



137729

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**FILE COPY**

**WORKPLAN FOR  
REMEDIAL INVESTIGATION AND  
FEASIBILITY STUDY AT THE  
ALGOMA LANDFILL  
ALGOMA, WISCONSIN**

May 1988

Revision 1 - August 1988  
Revision 2 - November 1988

USEPA Docket No. V-W-87-C-036

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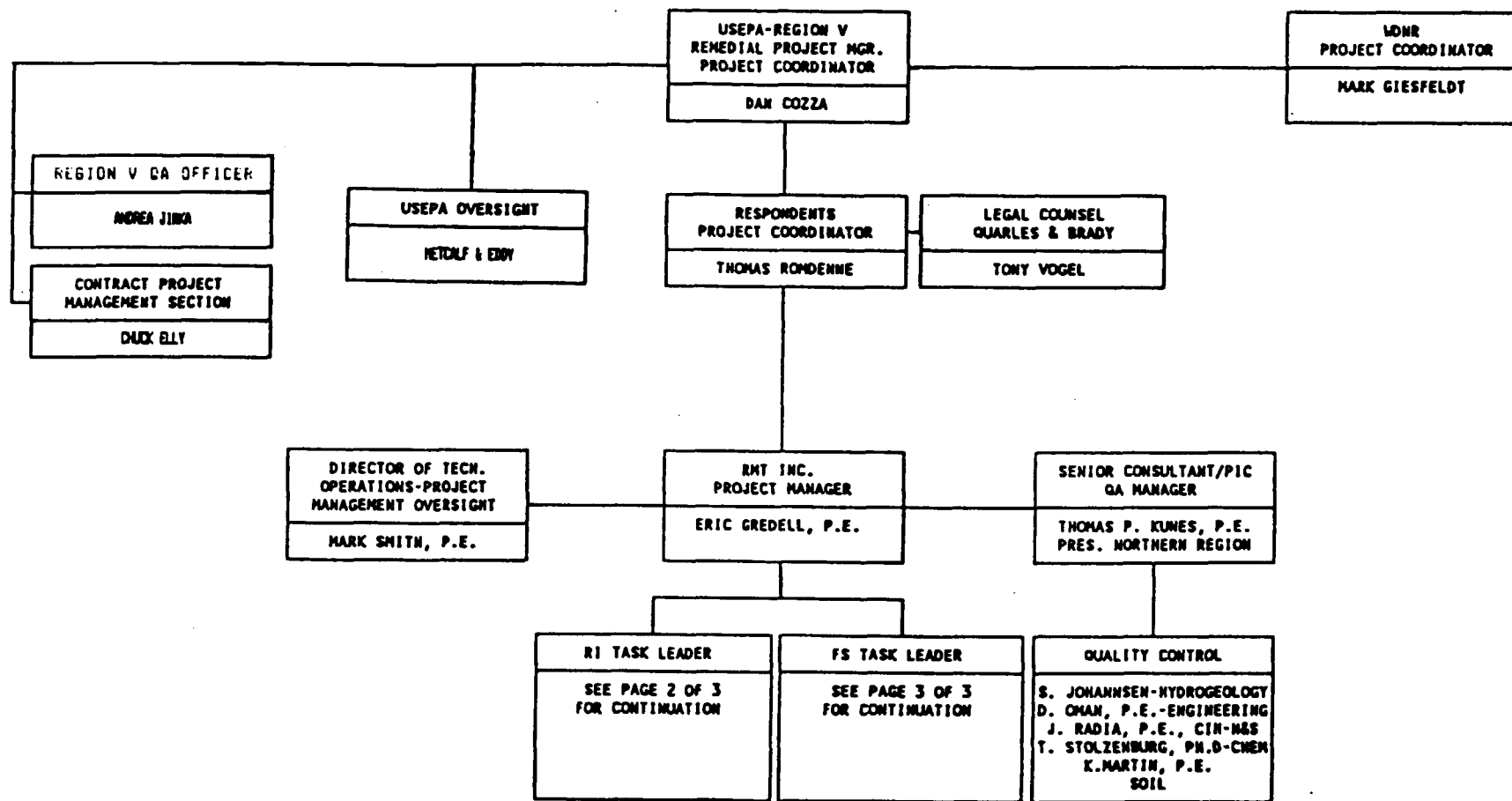
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The Quality Assurance Project Plan (QAPP), included as Appendix B of the Workplan, has been prepared in accordance with the guidance documents specified in the Scope of Work, and additional reference information provided by the United States Environmental Protection Agency (USEPA). The QAPP also addresses the comments provided by the USEPA during the pre-QAPP meeting held at the USEPA's office in Chicago on March 1, 1988, and written review comments provided by the USEPA in a letter to the Respondents dated September 12, 1988.

A schedule indicating key events during implementation of the RI/FS is presented in Section 13.

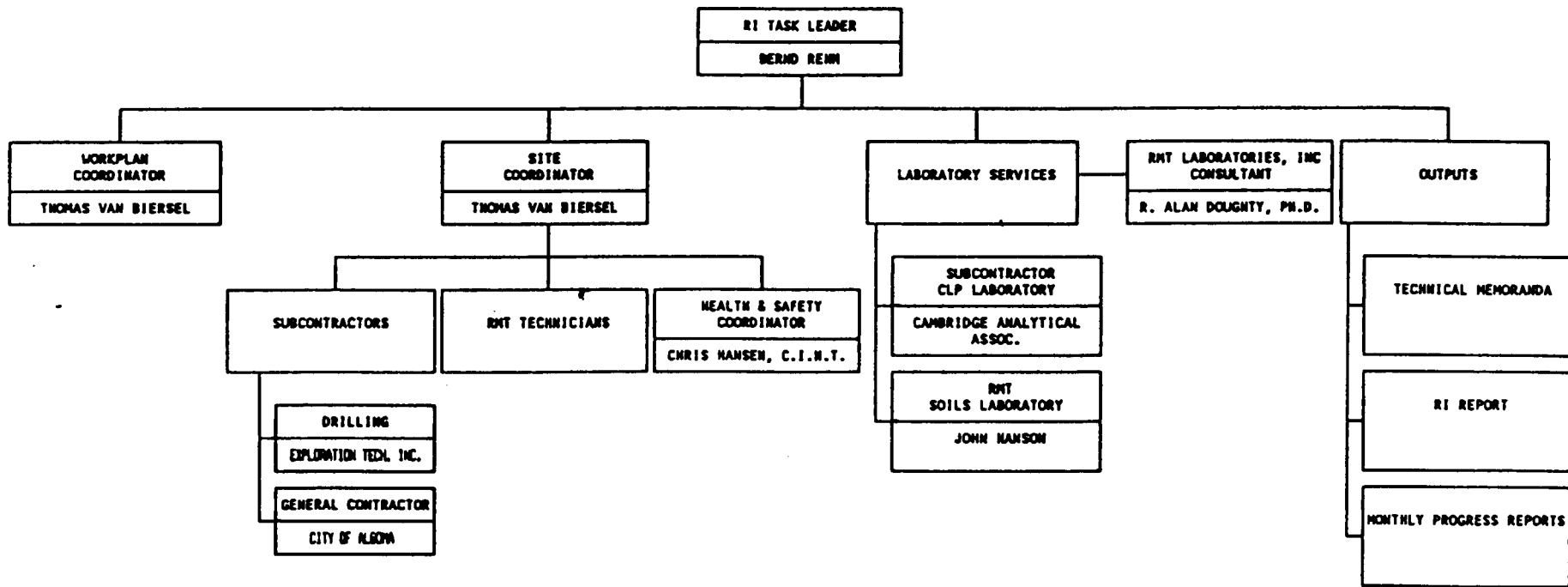
- . A geophysical survey of the landfill to delineate the areal extent and to help estimate the volume of disposal areas, provide information for locating the new monitoring wells, attempt to identify the location of concentrated areas of buried ferrous materials that may represent drums, and identify if the access road is encroaching onto the landfill.
- . Collection of fifteen (15) soil and sediment samples near the landfill for chemical analysis and physical analysis.
- . Collection of surface water samples at three (3) locations, with lab analysis of the samples.
- . Installation of six (6) new observation wells around the landfill.
- . In-situ permeability tests at the new wells.
- . Installation of a surface water staff gage.
- . Two rounds of ground water sampling from the six (6) new wells, and four (4) of the existing wells, with lab analysis of the samples.
- . Two rounds of sampling from existing potable water wells at five (5) private residences upgradient and downgradient of the landfill.
- . Measurement of ground water elevations at the six (6) new wells and all of the existing wells, and the surface water elevation in the wetlands.
- . Collection of eleven (11) samples of cover material on the landfill and at two (2) additional suspected disposal areas adjacent to the landfill, and physical tests of the samples to determine the cover material properties.
- . Soil gas sampling on the landfill with on-site analysis of the gas samples may be conducted during Round 2 of the Phase I ground water sampling, if the lab results from Round 1 of ground water sampling indicate there has been a significant release of organic constituents from the landfill to the ground water. The on-site analysis would be conducted with a portable gas chromatograph, to identify areas having high concentrations of volatile organic compounds (benzene, 2-butanone, toluene, trichloroethene, and xylene).


FIGURE 2  
PROJECT ORGANIZATION



Drawn by GDB  
Date NOV 11 1988  
Proj. # 1375.02

FIGURE 2 (CONT'D)  
PROJECT ORGANIZATION



	Dwn by <b>GOB</b>
	Date <b>NOV 11 1988</b>
	Proj. # <b>1375.02</b>

Nov. 1974 The WDNR requests a complete plan of operation, including a wet system for disposal of asbestos dust.

Apr. 1975 Preliminary plan of abandonment is developed by Mr. Allan Groll, City Engineer, and submitted to the WDNR.

Nov. 1975 Only slurried dust containing asbestos is sent to the landfill.

Feb. 1978 The WDNR notes that asbestos-containing material was used as cover material in violation of licensed operating procedures.

June 1980 BS&B contacts the WDNR about possible vertical expansion of the landfill. The WDNR states that the landfill is in violation of NR 180, and that unless there is a change in operating procedures, the expansion will be denied. The WDNR also states that the City has not yet submitted a complete plan of operation or feasibility study, including the abandonment plan.

Aug. 1980 The City files a Notification of Hazardous Waste Activity with the USEPA.

Sept. 1980 The City notifies local industries that they cannot bring their waste to the landfill, in an effort to extend the life of the landfill. Complaints are filed by local industries.

Oct. 1980 The WDNR requires that initially seven to eight soil borings be drilled on-site, and six monitoring wells be installed. The monitoring wells are to be sampled twice and the data included in the abandonment plan.

Nov. 1980 Nine borings (B-1, 2, 3, 4, 5, 6, 6A, 7, and 8) are drilled on-site, and six monitoring wells (OW-1, 2, 3, 4, 5, and 6A) are installed.

Feb. 1981 BS&B submits the proposed vertical expansion and abandonment plans for the landfill to the WDNR.

Mar. 1981 The WDNR inspects the site and notes that there are approximately two years of life remaining at the landfill, and that an expansion cannot be approved due to the nature of the ground (sand and gravel), the site's proximity (1200 feet) to a private well, the presence of leachate seeps, and the site's location upgradient of Algoma and Lake Michigan.

Apr. 1981 The expansion plan is denied by the WDNR.

### **7.2.2 Drum Storage Area**

A drum storage area will be located adjacent to the decontamination pad. The storage area will be comprised of a posted 50-by-50-foot area surrounded by a chain-link fence with a locked gate. The storage area will be used to store any contaminated liquids or solids. The stored drums will be labeled, sealed, set on wood pallets and covered with a tarp. The storage area will be inspected regularly to verify the integrity of the drums. The drums will be stored on-site for final disposal during the remedial action phase.

### **7.2.3 Decontamination Area**

A decontamination pad will be constructed on the east side of the haul road, northeast of the NDA (Figure 6). The area is expected to be located on top of clayey natural soils.

The decontamination pad will be a shallow sloping excavation, lined with a flexible 30-mil PVC liner which drains to a lined sump (Figures 7 and 8). The PVC liner will be covered with a geotextile fabric and coarse gravel. A perforated drum will be placed in the sump and surrounded by coarse gravel. The sump will be emptied at least once each week or when it is three-quarters full. The decontamination wastewater will be screened by measuring VOC concentrations in the headspace over the sump with an HNU Systems photoionization detector. If VOC concentrations greater than 5 ppm above background readings are measured in the headspace of the sump, the water will be pumped into DOT-approved drums and stored on-site. If VOC concentrations less than or equal to 5 ppm above background readings are measured in the

headspace of the sump, the wastewater will be transported to, and disposed at, the Algoma Municipal Wastewater Treatment Plant.

The decontamination pad will be constructed in the following manner:

landfill. The second objective is to establish whether the access road along the west side of the LDA is encroaching over waste materials buried in the landfill and to assess whether recent roadwork damaged the landfill cover. The third objective is to assess the presence of ferrous or magnetic materials that might be indicative of buried waste containers described in Section 4 of this Workplan. Identification of a concentrated area of drum disposal, if present, would be incorporated into the assessment of remedial alternatives designed to address control/removal of the source(s) of volatile organic compounds.

#### **7.4.2 Geophysical Survey Plan**

The detailed methodology and equipment specifications are presented in the QAPP (Appendix B). The survey is comprised of 16 survey lines that cross the four disposal areas (Figure 6 and Table 7-1). Data along additional survey lines may be collected to more accurately define significant geophysical anomalies identified by the initial 16-line survey. Data will be collected with a Geonics Ltd. Model EM-31 Terrain Conductivity Meter attached to a dual channel data logger. The data logger is a continuous chart recorder. It will trace both the quadrature (out-of-phase) and in-phase components of the induced magnetic field measured by the EM-31. The quadrature component is a measurement of the terrain conductivity, which will be used to differentiate between waste materials, natural soils, and ground water containing significant concentrations of dissolved solids. The in-phase component measurement is used to detect the magnetic fields surrounding ferrous materials such as drums.

**SDMS US EPA REGION V  
 FORMAT- OVERSIZED - 5  
 IMAGERY INSERT FORM**

The item(s) listed below are not available in SDMS. In order to view original document or document pages, contact the Superfund Records Center.

<b>SITE NAME</b>	<b>ALGOMA MUNICIPAL LANDFILL</b>		
<b>DOC ID #</b>	<b>137729</b>		
<b>DESCRIPTION OF ITEM(S)</b>	<b>Map - Groundwater, soil/sediment, and surface water sampling map</b>		
<b>REASON WHY UNSCANNABLE</b>	<u>  X  </u> <b>OVERSIZED</b>	<b>OR</b>	<u>      </u> <b>FORMAT</b>
<b>DATE OF ITEM(S)</b>	<b>11/11/1988</b>		
<b>NO. OF ITEMS</b>	<b>2</b>		
<b>PHASE</b>	<b>REM</b>		
<b>PRP</b>	<b>RMD Algoma Municipal</b>		
<b>PHASE (AR DOCUMENTS ONLY)</b>	<u>   </u> Remedial <u>   </u> Removal <u>   </u> Deletion Docket <u>   </u> AR <u>   </u> Original <u>      </u> Update # <u>      </u> Volume <u>   </u> of <u>   </u>		
<b>O.U.</b>			
<b>LOCATION</b>	Box # <u>  1  </u> Folder # <u>  1  </u> Subsection <u>      </u>		
<b>COMMENT(S)</b>			
<b>2 Maps - in plastic binders</b>			

**TABLE 7-4**  
**SUMMARY OF EXISTING MONITORING WELL SAMPLING**

<u>Monitoring Well #</u>	<u>Depth (ft.)</u>	<u>Objective</u>	<u>Data Collected</u>
OW-1	39.8	Ground water flow assessment. No sample - damaged - casing was repaired with solvent cements.	Hydraulic Head <sup>a</sup> Hydraulic Conductivity
OW-2	31.5	Ground water flow assessment. No sample - well located in water-filled depression.	Hydraulic Head <sup>a</sup> Hydraulic Conductivity
OW-3	35.0	Ground water flow assessment. No sample - well sand pack in contact with LDA fill material.	Hydraulic Head <sup>a</sup>
OW-4	27.0	Ground water flow assessment. Define ground water quality downgradient from the LDA.	Hydraulic Head <sup>a</sup> Hydraulic Conductivity Full TCL <sup>b</sup>
OW-5R	41.1	Ground water flow assessment. Define ground water quality downgradient from the LDA.	Hydraulic Head <sup>a</sup> Hydraulic Conductivity Full TCL <sup>b</sup>
OW-6A	38.0	Ground water flow assessment. Define ground water quality downgradient from the LDA.	Hydraulic Head <sup>a</sup> Hydraulic Conductivity Full TCL <sup>b</sup>
OW-9	70.8	Ground water flow assessment. Define ground water quality downgradient from the LDA.	Hydraulic Head <sup>a</sup> Hydraulic Conductivity Full TCL <sup>b</sup>

<sup>a</sup>A minimum of two (2) rounds of ground water elevations will be collected at all wells.

<sup>b</sup>The first round of ground water samples collected will include the complete TCL, including filtered and unfiltered metals. The second round of ground water samples collected will include the VOCs and all other fractions of the TCL which include constituents whose concentrations significantly exceed background concentrations detected in the first round of sampling.

significantly exceed background concentrations during the first round of sampling. The second round analytical program will be determined by the USEPA in consultation with the WDNR following a review of the first round results with the Respondents.

One duplicate sample will be collected during each round of sampling. The samples to be split will be selected at the discretion of the field crew. A single equipment rinse blank (field blank) from the filtering apparatus will be collected and analyzed for the filtered metal fraction. Other equipment blanks will not be collected since all sampling equipment will be dedicated to each monitoring or observation well. Matrix spike duplicates will be analyzed as defined by the USEPA Contract Laboratory Program protocols.

Private Residence Well Sampling. The objective of the private residence well sampling is to assess whether hazardous substances attributable to the Algoma Landfill have migrated to human receptor points within one-half mile of the landfill.

Phase I of the RI includes two sampling rounds of five (5) representative residences on the north, east, and south sides of Section 32 (Table 7-7 and Figure 10). The samples will be analyzed for the VOC fraction of the TCL, field pH, field specific conductance, and temperature during the first round of sampling. During the second round of sampling, the private wells will be sampled for at least the VOCs, and other constituents found to significantly exceed background concentrations in observation well samples during the first round of sampling. The second round analytical program will be determined by the USEPA in consultation with the WDNR following a review of the first

round results with the Respondents. Permission for sampling will be requested by the Respondents upon USEPA approval of this Workplan. Modification of the private residence sampling plan may be required depending on the ability to obtain permission from the property owners for sampling.

**TABLE 7-7**  
**SUMMARY OF PRIVATE WELL SAMPLING**

<u>Proposed Private Well #</u>	<u>Objective</u>	<u>Data Collected</u>
PW-1	Background sampling	VOC <sup>a</sup>
PW-2	Assess potential effect of North Disposal Area on well	VOC <sup>a</sup>
PW-3	Downgradient sampling	VOC <sup>a</sup>
PW-4	Downgradient sampling	VOC <sup>a</sup>
PW-5	Downgradient sampling	VOC <sup>a</sup>

<sup>a</sup>The private wells will be sampled twice. The first round will only include sampling for the VOC fraction of the TCL. The second round of sampling will include the VOC fraction as well as all other fractions found during the first round in the observation wells at concentrations that significantly exceed background concentrations (OW-14).

The Phase I sampling program includes private wells upgradient and downgradient from the Algoma Landfill. Private residential wells PW-3 through 5 (Figure 10) will be considered to be downgradient from the site since the local bedrock ground water flow direction is expected to be to the north or east. Private well PW-1 is probably upgradient of the site and therefore considered to be a background well.

The owners of the five residences will be interviewed by the field crew to obtain information on the well's construction, age, depth, and use. Where possible, the well and associated accessible plumbing will also be inspected. A copy of the well construction log will be obtained if available. The sampling points selected will have wells in good working condition and currently used by the residents. Whenever possible, the sampling point at each residence will be located as close to the well head as possible, bypassing any water softeners, heaters, and aerators. The field crew will note the well's condition and any use of chemicals in the well.

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Mark Giesfeldt, Chief  
Environmental Response and  
Repair Section  
WDNR  
P.O. Box 7921  
Madison, WI 53707

Where possible, the preferred remedy will reflect the following preferences:

1. Remedies involving treatment that significantly reduce the toxicity, mobility, or volume of hazardous constituents as a principal element.
2. Remedies minimizing the requirement for long-term management of residuals.

The evaluation and selection of alternatives will be consistent with the requirements of the National Contingency Plan and with USEPA guidance on performing Feasibility Studies Under CERCLA.

#### **12.8 Task 14: Reports**

Five copies of a preliminary and final report will be submitted to each of the following persons:

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Environmental Response and  
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Madison, WI 53707

The final report will address comments by the USEPA and WDNR, and will include a responsiveness summary to public comments.

### 13. PROJECT SCHEDULE

The estimated schedule for completion of the Algoma Landfill RI/FS presented on Figure 11 was prepared in August 1988. The schedule shown on Figure 11 is based on information available and project status as of August 1988. The schedule is also based on several assumptions made at that time, including the length of the Workplan reviews by the USEPA and WDNR, minimal changes to the draft Workplan, advance approval of the SIP and H&S Plan, no laboratory delays, a single RI phase, expedited reviews of the draft RI and FS reports by the USEPA and WDNR, and minimal changes to the draft RI and FS reports.

To address any anticipated revisions to the RI/FS schedule which may be required during the project, updated schedules will be submitted with the Monthly Progress Reports. Upon written approval of the USEPA's Remedial Project Manager, or unless other written notification regarding an updated schedule is received from the USEPA by the Respondents within 30 calendar days after any updated schedule is submitted, the updated schedules will become the RI/FS Workplan schedule referenced in Article IX of the Administrative Order by Consent. Each accepted updated schedule will supersede all previous Workplan schedules. This procedure for approval of updated schedules has been discussed with and accepted by the USEPA's Remedial Project Manager.





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**APPENDIX B**

QUALITY ASSURANCE PROJECT PLAN  
ALGOMA LANDFILL  
ALGOMA, WISCONSIN

May 1988

Revision 1 - August 1988  
Revision 2 - November 1988

USEPA Docket No. V-W-87-C-036

Prepared by:

Submitted by:

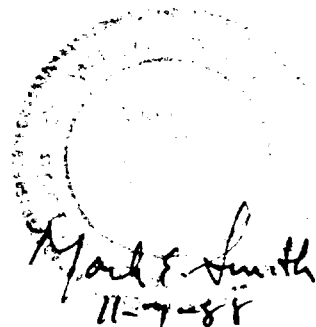
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1493.42 101:RTA:algo225BR2

QUALITY ASSURANCE PROJECT PLAN (QAPP)

Project Title: Algoma Landfill, Algoma, Wisconsin

EPA Docket No.: V-W-87-C-036

Approved by \_\_\_\_\_ Date: \_\_\_\_\_  
USEPA Remedial Project Manager

Approved by \_\_\_\_\_ Date: \_\_\_\_\_  
USEPA Director, Central Regional Laboratory

Approved by \_\_\_\_\_ Date: \_\_\_\_\_  
USEPA Quality Assurance Officer

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### **1.3 Target Compounds**

Hazardous substances disposed at the landfill included mainly organic compounds and asbestos (Section 4.7 of the Workplan). During this investigation, both volatile and semi-volatile organic compounds and heavy metals will be targeted for analyses. Asbestos is not considered to be generally mobile in the environment, except when exposed to the wind. The landfill has been capped for five years; therefore, asbestos will not be targeted in Phase I of the RI/FS.

During Phase I of the Algoma Landfill RI/FS, the samples collected will be analyzed for all or part of the Target Analyte List (TAL) and Target Compound List (TCL) (included in Attachment B) as defined by the USEPA Contract Laboratory Program (CLP).

### **1.4 Project Objectives**

The overall purpose of a remedial investigation as described by the National Contingency Plan (40 CFR 300.68[f]) is to "... determine the nature and extent of the problem presented by the release [of hazardous substance(s)]. This includes sampling and monitoring, as necessary, and includes the gathering of sufficient information to determine the necessity for and proposed extent of remedial action." The data must be sufficient not only to verify the need for remedial action, but also must be adequate to evaluate the preliminary remedial technologies that might be applicable to this site, should the need for remediation arise.

The specific objectives of Phase I of the Algoma Landfill RI/FS are as follows:

to provide enough data to fulfill the requirements set forth in the USEPA Scope of Work (Appendix A of the Workplan) and enable RMT to address the project objectives of Phase I of the RI. The sampling plans will provide, in a phased approach, a sufficient amount of quality data to meet the objectives (Section 2 of the Workplan).

Geophysical surveys, landfill cover material testing, ground water observation and residential sampling wells, and maybe pore gas sampling will be used to characterize the site. The chemical analysis of soil/sediment, surface water, and ground water will be used in assessing potential risk to public health and the environment. DQO summary forms are provided in Attachment D. Air monitoring will be performed as part of the health and safety procedures (Appendix C). The data collected will be used to evaluate the various remedial technologies set forth in the Workplan (Section 5) and to develop a preliminary data base for the engineering design of alternatives. Furthermore, the ground water monitoring well network could be used for monitoring the ground water quality during and after the remedial action phase.

#### **1.6 Sampling Program Summary**

The waste disposal areas that make up the Algoma Landfill site have been tentatively identified from available information (Section 4 of the Workplan). The site lacks engineering and operational data and information defining the environmental setting, and actual or observed hazardous substance migration is sparse. The sampling program proposed in the SIP addresses the objectives presented in Section 1.4, in light

of the limited existing data base. The sampling program objectives are summarized as follows:

Geophysical Data: Geophysical data will be collected to delineate the approximate limits of the disposal areas and locate metal targets, such as drums (see Section 7.4.1 of Site Investigation Plan).

Soil/Sediment Data: Soil/sediment data will be collected to determine whether or not releases of hazardous substances from the landfill have occurred by means of surface runoff (see Section 7.5.1 of Site Investigation Plan).

Surface Water Data: Surface water data will be collected to assess whether or not runoff or discharging ground water containing hazardous substances is currently entering wetlands adjacent to the site (see Section 7.6 of Site Investigation Plan).

Hydrogeologic Data: Hydrogeologic data will be collected to generally define potential migration pathways, to assess whether releases have occurred from the disposal areas, and to characterize the nature of the releases, if present (see Section 7.7.1 of Site Investigation Plan).

Landfill Cover Data: Data will be collected on the cover material of the disposal areas to characterize the material's geotechnical properties (see Section 7.8.1 of Site Investigation Plan).

Pore Gas Data: Landfill pore gas data will be obtained if the ground water data suggest that hazardous substances have been released from the landfill. The data will be used to identify locations within the disposal areas where VOC concentrations are high. These areas might be representative of drum concentrations or disposal pits (see Section 7.9.1 of Site Investigation Plan).

A summary of the Phase I chemical and physical sampling plan is presented in Tables B-1 and B-2. The Workplan discusses the rationale for the sampling design and describes the sampling points in Sections 4, 6, and 7. Eighty (80) chemical sampling stations (99 samples) will be established during the Phase I site investigation described in Section 7 of the Workplan. The samples will consist of soil/sediment, surface water, ground water, and pore gas (if appropriate). The

laboratory analytical program will vary by matrix and by sampling location as described in the Site Investigation Plan. Field screening analyses (GC) will be applied at up to sixty-two (62) points

TABLE B-1 (CONT'D)  
 SUMMARY OF SAMPLING AND ANALYSIS AT THE ALCONA LANDFILL

Sample Matrix	Field Parameters	Laboratory Parameters	Laboratory Analyses																
			Samples		Replicates		Field Blanks		Trip Blanks		Matrix Spikes		Matrix Totals						
			No.	Freq.	Tot.	No.	Freq.	Tot.	No.	Freq.	Tot.	No.	Freq.	Tot.	No.	Freq.	Tot.		
Ground Water(c) (Monitoring Wells)	pH	VOC	10	2	20	1	2	2	--	--	2	2	4	1	2	2	2	28	
		RAS Protocol Unfiltered																	
	Specific Conductance	ABM Extractables	10	1	10	1	1	1	--	--	--	--	--	--	1	1	1	1	12
		RAS Protocol Unfiltered																	
	Temperature	Pesticides/PCB	10	1	10	1	1	1	--	--	--	--	--	--	1	1	1	1	12
		RAS Protocol Unfiltered																	
		Inorganics	10	1	10	1	1	1	--	--	--	--	--	--	1	1	1	1	12
		RAS Protocol Unfiltered																	
		Inorganics	10	1	10	1	1	1	--	--	--	--	--	--	--	--	--	--	12
		RAS Protocol Filtered																	
	Cyanide	10	1	10	1	1	1	--	--	--	--	--	--	1	1	1	1	12	
	RAS Protocol Unfiltered																		
Ground Water(c) (Residential Wells)	pH	VOC	5	2	10	1	2	2	--	--	1	2	2	1	2	2	2	16	
		SAS (as defined by QAPP) Unfiltered																	
	Specific Conductance																		
	Temperature																		

(c) Table includes minimum requirements for second round of sampling. Final sampling and analysis program will be developed from results of first round-analyses, with the review and approval of the USEPA in consultation with the WDMR.

TABLE B-1  
SUMMARY OF SAMPLING AND ANALYSIS AT THE ALCONA LANDFILL

Sample Matrix	Field Parameters	Laboratory Parameters	Laboratory Analyses																
			Samples		Replicates		Field Blanks		Trip Blanks		Matrix Spikes								
			No.	Freq.	Tot.	No.	Freq.	Tot.	No.	Freq.	Tot.	No.	Freq.	Tot.	No.	Freq.	Tot.		
Soil & Sediment	VOC(a)	VOC	3	1	3	2	1	2	--	--	1	1	1	1	1	1	1	7	
		RAS Protocol																	
		ABW Extractables	11	1	11	2	1	2	--	--	--	--	1	1	1	1	1	1	14
		RAS Protocol																	
		Pesticides/PCB	11	1	11	2	1	2	--	--	--	--	1	1	1	1	1	1	14
		RAS Protocol																	
		Inorganics	15	1	15	2	1	2	--	--	--	--	1	1	1	1	1	18	
		RAS Protocol																	
		Cyanide	15	1	15	2	1	2	--	--	--	--	1	1	1	1	1	18	
		RAS Protocol																	
Surface Water	pH	VOC	3	1	3	1	1	1	--	--	1	1	1	1	1	1	1	6	
		RAS Protocol																	
	Specific Conductance	Unfiltered																	
		Temperature	1	1	1	1	1	1	--	--	--	--	1	1	1	1	1	3	
		ABW Extractables	1	1	1	1	1	1	--	--	--	--	1	1	1	1	1	3	
		RAS Protocol																	
		Unfiltered																	
		Pesticides/PCB	1	1	1	1	1	1	--	--	--	--	1	1	1	1	1	3	
		RAS Protocol																	
		Unfiltered																	
		Inorganics	3	1	3	1	1	1	--	--	--	--	1	1	1	1	1	5	
		RAS Protocol																	
		Unfiltered																	
		Cyanide	1	1	1	1	1	1	--	--	--	--	1	1	1	1	1	3	
		RAS Protocol																	
		Unfiltered																	
		Total Hardness	3	1	3	1	1	1	--	--	--	--	1	1	1	1	1	5	
		SAS (EPA 130.2)																	
		Unfiltered																	
Soil Pore Gas	VOC(b)	Not applicable	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	

(a) Field GC-PID analyses of 15 samples, including two replicate samples and two field blanks. Protocols described in QAPP Section 4.5  
(b) Field GC-PID analyses of 47 samples, including five replicate samples and five field blanks. Protocols described in QAPP Section 4.5.

(with seven replicate measurements and seven equipment blanks). Laboratory analyses will be performed on samples from thirty-seven (37) locations. Duplicate samples will be submitted to the laboratory from seven (7) locations. Only one (1) equipment blank will be collected because most of the sampling equipment will be disposable (single-use) or dedicated to a given sampling point.

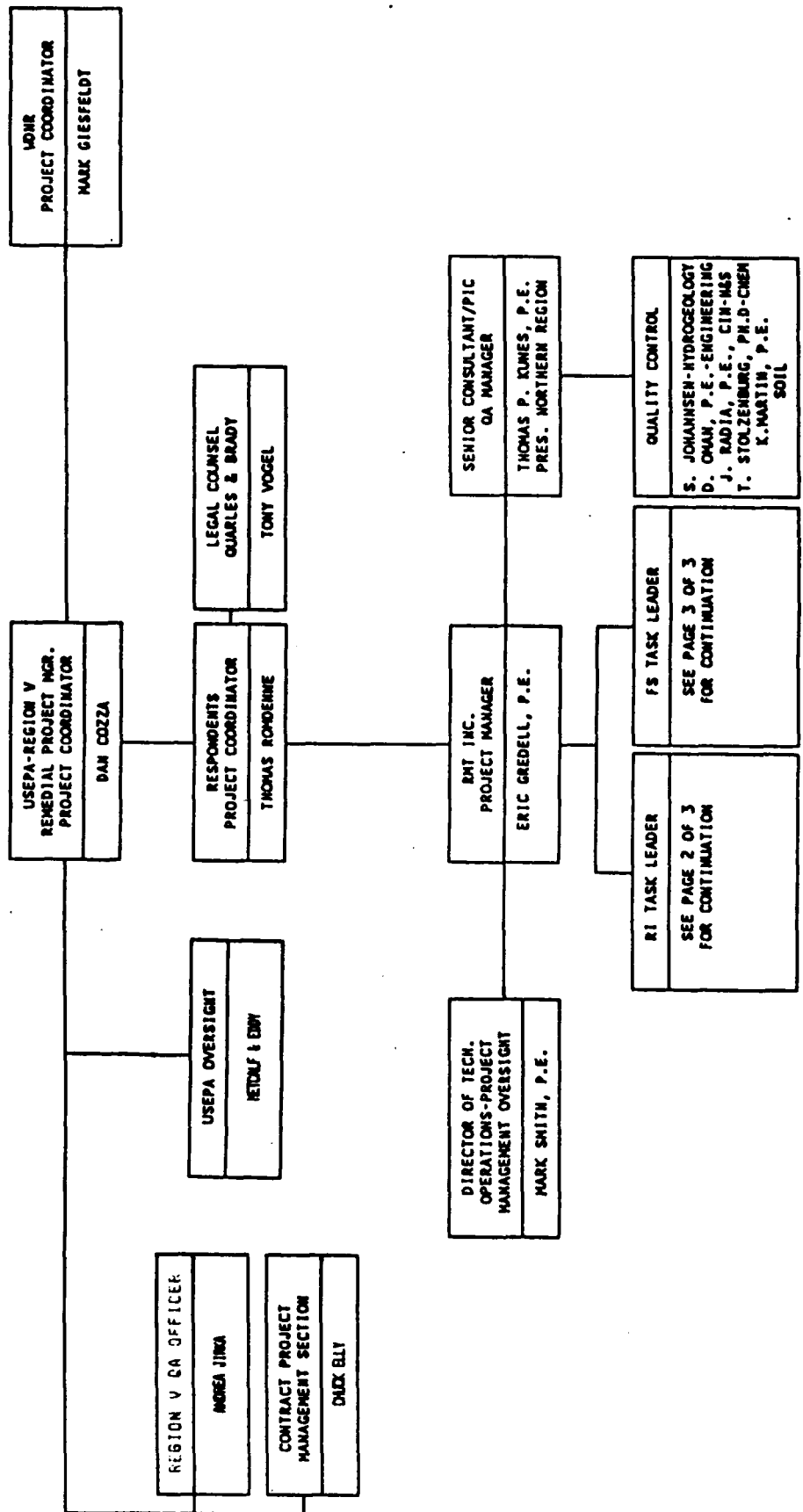
Samples for physical testing will be collected from twenty-one (21) stations on the landfill cover or from subsurface borings, as summarized in Table B-2. The laboratory testing program is designed to characterize the landfill cover and the basic hydrogeologic properties of subsurface materials. In addition, in-field testing of monitoring and observation wells will provide estimates of in-situ hydraulic conductivity of subsurface materials.

### **1.7 Project Schedule**

The estimated schedule for completion of the Algoma Landfill RI/FS presented on Figure B-1 was prepared in August 1988. The schedule shown on Figure B-1 is based on information available and project status as of August 1988. The schedule is also based on several assumptions made at that time, including the length of the Workplan reviews by the USEPA and WDNR, minimal changes to the draft Workplan, advance approval of the SIP and H&S Plan, no laboratory delays, a single RI phase, expedited reviews of the draft RI and FS reports by the USEPA and WDNR, and minimal changes to the draft RI and FS reports.

To address any anticipated revisions to the RI/FS schedule which may be required during the project, updated schedules will be submitted with the Monthly Progress Reports. Upon written approval of the USEPA's Remedial Project Manager, or unless other written notification regarding an updated schedule is received from the USEPA by the Respondents within 30 calendar days after any updated schedule is submitted, the updated schedules will become the RI/FS Workplan schedule referenced in Article IX of the Administrative Order by Consent. Each accepted updated schedule will supersede all previous Workplan schedules. This procedure for approval of updated schedules has been discussed with and accepted by the USEPA's Remedial Project Manager.

FIGURE B-2  
 PROJECT ORGANIZATION



Dwn by GDS  
 Date NOV 11 1988  
 Proj # 1375.02


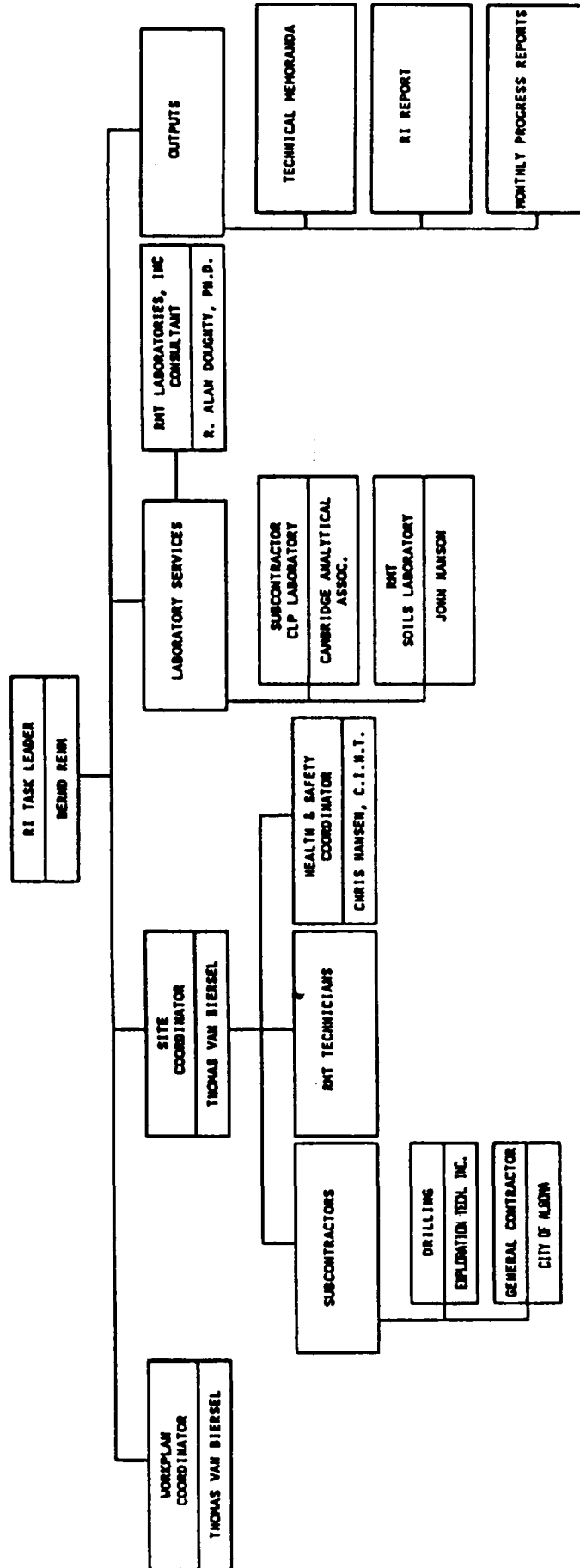


FIGURE 8-2 (CONT'D)  
 PROJECT ORGANIZATION

PAGE 2 OF 3



**RMT** INC

Draw by GDB

Date NOV 11 1988

Proj.# 1375.02

PHYSICAL ANALYSES

<u>Person</u>	<u>RMT Position Title</u>	<u>Project Assignment</u>
John Hanson	Supervisor, RMT Soils Laboratory	. Overall QA
Katherine E. Martin, P.E.	Manager - Construction Services Group	. QC Reviewer - Soils

CHEMICAL ANALYSES

<u>Person</u>	<u>Position Title</u>	<u>Project Assignment</u>
Thomas R. Stolzenburg, Ph.D.	Manager - Applied Chemistry Group	. QC Reviewer - Chemistry
Cambridge Analytical Associates (CAA)	Analytical Laboratory for All Chemical Analyses	. QA/QC as defined by USEPA-CLP SOW, Inorganics (rev. 12/87) and Organics (rev. 8/87).

Performance and system audits of the laboratories will be performed at the discretion of the USEPA Region V Contract Project Management Section. Cambridge Analytical Associates is currently participating in the USEPA CLP in Region V for both inorganic and organic constituent analyses.

Tentatively Identified Compounds (TICs) will be identified by the analytical laboratory (CAA) using the procedures defined by the USEPA CLP Statement of Work for Organics (USEPA, 1987c). The environmental significance of the TICs will be evaluated by the RI Task Leader and H.M. Rubenstein, RMT Organics Laboratory Manager.

### 3. QA OBJECTIVES FOR MEASUREMENT DATA

The overall QA objective for Phase I of the Algoma Landfill RI/FS is to develop and implement procedures for data acquisition and reporting that meet quality standards sufficient for the purposes of an RI/FS as defined by the Comprehensive Environmental Response, Compensation and Liability Act, and the Superfund Amendments and Reauthorization Act. Specific procedures for land surveying, geophysical surveying, pore gas sampling, soil borings and landfill cover sampling, surficial soil/sediment sampling, surface water sampling, observation well installation and sampling, chain-of-custody, and laboratory analytical procedures, reporting, internal QC, audits, preventive maintenance, calibration, and corrective actions are described in other sections of this QAPP. Discussion of calibration, preventive maintenance, and validation (duplicates and field blanks) are discussed with the field equipment procedures in the appropriate section of the QAPP. Section 3.0 defines the QA objectives for data precision, accuracy, and completeness for the field and laboratory equipment.

#### 3.1 Regulatory and Legal Requirements

The environmental samples (soil/sediment, surface water, and ground water from monitoring wells) will be analyzed for the constituents outlined in the Workplan and Table B-1 of the QAPP using the Routine Analytical Services (RAS) procedures specified in the USEPA Contract Laboratory Statements of Work for Inorganics (USEPA, 1987b) and Organics

(USEPA, 1987c). The private residential well samples will be analyzed according to procedures specified by the USEPA Region V Quality Assurance Section. These procedures define instrument detection limits or quantitation limits that are 133 to 1.3 times lower than Maximum Contaminant Levels (MCLs) as defined by 40 CFR Part 141 and on the order of 2 to 100 times less than RAS under the CLP.

### **3.2 Quality Assurance Level of Effort**

Field duplicates, field blanks, and trip blanks will be taken and submitted to the analytical laboratory to assess the quality of the analytical data generated by the Site Investigation. The duplicate samples will be used to evaluate sampling and analytical reproducibility (precision). Duplicate samples will be collected at a rate of approximately one duplicate for every ten environmental samples for each matrix sampled. The specifics of duplicate sample collection are summarized in Table B-1 of Section 1.6 of the QAPP.

Field blanks will be collected and analyzed to assess procedural errors in sampling and equipment decontamination. Field blanks will be collected at a rate of at least one blank for every ten environmental samples collected from those procedures and pieces of equipment that may be subject to cross-contamination during the field investigation. The specifics of field blank collection are summarized in Table B-1 of Section 1.6 of the QAPP.

Trip blanks will be analyzed to assess the possible cross-contamination of volatile organic compounds resulting from diffusion through septa during storage and shipment of samples intended for VOC analyses. Trip blanks will be included in every shipping container that includes water samples intended for VOC analyses. The trip blanks will be analyzed at a rate of one trip blank for each shipping container that the laboratory receives (or one per twenty samples if more than twenty samples are received on a day).

Matrix spike and spike duplicate samples will be collected and analyzed at a rate of one per twenty samples for each matrix sampled. These QC samples will be collected in the field by collecting twice the required sample volume of selected environmental samples. The selection of the sample for matrix spike and spike duplicate submittal will be left to the discretion of the field sampling personnel based on factors such as availability of the requisite sample volumes, access of the sampling point, and shipping schedules.

The level of QA effort for both organic and inorganic constituents will be in accordance with the CLP Statements of Work (USEPA, 1987b and 1987c) or the Standard Operating Procedures for residential well drinking water samples (Attachment C). The QC procedures for organic compound analyses include the following:

- . GC/MS instrument tuning.
- . Initial multi-level calibration for specified TCL constituents.
- . Continuing calibration.
- . Analyses of surrogate-spike samples.
- . Analyses of duplicated matrix-spike samples.
- . Analyses of reagent blanks.

The QC procedures for inorganic constituent analyses includes the following:

- . Initial calibration and calibration verification.
- . Continuing calibration.
- . ICP interference checks.
- . Analyses of preparation blanks.
- . Analyses of spiked samples.
- . Analyses of duplicated samples.
- . Analyses of laboratory control samples.

The frequency of analyses of QC samples for inorganic and organic constituents is specified in the respective CLP SOWs (USEPA 1987b and 1987c) or the SOPs provided in Attachment C.

The QA effort for field measurements is outlined in Section 4.0 of the QAPP for the following: field gas chromatograph use; pH, electrical conductivity, and temperature measurements of water samples; measurement of water levels in wells; geophysical measurements with a terrain conductivity meter; and land surveying.

### **3.3 Data Precision and Accuracy**

The data precision and accuracy will be dependent on that of the equipment. The precision and accuracy of the field equipment is summarized in Table B-3. The precision and accuracy of the analytical equipment used by the laboratory are specified for RAS under the CLP for both organic and inorganic constituents (USEPA, 1987b and 1987c).

### **3.4 Data Representativeness**

The Site Investigation Plan (Section 7 of the Workplan) is designed such that results are representative of the media and conditions being measured. The SIP was developed in accordance with the available information on past waste disposal, analytical data, site environmental conditions, sampling techniques, and sampling site locations. The analytical and sample collection techniques described herein have been developed to provide representative samples of each sample medium.

TABLE B-3  
SUMMARY OF DATA ACCURACY, PRECISION, COMPLETENESS,  
AND FREQUENCY OF CALIBRATION

<u>Equipment</u>	<u>Accuracy</u>	<u>Precision</u>	<u>Minimum Completeness</u>	<u>Frequency of Calibration (minimum)</u>
. Field Equipment				
Geonics Ltd., EM-31	5% at 20* millimhos/m	± 2%*	95%	Once (during assembly)
HNU Model PI-101	**	± 1%	90%	Twice daily
Photovac Model 10S50	+ 73% bias*	± 5%	90%	On
YSI Model 33 S-C-T	± 4 to 6% of reading*	± 5%	95%	Daily
Orion Research pH Meter	± 0.02 pH units*	± 0.015% pH units	95%	Daily
. Laboratory Equipment				
Soil Physical Testing	Not defined by ASTM	***	90%	Daily
Analytical Chemistry	***	***	90%*	***

\*From USEPA, 1987a. Appendix F. Historical precision and accuracy data/soils and water. No specific QA/QC samples will be analyzed to determine precision and accuracy. All instruments but the Geonics EM-31 will be calibrated against standards to ensure proper instrument operation.

\*\*Maximum sensitivity of 0-2 ppm full-scale deflection over 100 division meter scale.

\*\*\*Addressed in Section 5.

### **3.5 Data Completeness**

The goal for completeness of laboratory analytical measurements is 90 percent or better for most samples tested based on historical records of CLP performance (USEPA, 1987a). The only exception to this will be for samples identified as background samples in the SIP. The goal for background samples will be 95 percent because of the limited number of background samples being collected. Field measurements will have a completeness goal of 95 percent. Daily review of field data by the Site Coordinator should identify much of the invalid data, allowing for repeated measurements to be made before the field effort is terminated.

### **3.6 Data Comparability**

The measurement data collected during Phase I of the RI/FS will be obtained by following the procedures presented in this QAPP. The comparability of this data to previously obtained analytical data is dependent upon the similarity of the methods described here to the methods used previously.

- . Authors of the notes and the names of other persons assisting in the completion of the field activity (daily entries will be initialed by the respective author)

The field notebooks shall, at a minimum, include the following: sample descriptions, sample identifications, sample handling (preservation, filtration, shipping), water levels, pH, conductivity, etc. The daily field logs should include any other information or observations that, in the judgment of the field personnel, may be relevant to meeting the objectives of the SIP as specified in Section 7 of the Workplan.

The Site Coordinator will distribute and keep track of users of the field notebooks. Transfers of field notebooks to other individuals who have been designated to perform specific tasks on the project will be recorded. Field notebooks will not be purposefully destroyed or thrown away, even if they are illegible or contain inaccuracies. Voided documents will be returned to the originator and sent to the project file.

Any problems encountered which are not immediately corrected and/or which could jeopardize the integrity of the data will be reported to the RMT Project Manager and the USEPA Project Manager immediately.

#### **4.2 Sample Identification**

Each sample will be uniquely identified. Field sample identification numbers will incorporate the prefixes listed in Table B-5

of this document. The first two characters of the prefix identify the sample as originating from the Algoma Landfill, and the second two characters identify the sample type and general location within the site (e.g., North Disposal Area). Each prefix will be followed by sample identification numbers consistent with the sample station identifiers shown on Figures 9 and 10 of the Workplan. If point identifiers have not been provided, field sampling personnel will generate identifiers sequentially (in the order of sample collection, e.g., ALPGN-01, ALPGN-02, etc.). Field personnel will record the location of the sample point identifiers in field log notebooks or on field maps, as appropriate. The two-character point identifier will be followed by a two-digit number indicating the round of sampling for that sampling point (e.g., ALOW-14-02 to indicate the second sample from well OW-14). Round identifiers will only be applied to sampling points that can be returned to repeatedly. This includes observation wells (ALOW-), residential wells (ALPW-), gas probes (ALGL-), and surface water sampling stations (ALSW-).

Duplicate samples will be identified by a sample type/location identifier followed by a "D" and a sequential number beginning with one (e.g., ALSS-D-01, ALSS-D-02). Field blanks will be noted by an "F" (e.g., ALOW-F-01). The sequence will continue for the duration of the RI regardless of sampling round. If required, the phase of the RI during which the duplicate sample was collected can be determined from the sample collection date. The field sampling personnel shall record

the environmental sample identifier that corresponds to the duplicate sample identification in the field log notebooks.

