Determined

6.0 QUALITY ASSURANCE REQUIREMENTS

The following requirements apply to the respective QA Objectives and parameters identified in Section 3.0:

The following QA Protocols for QA-1 data are applicable to all sample matrices and include:

1. Provide sample documentation in the form of field logbooks, the appropriate field data sheets and chain of custody forms.

2. All instrument calibration and/or performance check procedures/methods will be summarized and documented in the field/personal or instrument log notebook.

3. The detection limit will be determined and recorded, along with the data, where appropriate.

The following QA Protocols for QA-2 data are applicable to all sample matrices and include:

1. Provide sample documentation in the form of field logbooks, the appropriate field data sheets and chain of custody forms. Chain of custody sheets are optional for field screening locations.

2. All instrument calibration and/or performance check procedures/methods will be summarized and documented in the field/personal or instrument log notebook.

3. The detection limit will be determined and recorded, along with the data, where appropriate.

4. Document sample holding times; this includes documentation of sample collection and analysis dates.

5. Provide initial and continuing instrument calibration data.

6. For soil samples include rinsate blanks and trip blanks.

7. Performance Evaluation samples are optional, if available.

8. Definitive identification:

    a. Screened data - confirm the identification of analytes via an EPA-approved method different from the screening method (field or lab) on at least 10% of the preliminary screened samples collected; provide documentation such as gas chromatograms, mass spectra, etc.

A minimum of 10% of the screened samples will be submitted to a laboratory for confirmatory analysis.

7.0 DELIVERABLES

The Ecology & Environment, Inc. Task Leader, Karen Spangler, will maintain contact with the EPA On-Scene Coordinator, Maureen O'Mara, to keep her informed about the technical and financial progress of this project. This communication will commence with the issuance of the work assignment and project scoping meeting. Activities under this project will be reported in status and trip reports and other deliverables (e.g., analytical reports, final reports) described herein. Activities will also be summarized in appropriate format for inclusion in monthly and annual reports.

The following deliverables will be provided under this project:

Maps/Figures

The following illustrations will be provided:

Maps: sample locations and grid square locations
Figures: as needed
Drawings: scale site drawings indicating sample locations

Data Review

A review of the data generated under this plan will be undertaken. The assessment of data acceptability or useability will be provided separately, or as part of the analytical report.

Analytical Report

An analytical report will be prepared for samples analyzed under this plan. Information regarding the analytical methods/procedures employed, sample results, QA/QC results, chain-of-custody documentation, laboratory correspondence, and raw data will be provided within this deliverable.

Draft Final Report

A (draft) final report will be prepared to correlate available background information with data generated under this sampling event and identify supportable conclusions and recommendations which satisfy the objectives of this sampling QA/QC plan.

8.0 DATA VALIDATION

QA 1

QA 1 does not require an extensive review process. Data for this level should be evaluated for calibration and detection limits at a minimum.

QA 2

Data generated under this QA/QC Sampling Plan will be evaluated accordingly with appropriate criteria contained in the Removal Program Data Validation Procedures which accompany OSWER Directive #9360.4-1.

Specific data review activities for QA 2 should be performed by the following approach:

1. Of the samples collected in the field, 10% will be confirmed for identification, precision, accuracy, and error determination.

2. The results of 10% of the samples in the analytical data packages should be evaluated for holding times, blank contamination, spike (surrogate/matrix) recovery, and detection capability.