Trip blank identifiers will be generated following the completion of the laboratory analyses. The laboratory control number for the trip blank will be used to determine the appropriate field sample type/location identifier. The identifier will then be followed by the analysis date of the blank (e.g., ALPW-TB-111888, ALPW-TB-010789).

Examples of site sample identification numbers include the following:

- ALOW-10-02: Second sample from observation well OW-10 at the Algoma Landfill site.
- ALCL-07: Seventh cover sample from the Landfill Disposal Area at the Algoma Landfill site.
- ALPW-D-04: Fourth duplicate sample for residential wells from the Algoma Landfill site.

A unique sample ID will be assigned by CAA to each sample at the time of receipt. All samples received at one time are grouped together using a common work order number, which makes up the first seven digits of the CAA sample ID. Each Sample is also assigned a unique two-digit sample number. Furthermore, each aliquot (i.e., separate bottles for volatiles and acid/base/neutrals analyses) of each sample is assigned a unique one-letter fraction code. The last two characters are reserved for future use. Very large projects (more than 42 total fractions) and samples received in batches over several days will have multiple work order numbers assigned. The analytical data for all samples within one work order are reported in one file named Myymmmnn.CAA, where yymmmnn is the CAA work order number.

TABLE B-5  
LIST OF FIELD SAMPLE IDENTIFIERS

<u>Field Sample Type/Location Identifier</u>	<u>Field Sample Point Identifier</u>	<u>Matrix/Subtask</u>
ALPN-	*	Pore Gas (North Disposal Area)
ALPS-	*	Pore Gas (South Disposal Area)
ALPL-	*	Pore Gas (Landfill Disposal Area)
ALGL-	*	Gas Probe from Landfill Disposal Area
ALSS-	*	Soil/Sediment
ALSW-	*	Surface Water
ALOW-	*	Ground Water from Observation or Monitoring Well
ALPW-	*	Ground water from Private Residence Well
ALST-	*	Soil (Physical) Test
ALCN-	*	Cover Material from North Disposal Area
ALCS-	*	Cover Material from South Disposal Area
ALCL-	*	Cover Material from Landfill Disposal Area

\*Point identifiers will be consistent with those shown on Figures 9 and 10 of the Workplan or will be generated sequentially by the field sampling personnel as the samples are collected.

to determine the magnitude and extent of conductivity anomalies produced by the waste in order to define the edges of the disposal areas. The magnetic data will be treated in a similar manner to determine whether there are discrete, localized anomalies that may be representative of past drum disposal.

#### **4.5 Gas Sampling**

The field methods described below will be used in the pore gas survey and for screening of soil/sediment and water samples. The first method described below (pore gas GC analysis) will be used in the pore gas survey. The second method (GC or HNU headspace analyses) will be used to analyze sediment samples and to screen the drill cuttings for on-site storage or disposal.

A Photovac Model 10S50 gas chromatograph and a HNU Systems Model PI-101 Analyzer, both with photoionization detectors, will be used for this project. The operating procedures for both instruments are specified in manuals provided by the instrument manufacturers. These manuals will accompany both instruments to the field and be used for all activities requiring these instruments.

##### **4.5.1 Pore Gas Analysis With Portable Gas Chromatograph (GC)**

The GC will be set-up on site according to manufacturer's specifications and calibrated according to the procedures outlined in Section 4.5.5 of the QAPP. Pore gas within the disposal areas will be collected using clean stainless steel probes in the following manner:

The stainless steel probes used for pore gas analysis are checked with the HNU meter for cleanliness prior to use. If the probes show residual contamination, then air is pulled through the probe with the hand pump and the probe rechecked with an HNU meter. If the probes are still not clean, they should be cleaned with a propane torch to drive off volatile compounds. If a probe is still not free of volatiles when tested with the HNU meter, then the probe should be rinsed with deionized water and reheated until clean, or the probe should be discarded and a new probe substituted.

#### 4.5.5 Calibration and QC Requirements

The HNU meter should be calibrated using the calibration gas (benzene) supplied by HNU Systems, Inc., prior to taking the instrument into the field. The meter will be recalibrated immediately prior to use on the first day in the field and at least once every three days thereafter. Calibration procedures specified by the instrument operations manual will be followed. This manual will accompany the instrument into the field.

Calibration of the portable GC is done by making up a standard gas containing benzene, 2-butanone, toluene, trichloroethene, vinyl chloride, and xylene at concentrations between 1 and 25 ppm (v/v). The standard is made by injecting a known volume from the saturated headspace over a pure solvent into a known volume of clean air except for vinyl chloride. The vinyl chloride calibration will use a commercially prepared standard from Scott Specialty Gases. The standard

concentrations are summarized in Table B-7. The instrument is calibrated in the lab prior to its use in the field. Instrument settings for analyzing the parameters of interest are also set in the lab prior to taking the instrument into the field.

TABLE B-7

PURE SOLVENT HEADSPACE DILUTIONS USED  
FOR PREPARING FIELD GC GAS STANDARDS

<u>Compound</u>	<u>Vapor Pressure atm*</u>	<u>Volume of Headspace Injected Into One Liter Gas Sample Bottle (ul)</u>	<u>Standard Concentration PPM(s)</u>
Vinyl Chloride	(gas)	Commerically prepared standard used	1.0
Benzene	0.125	100	12.5
2-butanone	0.102	100	10.2
Toluene	0.0370	500	18.5
Trichloroethene	0.0762	100	7.26
Xylene			
o-	0.0132	3,000	39.6
m-	0.0132	3,000	39.6
p-	0.0132	3,000	39.6

\*From Superfund Public Health Evaluation Manual, USEPA 540/1-86-060, 1986.

The instrument being used (a Photovac, Inc., Model 10S50 portable GC) has an internal calibration curve that identifies and quantifies compound peaks based on the stored standard curve. Each time the portable GC is turned on, blanks are run to ensure that there is no background contamination in the instrument. Then, a standard is run and the internal standard curve calibrated for site-specific operating conditions (especially temperature). Following this, samples are run. During routine operation, blanks and calibration standards are run after every 8 to 10 samples. This typically results in three standards runs each working day. If a sample with a particularly high VOC concentration has been injected, then the instrument is cleaned by running blanks until the baseline returns to background.

#### 4.5.6 Borings for Pore Gas Sampling

The approximate locations of the 45 soil borings and the two gas probes included in the pore gas sampling plan have been shown on Figure 9 of the Workplan. The borings will be advanced using a 3 3/4" OD solid-stem auger. Auger cuttings will be described and classified in the field according to the USCS. Additional comments will be documented on a boring log concerning consistency or density, plasticity, moisture content, color (Section 4.9.6 of the QAPP).

Survey. The coordinates of the soil borings drilled for pore gas sampling will be established by the RMT field crew by measuring the distance between the borings and the stakes placed for the grid system (Section 4.3).

#### 4.6.1 Documentation

**Field Notebook.** The on-site hydrogeologist with each drill rig will maintain a field notebook. The notebook will be bound, with prenumbered pages, and entries will be made with indelible ink. The field notebook will include the information specified in Section 4.1 of the QAPP and will be used to document field testing results from the photoionization detector (PID), instrument calibration, samples collected, general site observations, problems encountered, and any other information that may be relevant to the completion of the investigation.

**Borehole Logs.** In addition to the bound field notebook, the on-site hydrogeologist with each drill rig will maintain a complete and accurate drill log for each borehole. Borehole logs will be kept in a bound notebook. Each drill log will contain, at a minimum, the following information:

- . Name of project and site
- . Hole number
- . Location of the boring
- . Type of drill rig
- . Size and type of bit used
- . Depth of each change of stratum
- . Thickness of each stratum
- . Identification of the material of which each stratum is composed according to the Unified Soil Classification System, or standard rock nomenclature, as necessary
- . Depth interval from which the sample was taken, if any
- . Hole diameter and depth at which hole diameter (bit size) changes
- . Depth at which ground water is first encountered

- . Depth of the static water level and changes in static water level with hole depth
- . Total depth of hole
- . Depth or location of any loss of drill water circulation, loss of tools or equipment, and any other problems encountered
- . Reference point for all depth measurements
- . Drilling date(s)

**Survey.** The coordinates of the soil borings drilled for landfill cover material sampling will be established by the RMT field crew by measuring the distance between the borings and the stakes placed for the grid system (Section 4.3).

#### **4.7 Soil/Sediment Sampling**

##### **4.7.1 Sampling**

Fifteen (15) sediment samples will be collected from the site. This includes two background soil samples collected to the east and southwest of the site. Two duplicate samples and two equipment field blanks will also be collected.

The samples will be collected using dedicated stainless steel sampling trowels. The samples will be collected from the top six inches of soil immediately below the plant root zone, or from 1.0 to 1.5 feet below the plant root zone as specified in Section 7 of the Workplan. Two 40-ml VOA vials and one 1-quart Ball jar will be filled at each location for in-field GC analyses as described in Section 4.5.1 of the QAPP. Two additional 40-ml vials will be collected at three locations, as specified in Section 7 of the Workplan, for laboratory analyses for the TCL volatile organic compound fraction. The remaining portion of

each sample will be mixed in a dedicated aluminum pan or bowl using the sampling trowel. The composited sample will then be placed into the appropriate containers, handled as described in Section 5.0, and analyzed for the TCL fractions listed in Table B-1 of the QAPP and in Section 7 of the Workplan.

#### **4.7.2 Documentation**

The on-site hydrogeologist will maintain a field notebook as described in Sections 4.1 and 4.5.3 of the QAPP. The field notebook will be used to document field testing results from the PID and portable GC, instrument calibration, samples collected, sample identification, general site observations, problems encountered, and any other information that may be relevant to the completion of the investigation.

The sample point will be located on a site map. A labelled wooden stake will be driven at the sampling location and a photograph taken of the site.

#### **4.7.3 Decontamination**

The stainless steel trowels and aluminum pans or bowls used will be new. They will be cleaned prior to use as follows:

- . Brushed with soapy (trisodium-phosphate) water
- . Rinsed with tap water
- . Rinsed with deionized distilled water (organic free)
- . Air dry
- . Wrapped in aluminum foil (shiny side out) to prevent equipment contamination prior to use.

The equipment will only be used once. After usage, the trowels and bowls will be steam cleaned, packed in garbage bags (double), and disposed at the local sanitary landfill.

#### **4.8 Surface Water Sampling**

##### **4.8.1 Sampling**

The approximate locations of the three (3) proposed surface water sampling points are shown on Figure 10 of the Workplan. The sampling locations will be selected in the field. The locations will be accessible and will have at least one foot of standing water. The sampling locations will be located by the field crew on a map, staked, and the location documented (photographs, landmarks, etc.). A staff gage will be installed at one of the surface water sampling points (SW-01) located along the perimeter of the pond to the east of the site. A second staff gage may be established in the wetland if sufficient standing water is found and if the location is accessible by a survey crew.

The staff gage will be made of a 3-foot section of graduated (10 divisions to the foot) Stevens Style C (or similar) porcelain enameled staff gage section attached to a wood pole. The wood pole will be driven three feet into the sediment and the gage section attached such that one foot of the graduated staff gage is submerged.

The water samples will be collected by submerging the sampling container under the water, minimizing any disturbance of the bottom

sediments. All sampling containers will be filled directly from the surface water body without any prior treatment, such as filtering. Section 4.9.7 of the QAPP describes the sample containers required to meet the analytical program described in Section 7 of the Workplan.

#### **4.8.2 Survey**

Coordinates and elevations will be established for the staff gages according to procedures specified in Section 4.3. The staff gages will be surveyed after the last observation well is installed. The coordinates will be to the closest 1.0 foot and referenced to the grid system established for the site. A ground elevation to the closest 0.1 foot and an elevation for the top of the gage to the closest 0.01 foot will be obtained. These elevations will be referenced to Mean Sea Level. The location of the gage will be plotted on the site maps.

#### **4.8.3 Documentation**

The on-site hydrogeologist will maintain a field notebook as described in Section 4.1 of the QAPP, documenting field testing results from the pH and conductivity measurements, the temperature, the water elevation, sample description including color, odor and turbidity, general site observations, problems encountered, and any other information that may be relevant to the completion of the investigation. The sample points will be located on a map. A labelled wooden stake will be driven at the sampling location and a photograph taken of the site.

### **4.9 Observation Well Installation and Sampling**

#### **4.9.1 Well Design**

Observation wells will be installed at three different depths: the water table, at depths of approximately 65 feet, and at the surface of the bedrock. The water table wells will be screened to intercept the water table at an assumed depth of 10 to 15 feet. The 65-foot-deep

with inside diameters greater than or equal to 3 inches. The water extracted from the wells will be taken from near the top of the water column in the well to maximize the removal of the stagnant water from the well bore.

Sample Collection. It is important not to contaminate or alter the sample during collection. The sampling device should be clean and constructed of a material which is compatible with the well construction material and the laboratory testing program.

Each of the wells will be sampled, using a stainless steel bailer and leader dedicated to that well. Nylon rope attached to 10-foot-long stainless steel cable leaders will be used to raise and lower the bailers. New nylon rope will be used for each well. A clean plastic dropcloth will be placed on the ground around each well to protect equipment from contact with soil around the well.

Filtering in the field will be required for some parameters to prevent changes due to precipitation or biological activity and to collect a more representative sample of the water moving through the ground. In many cases, there may be a small amount of silt or clay in the water after purging the well. This sediment is not representative of constituents transported in ground water flow systems in porous media. The filtering is performed in the field immediately following sample collection because even short delays may drastically change the water chemistry.

The field filtering apparatus consists of a battery-powered vacuum pump and membrane filters with a 0.45-micron opening. The field filtering apparatus consists of a 12V DC battery-powered vacuum pump,

sample holding container, filtering flask, porcelain buchner funnel, zitex spacers, and membrane filters with a 0.45 micron opening. The filtering apparatus is decontaminated immediately prior to use following the procedures described in Section 4.9.4 of the QAPP. The apparatus is assembled and the membrane filter is set in place by use of stainless steel tweezers, the vacuum pump is turned on, and the sampler checked to be sure the filter has seated properly to the filtering funnel. The sample is then carefully poured into the funnel (preventing excessive agitation and aeration of sample), while the vacuum pulls the sample through the filter. The filtered sample is then transferred to the appropriate sample container supplied by the laboratory.

Field-filtered samples will be required for the (filtered) TAL metals. Filtering is not appropriate for trace organics because of the possible loss through adsorption on the filter or volatilization.

Sample Containers, Preservation, and Handling. Table B-8 and Table B-9 summarize the requirements for sample containers, preservatives, and holding times for the parameters to be analyzed in ground water and soil/sediment, respectively. Sample containers for field samples, duplicates, and field blanks will be supplied by Cambridge Analytical Associates; who obtain sample bottles from I-Chem Corp., a sample bottle supply contractor to the USEPA CLP.

These sample containers will be packed in Coleman-type steel coolers for shipment to RMT. Glass bottles will be packed in foam sleeves designed for the particular bottle size to prevent movement and breakage. Any remaining empty space in the cooler will be filled with additional foam inserts, allowing space for ice. Each cooler will have chain-of-custody seals and forms enclosed in plastic envelopes taped to the inside lid of the cooler for use in the field prior to return shipment. Appropriate trip blanks will be enclosed with sample containers of the same analysis type.

Field Analysis. Proper field analytical methods and procedures will be followed. The following steps are taken so that analytical data gathered in the field are both valid and unbiased:

- . Field technicians are thoroughly trained in the use of each piece of equipment.
- . Operation manuals accompany each piece of equipment in the field.
- . Preventive maintenance programs are carried out on a scheduled basis.
- . Spare components will be taken into the field in case of equipment failure or damage.
- . Instruments will be calibrated on a daily basis and rechecked at various times daily.

- . Readings and calibrations will be documented.
- . Daily QC checks of field notes will be performed.

The accuracy, sensitivity, and precision of the field analytical techniques (pH, temperature, Eh, and specific conductance) are dependent upon the specifications for the instruments used, as well as the QC techniques employed during their use. Specifications have been excerpted from the instrument instruction manuals.

Measurement of Temperature. A ground water sample will be collected after purging an observation well. One portion of the sample will be placed in a container and immediately tested for temperature.

TABLE B-8

GROUND WATER SAMPLE CONTAINERS, PRESERVATIVES, AND HOLDING TIMES

<u>Parameter</u>	<u>Container</u>	<u>Preservative</u>	<u>Holding Time</u>
<u>Water Testing</u>			
Volatile Organics	Two 40-ml glass VOA vials with Teflon septum, no headspace	Cool to 4°C and protect from light	10 days. (Sample should remain on-site less than 24 hours.)
A/B/N Extractable Organics	Two one-liter amber bottles, Teflon-lined lids, leave small amount of headspace	Cool to 4°C and protect from light	Extract within 5 days, analyze within 40 days after extraction
Pesticides and PCB's	Two one-liter amber glass bottles, Teflon-lined lids, leave small amount of headspace	Cool to 4°C and protect from light	Extract within 5 days, analyze within 40 days of collection
Dissolved Metals (except Mercury)*	One one-liter high density polyethylene bottle (Teflon-lined lid)	Filter through 0.45 micron filter paper, then HNO <sub>3</sub> to pH < 2	6 months
Mercury*	One 500-ml high density polyethylene or glass bottle, (Teflon-lined lid)	Filter through 0.45 micron filter paper, then HNO <sub>3</sub> to pH < 2	26 days

TABLE B-8 (CONT'D)

<u>Parameter</u>	<u>Container</u>	<u>Preservative</u>	<u>Holding Time</u>
Cyanide	One one-liter high density polyethylene (Teflon-lined lid)	NaOH to pH > 12. Cool to 4°C	14 days

\*Surface water samples will be analyzed for total metals. The samples will not be filtered, otherwise containers and holding times remain unchanged. Metals, mercury, and cyanide can be taken from a single one-liter bottle.

TABLE B-9  
SOIL AND SEDIMENT SAMPLE CONTAINERS, PRESERVATIVES,  
AND HOLDING TIMES

<u>Parameter</u>	<u>Container</u>	<u>Preservative</u>	<u>Holding Time</u>
Volatile Organics	Two 120-ml wide-mouth glass vials with teflon septa	Cool to 4°C and protect from light	10 days (sample should remain on-site less than 24 hours)
A/B/N Extractable Organics*	One 8-oz wide-mouth glass bottle (teflon-lined lid)	Cool to 4°C and protect from light	Extract within 5 days, analyze within 40 days after extraction
Pesticides and PCBs*	One 8-oz wide-mouth glass bottle (teflon-lined lid)	Cool to 4°C and protect from light	Extract within 5 days, analyze within 40 days after extraction
Metals (except mercury)**	One 8-oz. wide-mouth glass bottle (Teflon-lined lid)	Cool to 4°C	180 days
Mercury**	One 8-oz. wide-mouth glass bottle (Teflon-lined lid)	Cool to 4°C	26 days
Cyanide**	One 8-oz. wide-mouth glass bottle (Teflon-lined lid)	Cool to 4°C	14 days

\*Extractable organics and pesticide/PCB can be taken from a single 8-oz. bottle.

\*\*Metals, mercury, and cyanide can be taken from a single 8-oz. bottle.

## **5.2 Chemistry Laboratory**

### **5.2.1 Methods**

The laboratory analyses of soil/sediment, surface water, and ground water for the organic and inorganic constituents on the CLP Target Compound and Target Analyte Lists (as defined in Attachment B) will be analyzed by RAS procedures specified in the Statements of Work for those constituents (USEPA, 1987b and 1987c). Residential well drinking water samples will be analyzed for the constituents listed in Attachment B according to the Standard Operating Procedures defined in Attachment C. The laboratory selected to perform the analyses, Cambridge Analytical Associates, 106 Commonwealth Avenue, Boston, MA 02215, is participating in the USEPA CLP at this time.

Hardness will be analyzed by Method 130.2 (titrimetric, EDTA) as described in USEPA procedures developed for the Safe Drinking Water Act and the National Pollutant Discharge Elimination System (USEPA, 1979).

### **5.2.2 Laboratory Equipment Calibration and Maintenance**

Equipment calibration procedures and reporting requirements of the Inorganics and Organics SOW (USEPA, 1987b and 1987c) and the Standard Operating Procedures for residential wells (Attachment C) will be followed by the laboratory. Maintenance procedures have been submitted to the USEPA, Region V, in the laboratory's Quality Assurance Project Plan (Attachment C).

### **5.2.3 Data Analysis and Reporting**

The laboratory will generate reports in the format specified in Exhibit B of the Inorganics Statement of Work (USEPA, 1987b) and in the format specified in Exhibit B of the Organics Statement of Work (USEPA, 1987c). The total hardness data will be reported in the format shown in Table B-10. Quality Control analyses will be performed as specified in the Statements of Work and the appropriate data qualifiers will be reported (USEPA, 1987b and 1987c).

made the error should correct it when possible. Corrections or insertions are made by crossing out the incorrect information and inserting the correction needed. The date and the correcting person's initials will be written beside the correction. This procedure applies to words or figures inserted or added to a previously recorded statement. Completed chain-of-custody forms will be placed in a plastic bag, sealed, and taped to the inside cover of the shipping container. After icing the samples, the coolers will be sealed, dated, and shipped to the appropriate laboratory using an overnight delivery service. The samples to be sent to the RMT Soils Laboratory will not be iced and will be shipped by regular carrier or delivered by the field crew.

A separate Sample Receipt is prepared whenever samples are split with a government agency. The receipt is marked to indicate with whom the samples are being split. The person relinquishing the samples to the agency should request the agency representative's signature acknowledging sample receipt. If the representative is unavailable or refuses, this is noted on the receipt and in the field notebook.

If a chain-of-custody form is lost in shipment, a written statement will be prepared by the person who collected the samples listing the samples that were recorded on the lost form and describing when and how the samples were collected. The statement should include information such as field log book entries regarding the sample. This statement is submitted to the RI Task Leader and RMT Project Manager for further action, as necessary.

The laboratory assigns a unique, serially numbered, identifier to each sample received by the laboratory. The laboratory then follows the sample through the laboratory sample handling, analysis, storage, and reporting process by means of a standardized tracking report. This process has been provided to the USEPA, Region V, in the laboratory's Quality Assurance Project Plan (Attachment C).

The information and data generated and assembled during the course of the RI/FS will be maintained in a file at RMT, Inc., Madison, Wisconsin. The RMT Records Center Clerk is responsible for the daily maintenance of the project files. All materials generated by the RI/FS activities will be identified by a unique project and task number. The records will be maintained for a minimum of five years after the termination of the Administrative Order by Consent RE: RI/FS, USEPA Docket No. V-W-87-C-036, as specified in the Order. The file will include at least the following types of information:

- . Correspondence
- . Meeting summaries
- . Data such as:
  - Field notes
  - Photographs
  - Maps and Drawings
  - Chain-of-custody records
  - Laboratory reports
  - QA/QC evaluations
  - Computations
- . Background information such as:
  - USEPA or WDNR site reports
  - Interview notes
  - News clippings
  - Literature citations
  - Consent Order and Scope of Work
- . Reports such as:
  - Workplan/SIP/QAPP
  - Monthly status reports
  - Technical memorandum
  - RI report
  - FS report

Other information identified by project staff as appropriate and relevant to the objectives of the RI/FS will also be included in the project file.

## **7.0 CALIBRATION PROCEDURES AND FREQUENCY**

### **7.1 Field Equipment**

The specific calibration procedures and frequency for the field equipment to be used during the field activities are described in Section 4.0 of the QAPP.

### **7.2 Analytical Equipment**

The specific calibration procedures and frequency for the laboratory analytical equipment to be used are described in the USEPA CLP Statements of Work for organic and inorganic constituents (USEPA, 1987b and 1987c) and the Standard Operating Procedures for drinking water samples (Attachment C). General procedures are described in the laboratory Quality Assurance Project Plan (Attachment C).

## 8.0 INTERNAL QUALITY CONTROL CHECK

The QC checks for the matrices sampled will be provided by the use of the following field samples:

- . Duplicate (Replicate) Samples - Duplicate samples are samples collected simultaneously from the same source under identical conditions into separate containers.
- . Background Samples - Background samples are taken in an area known or thought to be free from the constituents of concern.
- . Trip Blank - A trip blank is a sample bottle which will be filled in the laboratory directly from an organic-free, deionized water source. The trip blank will accompany sample bottles to the site as well as to the laboratory whenever VOCs are to be analyzed in the samples.
- . Rinse (Equipment) Blank - A rinse blank is a sample bottle that is filled with deionized water in the field. The deionized water is handled in the same manner as the sample (e.g., if the sample is ground water that has been filtered, the deionized water will be filtered and preserved as needed).

The definition and quantities of each of these samples are summarized in Table B-1.

The internal QC program for the laboratory chemical analyses is defined in the USEPA CLP Statements of Work for organic and inorganic constituents (USEPA, 1987b and 1987c) and the Standard Operating Procedures for drinking water samples (Attachment C).

## 9.0 DATA REDUCTION, VALIDATION, AND REPORTING

This section establishes the procedures for data reduction, validation, and reporting. The procedures will apply to all data produced from field and laboratory measurements. Established techniques will be employed for data reduction and validation. The exact method used for data reduction and validation will be documented for each technique. Where possible, written procedures or instructions will accompany the data or be specifically cited. The QA/QC reviewers, identified in Section 2.0 of the QAPP, are responsible for ensuring that data reduction, validation, and reporting methods follow the approved procedures.

### 9.1 Data Validation

Mechanisms for data validation are included in the laboratory QC program defined by the CLP (e.g., spiked samples, replicate samples, calibration checks) and in the evaluation of data within the environmental setting following the release of the data from the laboratory (e.g., identification of outliers, spatial or temporal trend analyses, field duplicate samples). The chemistry QC Reviewer and the RI Task Leader have the primary responsibility for final data assessment and validation in the laboratory and post-laboratory phases, respectively. The following data reviews will be implemented by the QC Reviewer and/or the RI Task Leader:

- . Review data summaries and reports for transcriptional and typographical errors.
- . Review and determine if sampling protocols were appropriate.

- . Review and compare the data against the rinse and trip blanks to detect contamination from sampling.
- . Review and compare duplicate samples.
- . Review laboratory QC including laboratory blanks, spike recovery, method standards, and duplicates to determine whether data meet the more stringent of either project or CLP requirements or are usable for the stated objective for the data.
- . Data of questionable quality will be identified and appropriate qualifiers will be attached that explain the limitations of the data.
- . Review and summarize detection limits for nondetectable results.
- . Review detection limits for positive but nonquantifiable data. Confirm that appropriate qualifiers have been given.
- . Review sampling design for dealing with media variability.
- . Review data to determine that sufficient site-specific background samples are available.
- . Review data to determine that the data are of sufficient quality to estimate site-specific background concentrations.

#### **9.1.1 Field Activities Results**

Field measurements will be validated by comparison to replicate measurements or previous data. If there are substantial changes or inconsistencies with respect to time and space, the data will be repeated, if possible.

#### **9.1.2 Analytical Results**

Validation of laboratory data is accomplished by several different steps. Quality control checks of precision and accuracy data are used to confirm the validity of the results. Established quality control limits for precision and accuracy will be generated by each laboratory and used by the QA/QC coordinator to check the acceptability of the

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data. Data which does not conform to the acceptability limits will be dealt with using the procedures described in Section 12.0 of the QAPP. Validation procedures will include calculation checks, field and laboratory blanks, and reference standards. Data reported by the laboratories will be reviewed by the QC Reviewer-Chemistry and the RI Task Leader to validate acceptance of data before reports are finalized.

### **9.2 Data Reduction and Reporting**

The procedures described here apply to all data reduction and reporting of field and laboratory measurements. The specific method used for data reduction will be documented for each technique. The QA reviewers are responsible for seeing that these methods follow the approved procedures. The individuals responsible for this task are listed in Section 2.0 (Project Organization and Responsibility) of the QAPP.

The laboratory will provide paper copies of all results in the USEPA CLP formats specified in the SOW for Inorganics (USEPA, 1987b) and the SOW for Organics (USEPA, 1987c). The laboratory reports will be summarized in tabular form as shown on Table B-10. Additional data reporting formats (tables, charts, maps) will be developed for the report appropriate for the presentation of the significant findings of the RI.

### **9.2.1 Field Activities Results**

Field notes will be transferred regularly by field staff from the bound field notebooks to standard RMT reporting forms. All the field data used in the RI Report will be identified and appended in the form of tables, maps, or cross sections. Replicate measurements will be averaged.

### **9.2.2 Analytical Results**

The laboratory data reduction methods are dependent on the analytical technique. The reduction procedures are presented in the CLP

TABLE B-10  
EXAMPLE OF ANALYTICAL LABORATORY DATA SUMMARY TABLE

Algoma RI/FS  
Project No. 1493.21

Sample ID As defined by Workplan  
Sampling Date Month-day-year  
Matrix Water or soil or waste  
Depth Feet (if applicable)  
Lab. Ref. No. As defined by laboratory

ANALYTE NAME

Aluminum, mg/L or ug/g (dry weight)	(a)	(b)	(c)
.	.	.	.
.	.	.	.
.	.	.	.
Acetone, ug/L or ug/kg (dry weight)	.	.	.
.	.	.	.
.	.	.	.
.	.	.	.
Moisture Content (%)		(b)	
Hardness (mg/L CaCO <sub>3</sub> )		(b)	
pH (Std. Units)			Field measurements made
Spec. Cond. (umhos/cm @ 25°C)			at time of sample
Temp. (°C)			collection

(a) < or blank. < indicates analyte was not detected with analytical result (b) indicating the detection limit.

(b) Analytical result to same number of significant figures as laboratory report.

(c) Data reporting qualifiers, if necessary, as defined by the USEPA CLP SOWs for organics and inorganics (USEPA, 1987b and 1987c).

Statements of Work for organic and inorganic constituents (USEPA, 1987b and 1987c). The data will be formatted into reports presenting the analytical and QC results as specified in the Statements of Work. The laboratory data will also be reduced to summary tables to facilitate the interpretation of the data in the RI and FS reports.

## 10.0 PERFORMANCE AND SYSTEM AUDITS

Systems audits will be performed on a periodic basis throughout the duration of the project. Audits of non-laboratory activities will be performed at project milestones (e.g., completion of draft reports) and at any point deemed necessary by the QA reviewers or the RMT Project Manager. The audits will include reviews of QC procedures, implementation of those procedures, documentation, and corrective action implementation. These audits can also be implemented by the USEPA RPM or QA Officer.

Performance and systems audits of the Laboratory are conducted as part of the USEPA CLP. Laboratory audits are the responsibility of the Contract Project Management Section (CPMS) of the USEPA Region V Central Regional Laboratory. The laboratory performing the analyses (Cambridge Analytical Associates) will be participating in the program at the time the samples for this investigation are analyzed.

**11. PREVENTIVE MAINTENANCE**

**11.1 Field Equipment**

The specific preventive maintenance procedures for the field equipment to be used during the field activities are described in Section 4.0 of the QAPP.

**11.2 Laboratory Equipment**

The specific maintenance procedures for laboratory equipment are described in the Cambridge Analytical Associates Quality Assurance Project Plan (Attachment C).

**12.0 SPECIFIC ROUTINE PROCEDURES USED TO ASSESS DATA PRECISION,  
ACCURACY, AND COMPLETENESS**

The procedures used to assess data precision and accuracy will include a review of the laboratories' QC data, and the results of the rinse blank, the trip blank, and the duplicates using the procedures outlined in USEPA guidance documents (USEPA, 1987, 1987a, 1987b, and 1987c). The completeness of the sampling plan will be assessed against the data quality objectives listed in Table B-3 of the QAPP after the analytical results have been received.

### 13. CORRECTIVE ACTION

Corrective actions will be instituted whenever potential or existing conditions are identified that may negatively affect the quality of the information produced by the investigation. It is the responsibility of staff members to 1) report project activities or products discovered not to be in conformance with established plans and procedures, and 2) initiate the disposition process.

The individual who detects or suspects nonconformance to established criteria or protocols in equipment, instruments, data, methods, etc., will notify their supervisor, who will in turn notify the RI Task Leader and the QA Reviewer. The RI Task Leader will then investigate the nature and extent of the problem and take the necessary corrective steps in conjunction with the RMT Project Manager. Data that has been adversely affected by the nonconformance will be identified. The corrective action will be reviewed with the QA Reviewer.

Laboratory data which are found to fall outside of quality control limits will be considered nonconforming and will require corrective action that may include the following options:

- . Reanalyzing the samples, if holding time criteria permit.
- . Resampling and analyzing.
- . Evaluating and amending sampling and analytical procedures.
- . Accepting the data and acknowledging its level of uncertainty.

Corrective action procedures within the laboratory (Cambridge Analytical Associates) are described in the laboratory Quality Assurance Project Plan (Attachment C).

## 15.0 REFERENCES

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**ATTACHMENT B**

**USEPA CONTRACT LABORATORY PROGRAM STATEMENT OF WORK  
TARGET ANALYTE LIST AND TARGET COMPOUND LIST WITH  
CONTRACT REQUIRED DETECTION OR QUANTITATION LIMITS**

USEPA CONTRACT LABORATORY PROGRAM



STATEMENT OF WORK

FOR

INORGANICS ANALYSIS

Multi-Media

Multi-Concentration

SOW No. 787

Rev: 12/87

EXHIBIT C

INORGANIC TARGET ANALYTE LIST

## INORGANIC TARGET ANALYTE LIST (TAL)

Analyte	Contract Required Detection Limit (1,2) (ug/L)
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

- (1) 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 circumstance:

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 Contract Required Detection Limit. 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 (CRDL) - 5

The value of 220 may be reported even though instrument detection limit is greater than CRDL. The instrument or method detection limit must be documented as described in Exhibit E.

- (2) The CRDL are the instrument detection limits obtained in pure water that must be met using the procedure in Exhibit E. The detection limits for samples may be considerably higher depending on the sample matrix.

USEPA CONTRACT LABORATORY PROGRAM



STATEMENT OF WORK

FOR

ORGANICS ANALYSIS

Multi-Media

Multi-Concentration

10/86

Rev: 1/87, 2/87, 7/87, 8/87

EXHIBIT C

TARGET COMPOUND LIST (TCL) AND  
CONTRACT REQUIRED QUANTITATION LIMITS (CRQL)

Target Compound List (TCL) and  
Contract Required Quantitation Limits (CRQL)\*

Volatiles	CAS Number	Quantitation Limits**	
		Water ug/L	Low Soil/Sediment <sup>a</sup> 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-Dichloroethene	75-35-4	5	5
9. 1,1-Dichloroethane	75-34-3	5	5
10. 1,2-Dichloroethene (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-Dichloropropane	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. Tetrachloroethene	127-18-4	5	5
29. Toluene	108-88-3	5	5
30. 1,1,2,2-Tetrachloroethane	79-34-5	5	5

(continued)

Volatiles	CAS Number	Quantitation Limits**	
		Water ug/L	Low Soil/Sediment <sup>a</sup> ug/Kg
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

<sup>a</sup>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.

Target Compound List (TCL) and  
Contract Required Quantitation Limits (CRQL)\*

Semivolatiles	CAS Number	Quantitation Limits**	
		Water ug/L	Low Soil/Sediment <sup>b</sup> 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-	10	330
46. Hexachloroethane	67-77	10	330
47. Nitrobenzene	98-9-	10	330
48. Isophorone	78-55	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-Dichlorophenol	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

(continued)

## Quantitation Limits\*\*

Semivolatiles	CAS Number	Quantitation Limits**	
		Water ug/L	Low Soil/Sediment <sup>b</sup> ug/Kg
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-Dinitrotoluene	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-phenylether	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

(continued)

Semivolatiles	CAS Number	Quantitation Limits**	
		Water ug/L	Low Soil/Sediment <sup>b</sup> ug/Kg
95. Benzo(k)fluoranthene	207-08-9	10	330
96. Benzo(a)pyrene	50-32-8	10	330
97. Indeno(1,2,3-cd)pyrene	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

<sup>b</sup>Medium Soil/Sediment Contract Required Quantitation Limits (CRQL) for Semi-Volatile 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.

Target Compound List (TCL) and  
Contract Required Quantitation Limits (CRQL)\*

Pesticides/PCBs	CAS Number	Quantitation Limits**	
		Water ug/L	Low Soil/Sediment <sup>c</sup> ug/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. Heptachlor	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	50-29-3	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	53469-21-9	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

<sup>c</sup>Medium Soil/Sediment Contract Required Quantitation Limits (CRQL) for Pesticide/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.

**ATTACHMENT C**  
**CAMBRIDGE ANALYTICAL ASSOCIATES (CAA)**  
**QUALITY ASSURANCE PROJECT PLAN**  
**FOR THE**  
**ALGOMA PROGRAM**

RMT, Inc.  
1406 East Washington Avenue  
Suite 124  
Madison, Wisconsin 53703

Quality Assurance Project Plan  
for the  
Algoma Program (RMT Project #1439)

Prepared By:

Cambridge Analytical Associates, Inc.  
1106 Commonwealth Avenue  
Boston, Massachusetts 02215

November 9, 1988

Approved: Nancy Kilar Date: 11/10/88  
CAA Project Manager

Approved: Clare M. Killough Date: 11/10/88  
CAA QA Coordinator

Approved: \_\_\_\_\_ Date: \_\_\_\_\_  
RMT Project Manager

Approved: \_\_\_\_\_ Date: \_\_\_\_\_  
RMT QA Coordinator



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### 3. PROJECT DESCRIPTION

#### 3.1 Introduction

This General Quality Assurance Plan (QAPP) is submitted by Cambridge Analytical Associates, Inc. (CAA) to RMT, Inc. for laboratory analysis services in support of the Algoma Program (Project 1493). These services consist of sample analysis by Contract Laboratory Program (CLP) protocols for volatile organics, semivolatile organics, pesticides/PCBs, metals and cyanide; and for modified CLP organic protocols for drinking water samples. A full target compound list (TCL) is provided in Table 3.1.

In addition, CAA is prepared to provide a wide variety of technical consulting services. This QAPP will ensure that the data generated by CAA is useful to RMT, Inc. and meets all of RMT's QA/QC needs.



Table 3.1 Target Compound List (TCL)

VOLATILES	CAS Number	CRDL Water ug/L	CRDL Low Soil/ Sediment ug/Kg <sup>a</sup>	Quantitation Limit Drinking Water ug/L <sup>b</sup>
1. Chloromethane	74-87-3	10	10	1.5
2. Bromomethane	74-83-9	10	10	1.5
3. Vinyl Chloride	75-01-4	10	10	1.5
4. Chloroethane	75-00-3	10	10	1.5
5. Methylene Chloride	75-09-2	5	5	1.5* 1.0
6. Acetone	67-64-1	10	10	5.0*
7. Carbon Disulfide	75-15-0	5	5	3.0
8. 1,1-Dichloroethene	75-35-4	5	5	1.5
9. 1,1-Dichloroethane	75-34-3	5	5	1.5
10. 1,2-Dichloroethene (total)	540-59-0	5	5	1.5
11. Chloroform	67-66-3	5	5	1.5
12. 1,2-Dichloroethane	107-06-2	5	5	1.5
13. 2-Butanone	78-93-3	10	10	5.0*
14. 1,1,1-Trichloroethane	71-55-6	5	5	1.5
15. Carbon Tetrachloride	56-23-5	5	5	1.5
16. Vinyl Acetate	108-05-4	10	10	5.0
17. Bromodichloromethane	75-27-4	5	5	1.5
18. 1,2-Dichloropropane	78-87-5	5	5	1.5
19. cis-1,3-Dichloropropene	10061-01-5	5	5	2.0
20. Trichlorethene	79-01-6	5	5	1.5
21. Dibromochloromethane	124-48-1	5	5	1.5
22. 1,1,2-Trichloroethane	79-00-5	5	5	1.5
23. Benzene	71-43-2	5	5	1.5
24. trans-1,3-Dichloropropene	10061-02-6	5	5	1.0
25. Bromoform	75-25-2	5	5	1.5
26. 4-Methyl-2-pentanone	108-10-1	10	10	1.5
27. 2-Hexanone	591-78-6	10	10	5.0
28. Tetrachloroethene	127-18-4	5	5	1.5
29. Toluene	108-88-3	5	5	1.5*
30. 1,1,2,2-Tetrachloroethane	79-34-5	5	5	1.5



Table 3.1 (cont'd.) Target Compound List (TCL)

VOLATILES	CAS Number	CRDL	CRDL	Quantitation
		Water	Low Soil/ Sediment	Limit
		ug/L	ug/Kg <sup>a</sup>	Drinking Water ug/L <sup>b</sup>
31. Chlorobenzene	108-90-7	5	5	1.5
32. Ethyl Benzene	100-41-4	5	5	1.5
33. Styrene	100-42-5	5	5	1.0
34. Xylenes (Total)	1330-20-7	5	5	1.5

-----  
 CRDL - contract required detection limit  
 -----

\*Common Laboratory Solvent. Blank limit is 5x Method Detection Limit

<sup>a</sup>Medium/Sediment CRDLs for Volatile Compounds are 125 times the individual Low Soil/Sediment CRDL.

Specific detection 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 a dry weight basis as required by the contract, will be higher.

<sup>b</sup>Sample volume is increased from 5 ml to 20 ml to achieve lower detection limits.



Table 3.1 (cont'd.) Target Compound List (TCL)

SEMIVOLATILES	CAS Number	CRDL Water ug/L	CRDL Low Soil/ Sediment ug/Kg <sup>c</sup>	Quantitation Limit Drinking Water ug/L <sup>d</sup>
35. Phenol	108-95-2	10	330	2.0
36. bis(2-chloroethyl)ether	111-44-4	10	330	1.5
37. 2-Chlorophenol	95-57-8	10	330	2.0
38. 1,3-Dichlorobenzene	541-73-1	10	330	2.0
39. 1,4-Dichlorobenzene	106-46-7	10	330	2.0
40. Benzyl Alcohol	100-51-6	10	330	2.0
41. 1,2-Dichlorobenzene	95-50-1	10	330	2.5
42. 2-Methylphenol	95-48-7	10	330	1.0
43. bis(2-chloroisopropyl)ether	108-60-1	10	330	2.5
44. 4-Methylphenol	106-44-5	10	330	1.0
45. N-nitroso-di-n-dipropylamine	621-64-7	10	330	1.5
46. Hexachloroethane	67-72-1	10	330	2.0
47. Nitrobenzene	98-95-3	10	330	2.5
48. Isophorone	78-59-1	10	330	2.5
49. 2-Nitrophenol	88-75-5	10	330	2.0
50. 2,4-Dimethylphenol	105-67-9	10	330	2.0
51. Benzoic acid	65-85-0	50	1600	20.0
52. bis(2-chloroethoxy)methane	111-91-1	10	330	2.5
53. 2,4-Dichlorophenol	120-83-2	10	330	2.0
54. 1,2,4-Trichlorobenzene	120-82-1	10	330	2.0
55. Naphthalene	91-20-3	10	330	2.0
56. 4-Chloroaniline	106-47-8	10	330	2.0
57. Hexachlorobutadiene	87-68-3	10	330	2.5
58. 4-Chloro-3-methylphenol (para-chloro-meta-cresol)	59-50-7	10	330	1.5
59. 2-Methylnaphthalene	91-57-6	10	330	2.0
60. Hexachlorocyclopentadiene	77-47-4	10	330	2.0
61. 2,4,6-Trichlorophenol	88-06-2	10	330	1.5
62. 2,4,5-Trichlorophenol	95-95-4	50	1600	1.5
63. 2-Chloronaphthalene	91-58-7	10	330	1.5
64. 2-Nitroaniline	88-74-4	50	1600	1.0



Table 3.1 (cont'd.) Target Compound List (TCL)

SEMIVOLATILES	CAS Number	CRDL	CRDL	Quantitation	
		Water	Low Soil/ Sediment	Limit	
		ug/L	ug/Kg <sup>c</sup>	Drinking Water <sup>d</sup> ug/L	
65.	Dimethylphthalate	131-11-3	10	330	1.5
66.	Acenaphthylene	208-96-8	10	330	1.5
67.	2,6-Dinitrotoluene	606-20-2	10	330	1.0
68.	3-Nitroaniline	99-09-2	50	1600	2.5
69.	Acenaphthene	83-32-9	10	330	1.5
70.	2,4-Dinitrophenol	51-28-5	50	1600	(15)
71.	4-Nitrophenol	100-02-7	50	1600	1.5
72.	Dibenzofuran	132-64-9	10	330	1.0
73.	2,4-Dinitrotoluene	121-14-2	10	330	1.0
74.	Diethylphthalate	84-66-2	10	330	1.0
75.	4-Chlorophenyl-phenyl ether	7005-72-3	10	330	1.0
76.	Fluorene	86-73-7	10	330	1.0
77.	4-Nitroaniline	100-01-6	50	1600	3.0
78.	4,6-Dinitro-2-methylphenol	534-52-1	50	1600	(15) <sup>*</sup>
79.	N-nitrosodiphenylamine (+ diphenylamine)	86-30-6 (122-39-4)	10	330	1.5 <sup>*</sup>
80.	4-Bromophenyl-phenyl ether	101-55-3	10	330	1.5
81.	Hexachlorobenzene	118-74-1	10	330	1.5
82.	Pentachlorophenol	87-86-5	50	1600	2.0
83.	Phenanthrene	85-01-8	10	330	1.0
84.	Anthracene	120-12-7	10	330	2.5
85.	Di-n-butylphthalate	84-74-2	10	330	2.0
86.	Fluoranthene	206-44-0	10	330	1.5
87.	Pyrene	129-00-0	10	330	1.5
88.	Butylbenzylphthalate	85-68-7	10	330	3.5
89.	3,3'-Dichlorobenzidine	91-94-1	20	660	
90.	Benzo(a)anthracene	56-55-3	10	330	1.5 <sup>**</sup>
91.	Chrysene	218-01-9	10	330	1.5 <sup>**</sup>
92.	bis(2-Ethylhexyl)phthalate	117-81-7	10	330	1.0
93.	Di-n-octylphthalate	117-84-0	10	330	1.5 <sup>***</sup>
94.	Benzo(b)fluoranthene	205-99-2	10	330	1.5 <sup>***</sup>



Table 3.1 (cont'd.) Target Compound List (TCL)

SEMIVOLATILES	CAS Number	CRDL	CRDL	Quantitation
		Water ug/L	Low Soil/ Sediment ug/Kg <sup>c</sup>	Limit Drinking Water <sup>d</sup> ug/L
95. Benzo(k) fluoranthene	207-08-9	10	330	***
96. Benzo(a) pyrene	50-32-8	10	330	2.0
97. Indeno(1,2,3-cd) pyrene	193-39-5	10	330	3.5
98. Dibenz(a,h) anthracene	53-70-3	10	330	2.5
99. Benzo(g,h,i) perylene	191-24-2	10	330	4.0

CRDL - contract required detection limit

Values in parentheses are estimates

- \* These two parameters are reported as total.
- \*\* These two parameters are reported as total.
- \*\*\* These two parameters are reported as total.

<sup>c</sup>Medium Soil/Sediment CRDLs for Semivolatile TCL Compounds are 60 times the individual Low Soil/Sediment CRDL.

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

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

<sup>d</sup>Extraction/blowdown: Extract entire liter bottle rinsing cap and bottle and add to sample. Final blowdown volume may be decreased to 0.5 ml to achieve required detection limits.



Table 3.1 (cont'd.) Target Compound List (TCL)

PESTICIDES/PCBs	CAS Number	CRDL	CRDL	Quantitation
		Water ug/L	Low Soil/ Sediment ug/Kg <sup>e</sup>	Limit Drinking Water ug/L <sup>f</sup>
100. alpha-BHC	319-84-6	0.05	8.0	0.010
101. beta-BHC	319-86-8	0.05	8.0	0.005
102. delta-BHC	319-86-8	0.05	8.0	0.005
103. gamma-BHC (lindane)	58-89-9	0.05	8.0	0.005
104. Heptachlor	76-44-8	0.05	8.0	0.030
105. Aldrin	309-00-2	0.05	8.0	0.005
106. Heptachlor epoxide	1024-57-3	0.05	8.0	0.005
107. Endosulfan I	959-98-8	0.05	8.0	0.010
108. Dieldrin	60-57-1	0.10	16.0	0.010
109. 4,4'-DDE	72-55-9	0.10	16.0	0.005
110. Endrin	72-20-8	0.10	16.0	0.010
111. Endosulfan II	33213-65-9	0.10	16.0	0.010
112. 4,4'-DDD	72-54-8	0.10	16.0	0.020
113. Endosulfan Sulfate	1031-07-8	0.10	16.0	0.100
114. 4,4'-DDT	50-29-3	0.10	16.0	0.020
115. Methoxychlor	72-43-5	0.5	80.0	0.020
116. Endrin ketone	53494-70-5	0.10	16.0	0.030
117. alpha-Chlordane	5103-71-9	0.5	80.0	0.020
118. gamma-Chlordane	5103-74-2	0.5	80.0	0.020
119. Toxaphene	8001-35-2	1.0	160.0	0.250
120. Aroclor-1016	12674-11-2	0.5	80.0	0.10
121. Aroclor-1221	11104-28-2	0.5	80.0	0.10
122. Aroclor-1232	11141-16-5	0.5	80.0	0.10
123. Aroclor-1242	53469-21-9	0.5	80.0	0.10
124. Aroclor-1248	12672-29-6	0.5	80.0	0.10
125. Aroclor-1254	11097-69-1	1.0	160.0	0.10
126. Aroclor-1260	11096-82-5	1.0	160.0	0.10

CRDL - contract required detection limit

<sup>e</sup>Medium Soil/Sediment CRDLs for Pesticide/PCB TCL compounds are 15 times the individual Low Soil/Sediment CRDL. 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 a dry weight basis will be higher.

<sup>f</sup>Extraction/blowdown: Extract entire liter bottle; rinse cap & bottle and add to sample. Final blowdown volume may be decreased up to 1/2 the SOW specifications to achieve detection limits.



Table 3.1 (cont'd) Target Compound List (TCL)

Analyte	CRDL <sup>d</sup> ug/L	Drinking Water Detection Limit (IDL) <sup>e</sup> ug/l
Aluminum	200	
Antimony	60	
Arsenic	10	5
Barium	200	50
Beryllium	5	
Cadmium	5	1
Calcium	5000	
Chromium	10	10
Cobalt	50	
Copper	25	
Iron	100	
Lead	5	2
Magnesium	5000	
Manganese	15	
Mercury	0.2	0.2
Nickel	40	
Potassium	5000	
Selenium	5	2
Silver	10	7
Sodium	5000	
Thallium	10	
Vanadium	50	
Zinc	20	
Cyanide	10	

<sup>d</sup>The CRDL are the instrument detection limits obtained in pure water. The detection limits for samples may be considerably higher depending on the sample matrix.

<sup>e</sup>Instrument Detection Limit

#### 4. PROJECT ORGANIZATION AND RESPONSIBILITIES

##### 4.1 Description of Responsibilities

The responsibilities of the individuals associated with this Quality Assurance/Quality Control (QA/QC) program are described below and illustrated in Figure 4.1:

- The Quality Assurance Officer is responsible for reviewing and advising on all aspects of QA/QC. The duties and responsibilities of the QA Officer are to:
  1. assist the project/task manager in specifying QA/QC procedures to be used during the project;
  2. implement quality control procedures and techniques to assure that the laboratory achieves established standards of quality;
  3. evaluate data quality and maintain records on related QC charts and other pertinent information;
  4. monitor laboratory activities to determine conformance with authorized quality assurance policy, and to implement appropriate steps to ensure adherence to quality assurance programs;
  5. coordinate internal audits with the Project Manager;
  6. review performance evaluation results;
  7. administer intralaboratory and interlaboratory QA efforts;  
and
  8. prepare quality assurance reports to management.
  
- The Project Manager has overall responsibility for management of the analytical tasks of the project. The duties and responsibilities of the project manager are to:
  1. administer and supervise all requirements of the analytical tasks to ensure meeting project objectives within budget and on schedule;



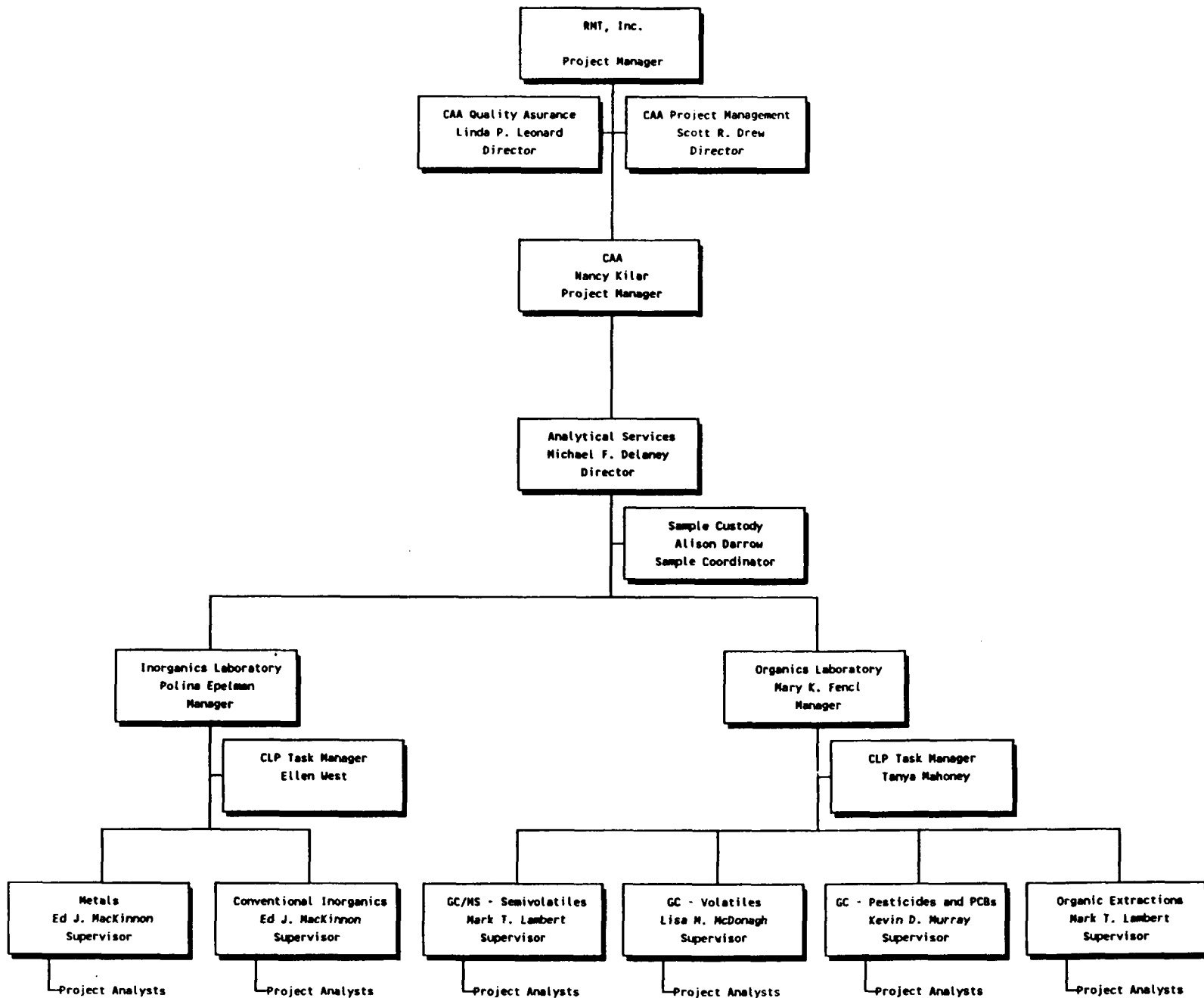
2. direct formulation of the work plan and initiate work plan revisions in accordance with the project officer's directions;
  3. work with task managers in planning and conducting project progress meetings;
  4. review work plans, progress reports, analytical reports, project reports, and financial reports prior to issue; and
  5. take part in corrective actions.
- The Task Managers (the CLP Task Managers, the Director of Analytical Services, the Laboratory Managers, and the Laboratory Supervisors) have the day-to-day responsibilities for the analytical tasks of the project. Their areas of responsibilities are to:
    1. organize the personnel, equipment, and materials in a manner required to meet the objectives of the analytical tasks of the project;
    2. implement analytical procedures for use in data evaluation;
    3. provide technical directions in conduct of laboratory analyses, and resolve day-to-day problems;
    4. direct the task activities and monitor performance of task members to ensure that they are adhering to high technical standards and to the budget and task schedules;
    5. review analytical data for validity and clarity ; and
    6. maintain contact with the project manager in areas of technical concern, and advise him of progress, needs, and potential problems of the various tasks.
  - The Project Analysts are responsible for each task identified in the scope of work. They are responsible for performing the laboratory technical activities within their tasks. In execution of their duties, the analysts are expected to:
    1. assist in planning for each phase of their tasks and in defining objectives and activities;
    2. respond to work plan revisions related to their tasks;
    3. advise the task manager of progress, needs, and potential



problems of their tasks;

4. train and qualify alternate analysts in specified laboratory QC and analytical procedures;
  5. verify that laboratory QC and analytical procedures are being followed as specified;
  6. review sample QC data at least daily. This will include examination of raw data such as chromatograms (and checking of calculations for a minimum of 10% for the samples analyzed) as well as an inspection of reduced data, calibration curves, and laboratory notebooks; and
  7. inform task managers if the daily review indicates a decline in data quality and implement corrective actions.
- Sample Coordinator - The sample coordinator acts as sample custodian for the laboratory. The duties and responsibilities of the sample coordinator are to:
1. Sign for the incoming field samples and verify the data entered on the chain-of-custody forms;
  2. Enter sample information into computerized Sample and Analysis Management System (SAM) for tracking and reporting;
  3. Generate computerized sample tracking and laboratory data entry forms;
  4. Transfer samples and tracking forms to laboratory project analysts.





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Figure 4.1 Project Organization



5. QUALITY ASSURANCE OBJECTIVES FOR MEASUREMENT  
OF DATA IN TERMS OF PRECISION, ACCURACY, COMPLETENESS  
REPRESENTATIVENESS, AND COMPARABILITY

The analytical quality assurance objectives for this project are to provide analytical data of known quality and to be able to defend the quality of that data. Data quality is assessed for precision, accuracy, completeness, representativeness, and comparability. The analytical protocols to be used for analyses contain detailed descriptions of the quality control measures to be employed. The routine analysis of replicate and spiked samples will provide precision and accuracy data for assessing the validity of analytical results.

In general, each method specifies the use and frequency of blank analyses, calibration standards, calibration check analyses, and surrogate/matrix spikes to monitor method performance. These quality control measures and their frequency employed by the laboratory are described in Table 5.2. The quality control objectives for these measures are outlined in Table 5.1.

5.1 Level of QA Efforts

Every attempt will be made to have all data generated be valid data. The precision of laboratory analysis will be evaluated using sample duplicates. Analytical accuracy will be monitored using recovery of analytes from surrogate spikes, matrix spikes, EPA reference check standards and Performance Evaluation (PE) samples. These quality control measures and their frequency are summarized in Table 5.2. These QA efforts will assist in determining the reliability of the analytical data.



## 5.2 Accuracy and Precision

Accuracy is a measure of the degree of agreement between an analyzed value and the true or accepted reference value where it is known. Accuracy is usually expressed as percent recovery. Precision is a measure of the mutual agreement among individual measurements of the same parameter under similar conditions, and usually is expressed as relative percent difference (RPD).

## 5.3 Completeness

Completeness is a measure of the amount of valid data obtained from the analytical measurement system, expressed as a percentage of the number of valid measurements that should have been or were planned to be collected. CAA will make every attempt to generate valid data from all samples received. However, realistically, some samples may be lost in laboratory accidents or some results may be deemed questionable based on internal QC procedures. Due to the variable nature of the completeness value, the objective will be to have data completeness for all samples received for analysis as high as possible to meet completeness objectives as described by the client.

## 5.4 Representativeness

Representativeness is a measure of how closely the measured results reflect the actual concentration or distribution of the chemical compounds in the sample. Sampling will be performed by the client or their contractors. Sample handling protocols (e.g., storage, preservation and transportation) have been developed to preserve the representativeness of the collected samples. Proper documentation will establish that protocols have been followed and sample identification and integrity assured.



## 5.5 Comparability

Comparability is a QA objective wherein all sample data is comparable with other representative measurements made by CAA or another organization. CAA will achieve comparability by operating within the instrument linear range and by strict adherence to analytical protocols. The use of published analytical methods, standard reporting units and thorough documentation will ensure meeting this objective.



Table 5.1

Quality Control Objectives  
 Volatile Organics

Audit	Parameter	Control Limit*	
		aqueous	soils
Holding Blank	Any project analyte	≤ 5 x CRQL	
Method Blank	methylene chloride	≤ 5 x CRQL	
	acetone	≤ 5 x CRQL	
	toluene	≤ 5 x CRQL	
	2-butanone	≤ 5 x CRQL	
	any other project analyte	≤ CRQL	
Continuing Calibration	CCC Compounds	RF < 25% from initial calibration	
Surrogate Spiking Compounds	d <sub>4</sub> -1,2-dichloroethane	76-114%	70-121%
	d <sub>8</sub> -toluene	86-110%	81-117%
	4-bromofluorobenzene	86-115%	74-121%
Matrix Spike/ Matrix Spike Duplicate	1,1-dichloroethylene	61-145% ≤14 RPD	59-172% ≤22 RPD
	trichloroethylene	71-120% ≤14 RPD	62-137% ≤24 RPD
	benzene	76-127% ≤11 RPD	66-142% ≤21 RPD
	toluene	76-125% ≤13 RPD	59-139% ≤21 RPD
	chlorobenzene	75-130% ≤13 RPD	60-133% ≤21 RPD

CRQL - Contract Required Quantitation Limit  
 CCC - Calibration Check Compounds specified in test method  
 RF - Response Factor  
 RPD - Relative Percent Difference

\*US EPA Contract Laboratory Program Statement of Work for Organics Analysis, Multi-Media, Multi-Concentration, Revision 7/87



Table 5.1 (cont'd.)

Quality Control Objectives

Pesticides/PCBs

Audit	Parameter	Control Limit*	
		Aqueous	Soil
Method Blank	Any target compound	≤ CRQL	
Analytical Standard	Aldrin, Endrin, 4,4'-DDT, and DBC	RF < 20% RSD from initial calibration	
Surrogate Standard Compound	Dibutylchloroendate (DBC)	24-154% **	20-150% ***
Matrix Spike/Matrix Spike Duplicate	Lindane	56-123% ≤15 RPD	46-127% ≤50 RPD
	Heptachlor	40-131% ≤20 RPD	35-130% ≤31 RPD
	Aldrin	40-120% ≤22 RPD	34-132% ≤43 RPD
	Dieldrin	52-126% ≤18 RPD	31-134% ≤38 RPD
	Endrin	56-121% ≤21 RPD	42-139% ≤45 RPD
	4,4'-DDT	38-127% ≤27 RPD	23-134% ≤50 RPD

CRQL - Contract Required Quantitation Limit  
 RF - Response Factor  
 RSD - Relative Standard Deviation  
 RPD - Relative Percent Difference

\*US EPA Contract Laboratory Program Statement of Work for Organics Analysis,  
Multi-Media, Multi-Concentration, Revision 7/87

\*\*These limits are advisory only



Table 5.1 (cont'd.)

Quality Control Objectives  
 Metals and Mercury

Audit	Element	Control Limit*
Preparation Blank	All	$\leq 5 \times \text{CRDL}$
Analytical Spike	All	75-125%
Initial Calibration Verification	Hg	80-120%
	All others	90-110%
Continuing Calibration	Hg	80-120%
	All others	90-110%
LCS	All	80-120%
Duplicate Samples	All	$\leq 20\% \text{ RPD}$

CRDL - Contract Required Detection Limit

\*US EPA Contract Laboratory Program Statement of Work for  
 Inorganics Analysis, Multi-Media, Multi-Concentration, Revision  
 7/85



Table 5.1 (cont'd.)

Quality Control Objectives

Cyanide

Audit	Control Limits*
Calibration Blank	$\leq 5 \times \text{CRDL}$
Digestion Blank	$\leq 5 \times \text{CRDL}$
Initial Calibration Verification	85-115%
Continuing Calibration Verification	85-115%
Spike Recovery	75-125%

CRDL - contract required detection limit

\*US EPA Contract Laboratory Program Statement of Work for Inorganics Analysis, Multi-Media, Multi-Concentration, Revision 7/85.



Table 5.2

Quality Control Measures and Frequency  
 Volatile Organics

Sample Type	Frequency*
Holding Blank	One per case
laboratory Method Blank	One per 12 hour time period
Continuing Calibration	One per 12 hour time period
Surrogate Spike <sup>a</sup>	Added to each sample, matrix spike, matrix spike duplicate, blank and standard
Matrix Spike/Matrix Spike Duplicate <sup>b</sup>	One per: each case of field samples received; each 20 field samples in a case; each group of samples of a similar concentration level (soils only); or each 14 calendar day period during which samples were received. Whichever is more frequent
GC/MS Tune	Once per day or per 12 hour period, whichever is more frequent
Performance Evaluation Samples	As required for State certifications and CLP

\*US EPA Contract Laboratory Program Statement of Work for Organics Analysis, Multi-Media, Multi-Concentration, Revision 7/87.

<sup>a</sup>For drinking water analysis, surrogate standards used to spike are at 20ppb (7/87 CLP at 50ppb).

<sup>b</sup>For drinking water analysis, matrix spike compounds are at 20 ppb.



Table 5.2 (cont'd.)

Quality Control Measures and Frequency  
 Semivolatile Organics

Sample Type	Frequency*
Method Blank	One per batch of samples extracted
Continuing Calibration	Once per 12 hour time period
GC/MS Tune	Once per 12 hour time period
Surrogate Standard <sup>a</sup>	Added to each sample, blank and standard
Matrix Spike/Matrix Spike <sup>b</sup>	One set per batch, per similar concentration level or per 20 samples analyzed, whichever is more frequent
Performance Evaluation Samples	As required for state certifications and CLP

\*US EPA Contract Laboratory Program Statement of Work for Organics Analysis, Multi-Media, Multi-Concentration, Revision 7/87

<sup>a</sup>For drinking water analysis, surrogate standards will be SOW standards spiked as 20 ppb for base-neutral standards and 40 ppb for the acid standards.

<sup>b</sup>For drinking water analysis; Matrix spike/matrix spike duplicate: Matrix spike compounds as per the SOW spiked at 20 ppb for base-neutrals and 40 ppb for the acids.



Table 5.2 (cont'd.)

Quality Control Measures and Frequency

Pesticides/PCBs

Sample Type	Frequency*
Laboratory Method Blank	One per case; per batch of samples of similar matrix or concentration extracted, or per 20 analyses, whichever is more frequent
Analytical Standards	One standard run after every 5 samples
Surrogate Standard <sup>a</sup>	Added to each sample, matrix spike, matrix spike duplicate, blank and standard
Matrix Spike/ Matrix Spike Duplicate <sup>b</sup>	For samples of similar matrix, one per case, per 20 samples, or per similar concentration level, whichever is more frequent
Performance Evaluation Samples	As required for state certifications and CLP

\*US EPA Contract Laboratory Program Statement of Work for Organics Analysis, Multi-Media, Multi-Concentration, Revision 7/87.

<sup>a</sup>For drinking water analysis, samples are spiked with surrogate standard compounds at 0.2 ppb.

<sup>b</sup>For drinking water analysis, matrix spike compounds are spiked at 1/5 the SOW concentration.



Table 5.2 (cont'd.)

Quality Control Measures and Frequency  
 Metals and Mercury

Sample Type	Frequency*
Preparation Blank	One per matrix, batch, or one for every 20 samples, whichever is more frequent
Analytical Spike Recovery	One per matrix, batch, or one for every 20 samples, whichever is more frequent
Duplicate Precision	One per matrix, or per batch (if sample quantity allows)
Initial Calibration Verification	Once for each time instrument is calibrated
Continuing Calibration Verification	One per every 10 analyses
Performance Evaluation	As required for State certifications and CLP

\*US EPA Contract Laboratory Program Statement of Work for Inorganics Analysis, Multi-Media, Multi-Concentration, Revision 7/85



Table 5.2 (cont'd.)

Quality Control Measures and Frequency

Cyanide

Type	Frequency
Preparation Blank	One per matrix, batch, or one for every 20 samples, whichever is more frequent
Digestion Spike Recovery	One per matrix, batch, or one for every 20 samples, whichever is more frequent
Duplicate Precision	One per matrix, batch, or one for every 20 samples, whichever is more frequent
Initial Calibration Verification	One for each time the instrument is calibrated
Continuing Calibration Verification	One per every 10 analyses
Performance Evaluation Samples	As required for State Certifications and for CLP

\*US EPA Contract Laboratory Program Statement of Work for Inorganics Analysis, Multi-Media, Multi-Concentration, Revision 7/85



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6. SAMPLING PROCEDURES

CAA does not expect to perform any sampling for this project. If sample collection should be required, quality control procedures will be provided as a revision to this QA plan.



## 7. SAMPLE CUSTODY

### 7.1 Chain-of-Custody Procedures

The purpose of the chain-of-custody procedure is to document in a legally defensible manner, the transfer of custody for each sample from collection through analysis to analytical data reports. The sample custody procedures to be used conform to the guidelines of the U.S. EPA Contract Laboratory Program, and are performed under the supervision of the Sample Coordinator. The Sample Coordinator will have primary responsibility for ensuring chain-of-custody procedures are followed and all documentation is properly executed.

When samples arrive at CAA, the Sample Coordinator documents the condition of the locked or sealed shipping box on the custody form. She then checks the sample label information (Figure 7.1) against the custody record (Figure 7.2) and notes the condition of the samples and verifies proper container and preservative procedures as noted in Table 7.1. Where discrepancies occur, the Sample Coordinator contacts the Project Manager. The Project Manager will then resolve the issue with the Client Project Officer. Samples are then logged in by assigning laboratory identification numbers in serialized ascending sequence. The sample log-in record will include the sample number, date of receipt, condition of sample when received, the assigned laboratory number, sample preparation, sample distribution and other pertinent information. A sample distribution sheet will be generated. Samples will then be secured in a refrigerator maintained at 4°C prior to preparation and analysis. Analysts will sign for the receipt of all samples to be processed and maintain the samples in their possession or in view at all times when the samples are outside of the storage area. At all times when custody is transferred, both the issuing and receiving parties will verify that information in the sample label is properly recorded.



## 7.2 Laboratory Document Control

The goal of the Document Control Program is to assure that all documents for a group of samples will be accounted for when the project is completed.

All observations and results recorded by CAA, are entered into pre-printed data sheets or into permanent laboratory logbooks. Data recorded are referenced with the project number, date and analyst's signature at the top of the page. All pertinent data are maintained in the project file.

All documentation in logbooks and other documents are entered in ink. If an error is made in a logbook assigned to one individual, that person will make corrections simply by crossing a line through the error and entering the correct information. Changes made subsequently are dated and initialed. Corrections made to other data records or logbooks are made by crossing a single line through the error, entering the correct information and initialing and dating the correction.

Before releasing analytical results, the laboratory assembles and cross checks the information on custody records, lab bench sheets, analyst and instrument logs and other relevant data to ensure that data pertaining to each particular sample is consistent throughout the record.



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Figure 7.1  
CAA Sample Label


	<b>CAMBRIDGE ANALYTICAL ASSOCIATES</b>	
	1106 COMMONWEALTH AVENUE	
	BOSTON, MA 02215	
	617-232-2207	
<b>CHEMICAL ANALYSES:</b>		
<b>SAMPLE DATA:</b>	<b>PRESERVATIVE:</b>	
Client _____	_____ None	_____ Sterile
Project/Site _____	_____ HNO <sub>3</sub>	_____ MeOH rinsed
Date/Time _____	_____ H <sub>2</sub> SO <sub>4</sub>	_____ MeCl <sub>2</sub> rinsed
Sample ID _____	_____ ZnAc/NaOH	_____ Other
Location _____	_____ NaOH	(specify)
Collector _____		





Table 7.1  
 Recommendation for Sampling and Preservation of Samples<sup>1</sup>

Analyses	Volume	Container <sup>2</sup>	Preservation <sup>3</sup>	Analysis Holding Time <sup>4</sup>
<u>Metals</u>				
(CLP-aqueous)	1000 ml	P,G	HNO <sub>3</sub> to pH<2	180 (28 for Hg) days from date of sample receipt
(CLP-soil)	100 g	P	Cool, 4°C	180 (28 for Hg) days from date of sample receipt
<u>Cyanide</u>				
(CLP-aqueous)	1000 ml	P,G	Cool, 4°C; NaOH to pH>12; 0.6 g ascorbic acid	14 days <sup>5</sup>
(CLP-soil)	100 g	P,G	Cool, 4°C	14 days
<u>Semivolatiles - Base/Neutrals, Acids</u>				
(CLP-aqueous)	3000 ml	G,teflon lined cap	Cool, 4°C	5 days until extraction, 40 days after extraction
(CLP-soil)	250 g	G,teflon lined cap;	Cool, 4°C	10 days until extraction, 40 days after extraction
<u>Pesticides and PCBs</u>				
(CLP-aqueous)	3000 ml	G,teflon lined cap	Cool, 4°C	5 days until extraction, 40 days after extraction



Table 7.1 (cont'd.)  
 Recommendation for Sampling and Preservation of Samples<sup>1</sup>

Analyses Volume	Preservation	Container and Holding Time <sup>4</sup>	Analysis
(CLP-soil)	250 g	G, teflon lined cap;	Cool, 4°C 10 days until extraction, 40 days after extraction
<u>Volatiles - Purgeable Aromatics and Halocarbons</u>			
(CLP-aqueous)	6x40 ml	G, teflon lined septum	Cool, 4°C 10 days
(CLP-soil)	6x40 ml	G, teflon lined septum	Cool, 4°C 10 days



Notes:

- <sup>1</sup>More specific instructions are contained in each method.
- <sup>2</sup>Plastic (P) or Glass (G). For metals, polyethylene with a polypropylene cap (no liner) is preferred.
- <sup>3</sup>Sample preservation should be performed immediately upon sample collection. For composite samples, each aliquot should be preserved at the time of collection. When use of an automated sampler makes it impossible to preserve each aliquot, samples may be preserved by maintaining at 4 °C until compositing and sample splitting are complete.
- <sup>4</sup>Samples should be analyzed as soon as possible after collection. The times listed are the maximum times that samples may be held before analysis and still considered valid.
- <sup>5</sup>Maximum holding time is 24 hours when sulfide is present. Optionally, all samples may be tested with lead acetate paper before the pH adjustment in order to determine if sulfide is present. If sulfide is present, it can be removed by the addition of cadmium nitrate powder until a negative spot test is obtained. The sample is filtered and then NaOH is added to pH 12.



## 8. CALIBRATION PROCEDURES AND FREQUENCY

This section describes the calibration procedures and frequency for the instrumentation which will be used in the analysis of the parameters of interest. All materials used for instrument calibration, internal standards and surrogate standards will be of the highest purity available and will be obtained through the U.S. Environmental Protection Agency Pesticide and Industrial Chemicals Repository or a suitable commercial source. The calibration procedures presented here are those routinely used in the laboratory. Calibration frequencies are described in Table 5.2, Section 5.

### 8.1 Volatile and Semi-volatile Organics by Gas Chromatograph/Mass Spectrometry

#### 8.1.1 Calibration Standards

1. Prepare stock solutions using materials available from the EPA Reference Standards Repository.
2. Prepare working standards by dilution of the stock standards.
3. Verify the working standards by analysis of a calibration check standard prepared using either EPA QC concentrates or other independent standard.

#### 8.1.2 Calibration Procedure

1. At the beginning of each 12 hour shift that volatile organics analyses are performed, the GC/MS system must be checked to verify that acceptable performance criteria are obtained for bromofluorobenzene (BFB). The performance test must be passed before analyzing any samples, blanks or standards.



2. At the beginning of each 12 hour shift that semi-volatile organics analyses are performed, the GC/MS system must be checked to see if acceptable performance criteria are achieved for decafluorotriphenyl phosphine (DFTPP). The performance criteria must be achieved before any samples, blanks or standards are analyzed.
3. Analyze a five point initial calibration sequence using standards prepared following EPA protocols.<sup>a</sup> Calibration check compound (CCC) criteria must be met before sample analysis may begin. If the instrument has had a five point initial calibration performed, this step may be skipped, provided that all criteria in Step 4 are met.
4. Analyze a continuing calibration check standard prepared following EPA procedures.<sup>b</sup> If the CCC and System Performance Check Compounds (SPCC) compounds do not meet the criteria stated in the analytical method, the source of the problem must be located and the problem corrected before sample analysis can proceed. If SPCC and CCC criteria cannot be met, the instrument must have a new initial calibration performed following any necessary maintenance.
5. Record all values for the initial and subsequent calibration verifications. See Figure 8.1 for flow-chart of GC/MS calibration and sample analysis sequence.

<sup>a</sup>For drinking water VOA analysis, the five point calibration consists of the following: 5, 10, 20, 40 and 60 ug/L concentration for all compounds (CLP asks for 20, 50, 100, 150 and 200 ug/L). The % RSD for the RFS for all compounds (SPCC) must be  $\leq 35\%$ ; all others  $RF \geq 0.05$ .

For drinking water semivolatile analysis, the five point calibration consists of the following: 5, 10, 20, 50 and 100 total nanograms except for benzoic acid, 2,4-dinitrophenol, 2,4,5-trichlorophenol, all three nitroaniline isomers, 4-nitrophenol, 4,6-dinitro-2-methylphenol and pentachlorophenol which should be analyzed at 20, 50, 80, 100 and 120 total nanograms.



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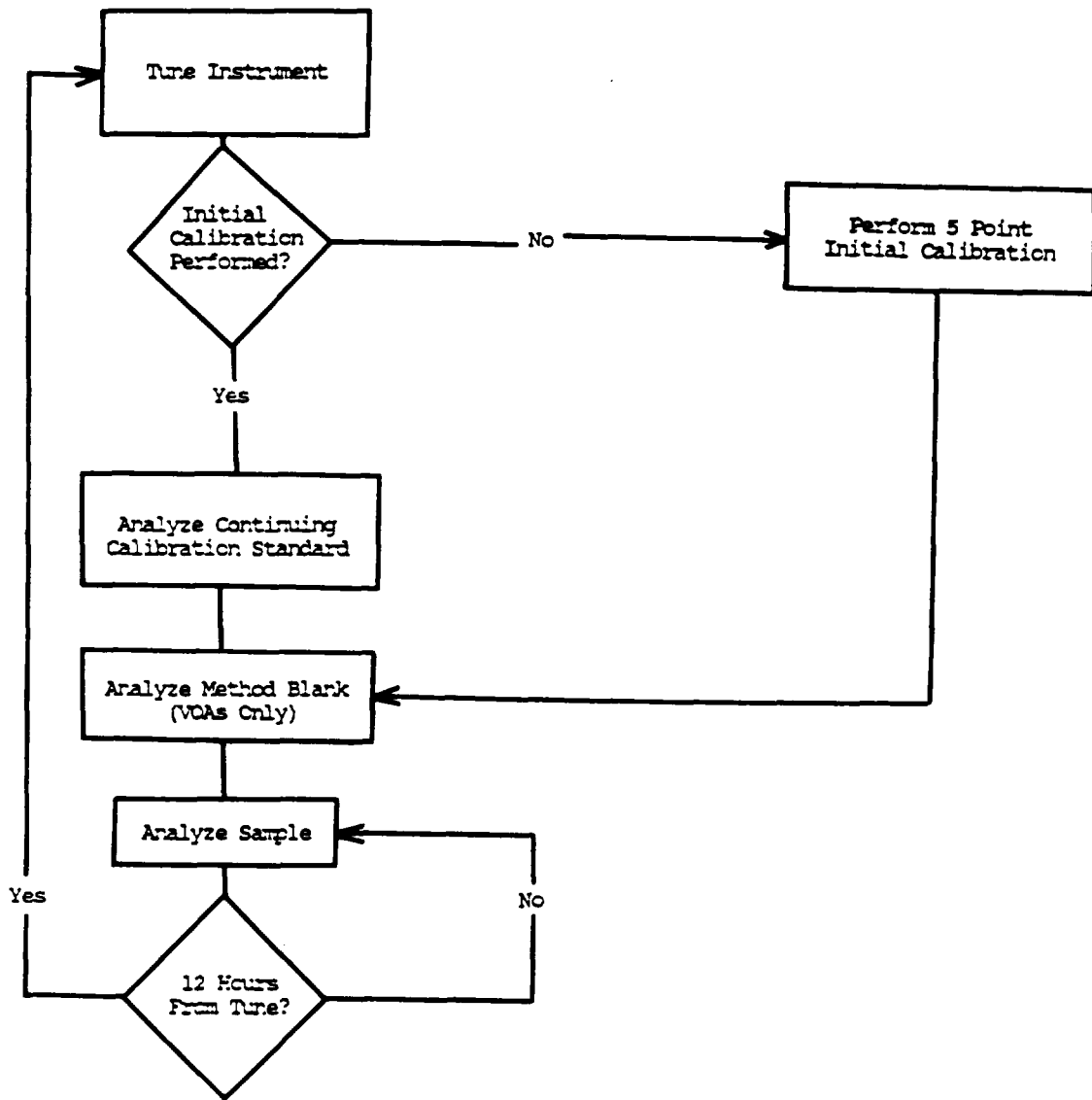
<sup>b</sup> For drinking water VOA analysis, the concentration of the continuing calibration standard is 20 ug/L for all compounds (CLP asks for 50 ug/L).

For drinking water semivolatile analysis, the concentration of the continuing calibration standard is 20 total nanograms except for benzoic acid, 2,4-dinitrophenol, 2,4,5-trichlorophenol, all three nitroaniline isomers, 4-nitrophenol, 4,6-dinitro-2-methylphenol and pentachlorophenol which should be analyzed at 50 total nanograms.



Figure 8.1

GC/MS Calibration and Sample Analysis Sequence



## 8.2 Pesticides/PCB Analysis by Gas Chromatography

### 8.2.1 Calibration Standards

1. Prepare stock solutions using materials available from the EPA Reference Standards Repository.
2. Prepare working standards by dilution of the stock standards.
3. Verify the working standards by analysis of a calibration check standard prepared using either EPA QC concentrates or other independent standard.

### 8.2.2 Calibration Procedure

1. Analyze initial Evaluation standard mixtures at three concentration levels (A,B,C). Determine linearity of each compound and breakdown of Endrin and 4,4'-DDT according to the procedures in the EPA CLP protocol.
2. Analyze initial Individual standard mixture(s) to determine response factors (RFs) for each compound by the external standard method.
3. Analyze Toxaphene and PCB standards.
4. Analyze samples in groups of five.
5. Periodically throughout the 72 hour analysis sequence (Figure 8.2) analyze continuing Evaluation standards to determine compound breakdown; and continuing Individual standards to determine % difference between current RFs and the RFs from the initial Individual standard analyses.



Figure 8.2

Pesticide Analysis 72 Hour Sequence

1. Evaluation Standard Mix A
2. Evaluation Standard Mix B
3. Evaluation Standard Mix C\*
4. Individual Standard Mix A\*
5. Individual Standard Mix B\*
6. Toxaphene
7. Aroclors 1016/1260
8. Aroclor 1221\*\*
9. Aroclor 1232\*\*
10. Aroclor 1242
11. Aroclor 1248
12. Aroclor 1254
13. 5 samples
14. Evaluation Standard Mix B
15. 5 samples
16. Individual Standard Mix A or B
17. 5 samples
18. Evaluation Standard Mix B
19. 5 samples
20. Individual Standard Mix A or B  
(whichever not run in step 16)
21. 5 samples
22. Repeat the above sequence starting with Evaluation Standard Mix B (step 14 above).
23. Pesticide/PCB analysis sequence must end with Individual Standard Mix A and B regardless of number of samples analyzed.

\*These may be combined into one mixture.

\*\*Aroclors 1221 and 1232 must be analyzed on each instrument and each column at a minimum of once per month. Copies of these chromatograms must be submitted for sample analyses performed during the applicable month.



### 8.3 Inductively Coupled Argon Plasma Emission Spectrometer

#### 8.3.1 Calibration Standards

1. Prepare calibration standards by dilution of the stock standard at the time of analysis.
2. The calibration standards are prepared using the same type of acid or combination of acids as the sample will have after preparation.

#### 8.3.2 Calibration Procedure

1. Calibrate the instrument using a blank and standards.
2. After the system is calibrated, verify and document the initial calibration for each element of interest using an EPA Quality Control concentrate or other independent standard at a concentration other than that used for calibration but within the linear range.
3. If the reported values for the calibration check sample exceed the control limits, the analysis is terminated and the problem corrected.
4. To assure calibration accuracy throughout each analysis run, the calibration check standard must be analyzed at a frequency of 10% or every 2 hours during an analysis run, whichever is more frequent. The calibration check sample is also analyzed after the last analytical sample. If the calibration check sample is outside the control limits, the analysis must be terminated and the instrument recalibrated. All samples analyzed since the last time the calibration check was in



control must be reanalyzed.

5. Record all values for the initial and subsequent calibration verifications.

#### 8.4 Atomic Absorption Spectrophotometer

##### 8.4.1 Calibration Standards

1. Prepare calibration standards by dilution of the stock standard.
2. The calibration standards are prepared using the same type of acid or combination of acids as the sample will have after preparation.

##### 8.4.2 Calibration Procedure

1. Calibrate the instrument beginning with the blank and working toward the highest standard.
2. After the system is calibrated, verify and document the initial calibration for each element of interest using an EPA Quality Control concentrate or other independent standard at a concentration other than that used for calibration but within the calibration range.
3. If the reported values for the calibration check sample exceed the control limits, the analysis is terminated and the problem corrected.
4. To assure calibration accuracy throughout each analysis run, the calibration check standard must be analyzed at a frequency of 10% or every 2 hours during an analysis run, whichever is



more frequent. The calibration check sample is also analyzed after the last analytical sample. If the calibration check sample is outside the control limits, the analysis must be terminated and the instrument recalibrated. All samples analyzed since the last time the calibration check was in control must be reanalyzed.

5. Record all values for the initial and subsequent calibration verifications.

## 8.5 Technicon AutoAnalyzer II

### 8.5.1 Calibration Standards

1. Prepare working standards by dilution of the stock standard. A minimum of a blank and three to five standards are required.
2. Prepare a calibration check standard using an EPA quality control concentrate or other independent standard.

### 8.5.2 Calibration Procedure

1. Calibrate the instrument beginning with the blank and working toward the highest standard.
2. After the instrument is calibrated verify and document the initial calibration using an EPA quality control concentrate or other independent standard at a concentration other than that used for calibration but within the calibration range.
3. If the reported values for the calibration check sample exceed



the control limits, the analysis is terminated and the problem corrected.

4. To assure calibration accuracy throughout each analysis run, the calibration check standard must be analyzed at a frequency of 10%. The calibration check sample is also analyzed after the last analytical sample. If the calibration check sample is outside the control limits, the analysis must be terminated and the instrument recalibrated. All samples analyzed since the last time the calibration check was in control must be reanalyzed.

## 8.6 Spectroproducts Hg-3 Mercury Analyzer

### 8.6.1 Calibration Standards

1. Prepare the calibration standards by dilution of the stock standard at the time of analysis. Calibrate the instrument using a blank and a minimum of three standards.
2. Prepare the standards in the same manner as samples using the same combination of reagents at the same concentration as that which the sample will have after preparation.

### 8.6.2 Calibration Procedure

1. Calibrate the instrument beginning with the blank and working toward the highest standard.
2. After the system is calibrated, verify and document the initial calibration using an EPA Quality control concentrate or other independent standard at a concentration other than that used for calibration but within the calibration range.



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3. If the reported values for the calibration check sample exceed the control limits, the analysis is terminated and the problem corrected.
  
4. To assure calibration accuracy throughout each analysis run, the calibration check must be analyzed at a frequency of 10% or every 2 hours during an analysis run, whichever is more frequent. The calibration check sample is also analyzed after the last analytical sample. If the calibration check sample is outside the control limits, the analysis must be terminated and the instrument recalibrated. All samples analyzed since the last time the calibration check was in control must be reanalyzed.



## 9. ANALYTICAL PROCEDURES

The analytical procedures to be used for this project are contained in the US EPA Contract Laboratory Program Statement of Work for Organic Analysis, Multi-Media, Multi-Concentration, Revision 7/87, and the US EPA Contract Laboratory Program Statement of Work for Inorganic Analysis, Multi-Media, Multi-Concentration, Revision 7/85. The Target Compound List (TCL) for these protocols is contained in Table 3.1. Sampling and holding time requirements, can be found in Table 7.1.

Drinking water samples will be analyzed for organic compounds by a modification of the CLP SOW 7/87. These modifications have been outlined in Sections 3, 5, and 8 of this QAPP.

CAA is prepared to use test methods other than those listed above should the client request it. If additional methods should be required, quality control procedures will be provided as a revision to this QA Plan.



## 10. DATA REDUCTION, VALIDATION, AND REPORTING

### 10.1 Data Reduction

Analysis results will be reduced to the concentration units specified in the analytical procedures using the equations provided in the analytical references listed in Section 9. Blank corrections will be applied where required by the method for the parameter of interest. All calculations will be independently checked by senior laboratory staff.

### 10.2 Data Validation

Data validation is the process by which analytical data are filtered and accepted or rejected based on a set of criteria. CAA personnel use the following criteria in the validation of laboratory data:

- use of published or approved analytical procedures
- use of properly operating and calibrated instrumentation
- precision and accuracy achieved comparable to that achieved in similar analytical programs
- precision, accuracy and blank contamination meeting project specific criteria outlined in Table 5.1 and 5.2
- completeness of data set.

Records of all data will be maintained, even those judged to be "outlying" values. Where applicable, outliers will be identified using Dixon's test<sup>1,2</sup> for extreme observations or the one-tailed t-test for difference. All data will be validated by laboratory supervisors prior to being released for reporting purposes to the CAA project manager. The persons validating the data will have sufficient knowledge of the technical work to identify questionable values. All analyses requiring CLP protocols will be validated in accordance with the requirements of those protocols.



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### 10.3 Data Reporting

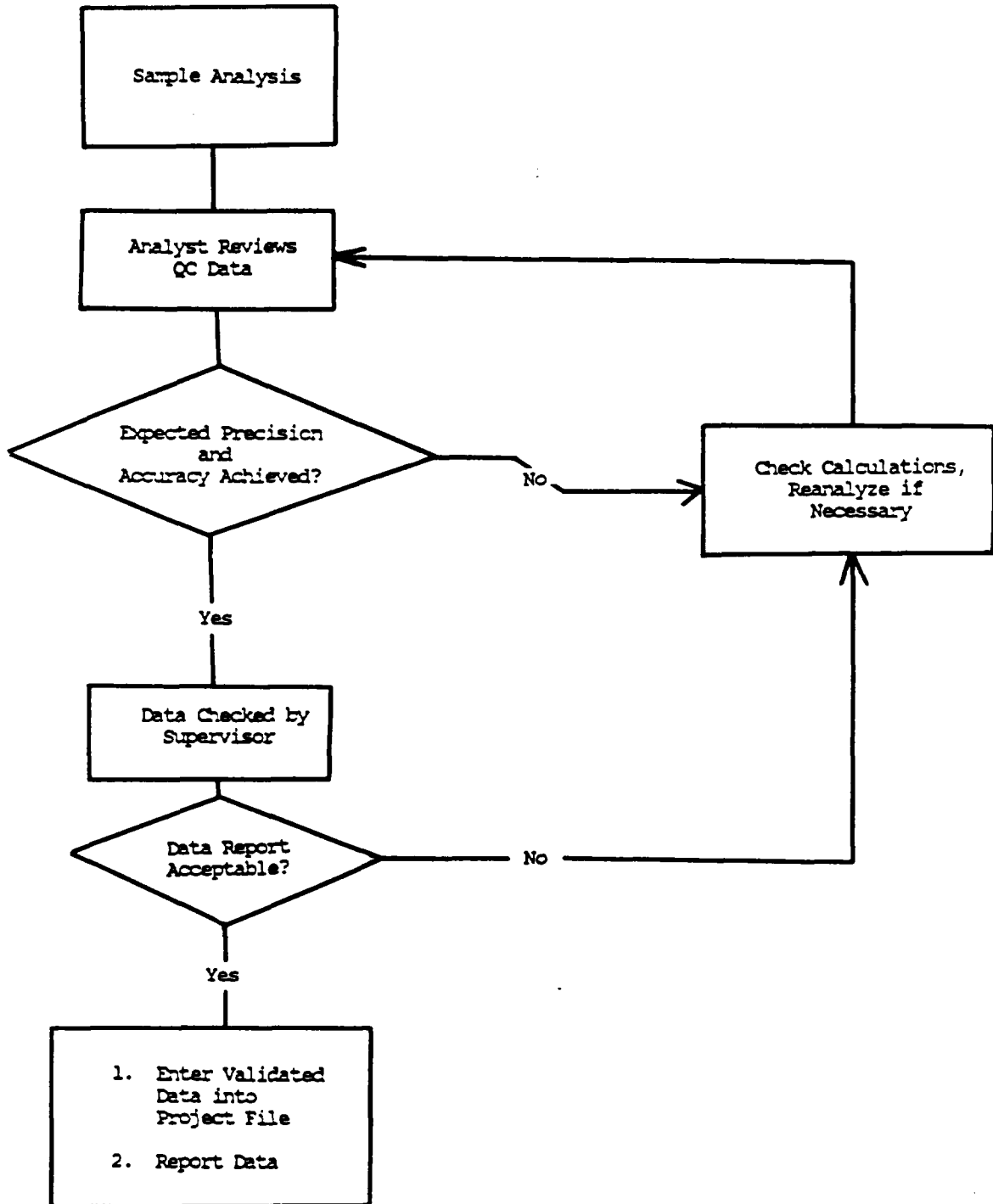
Figure 10.1 depicts the analytical data reduction, validation and reporting process. Key personnel who will handle data gathering and evaluation are shown in the Project Organization Chart (Figure 4.1). CAA uses a computerized Sample and Analysis Management System (SAM) for routine tracking and reporting of analysis data.

The reports issued will include a cover page/case narrative which will outline the case specifics, and any problems or corrective actions.

CLP data are reported using CLP specified forms and in CLP protocol format. CAA uses a custom designed data management system for reporting CLP inorganics data. This system transfers reduced data from dedicated microprocessors on each instrument to a central computer for storage and processing. The data are screened for compliance with QC limits and reported in CLP format. Organics CLP data are compiled and reduced by Finnigan's Q/A-Formaster II system which produces reports in CLP organics format.



Figure 10.1 CAA Analytical Data Reporting Scheme



## 11. INTERNAL QUALITY CONTROL AND QUALITY ASSURANCE

### 11.1 Internal Quality Control

Quality control is the routine application of procedures for obtaining prescribed standards of performance in the monitoring and measurement process. Quality control checks are the application of CAA's Quality Control program for laboratory analysis in order to ensure the generation of valid analytical results on project samples. These checks are performed by project participants throughout the program under the guidance of the Director of Quality Assurance.

CAA makes use of a number of different types of QC samples to document the validity of the generated data. The following types of QC samples are used routinely:

1. Blank Samples - Blanks are used to assess contamination introduced in transit, storage or in the laboratory.
  - a. Preparation Blanks - For inorganic analyses, these deionized water blanks are prepared using the same reagents and analytical procedures as the samples, in order to assess possible laboratory contamination.
  - b. Laboratory Method Blanks - For organic analyses, these blanks are "clean" samples, prepared in the laboratory to include surrogates, and analyzed according to a prescribed method in order to assess possible laboratory contamination.
  - c. Laboratory Holding Blank - For organic analyses, these blanks are placed in cold storage with the volatile organics samples during the holding time to assess contamination which may be introduced in storage.



- d. Calibration Blanks - For all analyses, these blanks are used in instrument calibration and contain all the reagents used in preparing instrument calibration standards except the parameters of interest.
2. Initial and Continuing Calibration Verification - Verification samples are analyzed during each analysis run to assure calibration accuracy for each analyte. For inorganic analysis, these are prepared from a source other than that used for calibration.
  3. Surrogate Spikes - For organic analyses, all samples are spiked with surrogate compounds prior to sample preparation in order to assess the behavior of actual components in individual samples during the entire preparative and analysis scheme. Surrogate standard compounds are chemically similar to compounds of interest (target compounds).
  4. Matrix Spikes/Analytical Spikes - For all analyses at frequencies particular to each method, samples are spiked with spiking solutions in order to evaluate any matrix effect of the samples on the analytical method. Matrix spikes and analytical spikes are performed using actual elements of interest or target compounds.
  5. Duplicate Samples - For all analyses, a second aliquot of a sample carried through all sample preparation and analysis procedures to verify the precision of the analytical method. At least one sample in each analysis batch of 20 or fewer samples is analyzed in duplicate.
  6. Laboratory Control Samples - For inorganic analyses, at least one sample in each preparation batch of 20 or fewer samples is prepared and analyzed for each analyte of interest, in order to verify the preparation and analytical methods.



Reagents used in the laboratory are normally of analytical reagent grade or higher purity. Each lot of acid or solvent received is checked for acceptability prior to lab use. All reagents are labeled with the date received and date opened. The quality of the laboratory deionized water is continuously monitored through the use of an in-line conductivity meter.

## 11.2 Internal Quality Assurance

To monitor quality, CAA's QA Department conducts internal quality assurance audits including:

1. QC Blind Samples - Blind samples prepared by CAA's QA Department are sent to the laboratory for analysis. These duplicate and/or spiked samples or standards are submitted as "blind" QC samples, those which are not recognizable to the analyst. These blind samples are inserted into the sample flow at the time the samples are logged in. Each section receives blind QC samples at least once per quarter. Lab and/or Project Managers may request that samples be submitted more frequently.
2. Internal Data Audit - Once per month a representative set of data is chosen randomly from work completed the previous month for one or more of CAA's commercial clients. This data review includes each laboratory section.
3. Internal laboratory Audits - The QA Director will perform laboratory audits quarterly or as needed. This involves evaluation of:
  - sample storage
  - chain-of-custody
  - instrument maintenance
  - documentation
  - precision, and
  - accuracy



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The results of the above procedures are distributed to laboratory and project personnel as well as corporate management. In addition the QA coordinators will meet periodically with the project manager and task managers to review QA/QC data summaries and other pertinent information. Further, the Director of Quality Assurance prepares quarterly reports summarizing the performance of measurement systems and data quality.



## 12. SYSTEM AND PERFORMANCE AUDITS

### 12.1 System Audits

A system audit is an evaluation of the various components of a laboratory's measurement system to assess proper selection and use. This audit will consist of an on-site review of a laboratory's quality assurance systems and physical facilities for sampling, calibration and measurements. System audits are performed on a regular basis by the U.S. EPA as well as various state agencies. CAA will cooperate on all on-site external systems audits performed by the client. The audit may include several or all of the components listed below:

- Personnel, facilities and equipment
- Chain-of-custody procedures
- Instrument calibration and maintenance
- Standards preparation and verification
- Analytical procedures
- Quality control procedures
- Data handling procedures
- Documentation control procedures

### 12.2 Performance Audits

Performance audits provide a systematic check of laboratory operations and measurement systems by comparing independently obtained data with routinely obtained data. CAA routinely participates in laboratory performance evaluations for the U.S. EPA as part of the Water Supply (WS) and Water Pollution (WP) programs. The laboratory also undergoes quarterly audits by EPA as required by the Contract Laboratory Program which supports Superfund investigations and activities. In addition, CAA participates in numerous on-going state performance evaluations. A schedule for CAA's participation in these performance evaluations is detailed in Table 12.1. The reports from these audits will be made available if requested by the client.



Table 12.1 Laboratory Performance Evaluation Schedule (1 yr)

Source	1st quarter	2nd quarter	3rd quarter	4th quarter
EPA WS		X		X
EPA WP	X		X	
NYSDOH (New York State Dep't of Health)	Non-Potables	Potables	Non-Potables	Potables
CLP-organic	X	X	X	X
-inorganic	X	X	X	X



13. PREVENTIVE MAINTENANCE

CAA follows a well-defined program to prevent the failure of laboratory equipment or instrumentation during use. This preventive maintenance and careful calibration help to assure accurate measurements from laboratory instruments. CAA also avoids any time delays during analyses due to unscheduled downtime by maintaining more than one instrument of each type in full working order.

Preventive maintenance procedures such as lubrication, source cleaning, detector cleaning and the frequency of such maintenance are performed according to the procedures delineated in the manufacturer's instrument manual. Chromatographic carrier gas purification traps, injector liners, and injector septa are cleaned or replaced on a regular basis. Precision and accuracy data are examined for trends and excursions beyond control limits to determine evidence of instrument malfunction. Maintenance must be performed when the instrument begins to degrade as evidenced by the degradation of peak resolution, shift in calibration curves, decreased sensitivity, or failure to meet one or another of the quality control criteria. The preventive maintenance performed on the major instrumentation which will be used is summarized in Table 13.1.

Instrument logbooks are maintained in the laboratories at all times. They contain records of usage, calibration, maintenance and repairs. Adequate supplies of spare parts such as GC columns, syringes, septa, injection port liners, and electronic parts are maintained in the laboratories so that they are available when needed.