3. The holding times, blank contamination, and detection capability will be reviewed for the remaining samples.

TARGET COMPOUND LIST (TCL) AND CONTRACT REQUIRED QUANTITATION LIMITS (CROL)*

		Quantitation Limits**	
Volatiles	CAS Number	Water ug/L	Low Soil/Sediment ug/Kg
1. Chloromethane	74-87-3	10	10
2. Bromomethane	74-83-9	10	10
3. Vinyl Chloride	75-01-4	10	10
4. Chloroethane	75-00-3	10	10
5. Methylene Chloride	75-09-2	5	5
6. Acetone	67-64-1	10	10
7. Carbon Disulfide	75-15-0	5	5
8. 1,1-Dichloroethane	75-35-4	5	5
9. 1,1-Dichloroethane	75-34-3	5	5
10. 1,2-Dichloroethane (total)	540-59-0	5	5
11. Chloroform	67-66-3	5	5
12. 1,2-Dichloroethane	107-06-2	5	5
13. 2-Butanone	78-93-3	10	10
14. 1,1,1-Trichloroethane	71-55-6	5	5
15. Carbon Tetrachloride	56-23-5	5	5
16. Vinyl Acetate	108-05-4	10	10
17. Bromodichloromethane	75-27-4	5	5
18. 1,2-Dichloropropene	78-87-5	5	5
19. cis-1,3-Dichloropropene	10061-01-5	5	5
20. Trichloroethene	79-01-6	5	5
21. Dibromochloromethane	124-48-1	5	5
22. 1,1,2-Trichloroethane	79-00-5	5	5
23. Benzene	71-43-2	5	5
24. trans-1,3-Dichloropropene	10061-02-6	5	5
25. Bromoform	75-25-2	5	5
26. 4-Methyl-2-pentanone	108-10-1	10	10
27. 2-Hexanone	591-78-6	10	10
28. Tetrachloroethane	127-18-4	5	5
29. Toluene	108-88-3	5	5
30. 1,1,2,2-Tetrachloroethane	79-34-5	5	5
31. Chlorobenzene	108-90-7	5	5
32. Ethyl Benzene	100-41-4	5	5
33. Styrene	100-42-5	5	5
34. Xylenes (total)	1330-20-7	5	5

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a Medium Soil/Sediment Contract Required Quantitation Limits (CRQL) for Volatile TCL Compounds are 125 times the individual Low Soil/Sediment CRQL.

* Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

** Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on dry weight basis as required by the contract, will be higher.

Semivolatiles	CAS Number	Quantitation Limits**	
		Water ug/L	Low Soil/Sediment ug/Kg
35. Phenol	108-95-2	10	330
36. bis (2-Chloroethyl) ether	111-44-4	10	330
37. 2-Chlorophenol	95-57-8	10	330
38. 1,3-Dichlorobenzene	541-73-1	10	330
39. 1,4-Dichlorobenzene	106-46-7	10	330
40. Benzyl alcohol	100-51-6	10	330
41. 1,2-Dichlorobenzene	95-50-1	10	330
42. 2-Methylphenol	95-48-7	10	330
43. bis (2-Chloroisopropyl) ether	108-60-1	10	330
44. 4-Methylphenol	106-44-5	10	330
45. N-Nitroso-di-n-dipropylamine	621-64-7	10	330
46. Hexachloroethane	67-72-1	10	330
47. Nitrobenzene	98-95-3	10	330
48. Isophorone	78-59-1	10	330
49. 2-Nitrophenol	88-75-5	10	330
50. 2,4-Dimethylphenol	105-67-9	10	330
51. Benzoic acid	65-85-0	50	1600
52. bis (2-Chloroethoxy) methane	111-91-1	10	330
53. 2,4-Dichloropheno	120-83-2	10	330
54. 1,2,4-Trichlorobenzene	120-82-1	10	330
55. Naphthalene	91-20-3	10	330
56. 4-Chloroaniline	106-47-8	10	330
57. Hexachlorobutadiene	87-68-3	10	330
58. 4-Chloro-3-methylphenol (para-chloro-meta-cresol)	59-50-7	10	330
59. 2-Methylnaphthalene	91-57-6	10	330
60. Hexachlorocyclopentadiene	77-47-4	10	330
61. 2,4,6-Trichlorophenol	88-06-2	10	330
62. 2,4,5-Trichlorophenol	95-95-4	50	1600
63. 2-Chloronaphthalene	91-58-7	10	330
64. 2-Nitroaniline	88-74-4	50	1600
65. Dimethylphthalate	131-11-3	10	330
66. Acenaphthylene	208-96-8	10	330
67. 2,6-Dinitrotoluene	606-20-2	10	330
68. 3-Nitroaniline	99-09-2	50	1600
69. Acenaphthene	83-32-9	10	330
70. 2,4-Dinitrophenol	51-28-5	50	1600
71. 4-Nitrophenol	100-02-7	50	1600
72. Dibenzofuran	132-64-9	10	330
73. 2,4-Dinitroroluene	121-14-2	10	330
74. Diethylphthalate	84-66-2	10	330
75. 4-Chlorophenyl-phenyl ether	7005-72-3	10	330
76. Fluorene	86-73-7	10	330
77. 4-Nitroaniline	100-01-6	50	1600
78. 4,6-Dinitro-2-methylphenol	534-52-1	50	1600