Table 13.1 Maintenance Procedures and Schedule  
 For Major Instrumentation

Instrument	Maintenance Procedure/Schedule	Spare Parts
Gas Chromatography/ Mass Spectrometry (GC/MS)	<ol style="list-style-type: none"> <li>1. Replace pump oils as needed</li> <li>2. Change septa as needed</li> <li>3. Change gas line dryers as needed</li> <li>4. Replace electron multiplier as needed</li> </ol>	<ol style="list-style-type: none"> <li>1. Syringes</li> <li>2. Septa</li> <li>3. Various electronic components</li> <li>4. Plumbing supplies-tube fittings</li> </ol>
Gas Chromatograph (GC)	<ol style="list-style-type: none"> <li>1. Change septa as needed</li> <li>2. Change gas line dryers as needed</li> <li>3. Leak check when installing new analytical column</li> <li>4. Periodically check inlet system for residue buildup</li> </ol>	<ol style="list-style-type: none"> <li>1. Syringes</li> <li>2. Septa</li> <li>3. Various electronic components</li> <li>4. Plumbing supplies-tube fittings</li> </ol>
Inductively Coupled Argon Plasma Spectrometer (ICP)	<ol style="list-style-type: none"> <li>1. Clean torch assembly and mixing chamber when discolored or after 8 hours of running high dissolved solids samples</li> </ol>	<ol style="list-style-type: none"> <li>1. Spare torch and mixing chamber</li> <li>2. Spare coil</li> </ol>
Purge and Trap Sample Concentrator	<ol style="list-style-type: none"> <li>1. Replace trap as needed</li> <li>2. Decontaminate system as required by blank analysis</li> <li>3. Leak check system</li> </ol>	<ol style="list-style-type: none"> <li>1. Spare traps</li> <li>2. Various electronic components and circuit boards</li> <li>3. Plumbing supplies-tube fittings</li> </ol>
Graphite Furnace Atomic Absorption Spectro- photometer	<ol style="list-style-type: none"> <li>1. Change graphite contact rings as necessary</li> <li>2. Change D<sub>2</sub> background connection lamp as necessary</li> <li>3. Clean quartz windows as necessary</li> </ol>	<ol style="list-style-type: none"> <li>1. Contact rings</li> <li>2. D<sub>2</sub> arc lamp</li> </ol>
Spectroproducts Hg Analyzer	<ol style="list-style-type: none"> <li>1. Clean tubing and quartz cell as necessary</li> <li>2. Clean aspirator as necessary</li> </ol>	<ol style="list-style-type: none"> <li>1. Quartz cells</li> <li>2. Aspirator</li> </ol>
Technicon Autoanalyzer II	<ol style="list-style-type: none"> <li>1. Inspect pump tubes after each 8-hr run; replace if discolored or distorted</li> </ol>	<ol style="list-style-type: none"> <li>1. Pump tubes, glass coil, flow cells</li> </ol>



14. SPECIFIC ROUTINE PROCEDURES TO ASSESS DATA PRECISION, ACCURACY,  
AND COMPLETENESS

14.1 Precision

Precision is a measure of the degree of agreement between repeated measurements of the same parameter under prescribed, similar conditions. Analytical precision will be monitored using results from duplicate analyses. The program analytical precision goals, expressed as relative percent difference (RPD), are presented in Table 5.1, Section 5. The RPD is expressed as follows:

$$RPD = \frac{|D_1 - D_2|}{(D_1 + D_2)/2} \times 100$$

where RPD = Relative Percent Difference

$D_1$  = First Duplicate Value (percent recovery)

$D_2$  = Second Duplicate Value (percent recovery)

14.2 Accuracy

Accuracy is the degree of agreement between the true value of the parameter being measured and the observations made according to the test method. Accuracy will be evaluated by comparing the recovery of the parameters of interest against the goals established in Section 5 through the use of EPA Quality Control Samples or NBS Standard Reference Materials. The recovery of a compound will be defined as:

$$\text{Percent Recovery} = \frac{Q_d}{Q_a} \times 100\%$$



where  $Q_d$  = quantity determined by analysis

$Q_a$  = true value

Accuracy criteria for this project are included in Table 5.1.

### 14.3 Completeness

Completeness is a measure of the amount of valid data obtained from the analytical measurement system. It is defined as the total amount of acceptable data divided by the total number of samples received multiplied by 100. The QA objective for this study is to obtain acceptable data for all of the samples received. The procedures in Section 10 of this QA Plan for validating data will be used to determine which data are acceptable. Completeness also implies the ability of the final report to answer the client's questions. CAA's scientists and engineers will be available to interpret the analytical reports and consult with the client to recommend future courses of action.

$$C = 100 \frac{V}{T}$$

where:

C = Percent completeness

V = Number of measurements judged valid

T = Total number of measurements



## 15. CORRECTIVE ACTION

An important part of any quality assurance program is a well-defined effective policy for correcting quality problems. CAA maintains a closed-loop corrective action system which operates under the direction of the QA Director. While the entire quality assurance program is designed to avoid problems, it also serves to identify and correct those that may exist. Usually these quality problems fall into two categories, immediate corrective action or long-term corrective action.

Specific quality control procedures are designed to help analysts detect the need for corrective action. Often an analyst's experience will be most valuable in identifying suspicious data or malfunctioning equipment; immediate corrective action may then be taken. The actions should be noted in laboratory notebooks but no other formal documentation is required unless further corrective action is necessary.

The need for long-term action may be identified by standard QC procedures, control charts, performance or system audits. Any quality problem which cannot be solved by immediate corrective action falls into this long-term category. CAA uses a system to insure that the condition is reported to a person who is part of the closed-loop action and follow up plan.

The essential steps in the closed-loop corrective action system are:

- a. The problem will be identified.
- b. Responsibility for investigating the problem will be assigned.
- c. The cause of the problem will be investigated and determined.
- d. A corrective action to eliminate the problem will be determined.
- e. Responsibility for implementing the corrective action will be assigned and accepted.
- f. The effectiveness of the corrective action will be established and



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the corrective action implemented.

- g. The fact that the corrective action has eliminated the problem will be verified.
- h. The complete process of establishing and implementing corrective action will be documented. The Corrective Action Request Form (Figure 15.1) serves to summarize all such documentation.

This process of corrective action will be used to make all corrections deemed necessary by the CAA Project Manager or QA Department, the client QA Coordinator, or the client Project Officer. CAA's QA Coordinator assigned to the project will coordinate correspondence and ensure compliance with their request.



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Figure 15-1

Corrective Action Request Form No. \_\_\_\_\_

Originator \_\_\_\_\_ Date \_\_\_\_\_

Person responsible  
for replying \_\_\_\_\_ Laboratory \_\_\_\_\_

Nature of Problem:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Cause of Problem:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Corrective Action Planned:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Temporary Action

Permanent Action

Acceptance of Corrective Action

Record Distribution

Approved By: \_\_\_\_\_

Original: QC Coordinator  
2nd copy: Originator  
3rd copy: CAA file



16. QUALITY ASSURANCE REPORT TO MANAGEMENT

In order to provide information to CAA's Project Manager on the performance of the quality assurance program for this project, the laboratory Quality Assurance Coordinator will meet with the Project Manager, and Task Managers on a periodic basis to review quality control data summary documentation, and other pertinent information.

On a quarterly basis the Quality Assurance Director prepares reports to CAA's corporate management summarizing the performance of measurement systems and data quality. These reports will include:

- results of interlaboratory precision and accuracy studies;
- results of performance evaluation studies for ongoing or new contracts;
- summary results of blind internal QC test samples;
- an assessment of measurement data accuracy, precision and completeness;
- significant quality assurance problems and recommended solutions.



**ATTACHMENT D**

**DATA QUALITY OBJECTIVE SUMMARY FORMS**

**DQO SUMMARY FORM**

<b>1. SITE</b> NAME <u>ALGOMA LANDFILL</u> LOCATION <u>KEWAUNEE CTY WI</u> NUMBER <u>WI/D980610380</u>		EPA REGION <u>V</u> PHASE <u>RI1</u> RI 2 RI 3 ERA FS RD RA (CIRCLE ONE)					
<b>2. MEDIA</b> (CIRCLE ONE)	SOL	<input checked="" type="radio"/> GW	SW/SED	AIR	BIO	OTHER	
<b>3. USE</b> (CIRCLE ALL THAT APPLY)	SITE CHARAC. (H&S)	<input checked="" type="radio"/> RISK ASSESS	EVAL. ALTS.	ENGG DESIGN	PRP DETER.	MONITORING REMEDIAL ACTION	OTHER
<b>4. OBJECTIVE</b> <u>determine whether hazardous substances have reached residential water supply wells from the Algoma landfill</u>							
<b>5. SITE INFORMATION</b> AREA <u>9+ acre solid waste landfill</u> DEPTH TO GROUND WATER <u>~20 ft</u> GROUND WATER USE <u>residential wells ~ 0.5 mi from landfill</u> SOIL TYPES <u>sand or silt &amp; clay</u> SENSITIVE RECEPTORS <u>residential well users, wetlands ecosystem</u>							
<b>6. DATA TYPES (CIRCLE APPROPRIATE DATA TYPES)</b>							
<b>A. ANALYTICAL DATA</b>				<b>B. PHYSICAL DATA</b>			
<input checked="" type="radio"/> pH <input checked="" type="radio"/> CONDUCTIVITY <input checked="" type="radio"/> VOA <input checked="" type="radio"/> ABN <input checked="" type="radio"/> TCLP	<input checked="" type="radio"/> PESTICIDES <input checked="" type="radio"/> PCB <input checked="" type="radio"/> METALS <input checked="" type="radio"/> CYANIDE	<input type="radio"/> TOX <input type="radio"/> TOC <input type="radio"/> BTX <input type="radio"/> COD	<input type="radio"/> PERMEABILITY <input type="radio"/> POROSITY <input type="radio"/> GRAIN SIZE <input type="radio"/> BULK DENSITY	<input type="radio"/> HYDRAULIC HEAD <input type="radio"/> PENETRATION TEST <input type="radio"/> HARDNESS			
<b>7. SAMPLING METHOD (CIRCLE METHOD(S) TO BE USED)</b>							
<input checked="" type="radio"/> ENVIRONMENTAL SOURCE	<input checked="" type="radio"/> BIASED GRID	<input checked="" type="radio"/> GRID COMPOSITE	<input type="radio"/> NON-INTRUSIVE	<input checked="" type="radio"/> PHASED	<input checked="" type="radio"/> INTRUSIVE		
<b>8. ANALYTICAL LEVELS (INDICATE LEVEL(S) AND EQUIPMENT &amp; METHODS)</b>							
LEVEL 1 FIELD SCREENING - EQUIPMENT _____ LEVEL 2 FIELD ANALYSIS - EQUIPMENT <u>pH &amp; conductivity</u> LEVEL 3 NON-CLP LABORATORY - METHODS _____ LEVEL 4 CLP/RAS - METHODS _____ LEVEL 5 NON STANDARD <u>SAS as defined by Region II QAS</u>							
<b>9. SAMPLING PROCEDURES</b>							
BACKGROUND - <del>PER EVENT</del> OR <u>PW-1</u> CRITICAL (LIST) _____ PROCEDURES <u>collect from residential tap</u>							
<b>10. QUALITY CONTROL SAMPLES (CONFIRM OR SET STANDARD)</b>							
<b>A. FIELD</b> COLLOCATED - 5% OR <u>NA</u> REPLICATE - 5% OR <u>1 in 9 sps</u> FIELD BLANK - 5% OR <u>NA*</u> TRIP BLANK - <u>1 per day or 1 per shipping case</u>			<b>B. LABORATORY</b> REAGENT BLANK - 1 PER ANALYSIS BATCH OR _____ REPLICATE - 1 PER ANALYSIS BATCH OR _____ MATRIX SPIKE - 1 PER ANALYSIS BATCH OR <u>1 per 9 sps</u> OTHER _____				
<b>11. BUDGET REQUIREMENTS</b>							
BUDGET <u>Not applicable</u> SCHEDULE <u>2 days</u> STAFF <u>1 person field crew, chemist &amp; environmental scientist(s) for data validation &amp; interpretation</u>							
CONTRACTOR <u>RMT</u> PRIME CONTRACTOR _____ SITE MANAGER <u>RMT</u> DATE <u>OCTOBER 1988</u>							

FOR DETAILS SEE SAMPLING & ANALYSIS PLAN  
 \* no sampling equipment from which to collect blank.

**DQO SUMMARY FORM**

<b>1. SITE</b>  NAME <u>ALGOMA LANDFILL</u> LOCATION <u>KEWANEE COUNTY WI</u> NUMBER <u>WV D980610380</u>		EPA REGION <u>V</u>  PHASE <u>RI1</u> RI2 RI3 ERA FS RD RA (CIRCLE ONE)																																														
<b>2. MEDIA</b> (CIRCLE ONE)	<input type="checkbox"/> SOL	<input type="checkbox"/> GW	<input type="checkbox"/> SW/SED	<input type="checkbox"/> AIR	<input type="checkbox"/> BIO	<input checked="" type="checkbox"/> OTHER <small>soil gas</small>																																										
<b>3. USE</b> (CIRCLE ALL THAT APPLY)	<input checked="" type="checkbox"/> SITE CHABAC. (H&S)	<input type="checkbox"/> RISK ASSESS.	<input checked="" type="checkbox"/> EVAL. ALTS.	<input type="checkbox"/> ENGG DESIGN	<input type="checkbox"/> PRP DETER.	<input type="checkbox"/> MONITORING REMEDIAL ACTION	<input type="checkbox"/> OTHER																																									
<b>4. OBJECTIVE</b> <u>optional task to be completed if significant TCL VOCs found in monitoring well samples. objective to delineate extent and nature of VOC disposal within landfill.</u>																																																
<b>5. SITE INFORMATION</b>  AREA <u>9+ acre solid waste landfill</u> DEPTH TO GROUND WATER <u>~ 20 ft</u> GROUND WATER USE <u>residential wells ~ 0.5 mi from landfill</u> SOIL TYPES <u>sand or silt &amp; clay</u> SENSITIVE RECEPTORS <u>residential well users, wetland ecosystem</u>																																																
<b>6. DATA TYPES (CIRCLE APPROPRIATE DATA TYPES)</b> <table style="width:100%; border: none;"> <tr> <td colspan="3" style="text-align: center;">A. ANALYTICAL DATA</td> <td colspan="4" style="text-align: center;">B. PHYSICAL DATA</td> </tr> <tr> <td style="text-align: center;">pH</td> <td style="text-align: center;">PESTICIDES</td> <td style="text-align: center;">TOX</td> <td style="text-align: center;">PERMEABILITY</td> <td colspan="2" style="text-align: center;">HYDRAULIC HEAD</td> <td></td> </tr> <tr> <td style="text-align: center;"><input checked="" type="checkbox"/> CONDUCTIVITY</td> <td style="text-align: center;">PCB</td> <td style="text-align: center;">TOC</td> <td style="text-align: center;">POROSITY</td> <td colspan="2" style="text-align: center;">PENETRATION TEST</td> <td></td> </tr> <tr> <td style="text-align: center;"><input checked="" type="checkbox"/> VOA</td> <td style="text-align: center;">METALS</td> <td style="text-align: center;">BTX</td> <td style="text-align: center;">GRAIN SIZE</td> <td colspan="2" style="text-align: center;">HARDNESS</td> <td></td> </tr> <tr> <td style="text-align: center;">ABN</td> <td style="text-align: center;">CYANIDE</td> <td style="text-align: center;">COD</td> <td style="text-align: center;">BULK DENSITY</td> <td colspan="2"></td> <td></td> </tr> <tr> <td style="text-align: center;">TCLP</td> <td></td> <td></td> <td></td> <td colspan="2"></td> <td></td> </tr> </table>							A. ANALYTICAL DATA			B. PHYSICAL DATA				pH	PESTICIDES	TOX	PERMEABILITY	HYDRAULIC HEAD			<input checked="" type="checkbox"/> CONDUCTIVITY	PCB	TOC	POROSITY	PENETRATION TEST			<input checked="" type="checkbox"/> VOA	METALS	BTX	GRAIN SIZE	HARDNESS			ABN	CYANIDE	COD	BULK DENSITY				TCLP						
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TCLP																																																
<b>7. SAMPLING METHOD (CIRCLE METHOD(S) TO BE USED)</b>  <input checked="" type="checkbox"/> ENVIRONMENTAL SOURCE <input checked="" type="checkbox"/> BIASED GRID <input checked="" type="checkbox"/> GRAB COMPOSITE             NON-INTRUSIVE             PHASED <input type="checkbox"/> INTRUSIVE																																																
<b>8. ANALYTICAL LEVELS (INDICATE LEVEL(S) AND EQUIPMENT &amp; METHODS)</b>  LEVEL 1 FIELD SCREENING - EQUIPMENT _____ <input checked="" type="checkbox"/> LEVEL 2 FIELD ANALYSIS - EQUIPMENT <u>field GC-PID calibrated for 6 VOC's</u> LEVEL 3 NON-CLP LABORATORY - METHODS _____ LEVEL 4 CLP/RAS - METHODS _____ LEVEL 5 NON STANDARD _____																																																
<b>9. SAMPLING PROCEDURES</b>  BACKGROUND <del>1 PER EVENT OR</del> <u>zeroed against "clean" air</u> CRITICAL (LIST) _____ PROCEDURES <u>withdraw gas from probe inserted through shallow auger hole</u>																																																
<b>10. QUALITY CONTROL SAMPLES (CONFIRM OR SET STANDARD)</b> <table style="width:100%; border: none;"> <tr> <td colspan="2" style="text-align: center;">A. FIELD</td> <td colspan="2" style="text-align: center;">B. LABORATORY</td> </tr> <tr> <td>COLLOCATED - 5% OR <u>NA</u></td> <td></td> <td>REAGENT BLANK - 1 PER ANALYSIS BATCH OR <u>NA</u></td> <td></td> </tr> <tr> <td>REPLICATE - 5% OR <u>5 per 47 sps</u></td> <td></td> <td>REPLICATE - 1 PER ANALYSIS BATCH OR <u>NA</u></td> <td></td> </tr> <tr> <td>FIELD BLANK - 5% OR <u>5 per 47 sps</u></td> <td></td> <td>MATRIX SPIKE - 1 PER ANALYSIS BATCH OR <u>NA</u></td> <td></td> </tr> <tr> <td>TRIP BLANK - 1 PER DAY OR <u>NA</u></td> <td></td> <td>OTHER _____</td> <td></td> </tr> </table>							A. FIELD		B. LABORATORY		COLLOCATED - 5% OR <u>NA</u>		REAGENT BLANK - 1 PER ANALYSIS BATCH OR <u>NA</u>		REPLICATE - 5% OR <u>5 per 47 sps</u>		REPLICATE - 1 PER ANALYSIS BATCH OR <u>NA</u>		FIELD BLANK - 5% OR <u>5 per 47 sps</u>		MATRIX SPIKE - 1 PER ANALYSIS BATCH OR <u>NA</u>		TRIP BLANK - 1 PER DAY OR <u>NA</u>		OTHER _____																							
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<b>11. BUDGET REQUIREMENTS</b>  BUDGET <u>not applicable</u> SCHEDULE <u>~ 5 days to complete field work</u> STAFF <u>2 person field crew. chemist &amp; environ. scientist for data valida- &amp; interpretation.</u>																																																
CONTRACTOR <u>RMT</u> SITE MANAGER <u>RMT</u>			PRIME CONTRACTOR <u>not applicable</u> DATE <u>October 1988</u>																																													

FOR DETAILS SEE SAMPLING & ANALYSIS PLAN

DQO SUMMARY FORM

<b>1. SITE</b> NAME <u>ALGOMA LANDFILL</u> LOCATION <u>KEWANEE CTY WI</u> NUMBER <u>WI/D980610380</u>		EPA REGION <u>VI</u> PHASE <u>RI 1</u> (CIRCLE ONE) RI 2 RI 3 ERA FS RD RA (CIRCLE ONE)					
<b>2. MEDIA</b> (CIRCLE ONE)	SOL <input type="checkbox"/>	GW <input checked="" type="checkbox"/>	SW/SED <input type="checkbox"/>	AIR <input type="checkbox"/>	BIO <input type="checkbox"/>	OTHER <input type="checkbox"/>	
<b>3. USE</b> (CIRCLE ALL THAT APPLY)	SITE CHARAC. (R&S) <input checked="" type="checkbox"/>	RISK ASSESS. <input checked="" type="checkbox"/>	EVAL. ALTS. <input type="checkbox"/>	ENGG DESIGN <input type="checkbox"/>	PRP DETER. <input type="checkbox"/>	MONITORING REMEDIAL ACTION <input type="checkbox"/>	OTHER <input type="checkbox"/>
<b>4. OBJECTIVE</b> <u>determine whether hazardous substances have been released from the landfill and evaluate actual &amp;/or potential contaminant pathways.</u>							
<b>5. SITE INFORMATION</b> AREA <u>9+ acre solid waste landfill</u> DEPTH TO GROUND WATER <u>~20 ft</u> GROUND WATER USE <u>residential wells ~ 0.5 mi from landfill</u> SOIL TYPES <u>sand or silt &amp; clay</u> SENSITIVE RECEPTORS <u>residential well users, wetland ecosystem</u>							
<b>6. DATA TYPES (CIRCLE APPROPRIATE DATA TYPES)</b>							
A. ANALYTICAL DATA			B. PHYSICAL DATA				
pH <input checked="" type="checkbox"/> CONDUCTIVITY <input checked="" type="checkbox"/> VOC <input checked="" type="checkbox"/> ABN <input checked="" type="checkbox"/> TCLP <input checked="" type="checkbox"/>	PESTICIDES <input checked="" type="checkbox"/> PCB <input checked="" type="checkbox"/> METALS <input checked="" type="checkbox"/> CYANIDE <input checked="" type="checkbox"/>	TOX <input type="checkbox"/> TOC <input type="checkbox"/> BTX <input type="checkbox"/> COD <input type="checkbox"/>	PERMEABILITY <input checked="" type="checkbox"/> POROSITY <input checked="" type="checkbox"/> GRAIN SIZE <input checked="" type="checkbox"/> BULK DENSITY <input checked="" type="checkbox"/>	HYDRAULIC HEAD <input checked="" type="checkbox"/> PENETRATION TEST <input checked="" type="checkbox"/> HARDNESS <input checked="" type="checkbox"/> TEMPERATURE <input checked="" type="checkbox"/>			
<b>7. SAMPLING METHOD (CIRCLE METHOD(S) TO BE USED)</b>							
ENVIRONMENTAL SOURCE <input checked="" type="checkbox"/>	BIASED GRID <input checked="" type="checkbox"/>	GRAB COMPOSITE <input checked="" type="checkbox"/>	NON-INTRUSIVE <input type="checkbox"/>	INTRUSIVE <input checked="" type="checkbox"/>	PHASED <input checked="" type="checkbox"/>		
<b>8. ANALYTICAL LEVELS (INDICATE LEVEL(S) AND EQUIPMENT &amp; METHODS)</b>							
LEVEL 1 <input checked="" type="checkbox"/> FIELD SCREENING - EQUIPMENT <u>EM-31, HNU</u>							
LEVEL 2 <input checked="" type="checkbox"/> FIELD ANALYSIS - EQUIPMENT <u>pH &amp; conductivity</u>							
LEVEL 3 <input checked="" type="checkbox"/> NON-CLP LABORATORY - METHODS <u>single well response test, ASTM soils analyses</u>							
LEVEL 4 <input checked="" type="checkbox"/> CLP/RAS - METHODS <u>VOC, ABN, metals, cyanide, PCB test.</u>							
LEVEL 5 <input type="checkbox"/> NON STANDARD							
<b>9. SAMPLING PROCEDURES</b>							
BACKGROUND - 2 PER EVENT OR <u>QW-14 (2-rounds)</u>							
CRITICAL (LIST) _____							
PROCEDURES <u>EM-31, ASTM soil spg, bailer</u>							
<b>10. QUALITY CONTROL SAMPLES (CONFIRM OR SET STANDARD)</b>							
A. FIELD			B. LABORATORY				
COLLOCATED - 3% OR <u>NA</u>			REAGENT BLANK - 1 PER ANALYSIS BATCH OR _____				
REPLICATE - 3% OR <u>1 in 10 sps</u>			REPLICATE - 1 PER ANALYSIS BATCH OR _____				
FIELD BLANK - 3% OR <u>1 in 10 filtered metal sps</u>			MATRIX SPIKE - 4 PER ANALYSIS BATCH OR <u>1 per 10 sps</u>				
TRIP BLANK - 4 PER DAY OR <u>1 per shipping container</u>			OTHER _____				
<b>11. BUDGET REQUIREMENTS</b>							
BUDGET <u>NOT APPLICABLE</u> SCHEDULE <u>8 weeks for geophys, well installa &amp; spg</u>							
STAFF <u>variable 1-3 person field crew, chemists &amp; environ scientists for data validation &amp; interpretation</u>							
CONTRACTOR <u>RMT</u>			PRIME CONTRACTOR _____				
SITE MANAGER <u>RMT</u>			DATE <u>OCTOBER 1988</u>				

FOR DETAILS SEE SAMPLING & ANALYSIS PLAN

DQO SUMMARY FORM

<b>1. SITE</b> NAME <u>ALGOMA LANDFILL</u> LOCATION <u>KEWAUNEE CTY WI</u> NUMBER <u>WYD980610380</u>		EPA REGION <u>V</u> PHASE <u>RI1</u> RI2 RI3 ERA FS RD RA (CIRCLE ONE)					
<b>2. MEDIA</b> (CIRCLE ONE)	<input checked="" type="checkbox"/> SOIL	<input type="checkbox"/> GW	<input checked="" type="checkbox"/> SW/SED	<input type="checkbox"/> AIR	<input type="checkbox"/> BIO	<input type="checkbox"/> OTHER	
<b>3. USE</b> (CIRCLE ALL THAT APPLY)	<input checked="" type="checkbox"/> SITE CHARAC. (H&S)	<input checked="" type="checkbox"/> RISK ASSESS.	<input type="checkbox"/> EVAL. ALTS.	<input type="checkbox"/> ENGG. DESIGN	<input type="checkbox"/> PRP DETER.	<input type="checkbox"/> MONITORING REMEDIAL ACTION	<input type="checkbox"/> OTHER
<b>4. OBJECTIVE</b> <u>determine whether hazardous substances have been released from landfill to nearby runoff channels and wet lands</u>							
<b>5. SITE INFORMATION</b> AREA <u>9+ acre solid waste landfill</u> DEPTH TO GROUND WATER <u>~ 20 ft</u> GROUND WATER USE <u>residential wells ~ 0.5 miles from landfill</u> SOIL TYPES <u>sand, silty clay</u> SENSITIVE RECEPTORS <u>residential well users, wetland ecosystem</u>							
<b>6. DATA TYPES (CIRCLE APPROPRIATE DATA TYPES)</b>							
<b>A. ANALYTICAL DATA</b>				<b>B. PHYSICAL DATA</b>			
PH <input checked="" type="checkbox"/> CONDUCTIVITY <input checked="" type="checkbox"/> VOA <input checked="" type="checkbox"/> ABN <input type="checkbox"/> TCLP	<input checked="" type="checkbox"/> PESTICIDES <input checked="" type="checkbox"/> PCB <input checked="" type="checkbox"/> METALS <input checked="" type="checkbox"/> CYANIDE	TOX TOC BTX COD	PERMEABILITY POROSITY GRAIN SIZE BULK DENSITY	HYDRAULIC HEAD PENETRATION TEST HARDNESS			
<b>7. SAMPLING METHOD (CIRCLE METHOD(S) TO BE USED)</b>							
<input checked="" type="checkbox"/> ENVIRONMENTAL SOURCE	<input checked="" type="checkbox"/> BIASED GRID	<input checked="" type="checkbox"/> GRAB COMPOSITE	<input type="checkbox"/> NON-INTRUSIVE <input checked="" type="checkbox"/> INTRUSIVE	<input type="checkbox"/> PHASED			
<b>8. ANALYTICAL LEVELS (INDICATE LEVEL(S) AND EQUIPMENT &amp; METHODS)</b>							
LEVEL 1 FIELD SCREENING - EQUIPMENT _____ <input checked="" type="checkbox"/> LEVEL 2 FIELD ANALYSIS - EQUIPMENT <u>Field GC analyses for VOC w/ lab confirmation</u> LEVEL 3 NON-CLP LABORATORY - METHODS _____ <input checked="" type="checkbox"/> LEVEL 4 CLP/RAS - METHODS <u>combinations of metals, ABN and PCB post per SIP</u> LEVEL 5 NON STANDARD _____							
<b>9. SAMPLING PROCEDURES</b>							
BACKGROUND - 2 PER EVENT OR <u>ALSS-03 &amp; ALSS-08</u> CRITICAL (LIST) _____ PROCEDURES <u>excavation &amp; collection of near surface soil &amp; or sediment</u>							
<b>10. QUALITY CONTROL SAMPLES (CONFIRM OR SET STANDARD)</b>							
<b>A. FIELD</b> COLLOCATED - <u>NA</u> REPLICATE - <u>NA</u> OR <u>1 in 15 sps</u> FIELD BLANK - <u>NA</u> OR <u>NA</u> TRIP BLANK - <u>1 per day</u> OR <u>1 per shipping container</u>			<b>B. LABORATORY</b> REAGENT BLANK - 1 PER ANALYSIS BATCH OR _____ REPLICATE - 1 PER ANALYSIS BATCH OR _____ MATRIX SPIKE - 1 PER ANALYSIS BATCH OR <u>per 15 sps.</u> OTHER _____				
<b>11. BUDGET REQUIREMENTS</b>							
BUDGET <u>no applicable</u> SCHEDULE <u>3 days to collect sps</u> STAFF <u>2 person field crew - chemist &amp; environ. scientist for data validation and interpretation</u>							
CONTRACTOR <u>RMT</u> PRIME CONTRACTOR <u>not applicable</u> SITE MANAGER <u>RMT</u> DATE <u>October 1988</u>							

FOR DETAILS SEE SAMPLING & ANALYSIS PLAN

\* all sampling equipment used for single sample then discarded.

DQO SUMMARY FORM

1. SITE		EPA REGION <u>V</u>					
NAME <u>ALGOMA LANDFILL</u>		PHASE _____					
LOCATION <u>KEWANEE CITY WI</u>		<input checked="" type="radio"/> RI 1 <input type="radio"/> RI 2 <input type="radio"/> RI 3 <input type="radio"/> ERA <input type="radio"/> FS <input type="radio"/> RD <input type="radio"/> RA (CIRCLE ONE)					
NUMBER <u>WV D980610380</u>							
2. MEDIA (CIRCLE ONE)	SOL	GW	<input checked="" type="radio"/> SW/SED	AIR	BIO	OTHER	
3. USE (CIRCLE ALL THAT APPLY)	<input checked="" type="radio"/> SITE CHARAC. (H&S)	<input checked="" type="radio"/> RISK ASSESS.	EVAL. ALTS.	ENGG. DESIGN	PRP DETER.	MONITORING REMEDIAL ACTION	OTHER
4. OBJECTIVE <u>determining whether hazardous substances are being released to wetland area immediately E &amp; SE of landfill</u>							
5. SITE INFORMATION							
AREA <u>9+ acre solid waste landfill</u> DEPTH TO GROUND WATER <u>~ 20 ft</u>							
GROUND WATER USE <u>residential wells ~ 0.5 mi. from landfill</u>							
SOIL TYPES <u>sand or silty clay</u>							
SENSITIVE RECEPTORS <u>residential well users, wetland ecosystem</u>							
6. DATA TYPES (CIRCLE APPROPRIATE DATA TYPES)							
A. ANALYTICAL DATA			B. PHYSICAL DATA				
<input checked="" type="radio"/> pH	<input checked="" type="radio"/> PESTICIDES	TOX	PERMEABILITY	HYDRAULIC HEAD			
<input checked="" type="radio"/> CONDUCTIVITY	<input checked="" type="radio"/> PCB	TOC	POROSITY	PENETRATION TEST			
<input checked="" type="radio"/> VOC	<input checked="" type="radio"/> METALS	BTX	GRAIN SIZE	HARDNESS			
<input checked="" type="radio"/> ABN	<input checked="" type="radio"/> CYANIDE	COO	BULK DENSITY				
<input checked="" type="radio"/> TCLP							
7. SAMPLING METHOD (CIRCLE METHOD(S) TO BE USED)							
<input checked="" type="radio"/> ENVIRONMENTAL SOURCE	<input checked="" type="radio"/> BIASED GRID	<input checked="" type="radio"/> GRID COMPOSITE	<input checked="" type="radio"/> NON-INTRUSIVE	<input checked="" type="radio"/> INTRUSIVE			
8. ANALYTICAL LEVELS (INDICATE LEVEL(S) AND EQUIPMENT & METHODS)							
LEVEL 1 FIELD SCREENING - EQUIPMENT _____							
<input checked="" type="radio"/> LEVEL 2 FIELD ANALYSIS - EQUIPMENT <u>pH &amp; conductivity</u>							
LEVEL 3 NON-CLP LABORATORY - METHODS _____							
<input checked="" type="radio"/> LEVEL 4 CLP/RAS - METHODS <u>VOCs all &amp; combination of metals, ABN, P/P &amp; CN on others</u>							
LEVEL 5 NON STANDARD _____							
9. SAMPLING PROCEDURES							
BACKGROUND - 2 PER EVENT OR <u>no background locations w/in 0.5 mi of site.</u>							
CRITICAL (LIST) _____							
PROCEDURES <u>direct filling of spl containers</u>							
10. QUALITY CONTROL SAMPLES (CONFIRM OR SET STANDARD)							
A. FIELD			B. LABORATORY				
COLLOCATED - 5% OR <u>NA</u>			REAGENT BLANK - 1 PER ANALYSIS BATCH OR _____				
REPLICATE - 5% OR <u>in 3 spls</u>			REPLICATE - 1 PER ANALYSIS BATCH OR _____				
FIELD BLANK - 5% OR <u>NA*</u>			MATRIX SPIKE - 1 PER ANALYSIS BATCH OR <u>1 per 3 sps</u>				
TRIP BLANK - 4 PER DAY OR 1 per shipping container			OTHER _____				
11. BUDGET REQUIREMENTS							
BUDGET <u>not applicable</u> SCHEDULE <u>1 day to collect spl</u>							
STAFF <u>2 person field crew, chemist &amp; environ. scientist for data validation &amp; interpretation</u>							
CONTRACTOR <u>RMT</u>		PRIME CONTRACTOR <u>not applicable</u>					
SITE MANAGER <u>RMT</u>		DATE <u>October 1988</u>					

FOR DETAILS SEE SAMPLING & ANALYSIS PLAN

\* no sampling equipment from which to take a blank.

DQO SUMMARY FORM

<b>1. SITE</b> NAME <u>ALGOMA LANDFILL</u> LOCATION <u>KEWANEE COUNTY WI</u> NUMBER <u>W/D980610380</u>		EPA REGION <u>V</u> PHASE <u>RI1</u> RI2 RI3 ERA FS RD RA (CIRCLE ONE)					
<b>2. MEDIA</b> (CIRCLE ONE)	SOIL <input type="checkbox"/>	GW <input type="checkbox"/>	SW/SED <input type="checkbox"/>	AIR <input type="checkbox"/>	BIO <input type="checkbox"/>	OTHER <input checked="" type="checkbox"/> L.F. COVER	
<b>3. USE</b> (CIRCLE ALL THAT APPLY)	SITE CHARAC. (H&S) <input type="checkbox"/>	RISK ASSESS. <input type="checkbox"/>	EVAL. ALTS. <input checked="" type="checkbox"/>	ENGG DESIGN <input checked="" type="checkbox"/>	PRP DETER. <input type="checkbox"/>	MONITORING REMEDIAL ACTION <input type="checkbox"/>	OTHER <input type="checkbox"/>
<b>4. OBJECTIVE</b> <u>assess quality of landfill cover</u>							
<b>5. SITE INFORMATION</b> AREA <u>9+ acre solid waste landfill</u> DEPTH TO GROUND WATER <u>~20 ft</u> GROUND WATER USE <u>residential wells ~ 0.5 mi from landfill</u> SOIL TYPES <u>sand or silt &amp; clay</u> SENSITIVE RECEPTORS <u>residential well users, wetland ecosystem</u>							
<b>6. DATA TYPES (CIRCLE APPROPRIATE DATA TYPES)</b>							
A. ANALYTICAL DATA PH _____ PESTICIDES _____ TOX _____ CONDUCTIVITY _____ PCB _____ TOC _____ VOA _____ METALS _____ BTX _____ ABN _____ CYANIDE _____ COD _____ TCLP _____			B. PHYSICAL DATA PERMEABILITY <input checked="" type="checkbox"/> HYDRAULIC HEAD _____ POROSITY <input checked="" type="checkbox"/> PENETRATION TEST _____ GRAIN SIZE <input checked="" type="checkbox"/> HARDNESS _____ BULK DENSITY _____				
<b>7. SAMPLING METHOD (CIRCLE METHOD(S) TO BE USED)</b>							
<input checked="" type="checkbox"/> ENVIRONMENTAL SOURCE	<input checked="" type="checkbox"/> BIASED GRID	<input checked="" type="checkbox"/> GRAB COMPOSITE	NON-INTRUSIVE <input type="checkbox"/>		PHASED <input type="checkbox"/>		
<b>8. ANALYTICAL LEVELS (INDICATE LEVEL(S) AND EQUIPMENT &amp; METHODS)</b>							
LEVEL 1 FIELD SCREENING - EQUIPMENT _____ LEVEL 2 FIELD ANALYSIS - EQUIPMENT _____ LEVEL 3 <input checked="" type="checkbox"/> NON-CLP LABORATORY - METHODS <u>ASTM soil testing procedures</u> LEVEL 4 CLP/RAS - METHODS _____ LEVEL 5 NON STANDARD _____							
<b>9. SAMPLING PROCEDURES</b>							
BACKGROUND - 2 PER EVENT OR <u>not applicable</u> CRITICAL (LIST) _____ PROCEDURES <u>ASTM soil sampling procedures.</u>							
<b>10. QUALITY CONTROL SAMPLES (CONFIRM OR SET STANDARD)</b>							
A. FIELD COLLOCATED - 5% OR <u>NA</u> REPLICATE - 5% OR <u>NA</u> FIELD BLANK - 5% OR <u>NA</u> TRIP BLANK - 1 PER DAY OR <u>NA</u>			B. LABORATORY REAGENT BLANK - 1 PER ANALYSIS BATCH OR <u>NA</u> REPLICATE - 1 PER ANALYSIS BATCH OR <u>NA</u> MATRIX SPIKE - 1 PER ANALYSIS BATCH OR <u>NA</u> OTHER _____				
<b>11. BUDGET REQUIREMENTS</b>							
BUDGET <u>not applicable</u> SCHEDULE <u>2 days</u> STAFF <u>1 person field crew</u>							
CONTRACTOR <u>RMT</u>			PRIME CONTRACTOR _____				
SITE MANAGER <u>RMT</u>			DATE <u>OCTOBER 1988</u>				

FOR DETAILS SEE SAMPLING & ANALYSIS PLAN

**DQO SUMMARY FORM**

<p><b>1. SITE</b></p> <p>NAME <u>ALGOMA LANDFILL</u></p> <p>LOCATION <u>KEWANEE CTY WI</u></p> <p>NUMBER <u>WV D980610380</u></p>		<p>EPA REGION <u>V</u></p> <p>PHASE _____</p> <p><input checked="" type="radio"/> RI1 <input type="radio"/> RI2 <input type="radio"/> RI3 <input type="radio"/> ERA <input type="radio"/> FS <input type="radio"/> RD <input type="radio"/> RA</p> <p>(CIRCLE ONE)</p>																																														
<p><b>2. MEDIA</b> (CIRCLE ONE)</p>	<p>SOL</p>	<p>GW</p>	<p>SW/SED</p>	<p>AIR</p>	<p>BIO</p>	<p><input checked="" type="radio"/> OTHER WASTE</p>																																										
<p><b>3. USE</b> (CIRCLE ALL THAT APPLY)</p>	<p><input checked="" type="radio"/> SITE CHARAC (H&amp;S)</p>	<p>RISK ASSESS.</p>	<p><input checked="" type="radio"/> EVAL ALTS.</p>	<p>ENGG DESIGN</p>	<p>PRP DETER.</p>	<p>MONITORING REMEDIAL ACTION</p>	<p>OTHER _____</p>																																									
<p><b>4. OBJECTIVE</b> <u>evaluate areal extent of past waste disposal operations</u> <u>Assess damage to landfill cover by road work</u></p>																																																
<p><b>5. SITE INFORMATION</b></p> <p>AREA <u>9+ acre solid waste landfill</u> DEPTH TO GROUND WATER <u>~ 20 ft</u></p> <p>GROUND WATER USE <u>residential wells ~ 0.5 mi. from landfill</u></p> <p>SOIL TYPES <u>sand or silt &amp; clay</u></p> <p>SENSITIVE RECEPTORS <u>residential well users, wetland ecosystem</u></p>																																																
<p><b>6. DATA TYPES (CIRCLE APPROPRIATE DATA TYPES)</b></p> <table style="width:100%; border: none;"> <tr> <td colspan="3" style="text-align: center;">A. ANALYTICAL DATA</td> <td colspan="4" style="text-align: center;">B. PHYSICAL DATA</td> </tr> <tr> <td style="text-align: center;">pH</td> <td style="text-align: center;">PESTICIDES</td> <td style="text-align: center;">TOX</td> <td style="text-align: center;">PERMEABILITY</td> <td colspan="2" style="text-align: center;">HYDRAULIC HEAD</td> <td></td> </tr> <tr> <td style="text-align: center;">CONDUCTIVITY</td> <td style="text-align: center;">PCB</td> <td style="text-align: center;">TOC</td> <td style="text-align: center;">POROSITY</td> <td colspan="2" style="text-align: center;">PENETRATION TEST</td> <td></td> </tr> <tr> <td style="text-align: center;">VOA</td> <td style="text-align: center;">METALS</td> <td style="text-align: center;">BTX</td> <td style="text-align: center;">GRAIN SIZE</td> <td colspan="2" style="text-align: center;">HARDNESS</td> <td></td> </tr> <tr> <td style="text-align: center;">ABN</td> <td style="text-align: center;">CYANIDE</td> <td style="text-align: center;">COD</td> <td style="text-align: center;">BULK DENSITY</td> <td colspan="2" style="text-align: center;"><input checked="" type="radio"/> terrain conductivity</td> <td></td> </tr> <tr> <td style="text-align: center;">TCLP</td> <td></td> <td></td> <td></td> <td colspan="2"></td> <td></td> </tr> </table>							A. ANALYTICAL DATA			B. PHYSICAL DATA				pH	PESTICIDES	TOX	PERMEABILITY	HYDRAULIC HEAD			CONDUCTIVITY	PCB	TOC	POROSITY	PENETRATION TEST			VOA	METALS	BTX	GRAIN SIZE	HARDNESS			ABN	CYANIDE	COD	BULK DENSITY	<input checked="" type="radio"/> terrain conductivity			TCLP						
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<p><b>7. SAMPLING METHOD (CIRCLE METHOD(S) TO BE USED)</b></p> <table style="width:100%; border: none;"> <tr> <td style="text-align: center;">ENVIRONMENTAL</td> <td style="text-align: center;">BIASED</td> <td style="text-align: center;"><input checked="" type="radio"/> GRAB</td> <td style="text-align: center;"><input checked="" type="radio"/> NON-INTRUSIVE</td> <td style="text-align: center;">PHASED</td> </tr> <tr> <td style="text-align: center;"><input checked="" type="radio"/> SOURCE</td> <td style="text-align: center;"><input checked="" type="radio"/> GRID</td> <td style="text-align: center;">COMPOSITE</td> <td style="text-align: center;">INTRUSIVE</td> <td style="text-align: center;">_____</td> </tr> </table>							ENVIRONMENTAL	BIASED	<input checked="" type="radio"/> GRAB	<input checked="" type="radio"/> NON-INTRUSIVE	PHASED	<input checked="" type="radio"/> SOURCE	<input checked="" type="radio"/> GRID	COMPOSITE	INTRUSIVE	_____																																
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<p><b>8. ANALYTICAL LEVELS (INDICATE LEVEL(S) AND EQUIPMENT &amp; METHODS)</b></p> <p><input checked="" type="radio"/> LEVEL 1 FIELD SCREENING - EQUIPMENT <u>EM-31</u></p> <p>LEVEL 2 FIELD ANALYSIS - EQUIPMENT _____</p> <p>LEVEL 3 NON-CLP LABORATORY - METHODS _____</p> <p>LEVEL 4 CLP/RAS - METHODS _____</p> <p>LEVEL 5 NON STANDARD _____</p>																																																
<p><b>9. SAMPLING PROCEDURES</b></p> <p>BACKGROUND - 2 PER EVENT OR <u>several hundred feet of survey line beyond waste boundary</u></p> <p>CRITICAL (LIST) _____</p> <p>PROCEDURES <u>EM-31 as described in QAPP.</u></p>																																																
<p><b>10. QUALITY CONTROL SAMPLES (CONFIRM OR SET STANDARD)</b></p> <table style="width:100%; border: none;"> <tr> <td colspan="2" style="text-align: center;">A. FIELD</td> <td colspan="2" style="text-align: center;">B. LABORATORY</td> </tr> <tr> <td>COLLOCATED - 3% OR <u>1 per 1000 ft of survey line.</u></td> <td></td> <td>REAGENT BLANK - 1 PER ANALYSIS BATCH OR <u>NA</u></td> <td></td> </tr> <tr> <td>REPLICATE - 5% OR <u>NA</u></td> <td></td> <td>REPLICATE - 1 PER ANALYSIS BATCH OR <u>NA</u></td> <td></td> </tr> <tr> <td>FIELD BLANK - 5% OR <u>NA</u></td> <td></td> <td>MATRIX SPIKE - 1 PER ANALYSIS BATCH OR <u>NA</u></td> <td></td> </tr> <tr> <td>TRIP BLANK - 1 PER DAY OR <u>NA</u></td> <td></td> <td>OTHER _____</td> <td></td> </tr> </table>							A. FIELD		B. LABORATORY		COLLOCATED - 3% OR <u>1 per 1000 ft of survey line.</u>		REAGENT BLANK - 1 PER ANALYSIS BATCH OR <u>NA</u>		REPLICATE - 5% OR <u>NA</u>		REPLICATE - 1 PER ANALYSIS BATCH OR <u>NA</u>		FIELD BLANK - 5% OR <u>NA</u>		MATRIX SPIKE - 1 PER ANALYSIS BATCH OR <u>NA</u>		TRIP BLANK - 1 PER DAY OR <u>NA</u>		OTHER _____																							
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<p><b>11. BUDGET REQUIREMENTS</b></p> <p>BUDGET <u>Not Applicable</u> SCHEDULE <u>5 days</u></p> <p>STAFF <u>2-person field crew, geologist for data validation &amp; interpretation</u></p>																																																
<p>CONTRACTOR <u>RMT</u></p> <p>SITE MANAGER <u>RMT</u></p>		<p>PRIME CONTRACTOR _____</p>		<p>DATE <u>OCTOBER 1988</u></p>																																												

FOR DETAILS SEE SAMPLING & ANALYSIS PLAN

**SDMS US EPA REGION V  
 FORMAT- OVERSIZED - 5  
 IMAGERY INSERT FORM**

The item(s) listed below are not available in SDMS. In order to view original document or document pages, contact the Superfund Records Center.

<b>SITE NAME</b>	<b>ALGOMA MUNICIPAL LANDFILL</b>		
<b>DOC ID #</b>	<b>137729</b>		
<b>DESCRIPTION OF ITEM(S)</b>	<b>Map - Groundwater, soil/sediment, and surface water sampling map</b>		
<b>REASON WHY UNSCANNABLE</b>	<u>  X  </u> <b>OVERSIZED</b>	<b>OR</b>	<u>      </u> <b>FORMAT</b>
<b>DATE OF ITEM(S)</b>	<b>11/11/1988</b>		
<b>NO. OF ITEMS</b>	<b>2</b>		
<b>PHASE</b>	<b>REM</b>		
<b>PRP</b>	<b>RMD Algoma Municipal</b>		
<b>PHASE (AR DOCUMENTS ONLY)</b>	<u>  </u> Remedial	<u>  </u> Removal	<u>  </u> Deletion Docket <u>  </u> AR
	<u>  </u> Original	<u>      </u> Update # <u>      </u>	<u>      </u> Volume <u>      </u> of <u>      </u>
<b>O.U.</b>			
<b>LOCATION</b>	<b>Box # <u>  1  </u></b>	<b>Folder # <u>  1  </u></b>	<b>Subsection <u>      </u></b>
<b>COMMENT(S)</b>			
<b>2 Maps - in plastic binders</b>			

**APPENDIX A**

**USEPA SCOPE OF WORK FOR THE ALGOMA LANDFILL RI/FS**

ATTACHMENT 1

SCOPE OF WORK

FOR A

REMEDIAL INVESTIGATION/FEASIBILITY STUDY

ALGOMA LANDFILL  
KEWAUNEE COUNTY  
AHNAPEE, WISCONSIN

SCOPE OF WORK

FOR A

REMEDIAL INVESTIGATION (RI)

ALGOMA LANDFILL  
KEWAUNEE COUNTY  
AHNAPEE, WISCONSIN

PURPOSE

The purpose of this Remedial Investigation is to determine the nature and extent of the contamination at the Site and to gather all necessary data to support the feasibility study. A phased, iterative approach will be used to complete the Tasks described in the following statement of work. The Respondents will furnish all personnel, materials and services necessary for performing the remedial investigation at the Algoma Landfill hereinafter referred to as the "site." (The term "site" in this Scope of Work has the same meaning as the term "Facility" in the Administrative Order by Consent.)

SCOPE

The Remedial Investigation consists of eight tasks:

- Task 1 - Description of Current Situation
- Task 2 - Plans and Management
- Task 3 - Site Investigation
- Task 4 - Preliminary Remedial Technologies
- Task 5 - Site Investigation Analyses
- Task 6 - Remedial Investigation Report
- Task 7 - Community Relations Support
- Task 8 - Additional Requirements

GUIDANCE

The Remedial Investigation shall be performed in conformance with the guidance provided in the following documents:

USEPA. Guidance on Remedial Investigations Under CERCLA.  
EPA/540/G-85/002, June 1985.

USEPA. Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans. QAMS-005/80, December 1980.

USDHHS. Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities. October 1985.

USEPA. Standard Operating Safety Guides. November 1984.

USEPA. Interim Policy on Procedures for Planning and Implementing Off-Site Response Actions. 50 FR 45933. November 5, 1985.

Other guidance as specified by the U.S. EPA under the terms of the Administrative Order by Consent.

#### TASK 1 - DESCRIPTION OF CURRENT SITUATION

The Respondents shall describe the background information pertinent to the site and its potential problems and outline the purpose and need for Remedial Investigation at the site. The data gathered during any previous investigations or inspections and other relevant data should be used whenever practical.

- a. Site Background  
Prepare a summary of the regional location, pertinent area boundary features, and general site physiography, hydrology and geology. The total area of the site will be defined, as well as the general nature of the problem, including pertinent history relative to the use of the site for hazardous waste disposal and their interrelations.
- b. Nature and Extent of Problem  
Prepare a summary of the actual and potential on-site and off-site health and environmental effects. This may include, but is not limited to, the type, physical state and amount of hazardous substances, the existence and conditions of the landfills, excavation depths, base grades, amount of fill, affected media and pathways of exposure, contaminated releases such as leachate or runoffs and any human exposure. Describe any reports of human or animal related illnesses that may be related to the site. Emphasis should be placed on describing the threat or potential threat to public health. Data from previous site work and reports should be summarized with references listed.
- c. History of Response Actions  
Prepare a summary of any previous response actions conducted by either local, state, Federal or private parties, including site inspections, other technical reports and their results. A list of reference documents and their location shall be included. The scope of the RI/FS should be developed to address the problems and questions that have resulted from the previous work at the site.
- d. Site Visit  
Conduct an initial site visit to become familiar with site topography, access routes and proximity of receptors to possible contamination and collect data

for preparation of the site safety plan. The visit should be used to verify the site information developed in Task 1.

- e. Define Boundary Conditions  
Establish site boundary conditions to limit the areas of site investigations. The boundary conditions should be set so that subsequent investigations will cover the contaminated media in sufficient detail to support the activities that follow (e.g., the feasibility study). The boundary conditions may also be used to identify boundaries for site access control and site security. [If not in existence, a fence or other security measures may be installed as an initial remedial measure].
- f. Site Maps  
Prepare a site map showing all wetlands, floodplains, water features, drainage patterns, tanks, buildings, utilities, paved areas, easements, rights-of-way and other features. The site maps and all topographical surveys should be of sufficient detail and accuracy to locate and report work performed to date within or near the site. Consideration will also be given to potential remedial investigation activities and, when possible, to potential remedial actions within or near the site. Permanent baseline monument bench marks and reference grid tied into any existing reference system (i.e., State or USGS) should be included. A recommended scale is one (1) inch equal to 200 feet.
- g. Site Office  
If agreed to by U.S. EPA and the State, establish a temporary site office to support site work.
- h. Contractor Procurement  
Prepare contractor procurement documents and award subagreement to secure the services necessary to conduct the remedial investigation and feasibility study.

## TASK 2 - PLANS AND MANAGEMENT

Prepare all necessary plans for the remedial investigation. The workplan shall include the Description of Current Situation (Task 1) and the Preliminary Remedial Technologies (Task 4) in order to properly explain the technical approach proposed in the workplan. The work plan should include a detailed discussion of the technical approach, personnel requirements and schedules, as well as the following:

a. Site Investigation Plan

A Site Investigation Plan shall be prepared to address all field activities to obtain additional site data. The plan will contain a statement of sampling objectives; specification of equipment, analyses of interest, sample types, sample locations and frequency, and schedule. The plan must address all levels of the investigations as well as all types of investigations considered. Consideration should be given to the use of field screening techniques to screen out the samples that do not require off-site laboratory analysis. The plan will identify associated data that may be needed to evaluate alternatives for the feasibility study. The Site Investigation Plan will also include a Quality Assurance Project Plan (QAPP).

The Quality Assurance Plan (QAPP) will be submitted to and approved by the U.S. EPA in consultation with the Wisconsin Department of Natural Resources (WDNR) prior to the start of the Remedial Investigation at the Site. The purpose of the QAPP is to ensure that formal procedures are available for all activities affecting the quality of data collected.

The Quality Assurance Plan (QAPP) will be prepared according to the guidelines in, "Interim Guidelines and Specifications for preparing Quality Assurance Project Plans", U.S. EPA, 29 December 1980, including the following:

1. Title page with provisions for approval signatures,
2. Table of contents,
3. Project description,
4. Project Quality Assistance, (QA) organization and responsibility,
5. QA objectives for measurement data in terms of precision, accuracy, completeness, representativeness and comparability for each parameter,
6. Sampling procedures,
7. Chain of custody procedures,
8. Calibration procedures and frequency,
9. Analytical procedures, including methods verification and standard operating procedures,
10. Data reduction, validation and reporting,

11. Internal quality control checks and frequency,
12. Performance and system audits and frequency,
13. Preventive maintenance procedures and schedules,
14. Specific routine procedures to be used to assess data precision, accuracy, and completeness of specific measurement parameters involved,
15. Corrective action, and
16. Quality assurance reports to management.

b. Data Management Plan

A Data Management Plan shall be developed and initiated to document and track investigation data and results. The plan should identify and set up laboratory and data documentation materials and procedures, project file requirements and project-related progress.

c. Health and Safety Plan (HSP)

Preparation of the Health and Safety Plan is the responsibility of the Respondents. The Respondents, their contractors and respective employees must comply with the HSP. The Health and Safety Plan shall be submitted to the U.S. EPA and WDNR for review prior to the start of the Remedial Investigation. The purpose of the HSP is to assure that qualified personnel will be conducting the Remedial Investigation and to minimize the risks to personnel from chemical and physical hazards during the course of work. The plan will be consistent with:

- Section 111(c)(6) of CERCLA.
- 29 CFR 1910. Occupational Safety and Health Standards, as amended.
- U.S. EPA. Standard Operating Safety Guides. November 1984.
- USDHHS/NIOSH. Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities. October 1985.
- Other U.S. EPA guidance as provided, consistent with terms of the Administrative Order by Consent.
- State safety and health statutes.
- Site conditions.

The HSP should include the following items:

- Minimum training and medical requirements for on-site personnel,
- Health and Safety responsibilities,
- Work zone definitions,
- General work rules,
- Contingency plans in case of accident or injury,
- Environmental monitoring and sampling procedures, interpretation and response,
- Decontamination procedures for personnel and equipment,
- Health related information for identified chemicals of concern,
- Site security measures, and
- Procedures for protecting third parties, such as visitors or the surrounding community.

d. Community Relations Plan

The U.S. EPA shall develop a plan addressing community relations as specified under Task 7 of this scope of work. Respondents' involvement in community relations shall be consistent with Article XX of the Administrative Order by Consent.

e. ATSDR Health Assessment

The Work Plan for the site shall also provide for collection of adequate information to support an Agency Toxic Substances and Disease Registry (ATSDR) Health Assessment which is required by SARA. Since the Health Assessment will be prepared by ATSDR, all draft Work Plans and support documents shall be submitted by the U.S. EPA to ATSDR for review and comment to ensure that their needs and requirements are being met. In the event that the Health Assessment has already been completed by ATSDR, the RI report should include and address the findings of that report.

f. Feasibility Study

Prepare a plan incorporating the elements contained in the FS section of this Scope of Work.

### TASK 3 - SITE INVESTIGATIONS

The Respondents shall conduct those site remedial investigations necessary to characterize the site and its actual or potential hazard to public health and the environment. The site investigation should also result in data or adequate technical content to assess preliminary remedial alternatives developed in Task 4 and support the detailed evaluation of alternatives during the Feasibility Study. Schedules for the site investigation and corresponding field work shall be established in such a fashion as to take into account variations in weather.

The goals of the site investigation are:

- Characterize the chemical nature of wastes at the site to the extent needed for evaluation and selection of remedial alternatives;
- Define any identifiable contaminant sources at the site;
- Determine the vertical and horizontal extent of contamination originating at the site;
- Spatially quantify contamination to the extent necessary to enable preparation of an Endangerment Assessment and a FS to the extent that such contamination may be attributable to the site;
- Identify contaminant migration pathways and movement; and
- Quantify public health and environmental risk.

The site investigation activities will follow the plans set forth in the Work Plan. All sample analyses will be conducted at laboratories following EPA protocols or their equivalents. Strict chain-of-custody procedures will be followed and all sample locations will be identified on the site map and grid systems established under Task 1.

The U.S. EPA and WDNR believe the subtasks listed below are consistent with satisfying the goals above. The Work Plan developed pursuant to the Administrative Order may propose alternate methods of achieving the goals of the Site Investigation. Where an alternate method meets the purposes and requirements of this SOW, the replacement of the original method will be included. As specified in the Administrative Order, U.S. EPA retains approval authority over the initial Work Plan and any additions or modifications thereto.

a. Waste Characterization

Develop and conduct a program to characterize the waste materials at the site. Where possible, leachate from the site shall also be characterized. The waste materials in the landfill will be characterized, including those disposed of below the ground. Efforts should begin with a survey of existing documents and any other data relating to types of waste materials accepted at the site, and previous sampling episodes performed and their results. The Work Plan (Task 2) shall describe how the characterization will be performed. The characterization should support any subsequent conclusions about developing preliminary remedial alternatives.

Additional sampling may be required should the available information be insufficient to characterize the waste materials to the extent needed to evaluate and select remedial alternatives. The Site Investigation Plan and QAPP will need to describe the sampling analysis techniques appropriate to the site condition.

Where appropriate, in-field testing and analysis may be used to characterize the nature and extent of waste materials. The investigation will focus on VOCs and attempt to establish distribution of hazardous substances in the landfill (i.e., "hot spot" identification). The nature and quality of the landfill's cover will also be evaluated in order to assess potential containment remedial alternatives.

The number of samples needed to obtain representative data will also be discussed. Elements of the HSP and the QAPP plan will also apply to sampling.

b. Hydrogeologic Investigation

Develop and conduct a program to determine the present and potential extent of groundwater contamination within the sand and gravel aquifer and within the bedrock aquifer and to evaluate the suitability of the site for on-site containment systems and/or selective treatment/removal of waste materials or the applicability of the no-action alternative. Efforts should begin with a survey of previous hydrogeologic studies and other existing data. The survey should address the degree of hazard, the mobility of pollutants considered (from Waste Characterization), the soils attenuation capacity and mechanisms, discharge/recharge areas, porosities, regional and local flow direction and quality and the effects of any remedial alternatives described in Task 4. Such information may be available from the USGS, the Soil Conservation Service, and local well drillers.

Subsequent to the survey of existing data, a sampling program should be developed to determine the horizontal and vertical distribution of contaminants to the extent needed to evaluate remedial alternatives. The sampling program should include, but not be limited to, the evaluation of factors affecting groundwater characteristics, such as groundwater direction, existence of fractured bedrock conditions, existence of groundwater mounds, divides or old river channels, thickness of the aquifer(s), and interconnection between aquifers. Cross-section diagrams and contour maps must be drawn. The following must also be included in the sampling program and be in accordance with the QAPP: determination of upgradient levels of contaminants within the sand and gravel aquifer and within the bedrock aquifer, the type of well construction utilized (must be compatible with contaminants encountered), the number and location of wells, chain of custody and record of samples and the groundwater sampling method.

Geophysical techniques should be considered for use in defining subsurface conditions and design of the sampling program. The investigation shall also assess whether municipal, private, and/or industrial wells in the vicinity could be affected by contaminants from the site.

The first phase of the RI will focus on confirming the nature of potential hazardous substance releases and potential impacts to immediate receptors. The second phase of the RI will address extent if the first phase indicates that hazardous substance(s) have been released. The Phase 1 data will also be used to properly focus on investigation of extent (e.g., horizontal extent greater or less than 2,500 feet, vertical extent limited to unconsolidated sediment or do hazardous substances reach bedrock aquifer).

c. Soils and Sediments Investigation

Develop and conduct a program to determine the extent of contamination of surface and subsurface soils in and around the site and sediments within any nearby water bodies which may have been affected by the site. This process may overlap with certain aspects of the hydrogeologic study (e.g., characteristics of soil strata are relevant to both the transport of contaminants by groundwater and to the location of contaminants in the soil; cores from groundwater monitoring wells may serve as soil samples). A survey of existing data on soils and sediments may be useful. A sampling program should be developed and conducted to determine the horizontal and vertical extent of contaminated soils and sediments based on the findings of the Description of the Current Situation (Task 1). The

first phase of the RI will focus on soils and sediment in the 4,500-foot-long drainage swale that leads from the site to Silver Creek and on soils and sediments between the site and the wetland immediately to the south and southeast and including sediment in the wetland itself.

Information regarding local background levels, degree of hazard, location of samples, techniques utilized, and methods of analysis should identify the locations and probable quantities of subsurface wastes, such as buried drums, through the use of appropriate geophysical methods. This work will be in accordance with the QAPP and Sampling Plan.

d. Surface Water Investigation

Conduct a program to determine the extent of contamination, if any, reaching Silver Creek. This process may overlap with the soils and sediments and the hydrogeological investigations. A survey of existing data on surface water flow quantity and quality may be a useful first step, particularly information on local background levels, location and frequency of samples, sampling techniques and methods of analysis. If Silver Creek is found to be contaminated, the investigation should assess whether indigenous biota are affected by the wastes. All sampling activities should be in accordance with the QAPP and Sampling Plan.

The first phase of the RI will focus on the 4,500 feet of overland flow pathway between the site and Silver Creek. The second phase of the RI will evaluate Silver Creek if data from the overland flow pathway or data from the hydrogeologic investigation suggest that hazardous substances may be migrating to Silver Creek. The first phase of the RI will also address the wetlands approximately 1,000 feet to the east and southeast of the site to determine whether hazardous substances have reached the wetlands from the site through either groundwater or overland pathways.

e. Air Investigation

Conduct a program to determine the extent of atmospheric contamination. The program should address the tendency of the substances identified through the waste characterization to enter the atmosphere, local wind patterns and the degree of hazard. The work will follow the specifications of the QAPP and Sampling Plan.

The first phase of the RI will utilize air monitoring measurements made under the Health and Safety Plan during the course of other field investigations under Tasks 3a, 3b, and 3c to assess the current degree of

hazard. The tendency of hazardous substances identified under Task 3a to enter the atmosphere will be based on theoretical considerations.

The Respondent shall submit a technical memorandum to the U.S. EPA and WDNR for subtasks within Task 3. Two sets of technical memoranda will be produced. The first memorandum will include:

- Description of the subject activities.
- A plot of actual sampling locations along with corresponding sample numbers.
- All sample identification information.
- Photocopies of all pertinent field notes.

This technical memorandum is to be submitted no later than two weeks after the subtask's field work is completed. Five (5) copies should be sent to Dan Cozza, U.S. EPA, and five (5) copies to Mark Giesfeldt, WDNR.

The second technical memorandum will discuss the finding of the first phase RI activities and will recommend what, if any, second phase activities are required to meet the goals of the RI.

This technical memorandum will be submitted no later than five (5) weeks after receipt of analytical data for each subtask. Five (5) copies shall be sent to Dan Cozza, U.S. EPA, and five (5) copies to Mark Giesfeldt, WDNR.

#### TASK 4 - PRELIMINARY REMEDIAL TECHNOLOGIES

The Respondents will identify preliminary remedial technologies providing detail sufficient to ensure that site investigations will develop a data base adequate for the evaluation of alternatives during the Feasibility Study.

a. Pre-Investigation Action

Prior to collecting additional data, the Respondents will assess site conditions to determine potential categories of source control and/or off-site remedial actions. Criteria for off-site remedial actions can be found in EPA Interim Policy: "Procedures for Planning and Implementing Off-Site Response Actions" (50 Federal Register 45933. November 5, 1985). Examples of questions to be answered are:

1. Source Control Action

- i. What containment techniques appear feasible to prevent contamination of groundwater?

- ii. Does incineration or reclamation appear to be a viable option?
  - iii. Does on-site treatment appear to be a viable option, and if so, what category of treatment should be investigated (e.g., biological, physical, chemical, thermal)?
  - iv. Will substances migrate or continue to migrate off-site if no action is taken? If only source control measures are taken?
2. Off-Site Action
- i. Does the apparent volume of contaminated groundwater make investigation or treatment impracticable?
  - ii. What technologies are available to treat the identified contaminants at the site?
  - iii. What technologies exist to effectively remove off-site contaminated materials?
  - iv. Will the off-site contamination continue to pose a threat if no action is taken?

The U.S. EPA and WDNR will review and screen the preliminary technologies during the course of the Work Plan review so that the site investigation can be designed to answer these types of questions and support the Feasibility Study.

b. Post-Investigation Evaluation

Either during or following the site investigation, Respondents will assess the investigation results and recommend preliminary remedial technologies likely to apply to the site problem. These technologies should be a refinement of the options considered in Task 4a. They will provide the basis for developing detailed alternatives during the Feasibility Study. The work during the Remedial Investigation will generally be limited to the following:

1. Recommending types of remedial technologies appropriate to the site conditions.
2. Recommending whether or not to remove some or all of the waste for off-site treatment, storage, or disposal.

3. Determining the compatibility of groups of wastes with other wastes and with materials considered as part of potential remedial action (e.g., slurry walls, lagoon liners). Recommending alternatives for treatment, storage or disposal for each category of compatible waste.

#### TASK 5 - SITE INVESTIGATIONS ANALYSIS

The Respondents shall prepare a thorough analysis and summary of all site investigations and their results. The objective of this task will be to ensure that the investigation data are sufficient in quality and quantity to support the Feasibility Study. The summary shall be presented to the U.S. EPA and WDNR as a draft Remedial Investigation report. Comments on the draft will be addressed in the final document.

The results and data from all site investigations must be organized and presented logically so that the relationships between site investigations for each medium are apparent.

- a. Data Analysis

Analyze all site investigation data and develop a summary of the type and extent of contamination at the site. The summary should describe the quantities and concentration of a specific chemical at the site and ambient levels surrounding the site. Also describe the number, location, and types of nearby populations, activities and pathways that may result in an actual or potential threat to public health, welfare or the environment.

- b. Application in Preliminary Technologies

Analyze the results of the site investigations in relation to the preliminary remedial technologies developed in Task 4. Data supporting, or rejecting, types of remedial technologies, compatibility of wastes and construction materials and other conclusions will be presented.

#### TASK 6 - REMEDIAL INVESTIGATIONS REPORTS

The Respondents shall prepare a draft report covering the remedial investigation phase and submit five (5) copies to Dan Cozza, U.S. EPA, and five (5) copies to Mark Giesfeldt, WDNR.

The draft report shall include the results of Tasks 1 through 5, and should include additional information in an appendix. The report shall be structured to enable the reader to cross-reference with ease. Comments from the EPA and WDNR, compiled by the U.S. EPA, will be incorporated into the Final RI Report, of which copies shall be submitted to the U.S. EPA and WDNR as mentioned above.

## TASK 7 - COMMUNITY RELATIONS SUPPORT

A Community Relations Plan for the Algoma Landfill is required. The Community Relations Plan will be developed by the U.S. EPA. The plan will describe the history of community concern at this site and identify proposed community relations activities to be implemented during the Remedial Investigation and Feasibility Study. The Respondents will be given the opportunity to review the plan prior to its implementation.

The Respondents may be required to furnish the personnel, services, materials and equipment required to undertake a community relations program. Although this may be a limited program, community relations must be integrated closely with all remedial response activities. The objectives of this effort are to achieve community understanding of the actions taken and to obtain community input and support prior to selection of the remedial alternative(s).

## TASK 8 - ADDITIONAL REQUIREMENTS

### a. Reporting Requirements

In addition to such task reports required by U.S. EPA and WDNR, monthly reports shall be prepared by the Respondents to describe the technical progress of the project. These reports should discuss the following items:

1. Identification of site activity.
2. Status of work at the site and progress to date.
3. Percentage of completion.
4. Difficulties encountered during the reporting period.
5. Actions being taken to rectify problem.
6. Activities planned for the next month.
7. Changes in personnel.

The monthly progress report will list target and actual completion dates for each element of activity including project completion and provide an explanation of any deviation from the milestones in the Work Plan schedule.

Five (5) copies of the monthly progress report should be sent to Dan Cozza, U.S. EPA, and five (5) copies to Mark Giesfeldt, WDNR.

SCOPE OF WORK  
FOR A  
FEASIBILITY STUDY (FS)

ALGOMA LANDFILL  
KEWAUNEE COUNTY  
AHLAPEE, WISCONSIN

PURPOSE

The purpose of this Remedial Investigation/Feasibility Study is to develop and evaluate remedial alternatives for the Algoma Landfill. The Respondents shall furnish the necessary personnel, materials, and services required to prepare the Remedial Investigation/Feasibility Study, except as otherwise specified herein.

SCOPE

The Feasibility Study consists of seven tasks:

- Task 9 - Description of Current Situation and Proposed Response
- Task 10 - Development of Alternatives
- Task 11 - Initial Screening of Alternatives
- Task 12 - Laboratory Studies
- Task 13 - Evaluation of the Alternatives
- Task 14 - Reports
- Task 15 - Additional Requirements

GUIDANCE

USEPA. Guidance on Feasibility Studies under CERCLA.  
EPA/540/G-85/003. June 1985.

USEPA. Interim Policy on Procedures for Planning and Implementing Off-Site Response Actions. 50 FR 45933. November 5, 1985.

USEPA. Interim Guidance on Compliance with Other Applicable or Relevant and Appropriate Requirements. 52 FR 32495. August 27, 1987.

Other guidance as specified by the U.S. EPA under the terms of the Administrative Order by Consent.

A Work Plan that includes a detailed technical approach and schedules shall be submitted for the proposed Feasibility Study.

## TASK 9 - DESCRIPTION OF CURRENT SITUATION AND PROPOSED RESPONSE

Information on the site background, the nature and extent of the problem, and previous response activities presented in Task 1 of the Remedial Investigation may be incorporated by reference. Any changes to the original project scope described in the Task 1 description should be discussed and justified based on results of the Remedial Investigation.

Following this summary of the current situation, a site-specific statement of purpose for the response, based on the results of the remedial investigation, should be presented. The statement of purpose should identify the actual or potential exposure pathways that should be addressed by remedial alternatives.

## TASK 10 - DEVELOPMENT OF ALTERNATIVES

Based on the results of the Remedial Investigation and consideration of preliminary remedial technologies (Task 4), the Respondents shall develop a limited number of alternatives for source control and/or off-site remedial actions on the basis of objectives established for the response and applicable agency policy effective at the time of preparation of Task 10.

### a. Establishment of Remedial Response Objectives

Establish site-specific objectives for the response. Preliminary site-specific response objectives will be presented in the FS Work Plan (see RI Task 2, part f). These objectives will be based on public health and environmental concerns, the description of the current situation (from Tasks 1 and 9), information gathered during the Remedial Investigation, section 300.68 of the National Contingency Plan (NCP), 40 CFR 264.100, EPA's interim guidance, EPA's interim off-site policy and the requirements of any other applicable EPA, Federal and State environmental standards guidance and advisories as defined under Section 121 of SARA. Preliminary cleanup objectives shall be developed for review by the U.S. EPA and WDNR.

### b. Alternative Remedial Actions

Assemble combinations of identified technologies into alternative remedial actions. To the extent it is both feasible and appropriate, alternatives and other appropriate considerations should be developed into a comprehensive site specific approach. Alternatives are to be developed to include the following:

1. Treatment alternatives for source control that would eliminate the need for long-term management (including monitoring).
2. Alternatives involving treatment as principal element to reduce the toxicity, mobility or volume of waste at the site.

c. Additional Alternatives

Develop at least two additional alternatives:

1. An alternative that involves containment of waste with little or no treatment, but provides protection of human health and the environment primarily by preventing potential exposure or reducing the mobility of the waste.
2. A no action alternative.

For groundwater response actions designed to address hazardous constituents for which Federal Drinking Water Standards (MCL or RMCL as appropriate under 40 CFR Part 141) have not been specified, or for which other ARARs have not been specified by U.S. EPA in consultation with WDNR, develop a limited number of remedial alternatives within a performance range that is defined in terms of a remedial level within the risk range of  $10^{-4}$  to  $10^{-7}$  for maximum lifetime risk and includes different rates of restoration. Where feasible, one alternative should be configured that would restore groundwater to a  $10^{-6}$  for maximum lifetime risk level within five years.

Many remedial action alternatives necessarily involve both source control and groundwater response actions. The dynamic relationship between these two elements require that they be formulated together so that the comprehensive remedial action is effective and the elements are complementary. The different requirements of each [Section 300.68(d)(2) and (4) of the NCP], however, dictate that they be detailed separately in the development and analysis of alternatives.

TASK 11 - INITIAL SCREENING OF ALTERNATIVES

A. Alternatives

The alternatives developed in Task 10 will be screened by the Respondents and submitted in an interim report for review by U.S. EPA and WDNR. Respondents, U.S. EPA and WDNR shall confer to eliminate alternatives that are clearly not feasible or appropriate prior to undertaking detailed evaluations of the remaining alternatives. The list of alternatives will be screened based on site conditions, waste characteristics, and technical requirements, as well as applicable criteria found in EPA Interim Policy, "Procedures for Planning and Implementing Off-Site Response Actions" (50 Federal Register 45933, November 5, 1985), to eliminate or modify those technologies that may prove extremely difficult to implement, will require unreasonable time periods or will rely on insufficiently developed technology.

Considerations To Be Used In Initial Screening:

- a. Environmental Effects. Alternatives posing significant adverse environmental effects will be excluded.
- b. Environmental Protection. Only those alternatives that satisfy the response objectives and contribute substantially to the protection of public health, welfare, or the environment; attain Federal and State applicable, relevant, and appropriate requirements (ARARS), or other criteria, advisories or guidance, significantly and permanently reducing the toxicity, mobility or volume of hazardous constituents; are technically reliable, or are effective in other respects shall be considered further. Source control alternatives shall achieve adequate control of source materials. Off-site alternatives shall minimize or mitigate the threat of harm to public health, welfare, or the environment.
- c. Implementability. Alternatives that may prove extremely difficult to implement, will not achieve the remedial objective in a reasonable time period, or rely on unproven technology, will be eliminated. Alternatives will be evaluated as to the technical feasibility and availability of the technologies each alternative would employ; the technical and institutional ability to monitor, maintain, and replace technologies over time; and the administrative feasibility of implementing the alternative.
- d. Cost. Estimated construction costs and any long-term costs to operate and maintain the alternatives will be evaluated. A detailed cost analysis is not necessary at this time. During the initial screening, cost is an important factor when comparing alternatives providing similar results, but not between treatment and nontreatment alternatives.

TASK 12 - LABORATORY STUDIES

The Contractor shall conduct any necessary laboratory and bench scale treatability studies required to evaluate the effectiveness of remedial technologies and establish engineering criteria (e.g., leachate treatment; groundwater treatment; compatibility of waste/leachate with site barrier walls, cover, and other materials proposed for use in the remedy). It is expected that the scope of this task will depend on the results of Tasks 10 and 11 and therefore will not be complete at the start of Task 13. The Contractor will submit a separate work plan for any proposed laboratory studies for U.S. EPA. This submittal will be made in the time frame required to maintain steady progress of the overall feasibility study. Additional studies may also be

conducted during the design phase if needed, to refine treatability results or develop detailed design criteria. Prepare a report summarizing the testing program and its results, both positive and negative.

### TASK 13 - EVALUATION OF THE ALTERNATIVES

#### A. Identification of Alternatives

Identify and describe action-specific Federal and State ARARs and other criteria, advisories and guidance to be used in the analysis and selection of a remedy. Alternatives should be analyzed in sufficient detail so that the remedies can be selected from a set of defined and discrete hazardous waste management approaches.

Develop and use information necessary to evaluate each alternative. The alternatives will be evaluated against the broad factors of effectiveness, implementability and cost, using appropriate and more specific component measures such as protectiveness, compliance with applicable or relevant and appropriate requirements (ARAR), reliability and technical feasibility. The detailed analysis of each alternative shall include both short-term and long-term consideration for effectiveness, implementability and cost.

#### B. Comparison of Alternatives

Compare the alternatives to each other using the full array of evaluation factors appropriate at the site:

Component measures of effectiveness include the degree to which the alternative is protective of human health and the environment. Where health-based levels are established in applicable or relevant and appropriate requirements, they can be used to establish the minimum level of protection needed at the site. Where these levels do not exist, risk assessments can be used to help establish levels appropriate at the site. The reliability of the remedy, including the potential need for a cost of replacement, is another important element of effectiveness. Specific measures may also include other health risks borne by the affected population, population sensitivities, and the impacts on environmental receptors. For groundwater response actions, the potential for spread of the contaminant plume and the technical limits of aquifer restoration are necessary measures. Another important measure of effectiveness is the degree that the mobility, toxicity, or volume of the hazardous substance, pollutant or contaminant is reduced.

Component measures of implementability include the technical feasibility of the alternative, the administrative feasibility of implementing the alternative, and the availability of any needed equipment, specialists or off-site capacity. Specific measures

for groundwater response actions include the feasibility of providing an alternative water supply to meet current groundwater needs, the potential need for groundwater, and the effectiveness and reliability of institutional controls.

Component measures of cost include short-term capital and operation costs and any long-term operation or maintenance costs. Present worth analysis may be used to compare alternatives.

Component measures should be tailored appropriately to the site. Where the measures are likely to be important in discriminating among the alternatives, more emphasis and detail may be appropriate to assist in the selection of a remedy.

### C. Preferred Remedy

A chapter to the RI/FS shall be prepared which describes the preferred remedy for the site.

- a. The appropriate remedy shall be recommended among those alternatives that meet four findings:
  1. The alternative shall be protective of human health and the environment. This means that the remedy meets or exceeds ARARs or health based levels established through a risk assessment when ARARs do not exist or when they are waived.
  2. Except under those circumstances listed in the NCP, the alternative shall attain applicable or relevant and appropriate Federal and State public health and environmental requirements that have been identified for a specific site.
  3. The alternative shall be cost-effective, accomplishing a level of protection that cannot be achieved by less costly methods.
  4. The alternative will utilize treatment technologies and permanent solutions to the maximum extent practicable as determined by technological feasibility, availability and cost effectiveness.
- b. The preferred remedy should reflect two preferences:
  1. Remedies involving treatment that significantly reduce the toxicity, mobility, or volume of hazardous constituents as a principal element.
  2. Remedies minimizing the requirement for long-term management of residuals.
- c. An alternative may be preferred that does not meet applicable or relevant and appropriate Federal and State public health

or environmental requirements under the following circumstances:

1. The alternative is an interim remedy and will become part of a more comprehensive final remedy that will meet applicable or relevant and appropriate Federal and State requirements.
  2. Compliance with the requirement will result in greater risk to human health and the environment than alternative options.
  3. Compliance with the requirements is technically impracticable.
  4. The alternative will attain a standard of performance that is equivalent to that required under the otherwise applicable standard, requirement or limitation through use of another method or approach.
  5. The State has not consistently applied, or demonstrated the intention to consistently apply, the state requirement at other remedial actions in the State.
- d. The evaluation of alternatives to select the appropriate remedy should, in addition to meeting the required findings in Section 300.68(b)(1) of the NCP and reflecting the preferences in Section 300.68(h)(2), also consider and weigh the full range of factors in Section 300.68(e)(2). The selected alternative should represent the best balance across all evaluation criteria.

#### TASK 14 - REPORTS

- a. Preliminary Report  
Prepare a preliminary report presenting the results of Tasks 9 through 13 and the recommended remedial alternative. Submit five (5) copies to Dan Cozza, U.S. EPA, and five (5) copies to Mark Giesfeldt, WDNR. (Note: U.S. EPA and the WDNR will review, and U.S. EPA in consultation with WDNR will select, a remedial alternative).
- b. Prepare a final report for submission to U.S. EPA and the WDNR. The report will include the results of Tasks 9 through 13 and should include any supplemental information in appendices. This report will include a responsiveness summary on public comments received on the draft Feasibility Study. Submit five (5) copies to Dan Cozza, U.S. EPA, and five (5) copies to Mark Giesfeldt, WDNR.

TASK 15 - ADDITIONAL REQUIREMENTS

Reporting requirements are described in Task 8 of the Remedial Investigation scope of work.



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APPENDIX B

QUALITY ASSURANCE PROJECT PLAN  
ALGOMA LANDFILL  
ALGOMA, WISCONSIN

May 1988

Revision 1 - August 1988

USEPA Docket No. V-W-87-C-036

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QUALITY ASSURANCE PROJECT PLAN (QAPP)

Project Title: Algoma Landfill, Algoma, Wisconsin

EPA Docket No.: V-W-87-C-036

Approved by \_\_\_\_\_ Date: \_\_\_\_\_  
USEPA Remedial Project Manager

Approved by \_\_\_\_\_ Date: \_\_\_\_\_  
USEPA Director, Central Regional Laboratory

Approved by \_\_\_\_\_ Date: \_\_\_\_\_  
USEPA Quality Assurance Officer

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## 1.0 PROJECT DESCRIPTION

### 1.1 Introduction

RMT, Inc., was retained by the Respondents to develop this Quality Assurance Project Plan (QAPP) as part of the RI/FS Workplan for the Algoma Landfill, Algoma, Wisconsin. This document, presented as Appendix B of the RI/FS Workplan, has been prepared to fulfill requirements under CERCLA and to include all items listed in the Scope of Work presented in the Consent Order of January 28, 1988 (Appendix A of the Workplan).

### 1.2 Site History and Description

The Algoma Landfill is a municipal landfill used between 1969 and 1983 for disposal of municipal and industrial waste. The landfill accepted drummed paints, glues, thinners, and materials containing asbestos, as well as other potentially hazardous materials. The site appears to be comprised of four separate disposal areas. The landfill disposal area, the largest of the four disposal areas, was closed and capped in 1983. Ground water monitoring data collected immediately downgradient indicated that several hazardous volatile organic compounds (benzene, 2-butanone, methylene chloride, and xylenes) and inorganics (arsenic, cadmium, and lead) were present in the ground water. The landfill was placed on the National Priorities List (NPL) in 1986. A more detailed site description and history are given in Section 4 of the Workplan.

### 1.3 Target Compounds

Hazardous substances disposed at the landfill included mainly organic compounds and asbestos (Section 4.7 of the Workplan). During this investigation, both volatile and semi-volatile organic compounds and heavy metals will be targeted for analyses. Asbestos is not considered to be generally mobile in the environment, except when exposed to the wind. The landfill has been capped for five years; therefore, asbestos will not be targeted in Phase I of the RI/FS.

During Phase I of the Algoma Landfill RI/FS, the samples collected will be analyzed for all or part of the Target Compound List (TCL) as defined by the USEPA Contract Laboratory Program (CLP). The detection limits for the TCL constituents will be those required by the CLP.

### 1.4 Project Objectives

The overall purpose of a remedial investigation as described by the National Contingency Plan (40 CFR 300.68[f]) is to "... determine the nature and extent of the problem presented by the release [of hazardous substance(s)]. This includes sampling and monitoring, as necessary, and includes the gathering of sufficient information to determine the necessity for and proposed extent of remedial action." The data must be sufficient not only to verify the need for remedial action, but also must be adequate to evaluate the preliminary remedial technologies that might be applicable to this site, should the need for remediation arise.

The specific objectives of Phase I of the Algoma Landfill RI/FS are as follows:

- . To delineate the extent of general waste in the vicinity of the four disposal areas identified in the Workplan and, if possible, the extent of concentrations of hazardous waste within the disposal areas.
- . To assess whether or not releases have occurred from any of the disposal areas.
- . To determine the migration pathways, if any (Section 4.7 of the Workplan).
- . To determine the extent of contamination, if any, and its severity.
- . To assess the current effect of the release(s), if any, on human and environmental receptors.
- . To collect the necessary data to evaluate the preliminary remedial technologies set forth in Section 5 of the Workplan, including the adequacy of the existing landfill cover in minimizing the potential generation of hazardous leachates.
- . To present remedial action alternatives for the Algoma Landfill.

The activities needed to address the Phase I objectives are presented in the Site Investigation Plan (Section 7 of the Workplan). The need for additional data (Phase II) will be addressed in Technical Memoranda and the RI Report. The first phase of the RI will enable RMT to evaluate preliminary remedial technologies; facilitate the identification of a cost-effective, environmentally sound, feasible remedial action; and screen, develop, and evaluate potential alternatives.

#### **1.5 Data Quality Objectives**

The data quality objectives (DQOs) for the Algoma Landfill RI are presented in the sampling plans of the SIP (Section 7 of the Workplan) as well as in this QAPP. The sampling plans were designed and selected

to provide enough data to fulfill the requirements set forth in the USEPA Scope of Work (Appendix A of the Workplan) and enable RMT to address the project objectives of Phase I of the RI. The sampling plans will provide, in a phased approach, a sufficient amount of quality data to meet the objectives (Section 2 of the Workplan).

Geophysical surveys, landfill cover material testing, ground water observation and residential sampling wells, and maybe pore gas sampling will be used to characterize the site. The chemical analysis of soil/sediment, surface water, and ground water will be used in assessing potential risk to public health and the environment. Air monitoring will be performed as part of the health and safety procedures (Appendix C). The data collected will be used to evaluate the various remedial technologies set forth in the Workplan (Section 5) and to develop a preliminary data base for the engineering design of alternatives. Furthermore, the ground water monitoring well network could be used for monitoring the ground water quality during and after the remedial action phase.

#### **1.6 Sampling Program Summary**

The waste disposal areas that make up the Algoma Landfill site have been tentatively identified from available information (Section 4 of the Workplan). The site lacks engineering and operational data and information defining the environmental setting, and actual or observed hazardous substance migration is sparse. The sampling program proposed in the SIP addresses the objectives presented in Section 1.4, in light

of the limited existing data base. The sampling program objectives are summarized as follows:

Geophysical Data: Geophysical data will be collected to delineate the approximate limits of the disposal areas and locate metal targets, such as drums.

Soil/Sediment Data: Soil/sediment data will be collected to determine whether or not releases of hazardous substances from the landfill have occurred by means of surface runoff.

Surface Water Data: Surface water data will be collected to assess whether or not runoff or discharging ground water containing hazardous substances is currently entering wetlands adjacent to the site.

Hydrogeologic Data: Hydrogeologic data will be collected to generally define potential migration pathways, to assess whether releases have occurred from the disposal areas, and to characterize the nature of the releases, if present.

Landfill Cover Data: Data will be collected on the cover material of the disposal areas to characterize the material's geotechnical properties.

Pore Gas Data: Landfill pore gas data will be obtained if the ground water data suggest that hazardous substances have been released from the landfill. The data will be used to identify locations within the disposal areas where VOC concentrations are high. These areas might be representative of drum concentrations or disposal pits.

A summary of the Phase I chemical and physical sampling plan is presented in Tables B-1 and B-2. The Workplan discusses the rationale for the sampling design and describes the sampling points in Sections 4, 6, and 7. Eighty-four (84) chemical sampling stations (103 samples) will be established during the Phase I site investigation described in Section 7 of the Workplan. The samples will consist of soil/sediment, surface water, ground water, and pore gas (if appropriate). The

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laboratory analytical program will vary by matrix and by sampling location as described in the Site Investigation Plan. Field screening analyses (GC) will be applied at up to sixty-two (62) points

TABLE B-1  
 SUMMARY OF THE PHASE I SAMPLING FOR CHEMICAL ANALYSIS

RI SubTask	Sampling Round	No. of Samples	Field Screening <sup>a</sup>	Laboratory Analyses of TCL Constituents							
				VOC <sup>b</sup>	Semi-Volatiles	Pesticides/PCB	Unfiltered Metals	Filtered Metals	Cyanide		
Soil Pore Gas		47	47 (5/5) <sup>c</sup>								
Soil/Sediment		15	15 (2/2)	3 (2/0)	11 (2/0)	11 (2/0)	15 (2/0)	15 (2/0)			15 (2/0)
Surface Water		3 <sup>d</sup>		3 (1/0)	1 (1/0)	1 (1/0)	3 (1/0)	3 (1/0)			3 (1/0)
Monitoring Wells	1st	10 <sup>d</sup>		10 (1/0)	10 (1/0)	10 (1/0)	10 (1/0)	10 (1/1)	10 (1/0)	10 (1/1)	10 (1/0)
	2nd	10 <sup>d</sup>		10 (1/0)	e	e	e	e	e	e	e
Private Wells	1st	9 <sup>d</sup>		9 (1/0)							
	2nd	9 <sup>d</sup>		9 (1/0)	e	e	e	e	e	e	e
Totals		103	62 (7/7)	44 (7/0)	22 (4/0)	22 (4/0)	28 (4/0)	10 (1/1)	28 (4/0)	28 (4/0)	

<sup>a</sup>Field screening for VOCs consists of analyses with a portable gas chromatograph (Table 7-10 of the Workplan).  
<sup>b</sup>Trip blanks will be sent one per day of sampling per matrix analyzed for VOCs.  
<sup>c</sup>The data is presented as: number of samples (number of duplicates/number of equipment field blanks).  
<sup>d</sup>Analyses of samples will include in-field measurement of sample temperature, pH, and electrical conductivity.  
<sup>e</sup>The private and monitoring wells will be sampled during the second round for, in addition to VOC, any fractions that had concentrations significantly in excess of background concentrations in the monitoring wells.

TABLE B-2  
SUMMARY OF PHASE I SAMPLING FOR PHYSICAL TESTING

<u>RI Subtask</u>	<u>Grain Size</u>		<u>Atterberg Limits</u>	<u>Laboratory Falling-Head Permeability**</u>	<u>In-field Permeability</u>
	<u>Sieve</u>	<u>Hydrometer*</u>			
Hydrogeologic Investigation Soil Testing	8	4	4	0	10
Landfill Cover Testing***	13	13	13	13	0

\*Will only be performed if the material is fine grained (Unified Soil Classification of CL or ML).

\*\*Will only be performed if an undisturbed sample can be obtained.

\*\*\*Additional samples will be collected if the LDA is found to be greater than nine (9) acres.

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(with seven replicate measurements and seven equipment blanks). Laboratory analyses will be performed on samples from thirty-seven (37) locations. Duplicate samples will be submitted to the laboratory from seven (7) locations. Only one (1) equipment blank will be collected because most of the sampling equipment will be disposable (single-use) or dedicated to a given sampling point.

Samples for physical testing will be collected from twenty-one (21) stations on the landfill cover or from subsurface borings, as summarized in Table B-2. The laboratory testing program is designed to characterize the landfill cover and the basic hydrogeologic properties of subsurface materials. In addition, in-field testing of monitoring and observation wells will provide estimates of in-situ hydraulic conductivity of subsurface materials.

### **1.7 Project Schedule**

The Algoma Landfill RI/FS is scheduled to be completed approximately 12 months after approval of the final Workplan. The schedule presented on Figure B-1 has been estimated based on several assumptions, including the length of the Workplan reviews by the USEPA and WDNR, advance approval of the SIP and H&S Plan, no laboratory delays, a single RI phase, expedited reviews of the draft RI and FS reports by the USEPA and WDNR, and minimal changes to the draft RI and FS reports.

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- Consent Order (1)
- Prepare Workplan
- Procure RI Contractor
- Obtain access agr
- Site Investio
- Support
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FIGURE B-1  
ALGOMA LANDFILL PROJECTED RI/FS SCHEDULE

	Jul 18	Aug 1	Sep 15	Oct 1	Nov 1	Dec 1	1989 Jan 9	Feb 6	Mar 6	Apr 3	May 1	Jun 5	Jul 3	Aug 7	Sep 11
Consent Order (1)															
Prepare Workplan			+++++												
Procure RI Contractor(s)			+++++												
Obtain access agreements			+++++												
Site Investigation															
- Support facilities			+++												
- Engineer survey			+++	+++											
- Geophys. survey			+++												
- Soil/sediment sampling							+++++								
- Surface water sampling							+++++								
- Hydro. invest.							+++++								
- Landfill cover eval.							+++++								
- Pore gas sampling (7)							+++++								
Technical Memoranda															
Field Work Summary															
- Engineer survey							+++++								
- Soil/sediment sampling							+++++								
- Surface water sampling							+++++								
- Hydro. investigation									+++++						
- Landfill cover sampling							+++++								
Summary of Findings (2)															
- Geophys. survey							+++++								
- Soil/sed. sampling							+++++								
- Surface water sampling							+++++								
- Hydro. investigation										+++++					
- Landfill cover sampling							+++++								
- Pore gas sampling (7)							+++++								
Post-Invest. Evaluation of Remed. Tech's.															
Site Invest. Analysis															
RI Report															
Prepare Prelim. Clean-up Obj.															
FS Report															
Monthly Progress Repo			+++0	+++0	+++0	+++0	+++0	+++0	+++0	+++0	+++0	+++0	+++0	+++0	+++0
Aerial Survey for Base Map(3)							+++								
Base Map Prep. (3)							+++++								

\*\*\* KEY \*\*\*

- + Consultant/Respondent Activity
- = Agency (USEPA/MDNR) Review
- \ Laboratory Analysis
- 0 Output
- M Milestone

\*\*\* FOOTNOTES \*\*\*

- 1 Consent Order Effective Date 28-Jan-88
- 2 Due 5 weeks after receipt of lab data
- 3 Aerial survey required only if existing base maps are insufficient
- 4 1st round of ground water sampling, 2 weeks for round 2 recommendation to USEPA and 3 weeks to reach decision regarding analytical plan for round 2
- 5 2nd round of ground water sampling
- 6 Technical memoranda including both a field work and findings summary
- 7 If performed

## 2.0 PROJECT ORGANIZATION AND RESPONSIBILITY

### 2.1 Project Organization

An organizational chart for the project is presented on Figure B-2. The designated Project Coordinator and Remedial Project Manager for the USEPA is Dan Cozza. Mr. Cozza will provide day-to-day management of the project and serve as the primary contact between the USEPA and the Respondents. The designated Project Coordinators for the WDNR and the Respondents are Mark Giesfeldt and Thomas Romdenne, respectively.

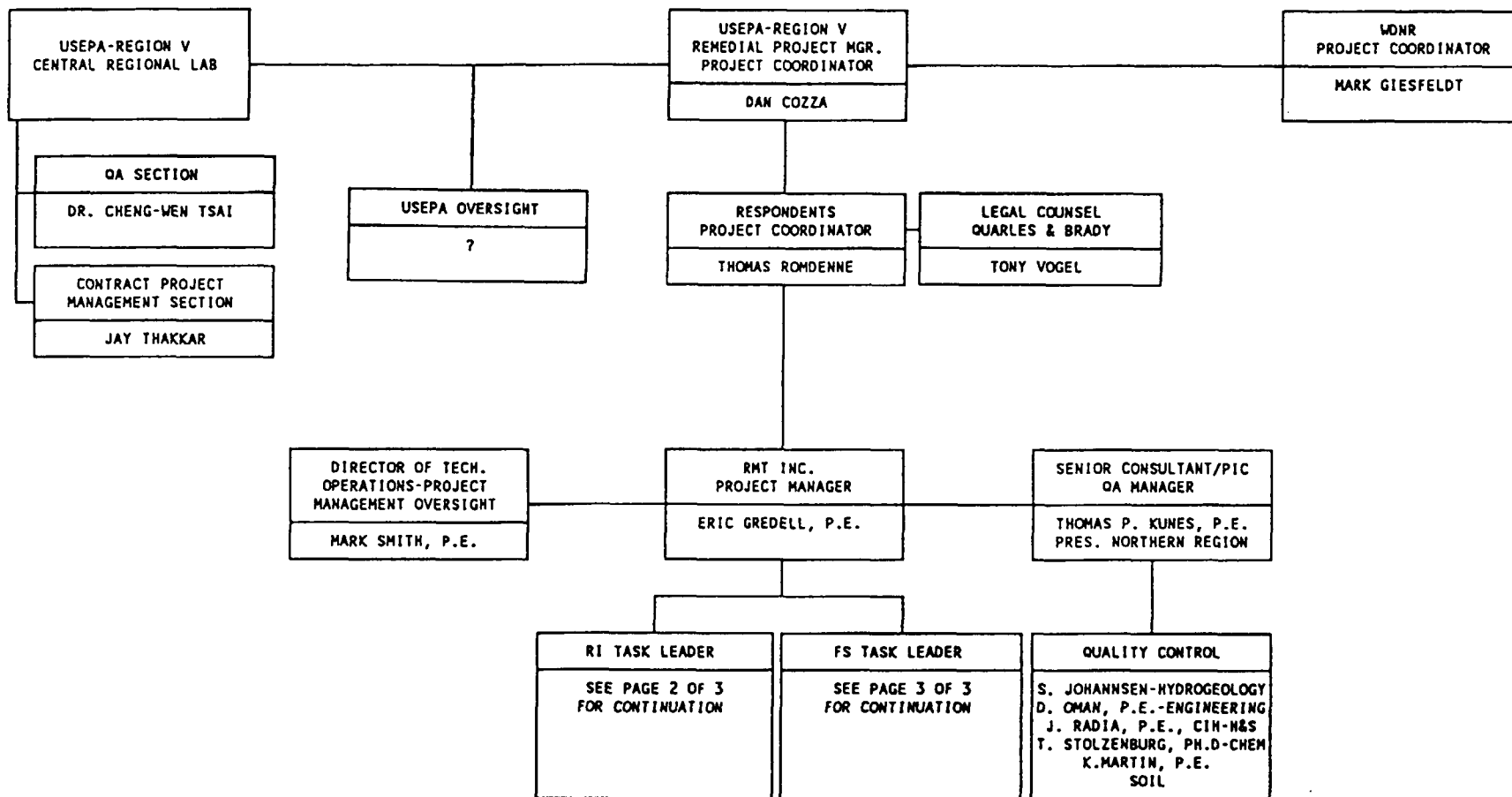
### 2.2 Project Communications

In accordance with Article XIV of the Consent Order, verbal and written communications among the Respondents, the WDNR, and the USEPA will normally be directed through the respective Project Coordinators. Communications between RMT and the Respondents, the USEPA, and the WDNR will normally be directed through the Project Coordinator for the Respondents, Mr. Romdenne.