79. N-nitrosodiphenylamine	86-30-6	10	330
80. 4-Bromophenyl-phenyl ether	101-55-3	10	330
81. Hexachlorobenzene	118-74-1	10	330
82. Pentachlorophenol	87-86-5	50	1600
83. Phenanthrene	85-01-8	10	330
84. Anthracene	120-12-7	10	330
85. Di-n-butylphthalate	84-74-2	10	330
86. Fluoranthene	206-44-0	10	330
87. Pyrene	129-00-0	10	330
88. Butylbenzylphthalate	85-68-7	10	330
89. 3,3-Dichlorobenzidine	91-94-1	20	660
90. Benzo (a) anthracene	56-55-3	10	330
91. Chrysene	218-01-9	10	330
92. bis (2-Ethylhexyl) phthalate	117-81-7	10	330
93. Di-n-octylphthalate	117-84-0	10	330
94. Benzo (b) fluoranthene	205-99-2	10	330
95. Benzo (k) fluoranthene	207-08-9	10	330
96. Benzo (a) pyrene	50-32-8	10	330
97. Indeno (1,2,3-cd)	193-39-5	10	330
98. Dibenz (a,h) anthracene	53-70-3	10	330
99. Benzo (g,h,i) perylene	191-24-2	10	330

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b Medium Soil/Sediment Contract Required Quantitation Limits (CRQL) for SemiVolatile TCL Compounds are 60 times the individual Low Soil/Sediment CRQL.

* Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

** Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on dry weight basis as required by the contract, will be higher.

Pesticides/PCBs	CAS Number	Quantitation Limits** Water ug/L	Low Soil/Sediment mg/Kg
100. alpha-BHC	319-84-6	0.05	8.0
101. beta-BHC	319-85-7	0.05	8.0
102. delta-BHC	319-86-8	0.05	8.0
103. gamma-BHC (Lindane)	58-89-9	0.05	8.0
104. Heptaclor	76-44-8	0.05	8.0
105. Aldrin	309-00-2	0.05	8.0
106. Heptachlor epoxide	1024-57-3	0.05	8.0
107. Endosulfan I	959-98-8	0.05	8.0
108. Dieldrin	60-57-1	0.10	16.0
109. 4,4'-DDE	72-55-9	0.10	16.0
110. Endrin	72-20-8	0.10	16.0
111. Endosulfan II	33213-65-9	0.10	16.0
112. 4,4'-DDD	72-54-8	0.10	16.0
113. Endosulfan sulfate	1031-07-8	0.10	16.0
114. 4,4'-DDT	70-29-3	0.10	16.0
115. Methoxychlor	72-43-5	0.5	80.0
116. Endrin ketone	53494-70-5	0.10	16.0
117. alpha-Chlordane	5103-71-9	0.5	80.0
118. gamma-Chlordane	5103-74-2	0.5	80.0
119. Toxaphene	8001-35-2	1.0	160.0
120. Aroclor-1016	12674-11-2	0.5	80.0
121. Aroclor-1221	11104-28-2	0.5	80.0
122. Aroclor-1232	11141-16-5	0.5	80.0
123. Aroclor-1242	53469-29-6	0.5	80.0
124. Aroclor-1248	12672-29-6	0.5	80.0
125. Aroclor-1254	11097-69-1	1.0	160.0
126. Aroclor-1260	11096-82-5	1.0	160.0

c Medium Soil/Sediment Contract Required Quantitation Limits (CRQL) for Pesticides/PCB TCL compounds are 15 times the individual Low Soil/Sediment CRQL.

* Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

** Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on dry weight basis as required by the contract, will be higher.

INORGANIC TARGET ANALYTE LIST (TAL)

Analyte	Contract Required Detection Limit 1,2 (ug/L -- water*)
Aluminum	200
Antimony	60
Arsenic	10
Barium	200
Beryllium	5
Cadmium	5
Calcium	5000
Chromium	10
Cobalt	50
Copper	25
Iron	100
Lead	5
Magnesium	5000
Manganese	15
Mercury	0.2
Nickel	40
Potassium	5000
Selenium	5
Silver	10
Sodium	5000
Thallium	10
Vanadium	50
Zinc	20
Cyanide	10

Subject to the restrictions specified in the first page of Part G. Section IV of Exhibit D (Alternate Methods - Catastrophic Failure) any analytical method specified in SOW Exhibit D may be utilized as long as the documented instrument or method detection limits meet the Contract Required Detection Limit (CRDL) requirements. Higher detection limits may only be used in the following circumstances:

If the sample concentration exceeds five times the detection limit of the instrument or method in use, the value may be reported even though the instrument or method detection limit may not equal the CRDL. This is illustrated in the example below:

For lead:
Method in use = ICP
Instrument Detection Limit (IDL) = 40
Sample concentration = 220
Contract Required Detection Limit = 5

* Sediment detection limit 100x water