### 2.3 RMT Operational Responsibility

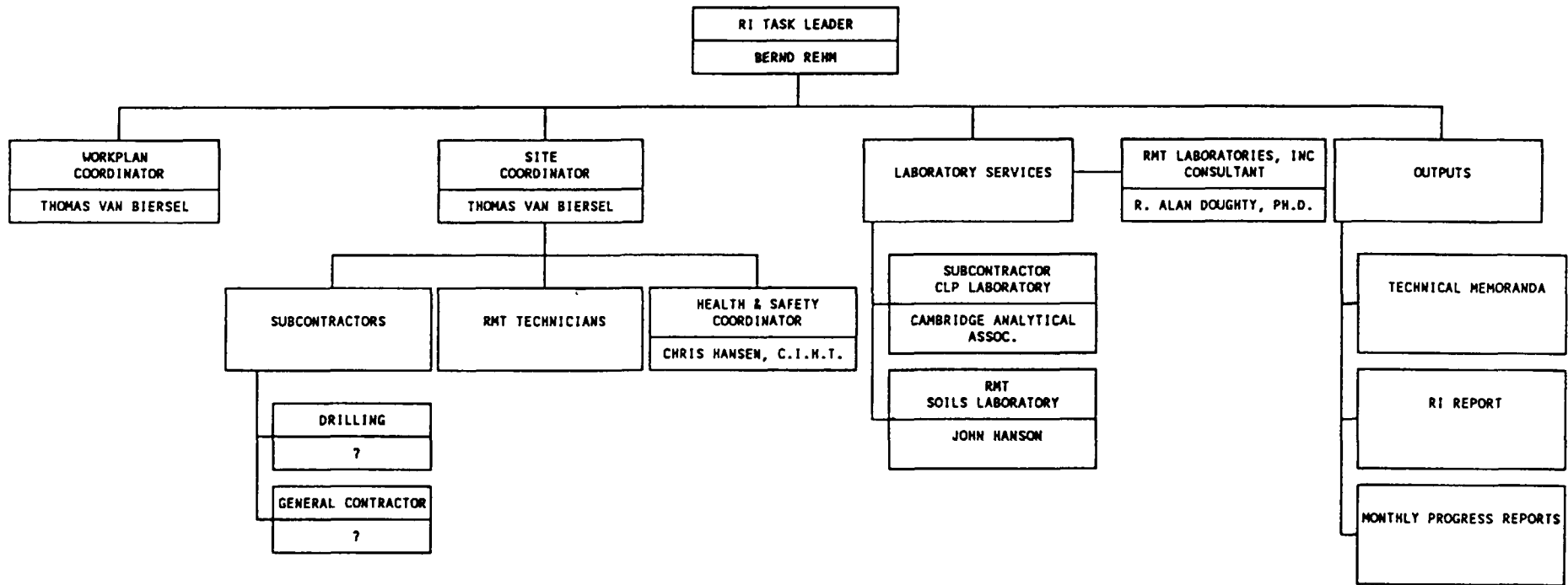
Key individuals assigned to the project are listed below. Key individuals are defined as persons having responsibility for major work components, critical technical input, QA/QC above the peer review QC level, primary coordination with outside parties, and overall project management and oversight.

FIGURE B-2  
PROJECT ORGANIZATION



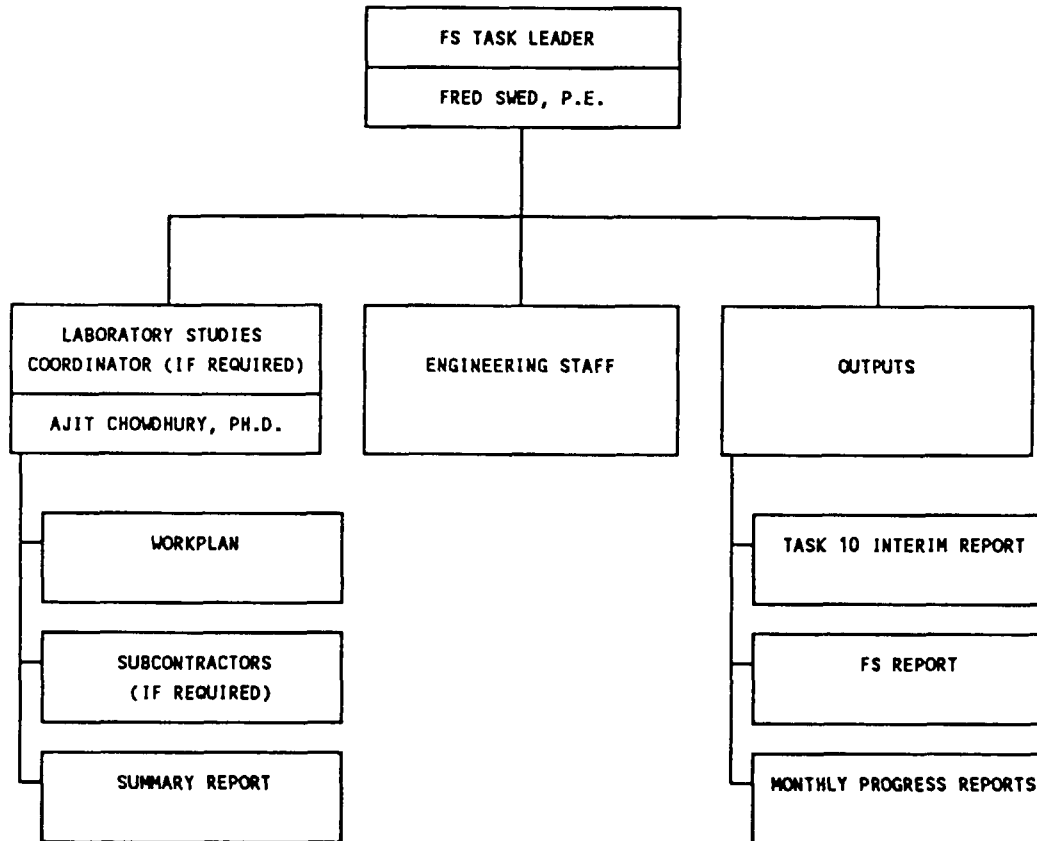
Own by GDB  
Date MAY 11 1988  
Proj # 1375.02

FIGURE B-2 (CONT'D)  
PROJECT ORGANIZATION



<b>RMT</b> <small>INC</small>	Dwn by <b>GDB</b>
	Date <b>MAY 11 1988</b>
	Proj.# <b>1375.02</b>

FIGURE B-2 (CONT'D)  
PROJECT ORGANIZATION



Dwn. by	GDB
Date	
Proj. #	1375.02

<u>Person</u>	<u>RMT Position Title</u>	<u>Project Assignment</u>
Thomas P. Kunes, P.E.	President, Northern Region	. QA Manager
Mark E. Smith, P.E.	Director of Technical Operations	. QC Manager . Project Management Oversight
Eric Gredell, P.E.	Project Manager	. Project Manager
Stephen D. Johansen	Manager - Hydrogeology and Applied Chemistry Department	. QC Reviewer - Hydrogeology
Daniel E. Oman, P.E.	Manager - Environmental Process Engineering Department	. QC Reviewer - Engineering
Jitendra T. Radia, P.E., CIH	Manager - Industrial Hygiene and Air Pollution Control Engineering Department	. QC Reviewer - Health and Safety
Thomas R. Stolzenburg, Ph.D.	Manager - Applied Chemistry Group	. QC Reviewer-Chemistry
Bernd W. Rehm	Manager - RCRA/Cercla Hydrogeologic Services Group	. RI Task Leader
Katherine E. Martin, P.E.	Manager - Construction Services Group	. QC Reviewer - Soil Testing
Thomas Van Biersel	Hydrogeologist	. Site Coordinator
Chris Hansen, CIHT	Industrial Hygienist	. Health and Safety Coordinator
Fred M. Swed, P.E.	Manager - Remedial Action Group	. FS Task Leader
Ajit Chowdhury, Ph.D.	Chemical Engineer	. Laboratory Studies Coordinator
R. Alan Doughty, Ph.D.	Director - RMT Laboratories, Inc.	. Consultant -Analytical Chemistry

#### **2.4 Project Quality Management (QM) Responsibilities**

Primary site investigation activities will be performed by RMT, Inc., Madison, Wisconsin. Quality management responsibilities for the field activities will be shared by RMT office and field personnel. In

general, typical responsibilities for the various personnel include the following:

- . Site Coordinator: Technical oversight and review for daily on-site operations. Responsible for conformance with project plans, schedule, and procedures on-site. Daily review and signing of notes and logs. Ongoing coordination with the RMT Project Manager on work progress, interim results, and problems. Serves as primary contact between RMT field staff, the RMT office, and subcontractor personnel.
- . Project Manager: Responsible for meeting the overall project objectives and identifying major project issues. Provides quality control review and conformance with project plans. Ongoing review for logic and reasonableness of interim results. Approves and signs major outputs. Coordinates activities of the Quality Assurance (QA) Manager and other QA/QC reviewers to provide objective oversight. Primary point of contact for the Respondents.
- . Quality Assurance Manager: Provides overall independent quality assurance oversight for the project. Follows the project to audit QA procedures and document conformance with QA objectives. Coordinates his activities with discipline-specific QA/QC reviewers for review of project methods and performance.
- . Quality Control Reviewers: Discipline-specific reviewers of portions of the project workplans, progress, problems, and outputs, and systems audits as appropriate for specified disciplines. Used systematically for some reviews, and when called upon by the QA Manager for specific problems.
- . Peer Review: Ongoing checking in the field and office of calculations, procedures, issues, and logic.

## **2.5 Laboratory Responsibilities**

The following key individuals have the responsibility for major work components and QA review:

PHYSICAL ANALYSES

<u>Person</u>	<u>RMT Position Title</u>	<u>Project Assignment</u>
John Hanson	Supervisor, RMT Soils Laboratory	. Overall QA
Katherine E. Martin, P.E.	Manager - Construction Services Group	. QC Reviewer - Soils

CHEMICAL ANALYSES

<u>Person</u>	<u>Position Title</u>	<u>Project Assignment</u>
Thomas R. Stolzenburg, Ph.D.	Manager - Applied Chemistry Group	. QC Reviewer - Chemistry

### 3.0 QA OBJECTIVES FOR MEASUREMENT DATA

The overall QA objective for Phase I of the Algoma Landfill RI/FS is to develop and implement procedures for data acquisition and reporting that meet quality standards sufficient for the purposes of an RI/FS as defined by the Comprehensive Environmental Response, Compensation and Liability Act, and the Superfund Amendments and Reauthorization Act. Specific procedures for land surveying, geophysical surveying, pore gas sampling, soil borings and landfill cover sampling, surficial soil/sediment sampling, surface water sampling, observation well installation and sampling, chain-of-custody, and laboratory analytical procedures, reporting, internal QC, audits, preventive maintenance, calibration, and corrective actions are described in other sections of this QAPP. Discussion of calibration, preventive maintenance, and validation (duplicates and field blanks) are discussed with the field equipment procedures in the appropriate section of the QAPP. Section 3.0 defines the QA objectives for data precision, accuracy, and completeness for the field and laboratory equipment.

#### 3.1 Regulatory and Legal Requirements

The data used to evaluate RI data with regard to the National Interim Primary Drinking Water Standards should have detection limits that are less than the maximum levels established under the standards. The ground water samples will be analyzed by the procedures specified under the USEPA Contract Laboratory Program. The Maximum Contaminant

Levels (MCLs) established by the Standards and the Contract Required Detection Limits (CRDL) for Routine Analytical Services (RAS) under the CLP are summarized as follows:

<u>Constituent</u>	<u>MCL (mg/l)</u>	<u>CRDL (mg/l)</u>
Arsenic	0.05	0.010
Barium	1	0.2000
Cadmium	0.010	0.005
Chromium	0.05	0.010
Lead	0.05	0.005
Mercury	0.002	0.0002
Selenium	0.01	0.005
Silver	0.05	0.010

The CRDLs are two to ten times below the MCLs; therefore, RAS will be adequate for the objectives of the RI/FS.

### 3.2 Quality Assurance Level of Effort

Field duplicates and trip blanks will be taken and submitted to the analytical laboratory to assess the quality of the analytical data generated by the Site Investigation. The duplicate samples will be used to evaluate sampling and analytical reproducibility (precision), and trip blanks will be collected to evaluate site or laboratory procedures that may cause sample contamination with volatile organic compounds. Duplicate samples will be collected at a rate of approximately one duplicate for every ten environmental samples for each matrix sampled. The specifics of duplicate sample collection are summarized in Table B-1 of Section 1.6 of the QAPP.

Laboratory chemical analyses for all sampled matrices will be performed under the procedures and protocols specified by the USEPA CLP

for Routine Analytical Services. The level of QA effort for both organic and inorganic constituents will also be in accordance with the CLP.

The QA effort for field measurements is outlined in Section 4.0 of the QAPP for the following: field gas chromatograph use; pH, electrical conductivity, and temperature measurements of water samples; measurement of water levels in wells; geophysical measurements with a terrain conductivity meter; and land surveying.

### **3.3 Data Precision and Accuracy**

The data precision and accuracy will be dependent on that of the equipment. The precision and accuracy of the field equipment is summarized in Table B-3. The precision and accuracy of the analytical equipment used by the laboratory are specified for RAS under the CLP for both organic and inorganic constituents.

### **3.4 Data Representativeness**

The Site Investigation Plan (Section 7 of the Workplan) is designed such that results are representative of the media and conditions being measured. The SIP was developed in accordance with the available information on past waste disposal, analytical data, site environmental conditions, sampling techniques, and sampling site locations. The analytical and sample collection techniques described herein have been developed to provide representative samples of each sample medium.

TABLE B-3  
 SUMMARY OF DATA PRECISION, COMPLETENESS,  
 AND FREQUENCY OF CALIBRATION

<u>Equipment</u>	<u>Precision</u>	<u>Completeness</u>	<u>Frequency of Calibration</u>
• Field Equipment			
Geonics Ltd., EM-31	+ 2%	90%	Once (during assembly)
HNU Model PI-101	+ 1%	90%	Twice daily
Photovac Model 10S50	+ 5%	90%	Daily
YSI Model 33 S-C-T	+ 5%	90%	Daily
Orion Research pH Meter	+ 0.02%	90%	Daily
• Laboratory Equipment			
Soil Physical Testing	**	90%	Daily
Analytical Chemistry	**	80%**	**

\*From USEPA, 1987a.

\*\*Addressed in Section 5.

### 3.5 Data Completeness

The goal for completeness of laboratory analytical measurements is 85 percent for most samples tested (USEPA, 1987). The only exception to this will be for samples identified as background samples in the SIP. The goal for background samples will be 95 percent because of the limited number of background samples being collected. Field measurements will have a completeness goal of 95 percent. Daily review of field data by the Site Coordinator should identify much of the invalid data, allowing for repeated measurements to be made before the field effort is terminated.

### 3.6 Data Comparability

The measurement data collected during Phase I of the RI/FS will be obtained by following the procedures presented in this QAPP. The comparability of this data to previously obtained analytical data is dependent upon the similarity of the methods described here to the methods used previously.

#### 4.0 SAMPLING PROCEDURES AND FIELD EQUIPMENT

##### 4.1 Field Records

This section of the QAPP describes requirements and procedures for documentation of field activities. Documentation of the field team's activities provides the basis for technical site evaluations and related written reports. Additionally, records and notes generated in the field may be considered pertinent in the discovery process as part of potential future litigation. It is essential that all field documentation provide a clear, unbiased picture of field activities. Field records of activities at the Algoma Landfill will be in the form of daily logs.

Daily logs will be used to document site activities. The Site Coordinator will be responsible for providing bound, serialized field notebooks and for documenting the assignment of each field notebook to be used for the daily logs. Entries into field notebooks will be legibly written in indelible ink and will provide a clear record of all field activities. Incorrect entries will be crossed out with a single line and the correct information will be entered near the original entry in a manner that clearly shows where the correction belongs.

The following information must be provided on the inside front cover or first page of the field notebooks:

- . Project Name (site name)
- . Site Location
- . RMT Project Number
- . Date of Issue
- . Name of the individual to whom the notebook is assigned

- . Authors of the notes (daily entries will be initialed by the respective author)

In addition to recording field data such as sample descriptions, sample identifications, water levels, pH, conductivity, etc., the daily field logs should include any other information that, in the judgement of the field personnel, may be relevant to meeting the objectives of the SIP as specified in Section 7 of the Workplan.

The Site Coordinator will distribute and keep track of users of the field notebooks. Transfers of field notebooks to other individuals who have been designated to perform specific tasks on the project will be recorded. Field notebooks will not be purposefully destroyed or thrown away, even if they are illegible or contain inaccuracies. Voided documents will be returned to the originator and sent to the project file.

Any problems encountered which are not immediately corrected and/or which could jeopardize the integrity of the data will be reported to the RMT Project Manager and the USEPA Project Manager immediately.

#### **4.2 Sample Identification**

Each sample will be uniquely identified. Sample containers will be pre-labeled with the laboratory control number. Field sample identification numbers will incorporate the prefixes listed in Table B-5 of this document. Sample identification numbers will be consistent with the sample station identifiers shown on Figures 9 and 10 of the Workplan.

TABLE B-5  
LIST OF FIELD SAMPLE IDENTIFIERS

<u>Identifier</u>	<u>Matrix/Subtask*</u>
PGN-	Pore Gas (NDA)
PGS-	Pore Gas (SDA)
PGL-	Pore Gas (LDA)
G-	Gas Probe
SS-	Soil/Sediment
SW-	Surface Water
OW-	Observation or Monitoring Well, Ground Water
PW-	Private Residence Well, Ground Water
ST-	Soil (Physical) Test
CMN-	NDA Cover Material
CMS-	SDA Cover Material
CML-	LDA Cover Material

\*NDA = North Disposal Area  
SDA = South Disposal Area  
LDA = Landfill Disposal Area

Field sample identification numbers will be included on chain-of-custody forms (Section 5.0). A copy of the chain-of-custody form with its assigned sample numbers will be kept in the field office files and in the laboratory to help identify lost or missing samples.

#### **4.3 Engineer Surveying**

After completing the soil borings and ground water monitoring wells, surveying will be performed to establish coordinates and elevations for these items.

##### **4.3.1 Surveying Notes**

The taking of accurate, complete, and informative field notes in surveying is a prime objective. The quality of the final output is a reflection of the field record. The field notes are the only reliable record of measurements made and information gathered in the field. Information gathered will be recorded in the field in bound field notebooks. Notes will be legible and complete, and will be made with a hard lead pencil.

Field notes will be recorded in the field. Records will not be made on scratch paper and copied later, or based on other information recorded from memory. Mistakes in field notes will be crossed out; no erasing of field notes will be allowed.

Field notes will be legible, and lettered instead of cursive handwriting. The lettering will be of a size which is easily readable. The surveyor is encouraged to use notebook space liberally in recording necessary data. Explanatory remarks will be used to clarify

the field procedures and provide added details. Field sketches will be included to clarify notes.

The following two important aspects of each survey will be addressed in the field notes:

1. The Starting and Ending Basis of the Survey. The surveyor will explain and document the starting and ending points of the survey. This applies to both the horizontal and vertical controls. This will require a paragraph of explanation and sketches and/or cross references to data in notes of previous surveys.
2. Clear Indication of Final Results and Checking Procedures. The final results and checks will be plainly indicated. Erasures will not be used as they raise uncertainties about the reliability of the data. Of course, non-pertinent or insignificant errors such as misspelled words, wrong column headings, or a change in wording may properly be erased. Alterations, additions, revisions, reductions, or comments added to field notes will be done in ink (usually red) to indicate that such information is not part of the original field record. The person making such notations will initial and date each page so affected.

A check list of information to include in field notes follows:

1. Date.
2. Names of crew members.
3. Condition of weather, observed temperatures, relative wind speed, and barometric pressure if an EDM is to be used.
4. Numbers or other identification of equipment used.
5. Location of survey by section description or other legal parcel identification.
6. Project number.
7. North arrow.
8. Description of monuments found.
9. Measurements made (slope distance and vertical angles, temperature, taping, horizontal angles, etc.).
10. Corrected distances and angles.
11. Description of monuments set.

12. Outline or sketch of major traverse or property boundary.

Standard surveying signs and symbols which promote a common understanding and save space on the field notebook pages will be used. These symbols are not included in this document, but are available to the RMT surveying crew.

#### 4.3.2 Control Survey

Records of field work in the horizontal plane (Horizontal Control) will be Third Order Accuracy (Federal Geodetic Control Committee). The Vertical Control will be Third Order Accuracy. Equipment will be clean and checked for accuracy prior to the start of this project. Once the equipment and personnel arrive on site, the equipment will be periodically field-checked.

**Field Control Traverse.** A Field Control Traverse will be performed for the site using a Dietzgen 20-Second Theodolite and a Topcon DM-S1 EDM (or similar). The survey will be tied to a permanent land monument. The survey will be on Mean Sea Level Datum. Horizontal angles will be doubled and the resulting angles will be averaged providing that they are not different by more than 30 seconds. Vertical angles will be recorded and then programmed into the EDM for slope reduction. Both the slope distance and the horizontal distance will be recorded and calculations checked in the field. At the completion of the traverse, a closure check will be performed, and field angles and coordinates will be adjusted by transit rule method as needed. Once the traverse has been checked and adjusted, a minimum of two permanent

control points will be placed at the site. The control monument will be marked with the proper coordinates and elevation. Monument locations will be selected by the RMT Site Coordinator and placed in areas with limited potential for being disturbed.

**Grid Survey.** A grid will be set up using the Theodolite for line and the EDM for distance. The maximum grid spacing will be on 200-foot centers. Each grid point will be marked with wood lathe and have the north and east coordinates written on them. These points will then be used to tie-in all boring locations and elevations with the topographic and/or geophysical surveys performed.

**Vertical Control.**

1. Level Circuits (General)

- . Before the survey crew leaves the field, note checks will be made to detect any mistakes in arithmetic and to verify achievement of acceptable closure as follows:
  - The summation of foresights and backsights will be completed immediately after running the closed loop. The difference between the rod sum (algebraic total of plus and minus sights) will determine the loop closure.
  - Immediately after page checks are calculated and the loop closure is determined, the notes will be checked by the second field party member or survey crew to document summation calculations and loop closure.
  - The survey crew chief will cross-check the "field item list" to double-check that all requested points have been picked up.
- . Level circuits run must be closed-loop.
- . Level circuits must close within the "allowable error of closure" as defined below.

2. Closure

- . The maximum allowable error of closure will be determined by the equation  $C = (0.05 \text{ feet}) (M)^{0.5}$

Where:

C = Permissible error of closure in feet

0.05 = Constant for Third Order Survey

M = Miles (feet/5280)

3. Level Circuit for Determining Well Elevations

- . Shoot, as a side shot, the (relative) ground elevations at each well location and record rod reading to the nearest one tenth (0.10) of a foot.
- . Shoot, as a side shot, the top of the steel protective casing with the lid open at each well location. Record rod reading to the nearest one hundredth (0.01) of a foot.
- . Turn on top of PVC well casings (with caps removed) and record rod reading to the nearest one hundredth (0.01) of a foot.

**4.3.3 Observation Wells and Staff Gage Locations**

Observation wells and the staff gage(s) will be surveyed using a Theodolite and EDM, and tied into the grid system for the site. These surveys are described in Sections 4.8.2 and 4.9.6.

**4.4 Geophysical Survey**

Apparent terrain conductivity measurements will be used to approximately delineate the extent of waste materials within the four disposal areas defined in the Workplan. The measurements will be made with a Geonics Limited Model EM-31 Terrain Conductivity Meter. The

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operation and maintenance of the instrument is described in the manufacturer's operating instructions (Geonics, 1984). The instrument

provides readings in the range of 3 to 1000 millimhos per meter with an accuracy of  $\pm 5$  percent at 20 millimhos per meter and a precision of  $\pm 2$  percent of full scale deflection. Instrument noise is less than 0.2 millimhos per meter.

Conductivity profiles will be conducted by taking continuous measurements across the site (Figure 6 of the Workplan). The general profile procedure includes the following steps:

1. Establish lines for the profile survey as specified in the SIP (Section 7 of the Workplan). Wood lathes will be used rather than metal poles for marking the survey lines. Stakes should be set in the ground every 200 feet.
2. Affix the Dual Channel Logger to the EM-31.
3. Check battery.
4. With the mode switch set to the "OPER" position, adjust the dial control to "zero" the electronics.
5. Adjust the range switch so that the meter reads on the upper two thirds of the scale. Set up chart speed.
6. With the EM-31 strapped on the shoulder of one person and the recorder on the shoulder of another, walk from station to station recording meter readings. The walking pace should be kept as constant as possible. All landmarks should be noted on the chart.
7. The measurement process should be repeated approximately every 1,000 feet by recording the conductivity at a selected point, turning off the instrument, repeating steps 3 and 4, and then recording the second conductivity value. Each replicate pair should have a relative difference of less than fifteen (15) percent, with relative difference defined as follows:

$$\text{Relative Percent Difference} = ([A-B]/((A+B)/2))*100$$

where A and B are the two measurements, and [ ] denotes an absolute value.

8. If the relative percent difference (RPD) is greater than 15 percent, repeat the instrument setup procedures, then repeat the two replicate measurements.

- a. If the repeated RPD is less than 15 percent, return to the last station at which a successful replicate measurement had been made. Complete two measurements at this station, and determine the RPD. If the RPD is less than 15 percent, remeasure the survey line between the locations of the successful and unsuccessful replicate measurements and continue the survey with Step 7.
  - b. If the repeated RPD is greater than 15 percent, refer to the operating manual for troubleshooting instructions and notify the Site Coordinator.
9. Record all observations in the field notebooks (refer to Section 4.4.1) or on the strip chart produced by the Dual Channel Logger, as appropriate.

#### **4.4.1 Documentation**

The general requirements and procedures for documentation of field activities conducted as part of the geophysical survey are outlined in Section 4.1 of the QAPP. Other specific information that should be recorded in the field notebook includes, but is not limited to, the following:

- . Visual observations of waste material or anthropogenic or natural features that may affect the EM-31 measurements. The logger chart should be annotated to enable cross-checks between the field notes and the instrument output.
- . Notations of anthropogenic or natural features that will ease the transfer of the logger output to site maps. The logger chart should again be annotated.
- . Observations regarding instrument performance, including the replicate measurements.

#### **4.4.2 Data Analysis and Interpretation**

The conductivity and magnetic profile data will be transferred from the logger chart to a map of the site and the values contoured with lines of equal values (isopleths). The contoured data will be evaluated

to determine the magnitude and extent of conductivity anomalies produced by the waste in order to define the edges of the disposal areas. The magnetic data will be treated in a similar manner to determine whether there are discrete, localized anomalies that may be representative of past drum disposal.

#### **4.5 Gas Sampling**

The field methods described below will be used in the pore gas survey and for screening of soil/sediment and water samples. The first method described below (pore gas GC analysis) will be used in the pore gas survey. The second method (GC or HNU headspace analyses) will be used to analyze sediment samples and to screen the drill cuttings for on-site storage or disposal.

A Photovac Model 10S50 gas chromatograph and a HNU Systems Model PI-101 Analyzer, both with photoionization detectors, will be used for this project. The operating procedures for both instruments are specified in manuals provided by the instrument manufacturers. These manuals will accompany both instruments to the field and be used for all activities requiring these instruments.

##### **4.5.1 Pore Gas Analysis With Portable Gas Chromatograph (GC)**

The GC will be set-up on site according to manufacturer's specifications and calibrated according to the procedures outlined in Section 4.5.4 of the QAPP. Pore gas within the disposal areas will be collected using clean stainless steel probes in the following manner:

1. Four-foot long hollow stainless steel probes will be used for collecting samples. The probe has a tapered hose attachment tube at one end and an open downhole end.
2. Prior to installing the probes, the cleanliness of the probe will be checked by drawing air through the probe and monitoring VOCs in the gas with an HNU meter. If the HNU reading is greater than 1 ppm over background, then the cleaning procedure specified below, under Decontamination, will be initiated. If the probe cannot be decontaminated, it will be discarded (returned to RMT laboratory) and another probe will be used.
3. Once a sampling location has been chosen, a power auger will be used to auger through the landfill cover or to a depth of 5 feet, whichever comes first. A loose-fitting screw is placed in the open end of the stainless steel probe. The probe is then placed vertically into the borehole. A drive head is placed over the tapered hose attachment, and the probe is hammered approximately 2 feet past the bottom of the borehole. The probe is withdrawn one foot from the bottom of the hole. The screw stays at the bottom of the hole, allowing the probe to draw pore gas from a one-foot vertical section of exposed media.
4. A vacuum is applied to the probe to determine if gas can be withdrawn from the ground. If gas can be withdrawn, then gas extraction is continued for approximately one minute with a hand pump. An HNU reading of the pore gas then taken by attaching the HNU meter to the probe. The reading is noted, and the meter is then taken off the probe and a vacuum is reapplied. After another minute evacuation, a second HNU reading is taken. If a constant HNU reading is obtained, a sample is taken for final HNU and portable GC analysis. If the reading is not steady, then the process is repeated until a steady reading is obtained. If no steady reading is obtained after 15 minutes of evacuation, a sample is taken and the unsteady HNU reading noted in the field notebook.
5. A gas sample is taken by attaching a deflated Tedlar® bag to the exhaust valve of the hand pump. The bag is sealed after complete inflation. The bag is then marked with the sample identification (sampling location, time, date, field staff initials, and project number), and saved for analysis.
6. Samples are taken directly from the bag for both HNU and portable GC analysis. The HNU measurement should be conducted first and used as a guide for GC injection volumes, as follows:

<u>HNU Reading (ppm)</u>	<u>Injection Volume (uL)</u>
0 - 5	250
5 - 25	100
25 - 100	50
100 - 200	25
> 200	10

7. Data is collected on the form shown in Table B-6.
8. The stainless steel probe assembly is checked for leaks following removal from the ground after each sampling episode. This is accomplished by applying a passive vacuum (pipet bulb) to the gas extraction end of the probe and sealing the other end by finger pressure. If the bulb maintains its vacuum, then the probe is still sealed.

Samples of pore gas will be collected at the two gas probes following the same procedures as for the auger hole except that the steel probes will not be necessary. The gas probes (1" ID PVC) are already fitted with a #5 neoprene stopper, a tygon tube, and a pinchcock clamp. The gas sample will be drawn through this existing probe into the Tedlar® bag (steps 4 through 7).

If major peaks for vinyl chloride and benzene cannot be separately identified (single peak), part of the sample will be drawn through detector tubes to identify the compound(s).

#### 4.5.2 Headspace Analysis of Soil/Sediment

1. For HNU analysis, a new one-quart Ball jar is filled approximately 1/2 full with soil or water. Any large chunks (greater than 1/2 inch) of soil should be broken up. The top of the Ball jar is covered with aluminum foil (shiny side up). The screw ring is then placed on the jar. The jar is marked with sample information (sampling location, time, date, field staff initials, and project number), then allowed to warm to approximate temperatures of 70°F or greater.

2. For the portable GC analysis, a 40-ml VOA vial is filled approximately 1/2 full of soil/sediment. The top is covered with aluminum foil (shiny side up), and the cap and septum are then put on the vial. The vial is marked with the same sample information as the Ball jar. Vials are allowed to warm to approximate temperatures of 70°F or greater while in an inverted position. Duplicate vials should be taken for all samples. Samples should be taken for both HNU and field GC analysis as quickly as possible to minimize volatilization.
  
3. The soil sample for HNU headspace analysis is equilibrated at a temperature of approximately 70°F or greater for between 1.5 and 2 hours within 2 hours of sample collection. The sample is then shaken immediately prior to analysis. The HNU probe is gently inserted through the aluminum foil, making as small a hole as possible. The probe is lowered approximately one-third of the way into the bottle (making sure the probe does not touch the soil). The meter reading should be carefully monitored as the probe is pushed through the foil and into the jar, because a rapid rise and fall in concentration may indicate very high VOC concentrations in the bottle. If there is no large spike in the HNU reading, then the highest and

TABLE B-6  
FIELD DATA FORM  
PORE GAS INVESTIGATION

DATE:  
PROJECT:  
FIELD STAFF:  
PROBE/HEADSPACE:

#	Sample Identification		HNU Reading (ppm)		Portable G C Results*						Comments	
	Location	Depth	Probe	Bag	A	B	C	D	E	F		

\*A = Benzene                      D = Trichloroethene  
B = 2-Butanone                    E = Xylene  
C = Toluene                        F = Vinyl Chloride  
Recorded as ppm on a volume-per-volume basis

stable reading are both recorded. The probe often takes 10 to 15 seconds to approach a stable reading, which is maintained for 20 to 30 seconds (or more) until the reading starts to fall as incoming air dilutes the headspace air.

4. Samples in VOA vials are equilibrated for at least 1.5 to 2 hours at a temperature of approximately 70°F or greater, but not more than 6 to 8 hours after sample collection. Samples for portable GC analysis are taken by inserting a syringe needle through the septum of the VOA vial into the headspace and removing a known volume for injection into the portable GC. The injection volume to be used is based on the soil headspace HNU reading obtained in Step 4, using the guide given for the soil pore gas analysis.

Portable GC and HNU analyses are recorded on Field Data Forms. The presence of major unidentified peaks is noted on the data sheet. If a tentative identification can be made based on relative retention time, then the identification should be noted in parentheses with a question mark (e.g., "PCE?").

If the results of portable GC analysis are off-scale or questionable for some reason, the duplicate soil sample should be run, adjusting the injection volume as appropriate. Duplicates should be run in any case on every fifth sample as part of the quality control program.

The chromatograms for the day or work period should be marked with the date, project name and number, and analyst's initials and filed with project records as specified in Section 8 of the Workplan.

All Ball jars and VOA vials should be returned to the RMT Laboratories for cleaning or disposal. Tedlar® bags will be cleaned by filling and emptying the bag several times with clean air.

#### 4.5.3 Documentation

All HNU readings are recorded on duplicate data sheets. One of these sheets is kept in a bound notebook at the site. The other sheet is sent to the location where the portable GC is being operated.

Portable GC results are also recorded in two places (in addition to the chromatogram itself). First, portable GC results are recorded on

the Field Data Form accompanying the samples, and stored in a bound notebook which is kept with the instrument. Second, the results are stored in the portable GC log book. All field GC runs - blanks, standards, samples, and replicates - are recorded in the log book so that a complete record of all analyses is maintained. The bound notebooks become part of the project file maintained in the RMT office. The log book is kept with the instrument in the field. Results from previous projects are stored in the laboratory. All chromatograms are marked with the sample information (e.g., sample identification number, injection volume) on the chromatogram itself. The instrument records sample date and time of analysis.

Each day's or work period's output is marked with the date and project number, and placed in project files for future reference. Thus, if there is any question about whether a sample was run and what the results were, the log book will provide information on what samples were run, and, if necessary, the actual chromatogram can be retrieved to review the results.

#### **4.5.4 Decontamination**

Augers will be carefully cleaned with a steam cleaner and dried before each sampling session. If organic residue appears to be adhering to the auger, then an HNU reading should be taken. If the reading indicates organic contamination, then the auger should be cleaned with soapy water and rinsed with clean water.

Precleaned Ball jars and 40-ml VOA vials supplied by the RMT laboratory are used for each sample.

The stainless steel probes used for pore gas analysis are checked with the HNU meter for cleanliness prior to use. If the probes show residual contamination, then air is pulled through the probe with the hand pump and the probe rechecked with an HNU meter. If the probes are still not clean, they should be cleaned with a propane torch to drive off volatile compounds. If a probe is still not free of volatiles when tested with the HNU meter, then the probe should be rinsed with deionized water and reheated until clean, or the probe should be discarded and a new probe substituted.

#### **4.5.5 Calibration and QC Requirements**

The HNU meter should be calibrated using the calibration gas supplied by HNU Systems, Inc., prior to taking the instrument into the field and at least once every three days while in the field. Calibration procedures specified by the instrument operations manual will be followed. This manual will accompany the instrument into the field.

Calibration of the portable GC is done by making up a standard gas containing benzene, 2-butanone, toluene, trichloroethene, vinyl chloride, and xylene at concentrations between 1 and 25 ppm (v/v). The standard is made by injecting a known volume from the saturated headspace over a pure solvent into a known volume of clean air. The instrument is calibrated in the lab prior to its use in the field. Instrument settings for analyzing the parameters of interest are also set in the lab prior to taking the instrument into the field.

The instrument being used (a Photovac, Inc., Model 10S50 portable GC) has an internal calibration curve that identifies and quantifies compound peaks based on the stored standard curve. Each time the portable GC is turned on, blanks are run to ensure that there is no background contamination in the instrument. Then, a standard is run and the internal standard curve calibrated for site-specific operating conditions (especially temperature). Following this, samples are run. During routine operation, blanks and standards are run after every 8 to 10 samples. If a sample with a particularly high VOC concentration has been injected, then the instrument is cleaned by running blanks until the baseline returns to background.

#### **4.5.6 Borings for Pore Gas Sampling**

The approximate locations of the 45 soil borings and the two gas probes included in the pore gas sampling plan have been shown on Figure 9 of the Workplan. The borings will be advanced using a 3 3/4" OD solid-stem auger. Auger cuttings will be described and classified in the field according to the USCS. Additional comments will be documented on a boring log concerning consistency or density, plasticity, moisture content, color (Section 4.9.6 of the QAPP).

**Survey.** The coordinates of the soil borings drilled for pore gas sampling will be established by the RMT field crew by measuring the distance between the borings and the stakes placed for the grid system (Section 4.3).

#### 4.6 Landfill Cover Sampling

The landfill cover samples will be collected during or shortly after the Phase I observation well installation (Section 4.9). The approximate locations of the thirteen (13) samples are presented on Figure 9 of the Workplan. At each location, soil will be sampled by pushing a 3" thin-walled (i.e., Shelby) tube with the drill rig (ASTM Method D 1587-83). The depth for collecting this sample will be determined in the field to obtain a representative sample of the landfill cover material. The thirteen (13) samples will be described as specified in Section 4.5.6. The samples from each location will be screened with a PID for VOC to assess the hazards the sample may pose to laboratory personnel. The screening method will consist of slowly moving the HNU probe along the exposed portion of the sample. The probe should be an inch or two away from the soil surface during this screening operation. The soil borings will be sealed after cover material sampling by backfilling the hole with a mixture of auger cuttings and bentonite grout.

The samples will be kept in the tube and the tube sealed. The tubes will be kept in a vertical position and handled with care to minimize physical disturbance of the samples. The tubes will be transported to the RMT Soils Laboratory and tested for the following:

- . Falling-Head Permeability
- . Grain-size Distribution (ASTM D421 and 422)
- . Atterberg Limits (ASTM D4318)

The soil tests are further discussed in Section 5.1.

#### 4.6.1 Documentation

**Field Notebook.** The on-site hydrogeologist with each drill rig will maintain a field notebook. The notebook will be bound, with prenumbered pages, and entries will be made with indelible ink. The field notebook will be used to document field testing results from the photoionization detector (PID), instrument calibration, samples collected, general site observations, problems encountered, and any other information that may be relevant to the completion of the investigation.

**Borehole Logs.** In addition to the bound field notebook, the on-site hydrogeologist with each drill rig will maintain a complete and accurate drill log for each borehole. Borehole logs will be kept in a bound notebook. Each drill log will contain, at a minimum, the following information:

- . Name of project and site
- . Hole number
- . Location of the boring
- . Type of drill rig
- . Size and type of bit used
- . Depth of each change of stratum
- . Thickness of each stratum
- . Identification of the material of which each stratum is composed according to the Unified Soil Classification System, or standard rock nomenclature, as necessary
- . Depth interval from which the sample was taken, if any
- . Hole diameter and depth at which hole diameter (bit size) changes
- . Depth at which ground water is first encountered

- . Depth of the static water level and changes in static water level with hole depth
- . Total depth of hole
- . Depth or location of any loss of drill water circulation, loss of tools or equipment, and any other problems encountered
- . Reference point for all depth measurements
- . Drilling date(s)

**Survey.** The coordinates of the soil borings drilled for landfill cover material sampling will be established by the RMT field crew by measuring the distance between the borings and the stakes placed for the grid system (Section 4.3).

#### **4.7 Soil/Sediment Sampling**

##### **4.7.1 Sampling**

Fifteen (15) sediment samples will be collected from the site, including two background soil samples collected to the east and southwest of the site. Two duplicate samples will be collected.

The samples will be collected using dedicated stainless steel sampling trowels. The samples will be collected from the top six inches of soil immediately below the plant root zone, or from 1.0 to 1.5 feet below the plant root zone as specified in Section 7 of the Workplan. Two 40-ml VOA vials and one 1-quart Ball jar will be filled at each location for in-field GC analyses as described in Section 4.5.1 of the QAPP. Two additional 40-ml vials will be collected at three locations, as specified in Section 7 of the Workplan, for laboratory analyses for the TCL volatile organic compound fraction. The remaining portion of

each sample will be mixed in a dedicated aluminum pan or bowl using the sampling trowel. The composited sample will then be placed into the appropriate containers, handled as described in Section 5.0, and analyzed for the TCL fractions listed in Table B-1 of the QAPP and in Section 7 of the Workplan.

#### **4.7.2 Documentation**

The on-site hydrogeologist will maintain a field notebook as described in Section 4.5.3 of the QAPP. The field notebook will be used to document field testing results from the PID and portable GC, instrument calibration, samples collected, sample identification, general site observations, problems encountered, and any other information that may be relevant to the completion of the investigation.

The sample point will be located on a site map. A labelled wooden stake will be driven at the sampling location and a photograph taken of the site.

#### **4.7.3 Decontamination**

The stainless steel trowels and aluminum pans or bowls used will be new. They will be cleaned prior to use as follows:

- . Brushed with soapy (trisodium-phosphate) water
- . Rinsed with tap water
- . Rinsed with deionized distilled water (organic free)
- . Air dry
- . Wrapped in aluminum foil (shiny side out) to prevent equipment contamination prior to use.

The equipment will only be used once. After usage, the trowels and bowls will be steam cleaned, packed in garbage bags (double), and disposed at the local sanitary landfill.

#### **4.8 Surface Water Sampling**

##### **4.8.1 Sampling**

The approximate locations of the three (3) proposed surface water sampling points are shown on Figure 10 of the Workplan. The sampling locations will be selected in the field. The locations will be accessible and will have at least one foot of standing water. The sampling locations will be located by the field crew on a map, staked, and the location documented (photographs, landmarks, etc.). A staff gage will be installed at one of the surface water sampling points (SW-01) located along the perimeter of the pond to the east of the site. A second staff gage may be established in the wetland if sufficient standing water is found and if the location is accessible by a survey crew.

The staff gage will be made of a 3-foot section of graduated (10 divisions to the foot) Stevens Style C (or similar) porcelain enameled staff gage section attached to a wood pole. The wood pole will be driven three feet into the sediment and the gage section attached such that one foot of the graduated staff gage is submerged.

The water samples will be collected by submerging the sampling container under the water, minimizing any disturbance of the bottom

sediments. Section 4.9.7 of the QAPP describes the sample containers required to meet the analytical program described in Section 7 of the Workplan.

#### 4.8.2 Survey

Coordinates and elevations will be established for the staff gage according to procedures specified in Section 4.3. The staff gage will be surveyed after the last observation well is installed. The coordinates will be to the closest 1.0 foot and referenced to the grid system established for the site. A ground elevation to the closest 0.1 foot and an elevation for the top of the gage to the closest 0.01 foot will be obtained. These elevations will be referenced to Mean Sea Level. The location of the gage will be plotted on the site maps.

#### 4.8.3 Documentation

The on-site hydrogeologist will maintain a field notebook documenting field testing results from the pH and conductivity measurements, the temperature, the water elevation, sample description including color, odor and turbidity, general site observations, problems encountered, and any other information that may be relevant to the completion of the investigation. The sample points will be located on a map. A labelled wooden stake will be driven at the sampling location and a photograph taken of the site.

### 4.9 Observation Well Installation and Sampling

#### 4.9.1 Well Design

Observation wells will be installed at three different depths: the water table, at depths of approximately 65 feet, and at the surface of the bedrock. The water table wells will be screened to intercept the water table at an assumed depth of 10 to 15 feet. The 65-foot-deep

wells will be screened within the sand and gravel or within whatever material is present at approximately 40-foot depth below the water table. The deepest well will be screened just above the bedrock, at an approximate depth of 100-110 feet. The observation well network and well design are described in greater detail in Section 7 of the Workplan.

#### 4.9.2 Drilling Methods

An RMT hydrogeologist will be on-site during all well drilling, installation, development, and testing activities. Boreholes for all wells will be advanced with 6 1/2-inch I.D. hollow-stem augers.

Soil samples will be collected from the deepest boring at each location at five-foot intervals by pushing a split-spoon sampler with the drill rig (ASTM D 1586). The 1.5-foot-long split-spoon sampler will be screened with a HNU Systems photoionization detector (PID) for the presence of volatile organic vapors. The screening methods will consist of opening the split-spoon sampler and slowly moving the HNU probe along the sampler. The probe should be an inch or two away from the sampler during this screening operation.

Split-spoon samples will be classified in the field according to the USCS. Additional comments will be noted on the boring log concerning consistency or density, plasticity, moisture content, color, blow counts, etc.

All downhole drilling equipment will be decontaminated before beginning work at a given boring location. This includes augers, drill rods, and other equipment that may come into contact with subsurface

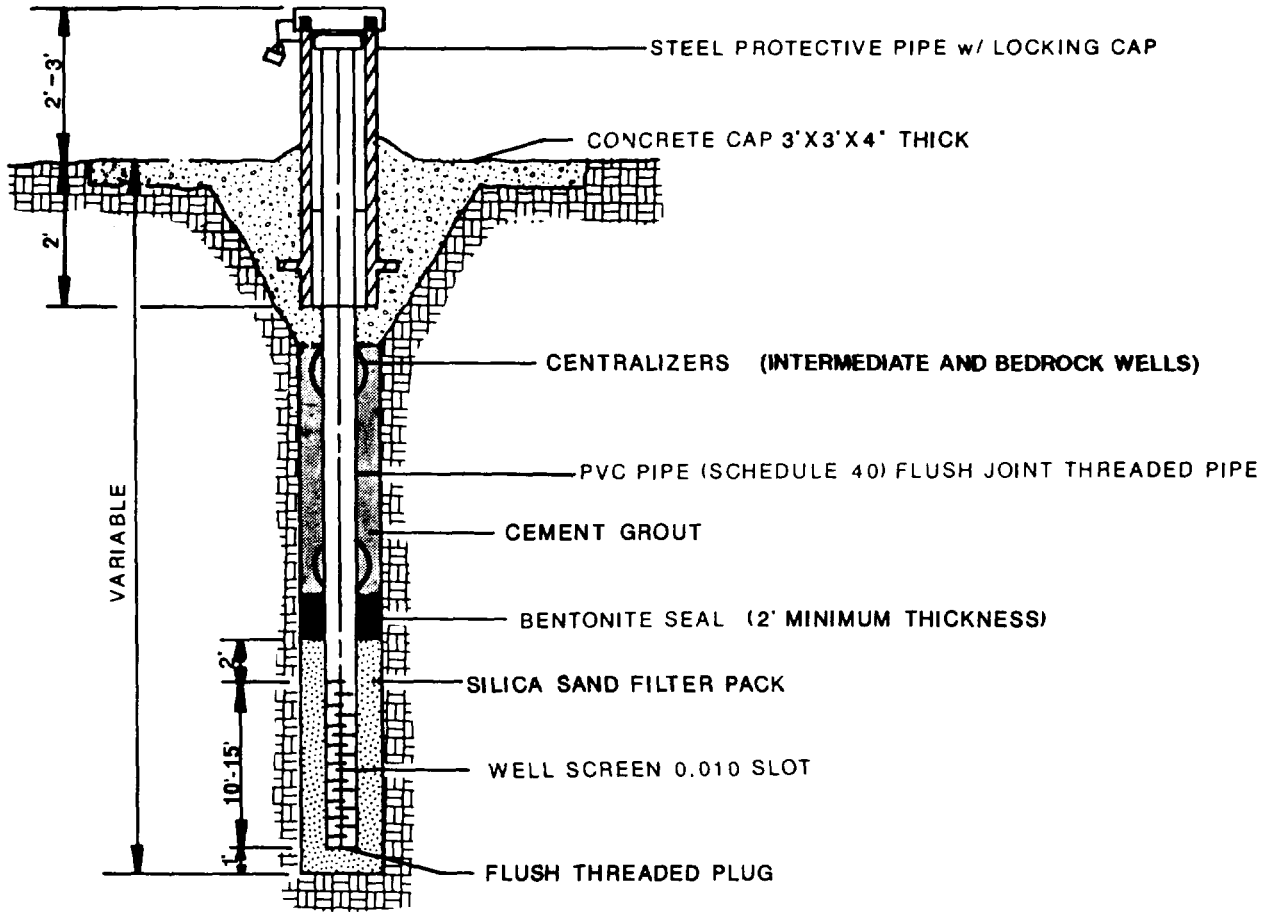
materials. Decontamination will consist of steam cleaning at the site decontamination area (Section 7.2.3 of the Workplan). The split-spoon samples will be cleaned before each use by scrubbing in water to remove any soil remaining on the sampler from the previous sample. Potable water for well installation, steam-cleaning, and other necessary field activities will be made available by the City of Algoma at a fire hydrant (or similar high flow-rate source).

Drill cuttings will be considered potentially hazardous material if a headspace analysis using an HNU shows cuttings to have a VOC concentration in excess of 5 ppm. At concentrations below 5 ppm, the cuttings will be disposed at a selected site (trench) at the edge of the LDA. Cuttings that register greater than 5 ppm on the HNU will be placed in properly labelled drums that are DOT-approved for hazardous materials. The drums will be filled only 75 percent full (to allow for freezing), and placed on wooden pallets in the storage area near the decontamination area (see Section 7.2.3 of the Workplan). The decontamination water will be hauled to the wastewater treatment plant in Algoma. Any waste materials or refuse exposed during drilling will be containerized and disposed at a licensed sanitary landfill (see Section 7.2.4 of the Workplan).

#### **4.9.3 Well Installation**

The wells will be constructed as summarized on Figure B-3, and as detailed in Section 7.8.2 of the Workplan.

The driller shall affix a permanent marking or tag to the outer steel protective casing which clearly identifies the well number, and the adjusted top-of-casing elevation.



## MONITORING WELL DETAIL

(NOT TO SCALE)

NOTE: WATER TABLE WELLS HAVE 2" DIA. PVC PIPE IN 6 1/2" MINIMUM BOREHOLE.  
 INTERMEDIATE & BEDROCK WELLS HAVE 3" DIA. PVC PIPE IN 8 1/2"  
 MINIMUM BOREHOLE.

<b>RMT</b> <small>INC</small>	Dwn. by: GDB
	Date: MAY 09 1988
	Proj. # 1375.02

**FIGURE B-3**

#### 4.9.4 Well Development

Within two weeks after each well has been constructed, but no sooner than 48 hours after grouting is completed, RMT staff will direct a program for well development without the use of dispersing agents, or acids. The objectives of well development are as follows:

- . Assure that ground water enters the well screen as freely as the porous media in which the well is completed allows, thus yielding a representative ground water sample and hydraulic head measurement.
- . Remove water or other drilling fluid that may have been introduced during drilling and well installation.
- . Remove very fine-grained sediment in the filter pack and (if appropriate) from the nearby formation to minimize turbidity of samples and siltation of the well.

Development will consist of pumping and surging, for at least one (1) hour for wells that are installed in aquifers. Wells installed in aquitards will be bailed until at least five (5) well volumes of water have been removed from the well. Specific conductivity of the removed water will be measured every 10 minutes or after each well volume during development. The specific conductance readings will be evaluated, and well development will continue if the specific conductance of the removed water is not constant (greater than  $\pm 10$  percent change between the final two measurements).

Some of the observation wells may be screened in formations that consist predominantly of silt and clay (glacial till). Therefore, it is unlikely that any combination of commercially available well screen, sand filter pack, and development procedures will prevent the movement of fine-grained material into the wells.

If the addition of water is required to facilitate surging and bailing, only formation water from that well will be used. In all cases, care will be taken not to collapse well screens during development activities. Pumps and other equipment placed into the well during development will be decontaminated between wells.

Stainless steel bailers will be dedicated to the two-inch diameter wells and will only be decontaminated before their first use. The bailers will be washed with trisodium-phosphate detergent, rinsed with potable water, and finally with double-deionized water from a Teflon<sup>TM</sup> spray bottle. Pumps used for development, purging, and sampling will be decontaminated by submersing the pumps in a large-diameter PVC tube which has been sealed on one end, and then flushing with soapy water and rinsing with potable water.

#### **4.9.5 In-Situ Hydraulic Conductivity Testing**

RMT will conduct in-situ permeability tests at the observation wells in conjunction with well development. These tests will be used to estimate the horizontal hydraulic conductivity of the material surrounding the well intakes.

Rising-head single-well response tests will be performed on the nine wells to be sampled using the following procedure. The static water level in the well will be measured. A predetermined volume of water will be removed from each well by pumping or with the dedicated bailer. The water level will be measured periodically as the water level returns to its static level. The record of water level recovery

with time will be used to estimate the horizontal hydraulic conductivity of the formation surrounding the intake zone of the well. The determination of hydraulic conductivity will be done at the RMT office in Madison, and will be based on the methods described by Hvorslev (1951); Cooper, Papadopoulos and Bredehoeft (1967); and Bouwer and Rice (1976).

#### 4.9.6 Documentation

Borehole and Well Construction Logs. Borehole logs and well construction logs detailing construction practices and parameters will be maintained for each well (Attachment A). Final borehole and construction logs will be prepared by a qualified hydrogeologist and submitted in the RI Report. Information provided in the final borehole logs is described in Section 4.6.3 of the QAPP.

The borehole logs include a generalized well diagram to facilitate the evaluation of well placement relative to the site hydrogeology. The well construction form (Attachment A to the QAPP) will include detailed information regarding well construction including:

- . Description of all construction materials: casings, filter packs, seals, and backfill materials,
- . Depths of well intake, seals, and backfill materials,
- . Elevation of ground and top of well casing,
- . Well development summary, and
- . Other comments relevant to the construction of the wells.

Survey. Coordinates and elevations will be established for each observation well according to procedures specified in Section 4.3 of the

QAPP. The observation wells will be surveyed after the last well is installed. The coordinates will be to the closest 1.0 foot and referenced to the grid system established for the site. A ground elevation to the closest 0.1 foot and an elevation for the top of the casing to the closest 0.01 foot will be obtained at each well. These elevations will be referenced to Mean Sea Level. The locations of the observation wells will be plotted on the site maps.

#### 4.9.7 Well Sampling

Water Level Measurement. The measurement of ground water levels in wells will be conducted in conjunction with ground water sampling. The data from such measurements are needed to determine well purging requirements, establish ground water gradients, and ultimately, to determine the direction of ground water flow.

All ground water level measurements will be made using a reference point established on the well casing. The reference point will consist of an indelible mark on the highest point of the well casing. The reference point will be documented in field records.

A battery-operated water level indicator will be the primary device for water level measurements. The indicator is a self-contained transistorized instrument equipped with a cable and sensor which activates a buzzer and a light when it comes in contact with the water. The depth to water is read from permanent one-foot increment markings on the cable. A one-foot engineer's rule is then used to measure the depth to water to the nearest 0.01 foot.

In case of instrument failure, depth to ground water will be measured by a popper tape which is a bell-or cup-shaped weight attached to a measuring tape. When lowered into the well a "plopping" or "popping" sound is made when the weight strikes the surface of the water. An accurate reading can be determined by lifting and lowering the weight in short strokes, and reading the tape when the weight just strikes the water. Depth to water will be recorded to the nearest 0.01 foot. The water level indicator and/or popper will be decontaminated between each well by rinsings with deionized water.

**Well Purging.** Well purging will be performed to remove stagnant water from the well casing prior to collecting a sample, because it is not representative of actual ground water chemistry. The purging will draw in water from the surrounding porous media which is more representative of the in-situ water quality.

Purging will be accomplished by removing water from the well until stable specific conductance readings are reached or a maximum of five (5) well volumes are removed. A minimum of three (3) well volumes will be removed prior to sampling. A single well-volume will be removed prior to sampling if the well can be bailed dry. The well volumes will be calculated by subtracting the depth to water from the depth of well, and multiplying the difference by the cross-sectional area of the well casing. In the field, RMT personnel use pre-calculated conversion formulas to determine the number of gallons that must be removed to reach the four well volumes criterion. A calibrated bucket is used to measure the volume of water removed.

Purging will be accomplished by one of two methods - bailing or pumping. For small-diameter wells, the stainless steel bailer dedicated to that well will be used. A submersible pump will be used for wells

with inside diameters greater than or equal to 3 inches. The water extracted from the wells will be taken from near the top of the water column in the well to maximize the removal of the stagnant water from the well bore.

**Sample Collection.** It is important not to contaminate or alter the sample during collection. The sampling device should be clean and constructed of a material which is compatible with the well construction material and the laboratory testing program.

Each of the wells will be sampled, using a stainless steel bailer and leader dedicated to that well. Nylon rope attached to 10-foot-long stainless steel cable leaders will be used to raise and lower the bailers. New nylon rope will be used for each well. A clean plastic dropcloth will be placed on the ground around each well to protect equipment from contact with soil around the well.

Filtering in the field will be required for some parameters to prevent changes due to precipitation or biological activity and to collect a more representative sample of the water moving through the ground. In many cases, there may be a small amount of silt or clay in the water after purging the well. This sediment is not representative of constituents transported in ground water flow systems in porous media. The filtering is performed in the field because even short delays may drastically change the water chemistry. The field filtering apparatus consists of a battery-powered vacuum pump and membrane filters with a 0.45-micron opening.

Field-filtered samples will be required for the (filtered) TCL metals. Filtering is not appropriate for trace organics because of the possible loss through adsorption on the filter or volatilization.

Sample Containers, Preservation, and Handling. Table B-7

summarizes the requirements for sample containers, preservatives, and holding times for the parameters to be analyzed in ground water. Sample containers for field samples, duplicates, and field blanks will be supplied by the laboratory.

Field Analysis. Proper field analytical methods and procedures will be followed. The following steps are taken so that analytical data gathered in the field are both valid and unbiased:

- . Field technicians are thoroughly trained in the use of each piece of equipment.
- . Operation manuals accompany each piece of equipment in the field.
- . Preventive maintenance programs are carried out on a scheduled basis.
- . Spare components will be taken into the field in case of equipment failure or damage.
- . Instruments will be calibrated on a daily basis and rechecked at various times daily.
- . Readings and calibrations will be documented.
- . Daily QC checks of field notes will be performed.

The accuracy, sensitivity, and precision of the field analytical techniques (pH, temperature, Eh, and specific conductance) are dependent upon the specifications for the instruments used, as well as the QC techniques employed during their use. Specifications have been excerpted from the instrument instruction manuals.

Measurement of Temperature. A ground water sample will be collected after purging an observation well. One portion of the sample will be placed in a container and immediately tested for temperature.

TABLE B-7

GROUND WATER SAMPLE CONTAINERS, PRESERVATIVES, AND HOLDING TIMES

<u>Parameter</u>	<u>Container</u>	<u>Preservative</u>	<u>Holding Time</u>
<u>Water Testing</u>			
Volatile Organics	4 oz wide mouth 2-40 ml glass VOA vials with Teflon septum, no headspace	Iced to 4°C	Analyze within 10 days. Sample should remain on-site less than 24 hours.
Total Recoverable Metals (except Mercury)	1 liter, high density polyethylene bottle (Teflon-lined lid)	Filter through 0.45 micron filter paper, then HNO <sub>3</sub> to pH < 2	6 months
Mercury	1-500 ml, high density polyethylene or glass bottle, (Teflon-lined lid)	Filter through 0.45 micron filter paper, then HNO <sub>3</sub> to pH < 2	28 days
A/B/N Extractable Organics	2-one liter amber bottles, Teflon-lined lids, leave small amount of headspace	Iced to 4°C	Extract within 5 days, analyze within 40 days after extraction
Pesticides and PCB's	2-one liter amber glass bottles, Teflon-lined lids, leave small amount of headspace	Iced to 4°C	Extract within 7 days, analyze within 30 days of collection

All field thermometers will be initially calibrated against a National Bureau of Standards (NBS) certified thermometer. Field measurements of ground water samples will be recorded to the nearest 1°C immediately after the sample is removed from the well.

Each field thermometer will be inspected before each field trip to see that it is not cracked and that there are no air spaces or bubbles in the mercury. A cross-check with a calibrated NBS-certified thermometer will be made semi-annually. Before using a thermometer in the field, field personnel will make a visual observation to ensure that it has not been damaged. Cross-checks and duplicate field analysis will agree to within  $\pm 0.5^{\circ}\text{C}$ .

A log book will be maintained with each thermometer property number recorded. All calibration information, individuals making the calibrations, and dates will be recorded. Each field calibration will be noted in the field notebooks indicating the temperature readings observed.

**Measurement of Conductivity.** The specific conductance of the water sample will be measured in the same ground water sample used for the temperature measurement. A portable specific conductance meter (YSI 33 S-C-T), wheatstone bridge type or equivalent, will be used to measure the specific conductance of the ground water sample.

Each meter will be inspected for physical damage before each field trip and daily while in the field. Batteries and conductivity cells will be cleaned and checked daily against known standards as described in the instrument's operations manual.

Reference will be made to the instrument's operations manual for temperature - conductance calculations. Duplicate field measurements should be taken once for every ten samples collected. The results should agree within ± 15 percent and be recorded in field notebooks.

A log book will be maintained with all specific conductance meter property numbers. All repairs, calibrations, and field time usage will be noted. The log book will include dates, repairs made, and the name of the person making the repairs.

Results will be expressed in micromhos/centimeter (umhos/cm) corrected to 25°C, and reported to the nearest ten units.

#### YSI 33 S-C-T Meter - Specifications

Range: 0-500, 0-5,000, 0-50,000 umhos/cm.

Meter Accuracy: ± 2.5% max. error at 500, 5,000, and 50,000  
plus probe accuracy.  
± 3.0% max. error at 250, 2,500, and 25,000  
plus probe accuracy.

Probe Accuracy: ± 2% of reading.

Readability: 2.5 umhos/cm on 500 umhos/cm range.  
25 umhos/cm on 5,000 umhos/cm range.  
250 umhos/cm on 50,000 umhos/cm range.

**Measurement of pH.** After purging, a portion of a ground water sample will be tested for temperature and specific conductance. A separate portion will be placed in a second container for a field pH measurement.

The pH measurements will be made electrometrically using a combination electrode and portable pH meter. The measurements will be recorded to the nearest 0.1 pH unit. Portable meters with provisions

for temperature compensation will be used. Reference will be made to the instrument's operations manual for pH measurement procedures and instrument operation instructions.

The meter will be checked before each field trip and daily while in the field for any mechanical or electrical failures, weak batteries, and cracked or fouled electrodes. The meter and electrode also will be checked against standard buffer solutions of known pH values (e.g., 4, 7, and 10) as described in the instrument's operations manual. While in the field, the meter will be checked several times per day with fresh buffers. In case of an apparent discrepancy in a pH measurement, the electrode will be checked with pH 7.0 buffer and rebuffered to the closest reference buffer. The sample will then be reanalyzed. Duplicate analyses will be taken once for every ten measurements and must agree within 0.1 pH units. The buffer solution containers will be refilled each day from fresh stock solution.

Decontamination of the pH probe and cup will be done by rinsing each three times with distilled water. Additionally, the cup will be rinsed three times with the next sample prior to obtaining a reading.

A log book will be maintained and will contain the property number of each pH meter. All calibrations and repairs will be noted in the log book indicating the date, repairs made, the person making the repairs, calibration records, and the time used in the field for each meter.

#### Orion Research Analysis pH Meter - Specification

pH range: 0 to 14 with  $\pm 0.02$  pH repeatability and  $\pm 0.05$  accuracy.

pH EXP range: -1.4 to +1.4 pH about any pH value from 0 to 14, with +0.005 repeatability and  $\pm 0.01$  accuracy.

mV range:  $\pm 700$  mV, with  $\pm 2.0$  mV repeatability and  $\pm 5$  mV accuracy.

#### 4.9.8 Preventive Maintenance

Field preventive maintenance will include a cursory check of instrument operation without the need of disassembly or test equipment. If any of these preliminary checks proves negative, the instrument is possibly not functioning properly, and the back-up meter will be used. Field check procedures for the various instruments are described below.

##### pH Meter.

1. Remove electrodes (and recorder, if used). Insert ORION shorting strap (Cat. No. 040030) securely to input the reference jacks.
2. With function switch in "off" position, check that the meter needle reads center scale; if not, adjust the zero adjust screw in the center of the panel for center scale.
3. Make sure that the line cord is securely attached to the instrument. If batteries are being used, check their condition before plugging cord into a power outlet. Turn the function switch to BATT. The needle should read in or to the right of the green BATT OK arc. If meter reads to the left of the BATT OK arc, leave instrument plugged into power outlet for twenty-four hours to recharge batteries. Continue checkout with line cord plugged into power outlet.
4. Zero Check: Turn function switch to the mV mode. The meter needle should be at center scale.

Stability Check: Turn function switch to the pH EXP mode. Adjust the calibration control so that the needle is at center scale. The needle should remain stable.

Slope Check: Turn function switch to the pH mode. Turn temperature compensator knob fully counterclockwise. Adjust calibration control so that the needle is at exactly zero pH (zero on the left side of meter). Turn temperature compensator knob fully clockwise. The meter needle should be at  $2.9 \pm 0.2$  on the black pH scale.

5. Set slope indicator dial to 100%, and turn the temperature compensator knob until the white arrow points to 29°C. Turn calibration control counterclockwise to check for full-scale left deflection of the needle. Repeat in a clockwise direction to check for full-scale right deflection.

#### pH Electrode.

1. Testing electrode operation:
  - a. Connect electrode to a working meter.
  - b. Set function switch to absolute mV mode.
  - c. Immerse electrode in fresh pH 7 buffer.
  - d. Displayed value should be  $0 \pm 30$  mV.
  - e. Rinse electrode and immerse in fresh pH 4 buffer.
  - f. Displayed value should be approximately 160 mV greater than in Step d.
2. If electrode fails this procedure, clean thoroughly as directed in the maintenance section of the operations manual. Then "heat cycle" the electrode in hot pH 7 buffer (about 85°C) for 10 minutes, shake down to remove air bubbles, and repeat test procedure when electrode has cooled to room temperature.
3. If cleaning and maintenance fail to rejuvenate the electrode, proceed as follows:
  - a. For separate pH and reference half cells, substitute each electrode (one at a time) with a known working electrode and repeat test procedure. By process of elimination, determine which electrode should be replaced.

NOTE: The appropriate portion of a working combination pH electrode may be used for test purposes. To substitute for the reference half cell, connect only the small pin tip connector of the combination electrode; for the pH half cell, connect only the larger U.S. standard connector.

- b. For combination electrodes, replace the entire electrode.

Conductivity Meter. The only maintenance required is battery replacement. Two "D" size alkaline flashlight cells, such as Eveready E95 or equivalent, will provide 200 hours of operation. Accuracy will

not be maintained if zinc-carbon "D" cells are used. Battery replacement is indicated when the redline adjustment cannot be accomplished.

Replace batteries every six months to reduce the danger of corrosion due to leaky batteries. To replace batteries, remove the six screws from the rear plate. The battery holders are color coded. The Positive (+ button) end must go on red.

**Conductivity Probe.** When the cell test indicates low readings, the probable cause is dirty electrodes. Hard water deposits, oils, and organic matter are the most likely contaminants.

For normal cleaning, soak the electrodes for five minutes with a locally available bathroom tile cleaning preparation such as: Dow Chemical "Bathroom Cleaner"; Horizon Industries "Rally, Tile, Porcelain, and Chrome Cleaner"; or Lysol Brand "Basin, Tub, and Tile Cleaner."

For stronger cleaning, a five-minute soak in a solution made of 10 parts distilled water, 10 parts isopropyl alcohol, and 1 part HCl can be used.

Always rinse the probe after cleaning and before storage.

CAUTION: Do not touch the electrodes inside the probe.  
Platinum black is soft and can be scraped off.

If cleaning does not restore the probe performance, re-platinizing is required.

Re-Platinizing - Equipment required:

1. YSI #3140 Platinizing Solution, 2 fl. oz. (3% platinum chloride dissolved in 0.025% lead acetate solution).
2. YSI Model 33 or 33M S-C-T Meter.
3. 50-mL glass beaker or equivalent bottle.
4. Distilled water.

## Procedure:

1. Clean the probe using either method mentioned above.
2. Place the cell in the beaker and add sufficient YSI #3140 solution to cover the electrodes. Do not cover the top of the probe.
3. Plug the probe into the Model 33 or 33M, and switch to the X100 scale to platinize the electrode. Move the probe slightly to obtain the highest meter reading and continue platinizing for the approximate time shown below:

<u>Meter</u> <u>umhos/cm</u>	<u>Reading</u> <u>mS/M</u>	<u>Time</u> <u>minutes</u>
30,000	3,000	5
25,000	2,500	6
20,000	2,000	8
15,000	1,500	11
10,000	1,000	16

4. After the elapsed time, remove the probe and rinse in fresh water.
5. Return the solution to its container. Two ounces of solution should be sufficient for 50 treatments.

Storage: It is best to store conductivity cells in deionized water. Cells stored in water require less frequent platinization. Any cell that has been stored dry should be soaked in deionized water for 24 hours before use.

## Probe Use:

1. Obstructions near the probe can disturb readings. At least two inches of clearance must be allowed for non-metallic underwater objects. Metallic objects such as pliers or weights should be kept at least six inches from the probe.
2. Weights are attached to the cable of the YSI 3310 and 3311 Probes. The YSI 3327 weights are supplied in pairs with a total weight of four ounces per pair. Should it become necessary to add more weight to overcome water currents, the total weight should be limited to two pounds (eight pairs). For weights in excess of two pounds, use an independent suspension cable. In either case, weights must be kept at least six inches away from the probe.

3. Gentle agitation by raising and lowering the probe several times during a measurement ensures flow of specimen solution through the probe and improves the time response of the temperature sensor.

## 5.0 LABORATORY PROCEDURES AND ANALYTICAL EQUIPMENT

### 5.1 Soils Laboratory

The soil samples taken for physical testing will be analyzed using ASTM methods as defined in the Workplan (Section 7). The one exception is permeability testing on fine-grained soils, because ASTM does not have an official testing method. RMT will use a method that is outlined below.

#### 5.1.1 Methods

**Grain-Size Distribution.** Samples to be tested for grain-size distribution will be prepared according to ASTM D 421 and tested in accordance with ASTM D 422. Sand and gravel portions of the samples will be analyzed using a sieve method, and the silt and clay portions will be analyzed using a hydrometer method. The data from these two tests will be combined into one grain-size distribution curve.

**Atterberg Limits.** The samples for this test will also be prepared according to ASTM D 421 and tested in accordance with ASTM D 4318. This test is used to classify the portion of the sample passing the #40 (425 micron) sieve, and is used along with the grain-size data to classify the entire sample according to the Unified Soil Classification System (USCS).

**Permeability Tests.** Samples that are considered fine-grained will be analyzed using flexible-wall permeameters using back-pressure and effective stresses as determined by the test engineer. This method minimizes the effects of side-wall leakage and allows the engineer to vary the effective stress on the samples to simulate field conditions.

The method is similar to the "Permeability Tests with Back Pressure" as discussed in EM 1110-2-1906 (DOA, 1970). The degree of saturation will be measured directly by performing B-checks, or by back-calculation when the test is completed.

#### **5.1.2 Lab Equipment Calibration and Maintenance**

The equipment used for the testing methods discussed in Section 5.1.1 is visually checked and maintained by the soils technicians as they use the equipment on a daily basis. They immediately notify the laboratory supervisor of any equipment problems, and watch for irregularities in the way equipment behaves or in the data which it provides.

#### **5.1.3 Data Analysis and Reporting**

The data produced in the RMT Soils Laboratory has several levels of quality control checks. The first level of control is the testing technicians themselves. Technicians are generally responsible for the testing and the data report that is produced. The next level of control is another technician or lab supervisor who checks the calculations or data input into the computer. The lab supervisor then reviews data for completeness and the appropriate signatures. The last step of quality control in the lab is the review of the data by a geotechnical engineer. Each of the control checks requires the initials of the person doing the check. The data are then copied and distributed to the appropriate technical staff for their use. The original data sheets are filed in a permanent file by project number.

**5.2 Chemistry Laboratory**

The laboratory analyses of soil/sediment, surface water, and ground water for the organic and inorganic constituents on the CLP Target Compound List will be analyzed by the procedures specified in the Statements of Work for those constituents. The laboratory which has tentatively been selected to perform the analyses (Cambridge Analytical Associates, 106 Commonwealth Avenue, Boston, MA 02215) is participating in the USEPA CLP at the time analyses are scheduled to be performed.

## 6.0 SAMPLE CUSTODY

The possession of samples must be traceable from the time of collection through the use of chain-of-custody procedures. Specific chain-of-custody forms must accompany all sample shipping containers to document the transfer of the shipping containers and samples from the field to the laboratory receiving the samples for analysis. The procedures to be implemented are as follows:

- . Preparation of sample containers with pre-applied labels by the laboratory, with chain-of-custody seals on shipping containers.
- . Proper identification and labeling of each sample in the field with indelible, waterproof ink.
- . Completion of chain-of-custody forms in the field, indicating sample identification, containers filled, sampling date, sampling time, sample collector, and sample preservation, if applicable. This information will also be noted in the field notebooks maintained on the site.
- . Repacking of shipping containers with samples, chain-of-custody forms, and ice packs. Each set of sample containers to be shipped together in a single shipping container is assigned a chain-of-custody form, which travels with the shipping container.
- . Sealing and shipping of containers to the appropriate laboratory. Common carriers or intermediate individuals shall be identified on the chain-of-custody form, and copies of all bills-of-lading will be retained.
- . Receiving and checking of shipping containers in the laboratory for broken seals or damaged sample containers. If no problems are noted, samples are logged into the laboratory, and the chain-of-custody form is completed.
- . Inclusion of copies of the chain-of-custody form with the analytical data.
- . Unused sample containers are returned to the laboratory with the chain-of-custody forms.

An example chain of custody form is included in Attachment A. If an error is discovered on a sample chain-of-custody form, the person who

made the error should correct it when possible. Corrections or insertions are made by crossing out the incorrect information and inserting the correction needed. The date and the correcting person's initials will be written beside the correction. This procedure applies to words or figures inserted or added to a previously recorded statement. Completed chain-of-custody forms will be placed in a plastic bag, sealed, and taped to the inside cover of the shipping container. After icing the samples, the coolers will be sealed, dated, and shipped to the appropriate laboratory using an overnight delivery service. The samples to be sent to the RMT Soils Laboratory will not be iced and will be shipped by regular carrier or delivered by the field crew.

A separate Sample Receipt is prepared whenever samples are split with a government agency. The receipt is marked to indicate with whom the samples are being split. The person relinquishing the samples to the agency should request the agency representative's signature acknowledging sample receipt. If the representative is unavailable or refuses, this is noted on the receipt and in the field notebook.

If a chain-of-custody form is lost in shipment, a written statement will be prepared by the person who collected the samples listing the samples that were recorded on the lost form and describing when and how the samples were collected. The statement should include information such as field log book entries regarding the sample. This statement is submitted to the RI Task Leader and RMT Project Manager for further action, as necessary.

## 7.0 CALIBRATION PROCEDURES AND FREQUENCY

### 7.1 Field Equipment

The specific calibration procedures and frequency for the field equipment to be used during the field activities are described in Section 4.0 of the QAPP.

### 7.2 Analytical Equipment

The specific calibration procedures and frequency for the laboratory analytical equipment to be used are described in the USEPA CLP Statements of Work for organic and inorganic constituents.

## 8.0 INTERNAL QUALITY CONTROL CHECK

The QC checks for the matrices sampled will be provided by the use of the following field samples:

- Duplicate (Replicate) Samples - Duplicate samples are samples collected simultaneously from the same source under identical conditions into separate containers.
- Background Samples - Background samples are taken in an area known or thought to be free from the constituents of concern.
- Trip Blank - A trip blank is a sample bottle which will be filled in the laboratory directly from an organic-free, deionized water source. The trip blank will accompany sample bottles to the site as well as to the laboratory whenever VOCs are to be analyzed in the samples.
- Rinse (Equipment) Blank - A rinse blank is a sample bottle that is filled with deionized water in the field. The deionized water is handled in the same manner as the sample (e.g., if the sample is ground water that has been filtered, the deionized water will be filtered and preserved as needed).

The definition and quantities of each of these samples are summarized in Table B-1.

The internal QC program for the laboratory chemical analyses is defined in the USEPA CLP Statements of Work for organic and inorganic constituents.

## 9.0 DATA REDUCTION, VALIDATION, AND REPORTING

This section establishes the procedures for data reduction, validation, and reporting. The procedures will apply to all data produced from field and laboratory measurements. Established techniques will be employed for data reduction and validation. The exact method used for data reduction and validation will be documented for each technique. Where possible, written procedures or instructions will accompany the data or be specifically cited. The QA/QC reviewers, identified in Section 2.0 of the QAPP, are responsible for ensuring that data reduction, validation, and reporting methods follow the approved procedures.

### 9.1 Data Validation

Mechanisms for data validation are included in the laboratory QC program defined by the CLP (e.g., spiked samples, replicate samples, calibration checks) and in the evaluation of data within the environmental setting following the release of the data from the laboratory (e.g., identification of outliers, spatial or temporal trend analyses, field duplicate samples). The chemistry QC Reviewer and the RI Task Leader have the primary responsibility for validation in the laboratory and post-laboratory phases, respectively. The following data reviews will be implemented by the QC Reviewer and/or the RI Task Leader:

- . Review data summaries and reports for transcriptional and typographical errors.
- . Review and determine if sampling protocols were appropriate.

- . Review and compare the data against the rinse and trip blanks to detect contamination from sampling.
- . Review and compare duplicate samples.
- . Review laboratory QC including laboratory blanks, spike recovery, method standards, and duplicates to determine whether data meet CLP requirements or are usable for the stated objective for the data.
- . Delete unusable data and attach appropriate qualifiers to usable data that explain the limitations of the data.
- . Review and summarize detection limits for nondetectable results.
- . Review detection limits for positive but nonquantifiable data. Confirm that appropriate qualifiers have been given.
- . Review sampling design for dealing with media variability.
- . Review data to determine that sufficient site-specific background samples are available.
- . Review data to determine that the data are of sufficient quality to estimate site-specific background concentrations.

#### **9.1.1 Field Activities Results**

Field measurements will be validated by comparison to replicate measurements or previous data. If there are substantial changes or inconsistencies with respect to time and space, the data will be repeated, if possible.

#### **9.1.2 Analytical Results**

Validation of laboratory data is accomplished by several different steps. Quality control checks of precision and accuracy data are used to confirm the validity of the results. Established quality control limits for precision and accuracy will be generated by each laboratory and used by the QA/QC coordinator to check the acceptability of the

data. Data which does not conform to the acceptability limits will be dealt with using the procedures described in Section 12.0 of the QAPP. Validation procedures will include calculation checks, field and laboratory blanks, and reference standards. Data reported by the laboratories will be reviewed by the QC Reviewer-Chemistry and the RI Task Leader to validate acceptance of data before reports are finalized.

## **9.2 Data Reduction and Reporting**

The procedures described here apply to all data reduction and reporting of field and laboratory measurements. The specific method used for data reduction will be documented for each technique. The QA reviewers are responsible for seeing that these methods follow the approved procedures. The individuals responsible for this task are listed in Section 2.0 (Project Organization and Responsibility) of the QAPP.

### **9.2.1 Field Activities Results**

Field notes will be transferred regularly by field staff from the bound field notebooks to standard RMT reporting forms. All the field data used in the RI Report will be identified and appended in the form of tables, maps, or cross sections. Replicate measurements will be averaged.

### **9.2.2 Analytical Results**

The laboratory data reduction methods are dependent on the analytical technique. The reduction procedures are presented in the CLP

Statements of Work for organic and inorganic constituents. The data will be formatted into reports presenting the analytical and QC results as specified in the Statements of Work. The laboratory data will also be reduced to summary tables to facilitate the interpretation of the data in the RI and FS reports.

**10.0 PERFORMANCE AND SYSTEM AUDITS**

Systems audits will be performed on a periodic basis throughout the duration of the project. Audits of non-laboratory activities will be performed at project milestones (e.g., completion of draft reports) and at any point deemed necessary by the QA reviewers or the RMT Project Manager. The audits will include reviews of QC procedures, implementation of those procedures, documentation, and corrective action implementation.

Performance audits of the Laboratory are conducted as part of the USEPA CLP. The laboratory performing the analyses will be participating in the program at the time the samples for this investigation are analyzed.

**11.0 PREVENTIVE MAINTENANCE**

**11.1 Field Equipment**

The specific preventive maintenance procedures for the field equipment to be used during the field activities are described in Section 4.0 of the QAPP.

**12.0 SPECIFIC ROUTINE PROCEDURES USED TO ASSESS DATA PRECISION,  
ACCURACY, AND COMPLETENESS**

The procedures used to assess data precision and accuracy will be limited to a review of the laboratories' QC data, and the results of the rinse blank, the trip blank, and the duplicates using the procedures outlined in USEPA guidance documents (USEPA, 1987). The completeness of the sampling plan will be assessed after the analytical results have been received.

### 13.0 CORRECTIVE ACTION

Corrective actions will be instituted whenever potential or existing conditions are identified that may negatively affect the quality of the information produced by the investigation. It is the responsibility of staff members to 1) report project activities or products discovered not to be in conformance with established plans and procedures, and 2) initiate the disposition process.

The individual who detects or suspects nonconformance to established criteria or protocols in equipment, instruments, data, methods, etc., will notify their supervisor, who will in turn notify the RI Task Leader and the QA Reviewer. The RI Task Leader will then investigate the nature and extent of the problem and take the necessary corrective steps in conjunction with the RMT Project Manager. Data that has been adversely affected by the nonconformance will be identified. The corrective action will be reviewed with the QA Reviewer.

Laboratory data which are found to fall outside of quality control limits will be considered nonconforming and will require corrective action that may include the following options:

- . Reanalyzing the samples, if holding time criteria permit.
- . Resampling and analyzing.
- . Evaluating and amending sampling and analytical procedures.
- . Accepting the data and acknowledging its level of uncertainty.

**14.0 QUALITY ASSURANCE REPORT**

The RI Report will contain a QA/QC section summarizing the quality of the data. The QA of the data will also be discussed in the Technical Memoranda produced at the end of each task of the SIP (Section 7 of the Workplan). The QA report will address the assessment of data precision, accuracy, completeness, representativeness, and comparability, the results of performance audits, if any, the results of system audits, any reported nonconformances, any significant QA problems and recommended solutions, and approved revisions to QA/QC processes.

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**ATTACHMENT A**

**EXAMPLES OF FIELD FORMS AND CHAIN-OF-CUSTODY FORM**



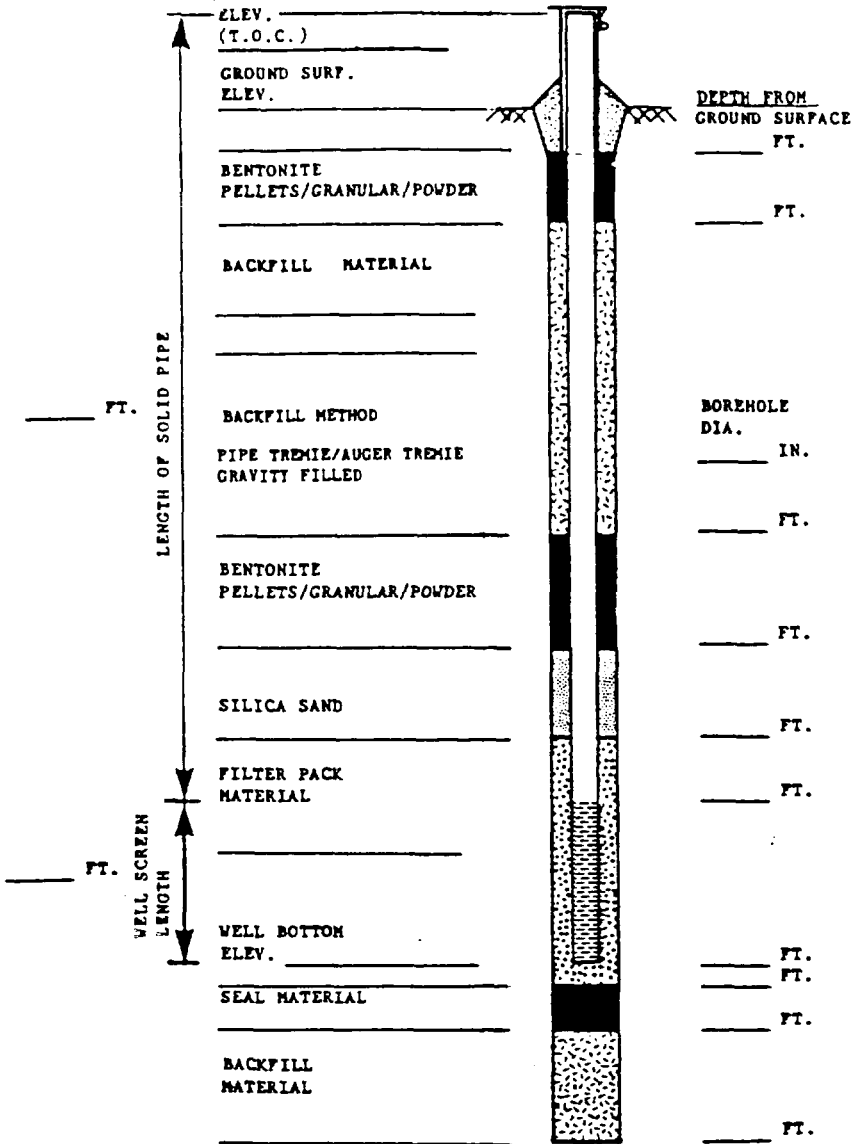




PROJECT NAME: \_\_\_\_\_ NO. \_\_\_\_\_

WELL NO. \_\_\_\_\_

DATE INSTALLED \_\_\_\_\_



1) CASING DETAILS

- A) TYPE OF PIPE: PVC, STAINLESS, TEFLON, OTHER \_\_\_\_\_  
PIPE SCHEDULE \_\_\_\_\_
- B) TYPE OF PIPE JOINTS; COUPLINGS, THREADED (W/TAPE?), OTHER \_\_\_\_\_
- C) WAS SOLVENT USED? YES OR NO
- D) TYPE OF WELL SCREEN: PVC, STAINLESS, TEFLON, OTHER \_\_\_\_\_
- E) WELL SCREEN SLOT SIZE \_\_\_\_\_
- F) PIPE DIA: ID IN. \_\_\_\_\_ OD IN. \_\_\_\_\_
- G) INSTALLED PROTECTOR PIPE W/LOCK? YES OR NO  
PROTECTOR PIPE DIA. \_\_\_\_\_ IN.

2) WELL DEVELOPMENT

- A) METHOD  
BAILING, PUMPING, SURGING, COMPRESSED AIR  
OTHER \_\_\_\_\_  
(NOTE ADDITIONAL COMMENTS BELOW)
- B) TIME SPENT FOR DEVELOPMENT? \_\_\_\_\_
- C) APPROXIMATE WATER VOLUME: REMOVED \_\_\_\_\_  
ADDED \_\_\_\_\_
- D) WATER CLARITY BEFORE DEVELOPMENT?  
CLEAR, TURBID, OPAQUE
- E) WATER CLARITY AFTER DEVELOPMENT?  
CLEAR, SLIGHTLY TURBID, TURBID, OPAQUE
- F) ODOR? YES OR NO

3) WATER LEVEL SUMMARY

- A) DEPTH FROM TOP OF CASING AFTER DEVELOPMENT?  
\_\_\_\_\_ FT. OR DRY
- B) OTHER MEASUREMENTS (T.O.C.):  
DATE/TIME \_\_\_\_\_ FT.  
DATE/TIME \_\_\_\_\_ FT.  
DATE/TIME \_\_\_\_\_ FT.

ADDITIONAL COMMENTS: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_









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**APPENDIX C**

**SITE-SPECIFIC HEALTH AND SAFETY PLAN  
ALGOMA LANDFILL  
ALGOMA, WISCONSIN**

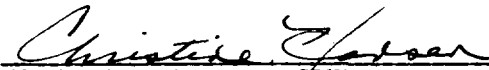
May 1988

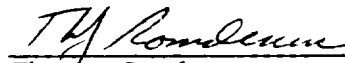
Revision 1 - August 1988


USEPA Docket No. V-W-87-C-036

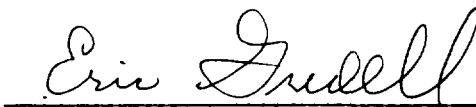
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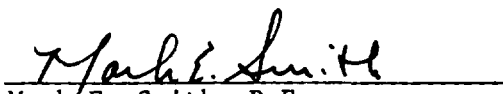
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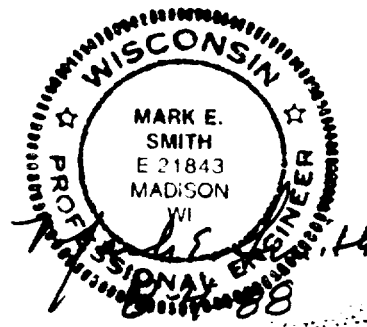
  
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- Appendix A - Table of Contents and Health and Safety Policy Statements, RMT Health and Safety Manual
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- Appendix C - Map of Route to Hospital

## **1. INTRODUCTION**

### **1.1 Background**

RMT, Inc., (RMT) has been retained by the Algoma Landfill Respondents to complete a remedial investigation and feasibility study of the Algoma Municipal Landfill, Algoma, Wisconsin.

Services to be provided by RMT during the Phase I field investigations include topographic surveying, geophysical surveying, pore gas surveying, soil boring and soil/sediment sampling, surface water sampling, well installation, and ground water sampling. The field investigations are scheduled to begin in August 1988.

### **1.2 Purpose**

The site-specific Health and Safety Plan (HSP) provides guidelines and procedures intended to help protect the health and safety of RMT field personnel conducting the field investigations. Personnel participating in the field work will review these guidelines and procedures before initially entering the site. Specific questions regarding the Health and Safety Plan should be addressed to the RMT Health and Safety Coordinator, Christine Hansen. The HSP will be updated as necessary when additional information becomes available.

A copy of the site-specific Health and Safety Plan and RMT's Corporate Health and Safety Manual will be kept at the site. They will be available for review by RMT personnel and authorized visitors upon request to RMT's Site Health and Safety Representative.

### **1.3 Scope**

The HSP is aimed specifically at protecting workers from reasonably foreseeable health and safety hazards arising from the wastes known or suspected to be at the project site, as described in Section 4 of the Workplan, and from hazards arising from the activities to be performed on the site as described in Section 7 of the Workplan. This plan is to be followed during the remedial investigation field tasks conducted at the Algoma Municipal Landfill.

The HSP has been developed based on the requirements and guidance contained in the following regulations and guidance documents:

- . Occupational Safety and Health Administration (OSHA) Standards, 29 CFR 1910 and 1926, including 29 CFR 1910.120
- . U.S. Environmental Protection Agency (USEPA) "Standard Operating Safety Guides," November, 1984
- . ER 385-1-92, "Safety and Occupational Health Document Requirements for Hazardous Waste Site Remedial Actions," August 30, 1984
- . NIOSH/OSHA/USCG/EPA "Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities," October 1985

The HSP is based on information available as of April 1988, and is subject to revision as new data and information on potential health and safety hazards on the site become available.

### **1.4 Applicability**

The HSP applies to RMT personnel who participate in the field investigations. It contains minimum requirements necessary to protect on-site personnel from physical and chemical hazards particular to this site, which have been identified as of the date of the HSP. Personnel

are required to comply with the approved HSP while performing work related to this investigation.

Employees of the government, government agencies, and authorized visitors are responsible for their own health and safety while on the site.

RMT personnel will also abide by policies and procedures included in the RMT Health and Safety Manual. A copy of the Table of Contents and RMT Health and Safety Policy Statement from the Health and Safety Manual is included as Appendix A to this plan. In the event of discrepancies between RMT's manual and this site-specific HSP, the policies and procedures in the HSP will take precedence.

## 2. FIELD PERSONNEL HEALTH AND SAFETY TRAINING AND MEDICAL SURVEILLANCE

### 2.1 Health and Safety Training

The training requirements in OSHA Standard 29 CFR 1910.120 are to be followed, at a minimum, by all personnel that enter the site.

Prior to the start of field activities, RMT personnel conducting or observing on-site activities will participate in the following health and safety training sessions:

- . Site-specific Health and Safety Meeting - This HSP will be reviewed, and any special procedures will be outlined.
- . Health and Safety for Hazardous Waste Site Activities - This 40-hour training session includes the following elements: regulations, industrial hygiene, toxicology, respiratory protection, physical hazards, noise, temperature extremes, personal protective equipment, medical surveillance, air monitoring equipment, site control and decontamination, standard operating procedures, and confined space entry.

Training will be provided to additional RMT field personnel so that back-up personnel can be assigned to the site as, and when, the need arises.

Documentation of attendance in training sessions is maintained by the RMT Personnel Department and the RMT Health and Safety Coordinator in Madison, Wisconsin.

In addition to the formal training required, RMT on-site personnel will have a brief meeting each day before beginning work to discuss the tasks to be done that day, potential health and safety hazards associated with the tasks, and any necessary precautions to be taken.

## 2.2 Medical Surveillance

Medical surveillance requirements contained in OSHA Standard 29 CFR 1910.134 and 29 CFR 1910.120 are to be followed, at a minimum, by all personnel that enter the site. RMT field personnel assigned to the site will receive an initial medical examination prior to performing their first field assignment, and on an annual basis thereafter. The protocol for the yearly medical examination includes the following:

- . Health history
- . Vital signs and physical examination screen
- . Pulmonary functions
- . Hematology survey
- . Urinalysis
- . Heavy metal screen
- . Blood chemistry screen (SMA-20)
- . Stool for occult blood
- . Vision test
- . Hearing test

The initial examination includes an EKG and chest x-ray, in addition to the above annual tests.

RMT field personnel assigned to conduct these investigations will have passed the required medical examination before entering the project site.

Medical records of RMT personnel are kept on file at the examining physician's clinic. A certificate of medical fitness or specified work restrictions is maintained in the employee's personnel file at RMT.

### 3. HAZARD EVALUATION

#### 3.1 Chemical Hazards

Organic Compounds - The primary potential chemical hazards that have been identified at the Algoma Municipal Landfill are organic compounds. The following organic compounds are suspected to be present on site:

<u>Chemical Name</u>	<u>OSHA Permissible Exposure Limit* in ppm</u>	<u>ACGIH Threshold Limit Value* in ppm</u>
Xylene	100	100
VM&P Naphtha	--	300
Toluene	200	100
Methanol	200	200
Formaldehyde	1	1
Vinyl Acetate	--	20
Benzene	1	10
Methyl Ethyl Ketone (2-butanone)	200	200

\*The OSHA Permissible Exposure Limits and the ACGIH Threshold Limit Values listed are for an eight-hour time-weighted average exposure (inhalation).

Material Safety Data Sheets for the compounds listed above are included in Appendix B to provide basic physical and safety related information.

The primary potential route of exposure for the above substances would be inhalation of vapors. In addition, methanol may be absorbed directly through the skin. Secondary potential routes of exposure would be skin contact with contaminated soils or liquids and accidental ingestion from contact with contaminants or contaminated articles.

Toxic Dusts - Information obtained by RMT indicates that wastes containing asbestos have been disposed at the Algoma Municipal Landfill. The waste has been covered with fill, as required by the WDNR

to prevent asbestos fiber release. If asbestos disposal areas are disturbed by weather conditions or work activities, there is a potential

for exposure of personnel to airborne asbestos fibers. The primary potential route of exposure would be inhalation of fibers. A secondary route of exposure would be inhalation of airborne fibers released from clothing or articles contaminated through contact with asbestos wastes.

The OSHA Permissible Exposure Limit for airborne asbestos fibers is 0.2 fibers of asbestos per cubic centimeter of air (f/cc) as an 8-hour time-weighted average exposure with an action level of 0.1 f/cc. The ACGIH 8-hour time-weighted average Threshold Limit Values for asbestos are: amosite - 0.5 f/cc, crocidolite - 0.2 f/cc, chrysotile and all other forms - 2.0 f/cc.

### **3.2 Physical Hazards**

#### **3.2.1 Utilities**

Overhead and underground utilities (e.g., electric, gas, telephone, water, sewer, drainage, etc.) in the area must be located by the drilling contractor before the start of any operations which require digging (soil boring and monitoring well installation) or moving and set-up of heavy equipment, such as the drill rig. Information regarding locations of utilities will be kept at the site by the RMT Site Coordinator for reference.

#### **3.2.2 Explosion**

Methane gas is anticipated to be present at the landfill site. The explosive range of methane gas in air is 5-15 percent. A combustible gas monitor will be used at the site to measure concentrations of methane during work activities that have the potential to release

methane, e.g., soil borings, well installation, etc. This is discussed further in Section 4 - Air Monitoring.

### **3.2.3 Heavy Equipment**

Heavy equipment such as the drill rig, or drum handling equipment to be used on the site is under the control of the contractor who is responsible for maintaining the equipment in good working order and operating it safely. Subcontract requirements for contractors operating this equipment will state that applicable OSHA and state health and safety requirements must be met by the contractor. However, RMT personnel shall not work near equipment that they judge to be unsafe because of deterioration, missing parts, obvious defects, or improper operation. The RMT Project Manager will be notified immediately if unsafe equipment or work practices are observed on the site.

Operation of heavy equipment in areas with steep embankments or unstable ground will be avoided if possible. If it is necessary to operate equipment in these areas, the contractor will make provisions to ensure the safety of the equipment operator and other personnel in the area.

### **3.2.4 Vehicle Traffic**

Gravel trucks will be operating on the haul road in the area adjacent to the exclusion zones and decontamination zone. Field personnel must be alert to traffic and yield right-of-way to the gravel trucks. Personnel shall notify the haulers if they will be working near the road.

### 3.2.5 Drum Handling

The drilling contractor will be responsible for providing and handling the drums containing drilling-related liquids or soils and liquids from decontamination procedures. RMT personnel may be required to assist with filling the drums. Protective clothing as specified in Section 5.1.1 will be worn during any drum filling operations.

### 3.2.6 Heat Stress

The USEPA Standard Operating Safety Guides (1984) recommend that a heat stress monitoring program be implemented when employees are wearing impervious clothing and ambient temperatures are 70°F or above. The frequency of monitoring should increase as temperatures increase, and employees should be monitored after each work period when ambient temperatures exceed 85°F. The following monitoring program recommended by the USEPA guide shall be used by personnel when ambient temperatures exceed 70°F:

- Heart Rate (HR) shall be measured by the radial pulse for 30 seconds as early as possible in the resting period. The HR at the beginning of the rest period should not exceed 110 beats per minute. If the HR is higher, the next work period shall be shortened by 10 minutes, while the length of the rest period stays the same. If the pulse rate is 100 beats per minute at the beginning of the next rest period, the following work cycle shall be shortened by another 33%.

All personnel shall remain alert to the symptoms of heat stress.

The general symptoms include the following:

- Heat Rash: Decreased ability to tolerate heat, chafing clothes.
- Heat Cramps: Muscle spasms and pain in the extremities and abdomen.

- . Heat Exhaustion: Shallow breathing; pale, cool, moist skin; profuse sweating; dizziness and lassitude.
- . Heat Stroke: Red, hot, dry skin; no perspiration; nausea; dizziness and confusion; strong rapid pulse; coma. Immediate medical assistance must be obtained.

Heat stress preventative measures will be implemented with shaded rest areas and ample quantities of cool liquids for worker consumption.

## **4. AIR MONITORING**

### **4.1 Purpose**

Air monitoring will be conducted to help ensure that the level of respiratory protection selected for field personnel is adequate for the different phases of the field investigation. Changes in the level of protection may be required if significant changes in airborne concentrations of contaminants occur.

### **4.2 Parameters**

Concentrations of total organic vapors and gases and combustible vapors and gases will be monitored using direct-reading equipment in the breathing zone during soil boring and sampling, well installation, ground water sample collection, and during other activities reasonably expected to generate air contaminants. RMT personnel will be instructed prior to going on-site of the potential presence of formaldehyde vapors.

A field gas chromatograph will be used on-site for analysis of pore gases beneath the surface of the disposal areas and initial sample screening (soil and sediments) for volatile organic compounds. These results may also be used to complement the measurements made by the direct-reading monitoring equipment.

In addition, in areas where high concentrations of airborne contaminants are likely to be released during work activities, initial air sampling using standard industrial hygiene procedures (pump, filter media, and laboratory analysis) may be conducted to identify and quantify the specific airborne contaminants. If required, the levels of personal protection shall then be changed based on this information.

#### 4.3 Monitoring Equipment

The HNU Systems, Inc., model PI-101 photoionization detector (HNU) with an 11.7 eV probe will be used as the primary instrument for routine monitoring of organic vapor concentrations. The HNU measures concentrations of organic vapors in air and provides a direct readout of the organic concentrations as parts per million (ppm) equivalent to benzene. The instrument will be calibrated in the field at least twice daily, before and after use, with span gas provided by HNU Systems, Inc.

The Foxboro OVA 128 Century Organic Analyzer (OVA) may also be used for routine monitoring of organic vapor concentrations. The OVA measures concentrations of organic vapors in air and provides a direct readout of the organic concentrations as ppm equivalent to methane.

The Neotronics Exotox 40-OHF triple gas detector will be used as the primary instrument for initial and routine monitoring of concentration levels of combustible vapors and gases. The Exotox simultaneously measures levels of combustible vapors and gases and oxygen concentrations. The direct readout for combustible gases and vapors is as a percent of the lower explosive limit (LEL) of methane. Oxygen is measured as the percent present in the air being monitored.

Detector tubes will be used for monitoring of benzene and vinyl chloride vapor concentrations when HNU readings in the air exceed 1 ppm. The tubes measure concentrations of benzene in the air between 0.5 and 10 ppm and vinyl chloride in the air between 0.25 and 6 ppm, and provide a direct readout of the benzene and vinyl chloride concentrations.

Temporary wind direction indicators (telldales) will be placed in the immediate vicinity of each work zone. The indicators will be used in evaluating air monitoring data (see Section 4.6) and as guidance for leaving the work zone should the air monitoring equipment indicate potentially hazardous conditions to be present in the work zone.

#### **4.4 Monitoring Schedule**

Air monitoring using the direct-reading equipment will be conducted at the beginning of each day on the upwind side of the site to establish background concentrations in the air. The air monitoring for organic vapors and gases will be conducted in the breathing zone of the workers to determine potential exposure levels. The HNU will be operated

continuously, and measurements will be recorded periodically by field personnel. Levels of combustible vapors and gases released from the ground will also be measured periodically whenever the soil is broken by excavations or drilling. These procedures will be employed daily throughout the field investigation wherever tasks are undertaken which can reasonably be expected to generate air contamination, such as drilling, pumping, sampling, etc.

#### **4.5 Establishing Background Levels of Air Contaminants**

Background concentrations in air, as equivalent parts per million of benzene, measured with the HNU or equivalent parts per million of methane measured with the OVA will be established prior to initiating any site activity which requires air monitoring. The background level will be re-established each time the project site is entered, at least once daily before the site is entered, and more frequently if conditions likely to affect the background level change significantly, e.g., airborne contaminants transported into the work areas from off-site sources.

If background concentration levels are found to present a potential health hazard, the levels of personal protection will be adjusted to provide protection from these additional exposures.

#### **4.6 Response to Concentrations of Air Contaminants Above Background Levels**

If the HNU or OVA measure significant breathing zone concentrations of organic vapors and gases above background levels, the following general guidelines will be used by the Site Health and Safety

Representative as part of decision-making criteria for establishing the appropriate level of protection:

- . Background to 5 ppm above background - Level D protection as defined in Section 5.1.1 will be used. Field personnel will use detector tube measurements of benzene and vinyl chloride and their experience and judgment to aid in determining whether an initial reading greater than background is "drift" on the equipment, exhaust from an engine, or is from other sources of erroneous readings. However, personnel will not be allowed to continue work in the area until the cause for the high reading has been determined. The determination must be documented in the field log book.
- . 5 ppm above background to 10 ppm above background - Level C protection as defined in Section 5.1.2 will apply. While working in Level C protection, if the airborne concentrations measured on the HNU or OVA fall below 5 ppm for at least 10 minutes, and the tasks being conducted are not reasonably expected to generate a recurrence of airborne levels exceeding 5 ppm (above background), the Site Health and Safety Representative may make the decision to return to Level D protection.
- . Greater than 10 ppm above background - Personnel will leave the area, and work in that area will be suspended until the concentrations return to levels less than 10 ppm above background. The Site Health and Safety Representative will notify the RMT Project Manager and the RMT Health and Safety Coordinator as soon as practical to inform them of the situation. After discussion, the Site Health and Safety Representative may be authorized by the PM and HSC to re-enter the site with adequate personal protection to determine if the concentration levels persist. If the levels persist, additional air sampling may be required to identify and quantify the air contaminants responsible for the excessive concentrations. The additional sampling may be through a specific direct-reading method (e.g., Draeger colorimetric tubes) or a method requiring laboratory analysis (e.g., personal sampling pump and sampling media). After evaluation of this data, the Health and Safety Coordinator may adjust the level of protection required based on the nature and extent of the airborne substances present and the degree of hazard to which on-site personnel may be exposed.

The combustible gas monitor contains pre-set audible alarms at 20% of the lower explosive limit (of methane) and 18.5% oxygen content in air. If either alarm registers, personnel will leave the immediate area and work will be suspended until concentrations return to levels within

the alarm limits. If the fire, explosion, or low oxygen hazard persists, the necessity to perform work in the specific location, or the methods and equipment used will be re-evaluated.

#### **4.7 Documentation**

Air monitoring readings from direct-reading instruments will be recorded in the field log books with the date, time, location, task being conducted, concentration levels, and any observations noted. Readings will be recorded of the concentration levels present prior to the start of field activities which may cause contaminants to become airborne by disturbing contaminated soil or ground water, every 30 minutes thereafter, and whenever there is any noticeable odor.

## 5. LEVELS OF PROTECTION

### 5.1 Levels of Protection for Work Activities

In general, protective clothing must be worn whenever the potential exists for employees to come in contact with or to be exposed to contaminated materials.

Work activities will be conducted under Level D or Level C protection based on the most current information available on potential health and safety hazards on the site. If Level B or Level A protection is deemed necessary, modifications of the Workplan and an extension of the field work schedule may be required.

#### 5.1.1 **Level D Protection: Background to 5 ppm Above Background**

Based on an evaluation of the data and information available as of April 1988, it has been determined that the field personnel can be adequately protected from potential health hazards present using Level D protection as long as significant airborne contaminant concentrations are not present. Hence, all field work will be conducted under Level D requirements unless the HNU or OVA readings indicate that organic vapor concentrations are exceeding 5 ppm above background.

#### Geophysical Surveys and Surveying

For tasks that involve little or no potential contact with contaminants, Level D protection will apply. Level D protection for these tasks will consist of the following:

- Sturdy work shoes
- Impervious PVC overboots

### Soil Borings and Sampling

During soil borings and soil sampling, Level D protection will consist of the following to protect the personnel from contact with contaminated soils:

- . Steel-toe work boots
- . Hard hat
- . Eye protection; safety glasses, goggles, or full-face shield
- . Impervious PVC overboots
- . Impervious PVC gloves
- . Tyvek® suits

### Surface Water Sampling, Monitoring Well Installation and Sampling, Equipment Decontamination, and Waste Drum Filling

During on-site activities with the potential for liquid splashes of contaminants, Level D protection will consist of the following:

- . Steel-toe work boots
- . Hard hat
- . Eye protection; either splash goggles or a full-face shield
- . Impervious PVC overboots
- . Impervious PVC gloves
- . Poly laminated Tyvek® suits

#### **5.1.2 Level C Protection: 5 ppm Above Background to 10 ppm Above Background**

Level C requirements include the protective clothing and equipment specified for the various categories of tasks listed under Level D protection plus air-purifying respirators which must be worn when

working in Level C. Air-purifying respirators with combination organic vapor/HEPA filtration will be available on-site and will be used when working in Level C. Each person required to use a respirator will be issued the type and size of respirator as determined by that person's fit test.

### **5.1.3 Level B Protection: Greater Than 10 ppm Above Background**

Level B protection requires that a self-contained breathing apparatus be used in addition to the personal protective clothing requirements. As stated in Section 4.6, if air contaminant concentrations exceed 10 ppm above background, work will be stopped and personnel will leave the area until concentrations return to levels less than 10 ppm above background, or until the Health and Safety Coordinator determines that Level B protection is to be implemented and the required personal protective equipment has been obtained.

## **5.2 Changes in Levels of Protection**

The Site Health and Safety Representative may authorize a change in the level of protection based on an evaluation of actual field conditions after consulting with the Health and Safety Coordinator.

New air monitoring data may reveal the presence of concentrations of organic vapors or other air contaminants above acceptable levels for the type of respiratory protection being used. If this occurs, the Site Health and Safety Representative will contact the Health and Safety Coordinator to evaluate the need to modify the level of protection required in a particular area and discuss the results of the evaluation

with the RMT Project Manager. If changes in the level of protection are warranted, the Site Health and Safety Representative will inform the field personnel and the RMT Project Manager of the changes.

### **5.3 Work Limitations**

- . No smoking will be allowed in the work zones.
- . No eating or drinking will be allowed in the work zones.
- . All personnel and equipment leaving the work zones must be properly decontaminated prior to leaving the site.
- . A minimum of two persons will be on-site during work activities in the work zones. This may be one RMT person and one subcontractor person.

## **6. SITE CONTROL**

### **6.1 Purpose**

The purpose of site control is to minimize the transfer of contaminants from and within the project site. Two contamination control methods are 1) establishment of work zones at the project site; and 2) decontamination of field personnel and equipment.

### **6.2 Work Zones**

To prevent the spread of contaminants during the work, an exclusion zone, contamination reduction zone, and support zone will be delineated. Figure C-1 shows locations of proposed geophysical survey lines (exclusion zone), decontamination area, and support area.

#### **6.2.1 Exclusion Zone**

The exclusion zone is the zone where hazardous substances may be present, based on available information. During field activities at the project site, the outer boundaries as shown on Figure C-1 for the North Disposal Area, Landfill Disposal Area, and South Disposal Area are considered to be the exclusion zones. Temporary exclusion zones will also be established around drilling rigs (30 to 40 foot radius) during subsurface investigations beyond the exclusion zones shown on Figure C-1. All personnel entering these zones must wear the required protective equipment.

### **6.2.2 Decontamination Zone**

The decontamination zone is a transition zone between contaminated (or potentially contaminated) and clean zones and serves as a buffer to reduce the possibility of the clean zone becoming contaminated.



**LEGEND**

WATER TABLE OBSERVATION WELL LOCATION.

PIEZOMETER LOCATION.

CAL SURVEY LINE LOCATION

LIMIT OF FILL AREAS.

GAS PROBE

COVER MATERIAL SAMPLING LOCATION

(G A 9 ACRE AREA FOR LDA)

AERIAL PHOTOGRAPH TAKEN 11-21-85.

(EMSL, 1986).

STATE SCALE 1 IN. = 300 FT.



Suite 124  
1406 East Washington Ave  
Madison, WI 53703  
Phone 608.255.2134

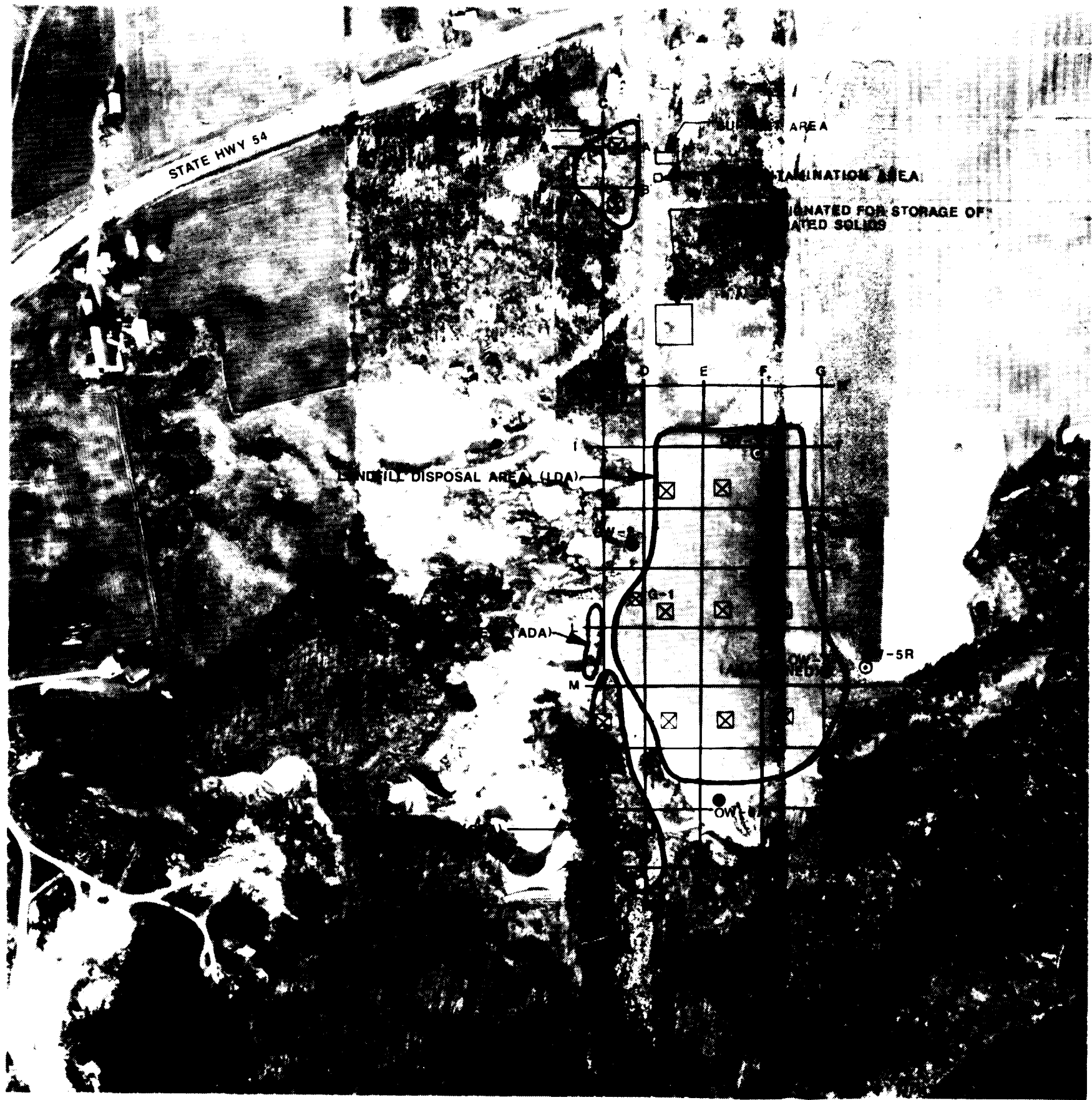
Dwn. by: GDB | Date: 07/26/88 | Proj. #: 1375.02

GEOPHYSICAL SURVEY  
LINE LOCATION

6.1988

FIGURE C-1

AUG 10 1988

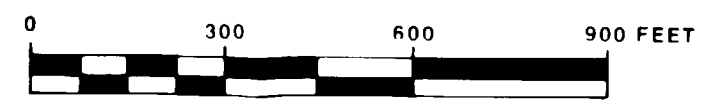


**LEGEND**

- EXISTING WATER TABLE OBSERVATION WELL LOCATION.
- EXISTING PIEZOMETER LOCATION.
- A-A GEOPHYSICAL SURVEY LINE LOCATION
- ◊ POSSIBLE LIMIT OF FILL AREAS.
- ⊗ EXISTING GAS PROBE
- ⊗ SURFACE COVER MATERIAL SAMPLING LOCATION (ASSUMING A 9 ACRE AREA FOR LDA)

NOTE: AERIAL PHOTOGRAPH TAKEN 11-21-85.  
BY EMSL (EMSL, 1986).

APPROXIMATE SCALE 1 IN. = 300 FT.



**RMT** INC  
Suite 124  
1406 East Washington Ave  
Madison, WI 53703  
Phone 608 255 2134

Dwn. by: GDB Date: 07/26/88 Proj. #: 1375.02

GEOPHYSICAL SURVEY  
LINE LOCATION

REVISION 1 AUGUST 16, 1988

FIGURE C-1

AUG 16 1988

A decontamination pad will be constructed in the location shown on Figure C-1. The pad will consist of a 30-mil PVC liner, covered with geotextile fabric and gravel, which will drain to a sump where the liquid will be collected and pumped into drums for screening and storage or disposal (refer to Section 7 of the Workplan).

Decontamination of field personnel and equipment will be done in the decontamination zone.

Field personnel will wear the required personal protection while working in the decontamination zone. Protective equipment worn in the decontamination zone will be removed according to the procedures presented in Section 6.3 before entering the support zone.

### **6.2.3 Support Zone**

The support zone is a noncontaminated or clean area. Support equipment (clean protective equipment, supplies, etc.) will be located in this zone, which will include the RMT trailer or field vehicle. Normal work clothing is appropriate in this zone.

The location of the support zone and any support facilities will be determined based on the following factors:

- . Wind direction - preferably the support zone should be located upwind of the exclusion zone.
- . Accessibility.
- . Support services - electric power supply, roads, drinking water, etc.

## **6.3 Decontamination Procedures**

### **6.3.1 Field Personnel**

Decontamination procedures will be as follows:

- Protective outer garments will be removed and placed in disposable plastic bags at the perimeter of the decontamination zone each time before leaving the decontamination zone.
- Boots will be removed first, then Tyvek® suits, and then outer gloves.
- For Level C work, respirators will then be removed, and spent cartridges or canisters will be removed to clean the facepiece. The inner gloves will then be removed.
- Field personnel will wash and dry their hands before leaving the contamination reduction zone, and used paper towels will be placed in the disposal bag.
- The plastic bags containing waste materials will be drummed, screened, and stored on-site with other waste materials or disposed. (Refer to Section 7 of the Workplan for details regarding disposal of bagged waste material.)

Clean outer garments will be kept accessible to field personnel in an area free from potential contamination. Water, soap, and paper towels will be kept in a clean location for both regular clean-up and emergency use.

Potable water for decontamination use will be brought to the site by the drilling contractor and stored in appropriate portable containers.

### **6.3.2 Sampling and Drilling Equipment**

Sampling equipment used in the field will be decontaminated following the procedures specified in the Quality Assurance Project Plan. Any equipment that may come into contact with potentially contaminated soil or ground water will be cleaned on the decontamination pad.

The drilling rig, drilling tools, associated equipment and other vehicles will be cleaned with a steam-cleaner during initial mobilization, and on the decontamination pad when leaving the site.

Decontamination liquids will be collected in a sump at the decontamination pad and transferred to drums for screening and temporary storage or disposal. (Refer to Section 7 of the Workplan for details regarding disposal of decontamination liquids.)

## 7. CONTINGENCY PLAN

### 7.1 Purpose

This contingency plan provides the emergency information needed should there be a sudden, life- or health-threatening situation where work activities are being conducted.

The provisions of the contingency plan are to be implemented immediately in the event of a fire, explosion, or accident which could threaten human health or the environment.

### 7.2 Emergency Contacts

Emergency contacts and phone numbers for use in emergency situations occurring during field activities are as follows:

- . City of Algoma
  - Fire 911
  - Police 911 or 388-3100
  - Algoma Memorial Hospital 487-5511
  - 1510 Fremont Street
  - (See map - Appendix C)
  - Ambulance (Kewaunee County) 911 or 388-3100
  
- . RMT, Inc., Office  
Madison, Wisconsin
  - Project Manager - Eric Gredell 608-255-2134(work)  
608-241-8834(home)
  
  - Health and Safety Coordinator-  
Christine Hansen 608-255-2134(work)  
608-241-5655(home)
  
  - Corporate Health & Safety Director-  
Jitendra Radia 608-255-2134(work)  
608-271-8206(home)
  
- . RMT, Inc., Field Office
  - Site Health and Safety Representative/  
Site Coordinator - Thomas Van Biersel Contact via Tom  
Romdenne at Algoma  
City Hall,  
414-487-5205

- . Respondents  
Project Coordinator-  
Thomas Romdenne 414-487-5205
- . USEPA  
Project Coordinator/Remedial  
Project Manager - Dan Cozza 312-886-7252
- . WDNR - Madison  
Project Coordinator-  
Mark Giesfeldt 608-267-7562
- . WDNR - Green Bay 414-497-4040

### 7.3 Emergency Procedures

If an emergency situation develops at the site, the discoverer will take the following course of action:

- . Notify the proper emergency services (fire, ambulance, police, etc.) for assistance.
- . Notify any other affected personnel at the site.
- . Contact RMT and all Project Coordinators to inform them of the incident as soon as possible.
- . Prepare a summary report of the incident for RMT and all Project Coordinators as soon as possible after the incident.

### 7.4 Emergency Equipment

Emergency equipment that will be on-site with RMT field personnel will include the following:

- . First aid kit
- . Clean water for emergency wash (including eyewash bottles)
- . Two-way radios

## **8. RECORD KEEPING**

### **8.1 Training Attendance**

A copy of each RMT employee's certificate of completion of the 40-hour Health and Safety Training for Hazardous Waste Sites is maintained in the RMT Personnel Department in the employee's personnel file. Each employee retains the original certificate issued.

Site-specific Health and Safety Plan review is documented by a sign-in sheet. The sign-in sheet is maintained by the Health and Safety Coordinator and a copy is kept in the project file.

### **8.2 Respirator Fit Test**

Copies of respirator fit testing forms containing the RMT employee's name, test protocol used, respirator tested, and fit test results are distributed as follows:

- . 1 copy to the employee
- . 1 copy to their personnel file
- . Signed original filed with the Health and Safety Coordinator

### **8.3 Medical Certification**

The Dean Clinic, 1313 Fish Hatchery Road, Madison, Wisconsin, maintains each RMT employee's medical testing records. A certification of medical fitness to wear a respirator and perform required job functions, and any work restrictions is sent by the physician to the RMT Personnel Department and is kept in the employee's personnel file.

#### **8.4 Air Monitoring Results**

Measurements of airborne contaminant concentration levels using the HNU or OVA or combustible gas and vapor monitor will be recorded by the person making the readings in the field log book noting the date, time, location, work task being performed, concentration level measured, and any observations.

#### **8.5 Site Entry Log**

Access to the site will be documented in a site entry log noting the person's name, company or agency affiliation, date, time entered the site, and time exited the site. The RMT Site Coordinator will be responsible for maintaining the log.

**APPENDIX A**

**TABLE OF CONTENTS AND HEALTH AND SAFETY POLICY**

**STATEMENTS, RMT HEALTH AND SAFETY MANUAL**



RMT, Inc.  
Suite 124  
1406 East Washington Ave.  
Madison, WI 53703-3009  
Phone: 608-255-2134  
FAX: 608-255-0234

HEALTH AND SAFETY MANUAL

RMT, INC.

1406 East Washington Avenue, Suite 124  
Madison, Wisconsin 53703

325 South Clinton  
Grand Ledge, Michigan 48837

1625 I Street, N.W.  
Washington, D.C. 20006

11 Regency Hills Drive  
Greenville, South Carolina 29607

3420 Ocean Park Boulevard  
Suite 3010  
Santa Monica, California 90405

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## 1. INTRODUCTION

### RMT Health and Safety Policy Statement

The personal health and safety of each RMT employee is of primary importance to RMT management. The prevention of work-related injuries and illnesses is of such consequence that it will be given precedence over operating productivity whenever necessary. Management will provide and require the use of facilities and protective equipment necessary to help protect employee health and safety.

RMT has established and implemented a health and safety program. To be successful, this program must embody the proper attitudes toward injury and illness prevention from supervisors and employees. Cooperation among employees in health and safety matters will help preserve an effective program.

The objective of RMT's health and safety program is to reduce work-related accidents, illnesses, and injuries to a minimum. Our health and safety program includes the following:

- . Providing the required safeguards.
- . Implementing a program of health and safety reviews to identify and minimize unsafe working conditions, to control and protect against hazards, and to comply with applicable health and safety standards for every job.
- . Training employees in safe work practices.
- . Providing appropriate personal protective equipment and instructions for its proper use and care.
- . Developing and enforcing health and safety rules and requiring employee compliance with these rules as a condition of employment.
- . Investigating accidents promptly and thoroughly to identify the cause and to correct the problem to prevent recurrence.

RMT recognizes that the responsibilities for health and safety are shared as follows:

- . RMT accepts the responsibility for leadership of the health and safety program, for its effectiveness and improvement, and for providing the safeguards required to ensure safe working conditions.
- . Supervisors are responsible for maintaining the proper attitudes toward health and safety in themselves and in those they supervise, and for ensuring that operations are performed with regard to the health and safety of the personnel involved, including themselves.
- . Employees are responsible for cooperating with all aspects of the health and safety program, including complying with applicable procedures, rules, regulations, and guidelines; and for continually practicing safety while performing their duties.

The RMT Health and Safety Manual provides only one of the tools necessary to achieve our above-mentioned objectives. It cannot, by itself, ensure a safe and healthful work environment. Each of us must take the responsibility of conducting our work in a manner that ensures our own well-being and that of our fellow workers, clients, and the general public.

RMT expects employees to follow the health and safety requirements and guidelines included in the manual and other associated documents.

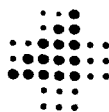


Brooks Becker, Ph.D.  
President

**APPENDIX B**  
**MATERIAL SAFETY DATA SHEETS**

# American Burdick & Jackson

## Material Safety Data Sheet



emergency telephone no. 312/973-3600 (American Scientific Products)  
chemtrec telephone no. 800/424-9300  
information telephone no. 616/726-3171 (American Burdick & Jackson)

MATERIAL SAFETY  
DATA SHEET

METHANOL

### I. Identification

chemical name Methanol molecular weight 32.04  
chemical family Alcohol formula CH<sub>4</sub>O  
synonyms Carbinol, Methyl Alcohol, Wood Alcohol  
DOT proper shipping name Methyl Alcohol or Methanol  
DOT hazard class Flammable Liquid  
DOT identification no. UN1230 CAS no. 67-56-1

### II. Physical and Chemical Data

boiling point, 760mm Hg. 64.7°C freezing point -97.7°C evaporation rate (BuAc=1) ca 5  
vapor pressure at 20°C 97 mm Hg vapor density (air = 1) 1.11 solubility in water @ 20°C complete  
% volatiles by volume ca 100 specific gravity (H<sub>2</sub>O = 1) @ 20°C 0.792 stability Stable  
hazardous polymerization Not expected to occur.  
appearance and odor A clear, colorless liquid with a slight alcoholic odor.  
conditions to avoid Heat, sparks, open flame, open containers, and poor ventilation.

materials to avoid Strong oxidizing agents and reactive metals which will displace hydrogen.

hazardous decomposition products Incomplete combustion can generate carbon monoxide and other toxic vapors such as formaldehyde.

### III. Fire and Explosion Hazard Data

flash point, (test method) 12°C (Tag closed cup) auto ignition temperature 385°C  
flammable limits in air % by volume: lower limit 6.0 upper limit 36.5  
unusual fire and explosion hazards May burn with an invisible flame. Mixtures with water as low as 21% by volume are still flammable (flash point below 37.8°C). Under some circumstances can corrode certain metals, including aluminum and zinc, and generate hydrogen gas.  
extinguishing media Carbon dioxide, dry chemical, alcohol foam, water mist or fog.  
special fire fighting procedures Wear full protective clothing and self-contained breathing apparatus. Heat will build pressure and may rupture closed storage containers. Keep fire-exposed containers cool with water spray.

### IV. Hazardous Components

Methanol % ca 100 TLV 200 ppm CAS no. 67-56-1

**American Burdick & Jackson's Disclaimer:** "The information and recommendations presented herein are based on sources believed to be reliable as of the date hereof. American Burdick & Jackson makes no representation as to the completeness or accuracy thereof. It is the user's responsibility to determine the product's suitability for its intended use, the product's safe use, and the product's proper disposal. No representations or warranties not expressly set forth herein are made hereunder, whether express or implied by operation of law or otherwise, including, but not limited to any implied warranties of MERCHANTABILITY OR FITNESS. American Burdick & Jackson neither assumes nor authorizes any other person to assume for it, any other or ADDITIONAL LIABILITY OR RESPONSIBILITY resulting from the use of, or reliance upon, this information."



American Burdick & Jackson

Subsidiary of American  
Hospital Supply Corporation

1953 South Harvey Street  
Muskegon, MI 49442

## V. Health Hazards

---

### Occupational Exposure Limits

OSHA 8-hour PEL - 200 ppm  
Ceiling - not listed  
Peak - not listed

ACGIH TLV-TWA - 200 ppm  
TLV-STEL (15-min) - 250 ppm

NIOSH TLV-TWA - 200 ppm  
TLV-C - 800 ppm

### Concentration Immediately Dangerous to Health

OSHA/NIOSH 25,000 ppm

### Odor Threshold

NSC & OHS 10 ppm  
NIOSH 2000 ppm

### Carcinogenic, Mutagenic, Teratogenic Data

Positive mutagen (RTEC)

### Primary Routes of Entry

Methanol may exert its effects through inhalation, skin absorption, and ingestion.

### Industrial Exposure: Route of Exposure/Signs and Symptoms

**Inhalation:** Exposure can cause drowsiness and intoxication, headache, visual disturbance leading to blindness, coughing and shortness of breath, collapse and death at high concentrations.

**Eye Contact:** Liquid can cause moderate burning, watering, swelling, and redness; high vapor concentration (greater than 2000 ppm) may cause same symptoms.

**Skin Contact:** This substance may be absorbed through intact skin and produce toxic effects. Extensive, repeated and/or prolonged skin contact can cause burning, itching, redness, or blisters.

**Ingestion:** Causes burning of the gastrointestinal tract and toxic effects. Swallowing more than 2 ounces of methanol can cause death.

### Effects of Overexposure

Mild poisoning is characterized by fatigue, nausea, headache, and delayed visual blurring. Moderate intoxication results in severe depression. Temporary or permanent blindness may follow in 2-6 days. In severe poisoning, symptoms progress to rapid, shallow respiration, cyanosis, coma, hypotension, dilated pupils, and visual disturbance. Death may result from respiratory failure.

### Medical Condition Aggravated by Exposure

Preclude from exposure those individuals with diseases of eyes, liver, kidneys, and lungs.

### Emergency First Aid

- Inhalation:** Immediately remove to fresh air. If not breathing, administer mouth-to-mouth rescue breathing. If there is no pulse administer cardiopulmonary resuscitation (CPR). Contact physician immediately.
- Eye Contact:** Rinse with copious amounts of water for at least 15 minutes. Get emergency medical assistance.
- Skin Contact:** Flush thoroughly for at least 15 minutes. Wash affected skin with soap and water. Remove contaminated clothing and shoes. Wash clothing before re-use, and discard contaminated shoes. Get emergency medical assistance.
- Ingestion:** Call local Poison Control Center for assistance. Contact physician immediately. Never induce vomiting or give anything by mouth to a victim unconscious or having convulsions.

### Note to Physician

In case of ingestion or massive inhalation, observe victim as an inpatient because slow metabolism causes a latent period of 24 hours between exposure and acidosis and blindness.

## **VI. Safety Measures and Equipment**

---

- Ventilation:** Adequate ventilation is required to protect personnel from exposure to chemical vapors exceeding the PEL and to minimize fire hazards. The choice of ventilation equipment, either local or general, will depend on the conditions of use, quantity of material, and other operating parameters.
- Respiratory:** Use approved respirator equipment. Follow NIOSH and equipment manufacturer's recommendations to determine appropriate equipment (air-purifying, air-supplied, or self-contained breathing apparatus).
- Eyes:** Safety glasses are considered minimum protection. Goggles or face shield may be necessary depending on quantity of material and conditions of use.
- Skin:** Protective gloves and clothing are recommended. The choice of material must be based on chemical resistance and other user requirements. Generally, neoprene or rubber offers acceptable chemical resistance. Individuals who are acutely and specifically sensitive to methanol may require additional protective equipment.

**Storage:** Methanol should be protected from temperature extremes and direct sunlight. Proper storage of methanol must be determined based on other materials stored and their hazards and potential chemical incompatibility. In general, methanol should be stored in an acceptably protected and secure flammable liquid storage room.

**Other:** Emergency eye wash fountains and safety showers should be available in the vicinity of any potential exposure. Ground and bond metal containers to minimize static sparks.

#### **VII. Spill and Disposal Data**

---

**Spill Control:** Protect from ignition. Wear protective clothing and use approved respirator equipment. Absorb spilled material in an absorbent recommended for solvent spills and remove to a safe location for disposal by approved methods. If released to the environment, comply with all regulatory notification requirements.

**Waste Disposal:** Dispose of methanol as an EPA hazardous waste. Hazardous waste numbers: U154 (Ignitable); D001 (Ignitable).

**Revision Date:** 1/85

#### **KEY**

ca	Approximately	STEL	Short Term Exposure Level
na	Not applicable	TLV	Threshold Limit Value
C	Ceiling	TWA	Time Weighted Average
PEL	Permissible Exposure Level	BuAc	Butyl Acetate

**NSC** National Safety Council ("Fundamentals of Industrial Hygiene", 1983)

**OHS** Occupational Health Services ("Hazardline")

----- SECTION 1 -----

SUNNYSIDE CORPORATION  
 225 CARPENTER AVE  
 WHEELING, ILLINOIS 60090  
 (312) 541-5700  
 EMERGENCY TELEPHONE (312) 541-5700 (312) 831-2415 (312) 394-2599

-----  
 PRODUCT CLASS: AROMATIC HYDROCARBON MANUFACTURER'S CODE: 822  
 -----

TRADE NAME: XYLENE (XYLOL)  
 -----

----- SECTION 2 HAZARDOUS INGREDIENTS -----

INGREDIENT	PERCENT	TLV	LEL	VAPOR PRESSURE
XYLENE	100%	100 PPM	1.0%	6 MM HG@68 DG. (F)

----- SECTION 3 PHYSICAL DATA -----

BOILING RANGE: 280-285 DG. (F) VAPOR DENSITY: HEAVIER THAN AIR  
 EVAPORATION RATE: SLOWER THAN ETHER % VOLATILE BY VOLUME: 100%  
 WEIGHT PER GALLON: 7.25 LBS.

----- SECTION 4 FIRE & EXPLOSION DATA -----

FLAMMABILITY CLASSIFICATION: FLAMMABLE LIQUID-CLASS IC  
 FLASH POINT: 80 DG. (F) TAG CLOSED CUP

LOWER EXPLOSIVE LIMIT: 1.0%  
 EXTINGUISHING MEDIA: CARBON DIOXIDE, FOAM, DRY CHEMICAL, WATER SPRAY. DO NOT USE DIRECT WATER STREAM; IT WILL SPREAD FIRE.  
 UNUSUAL FIRE AND EXPLOSION HAZARDS: DO NOT STORE OR MIX WITH STRONG OXIDANTS.  
 SPECIAL FIRE FIGHTING PROCEDURES: USE AIR-SUPPLIED RESCUE EQUIPMENT FOR ENCLOSED AREAS. COOL EXPOSED CONTAINERS WITH WATER.

----- SECTION 5 HEALTH HAZARD DATA -----

THRESHOLD LIMIT VALUE: 100 PPM (ACGIH, 1980)  
 EFFECTS OF OVEREXPOSURE: BREATHING HIGH VAPOR CONCENTRATIONS MAY RESULT IN MILD DEPRESSION, CONVULSIONS OR LOSS OF CONSCIOUSNESS. CONTACT MAY IRRITATE SKIN OR EYES.  
 EMERGENCY AND FIRST AID PROCEDURES: IF OVERCOME BY VAPORS, MOVE PATIENT TO FRESH AIR AND CALL A PHYSICIAN. APPLY ARTIFICIAL RESPIRATION, IF NECESSARY. FOR SKIN OR EYE CONTACT, FLUSH WITH COPIOUS QUANTITIES OF WATER. GET MEDICAL ATTENTION. IF SWALLOWED, DO NOT INDUCE VOMITING. CALL A PHYSICIAN.

-----SECTION 6 REACTIVITY DATA-----

STABILITY: STABLE

CONDITIONS TO AVOID: HEAT, SPARKS AND OPEN FLAME.

INCOMPATIBILITY (MATERIALS TO AVOID): STRONG OXIDIZING AGENTS LIKE LIQUID CHLORINE OR CONCENTRATED OXYGEN.

HAZARDOUS DECOMPOSITION PRODUCTS: THERMAL DECOMPOSITION MAY YIELD CARBON MONOXIDE.

HAZARDOUS POLYMERIZATION: WILL NOT OCCUR.

-----SECTION 7 SPILL OR LEAK PROCEDURES-----

STEPS TO BE TAKEN IN CASE MATERIAL IS SPILLED OR RELEASED: REMOVE IGNITION SOURCES, EVACUATE AREA, AVOID BREATHING VAPOR OR CONTACT WITH LIQUID. RECOVER FREE LIQUID OR STOP LEAK IF POSSIBLE. DIKE LARGE SPILLS AND USE ABSORBENT MATERIAL FOR SMALL SPILLS. KEEP SPILLED MATERIAL OUT OF SEWERS, DITCHES AND BODIES OF WATER.

WASTE DISPOSAL METHOD: INCINERATE UNDER SAFE CONDITIONS; DISPOSE OF IN ACCORDANCE WITH LOCAL, STATE AND FEDERAL REGULATIONS.

-----SECTION 8 SPECIAL PROTECTION INFORMATION-----

RESPIRATORY PROTECTION: APPROPRIATE VAPOR CANISTER, SELF-CONTAINED BREATHING APPARATUS OR SUPPLIED AIR HOSE MASK IF NEEDED.

VENTILATION: SUFFICIENT, IN VOLUME AND PATTERN, TO KEEP WORKROOM CONCENTRATION BELOW CURRENT APPLICABLE OSHA SAFETY AND HEALTH REQUIREMENTS. SEE SECTION II.

PROTECTIVE GLOVES: RUBBER OR NEOPRENE.

EYE PROTECTION: CHEMICAL SAFETY GOGGLES.

OTHER PROTECTIVE EQUIPMENT: IMPERVIOUS CLOTHING OR BOOTS, IF NEEDED.

-----SECTION 9 SPECIAL PRECAUTIONS-----

HANDLING AND STORING: KEEP AWAY FROM HEAT, SPARKS AND OPEN FLAME. KEEP CONTAINERS CLOSED WHEN NOT IN USE.

DEPT. OF LABOR STORAGE CATEGORY: FLAMMABLE LIQUID-CLASS IC

OTHER PRECAUTIONS: AVOID EYE CONTACT. AVOID PROLONGED OR REPEATED CONTACT WITH SKIN. WASH SKIN WITH SOAP AND WATER AFTER CONTACT. GROUND CONTAINERS WHEN TRANSFERRING LIQUID.

(LAST PAGE)

----- SECTION 1 -----

SUNNYSIDE CORPORATION  
225 CARPENTER AVE  
WHEELING, ILLINOIS 60090  
(312) 541-5700

EMERGENCY TELEPHONE (312) 541-5700 (312) 831-2415 (312) 394-2599

-----  
PRODUCT CLASS: PETROLEUM HYDROCARBON MANUFACTURER'S CODE: 800  
-----

TRADE NAME: VM&P NAPHTHA  
-----

----- SECTION 2 HAZARDOUS INGREDIENTS -----

INGREDIENT	PERCENT	TLV	LEL	VAPOR PRESSURE
VM&P NAPHTHA	100%	400	1.2%	50 MM HG@20 DG.(C)

----- SECTION 3 PHYSICAL DATA -----

BOILING RANGE: 240-290 DG.(F)  
EVAPORATION RATE: SLOWER THAN ETHER  
WEIGHT PER GALLON: 6.13 LBS.

VAPOR DENSITY: HEAVIER THAN AIR  
% VOLATILE BY VOLUME: 100%

----- SECTION 4 FIRE & EXPLOSION DATA -----

FLAMMABILITY CLASSIFICATION: FLAMMABLE LIQUID CLASS 1B  
FLASH POINT: 54 DG.(F) TAG CLOSED CUP

LOWER EXPLOSIVE LIMIT: 1.2%

EXTINGUISHING MEDIA: CARBON DIOXIDE, FOAM, DRY CHEMICAL, WATER SPRAY. DO NOT USE DIRECT WATER STREAM; IT WILL SPREAD FIRE.

UNUSUAL FIRE AND EXPLOSION HAZARDS: DO NOT STORE OR MIX WITH STRONG OXIDANTS.  
SPECIAL FIRE FIGHTING PROCEDURES: USE AIR-SUPPLIED RESCUE EQUIPMENT FOR ENCLOSED AREAS. COOL EXPOSED CONTAINERS WITH WATER.

----- SECTION 5 HEALTH HAZARD DATA -----

THRESHOLD LIMIT VALUE: 400 PPM (EXXON CO., USA)

EFFECTS OF OVEREXPOSURE: BREATHING HIGH VAPOR CONCENTRATIONS MAY RESULT IN MILD DEPRESSION, CONVULSIONS OR LOSS OF CONSCIOUSNESS. CONTACT MAY IRRITATE SKIN OR EYES.

EMERGENCY AND FIRST AID PROCEDURES: IF OVERCOME BY VAPORS, MOVE PATIENT TO FRESH AIR AND CALL A PHYSICIAN. APPLY ARTIFICIAL RESPIRATION, IF NECESSARY. FOR SKIN OR EYE CONTACT, FLUSH WITH COPIOUS QUANTITIES OF WATER. GET MEDICAL ATTENTION. IF SWALLOWED, DO NOT INDUCE VOMITING. CALL A PHYSICIAN.

-----SECTION 6 REACTIVITY DATA-----

STABILITY: STABLE

CONDITIONS TO AVOID: HEAT, SPARKS AND OPEN FLAME.

INCOMPATIBILITY (MATERIALS TO AVOID): STRONG OXIDIZING AGENTS LIKE LIQUID CHLORINE OR CONCENTRATED OXYGEN.

HAZARDOUS DECOMPOSITION PRODUCTS: THERMAL DECOMPOSITION MAY YIELD CARBON MONOXIDE.

HAZARDOUS POLYMERIZATION: WILL NOT OCCUR.

-----SECTION 7 SPILL OR LEAK PROCEDURES-----

STEPS TO BE TAKEN IN CASE MATERIAL IS SPILLED OR RELEASED: REMOVE IGNITION SOURCES, EVACUATE AREA, AVOID BREATHING VAPOR OR CONTACT WITH LIQUID. RECOVER FREE LIQUID OR STOP LEAK IF POSSIBLE. DIKE LARGE SPILLS AND USE ABSORBENT MATERIAL FOR SMALL SPILLS. KEEP SPILLED MATERIAL OUT OF SEWERS, DITCHES AND BODIES OF WATER.

WASTE DISPOSAL METHOD: INCINERATE UNDER SAFE CONDITIONS; DISPOSE OF IN ACCORDANCE WITH LOCAL, STATE AND FEDERAL REGULATIONS.

-----SECTION 8 SPECIAL PROTECTION INFORMATION-----

RESPIRATORY PROTECTION: APPROPRIATE VAPOR CANISTER, SELF-CONTAINED BREATHING APPARATUS OR SUPPLIED AIR HOSE MASK IF NEEDED.

VENTILATION: SUFFICIENT, IN VOLUME AND PATTERN, TO KEEP WORKROOM CONCENTRATION BELOW CURRENT APPLICABLE OSHA SAFETY AND HEALTH REQUIREMENTS. SEE SECTION II.

PROTECTIVE GLOVES: RUBBER OR NEOPRENE.

EYE PROTECTION: CHEMICAL SAFETY GOGGLES.

OTHER PROTECTIVE EQUIPMENT: IMPERVIOUS CLOTHING OR BOOTS, IF NEEDED.

-----SECTION 9 SPECIAL PRECAUTIONS-----

HANDLING AND STORING: KEEP AWAY FROM HEAT, SPARKS AND OPEN FLAME. KEEP CONTAINERS CLOSED WHEN NOT IN USE.

DEPT. OF LABOR STORAGE CATEGORY: FLAMMABLE LIQUID CLASS IB

OTHER PRECAUTIONS: AVOID EYE CONTACT. AVOID PROLONGED OR REPEATED CONTACT WITH SKIN. WASH SKIN WITH SOAP AND WATER AFTER CONTACT. GROUND CONTAINERS WHEN TRANSFERRING LIQUID.

(LAST PAGE)

# Mallinckrodt

## Material Safety Data

Emergency Phone Number: 314-982-5000

Mallinckrodt provides the information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. Individuals receiving this information must exercise their independent judgment in determining its appropriateness for a particular purpose.

Mallinckrodt makes no representations, or warranties, either express or implied, of merchantability, fitness for a particular purpose with respect to the information set forth herein or to the product to which the information refers. Accordingly, Mallinckrodt will not be responsible for damages resulting from use of or reliance upon this information.

Mallinckrodt, Inc., Science Products Division, P.O. Box M, Paris, KY 40361.

### FORMALDEHYDE

#### PRODUCT IDENTIFICATION:

Synonyms: Formaldehyde solution; Formaldehyde 37%; Formalin; Mordicid Acid

Formula CAS No.: 50-00-0

Molecular Weight: 30.03

Chemical Formula: CH<sub>2</sub>O

Hazardous Ingredients:  
CAS # 67-56-1 Methanol (10-15%)  
50-00-0 Formaldehyde (37%)

#### PRECAUTIONARY MEASURES

**DANGER! MAY BE FATAL IF SWALLOWED.  
HARMFUL IF INHALED OR ABSORBED THROUGH SKIN.  
POSSIBLE CANCER HAZARD BASED ON TESTS WITH LABORATORY  
ANIMALS. EXPOSURE MAY CREATE A CANCER RISK. CAUSES  
IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. MAY  
CAUSE BLINDNESS. COMBUSTIBLE.**

Keep away from heat, sparks and flame.  
Avoid breathing vapor.  
Keep container closed.  
Use only with adequate ventilation.  
Wash thoroughly after handling.

#### EMERGENCY/FIRST AID

In all cases call a physician. If swallowed, induce vomiting immediately by giving two glasses of water and sticking finger down throat. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact, immediately flush skin or eyes with plenty of water for at least 15 minutes.

SEE SECTION 5.

DOT Hazard Class: ORM-A

#### SECTION 1 Physical Data

Appearance: Clear, colorless liquid.

Odor: Pungent.

Solubility: Infinite in water.

Boiling Point: 96°C (205°F)

Melting Point: -15°C (5°F)

Specific Gravity (water = 1): 1.08

Vapor Density (Air = 1): 1.04

Vapor Pressure (mm Hg): No information found.

Evaporation Rate: No information found.

#### SECTION 2 Fire and Explosion Information

Fire:

Combustible Liquid!

Flashpoint: 60°C (140°F) (10% Methanol)

Autoignition temperature: 300°C (572°F)

Flammable limits in air, % by volume:

lcl: 7.0 ucl: 73

Gas vaporizes readily from solution and is flammable in air.

Explosion:

Above flash point, vapor-air mixtures are explosive within flammable limits noted above.

Fire Extinguishing Media:

Water spray can be used to extinguish fires and cool fire-exposed containers. Water spray may be used to keep fire exposed containers cool.

Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Water may be used to flush spills away from exposures and to dilute spills to non-flammable mixtures.

#### SECTION 3 Reactivity Data

Stability:

Stable under ordinary conditions of use and storage.

Hazardous Decomposition Products:

If involved in a fire, irritating gaseous formaldehyde and carbon monoxide may be released.

Hazardous Polymerization:

Trioxymethylene precipitate can be formed on long standing at very low temperatures. Nonhazardous polymerization may occur at low temperatures, forming paraformaldehyde, a white solid.

Incompatibilities:

Incompatible with oxidizing agents and alkalis. Reacts explosively with nitrogen dioxide at ca. 180°C (356°F). Reacts violently with perchloric acid, perchloric acid-aniline mixtures, and nitromethane. Reaction with hydrochloric acid may form bis-chloromethyl ether, an OSHA regulated carcinogen.

#### SECTION 4 Leak/Spill Disposal Information

Ventilate area of leak or spill. Remove all sources of ignition. Clean-up personnel require protective clothing and respiratory protection from vapors. Only specially trained or qualified personnel should handle the emergency. Do not flush to sewer or surface waters. Can be absorbed on inert material and disposed as hazardous waste in a RCRA approved facility or dissolved in an appropriate combustible solvent and atomized in a RCRA approved chemical incinerator equipped with an afterburner. Reportable Quantity (RQ) (CWA/CERCLA): 1000 lbs. Formaldehyde 5000 lbs. Methanol

Ensure compliance with local, state and federal regulations.

NFPA Ratings: Health: 2 Flammability: 2 Reactivity: 0

Effective Date: 10-15-86 Supersedes 08-23-85

FORMALDEHYDE

**SECTION 5 Health Hazard Information**

**A. EXPOSURE / HEALTH EFFECTS**

**Inhalation:**

May cause sore throat, coughing, and shortness of breath. Causes irritation to the respiratory tract. May be fatal in high concentrations.

**Ingestion:**

Can cause severe abdominal pain, violent vomiting, headache, and diarrhea. Larger doses may produce decreased body temperature, pain in the digestive tract, shallow respiration, weak irregular pulse, unconsciousness and death. Methanol component affects the optic nerve and may cause blindness.

**Skin Contact:**

Toxic. May cause irritation to skin with redness, pain, and possibly burns. Skin absorption may occur with symptoms paralleling those from ingestion.

**Eye Contact:**

Vapors cause irritation to the eyes with redness, pain, and blurred vision. Higher concentrations or splashes may cause irreversible eye damage.

**Chronic Exposure:**

Frequent or prolonged exposure to formaldehyde may cause hypersensitivity leading to contact dermatitis. Repeated or prolonged skin contact with formaldehyde may cause an allergic reaction in some people. Vision impairment and enlargement of liver may occur from methanol component. Formaldehyde is a suspected carcinogen (positive animal inhalation studies).

**Aggravation of Pre-existing Conditions:**

Persons with pre-existing skin disorders or eye problems, or impaired liver, kidney or respiratory function may be more susceptible to the effects of the substance.

**B. FIRST AID**

**Inhalation:**

Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.

**Ingestion:**

If swallowed, induce vomiting immediately by giving two glasses of water and sticking finger down throat. Never give anything by mouth to an unconscious person. Call physician immediately.

**Skin Exposure:**

In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

**Eye Exposure:**

Wash eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

**C. TOXICITY DATA (RTECS, 1982)**

**Formaldehyde:** Oral rat LD50: 800 mg/kg. Skin rabbit LD50: 270 mg/kg. Inhalation rat LC50: 590 mg/m<sup>3</sup>. Mutation references cited. Reproductive effects cited. Tumorigenic effects cited. Carcinogenic determination (Formaldehyde gas): Sufficient evidence in animals - Inadequate evidence in humans (IARC Supplement 4, 1982 Category 2B) Listed in the NTP 4th Annual Report on Carcinogens; May reasonably be anticipated to be a carcinogen. **Methanol:** Mutation references cited and reproductive effects cited.

**SECTION 6 Occupational Control Measures**

**Airborne Exposure Limits:**

**Formaldehyde:**

- OSHA Permissible Exposure Limit (PEL): 3 ppm (TWA); 5 ppm Ceiling; 10 ppd Peak
- ACGIH Threshold Limit Value (TLV): 1 ppm (TWA) 2 ppm (STEL) Listed in Appendix A2 as Industrial Substances Suspect of Carcinogenic Potential for Man.

**Methanol:**

- OSHA Permissible Exposure Limit (PEL): 200 ppm (TWA)
- ACGIH Threshold Limit Value (TLV): 200 ppm (TWA) 250 ppm (STEL) skin

**Ventilation System:**

A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

**Personal Respirators: (NIOSH Approved)**

If the TLY is exceeded, wear a supplied air, full-facepiece respirator, airline hood, or self-contained breathing apparatus.

**Skin Protection:**

Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls to prevent skin contact.

**Eye Protection:**

Use chemical safety goggles and/or a full face shield where splashing is possible. Contact lenses should not be worn when working with this material. Maintain eye wash fountain and quick-drench facilities in work area.

**SECTION 7 Storage and Special Information**

Keep in a tightly closed container. Protect against physical damage. Outside or detached storage is preferred. Inside storage should be in a standard flammable liquids storage room or cabinet. Separate from oxidizing materials. Storage and use areas should be No Smoking areas. Wear special protective equipment (Sec. 6) for maintenance break-in or where exposures may exceed established exposure levels. Wash hands, face, forearms and neck when exiting restricted areas. Shower, dispose of outer clothing, change to clean garments at the end of the day. Avoid cross-contamination of street clothes. Wash hands before eating and do not eat, drink, or smoke in workplace.

.....

**Mallinckrodt**

**BENZENE**

Material Safety Data Sheet

Emergency Telephone Number  
314-982-5000

Mallinckrodt Inc.  
Science Products Division  
P.O. Box M  
Paris, Kentucky 40361

Effective Date: 11-05-85

PRODUCT IDENTIFICATION:

Synonyms: Benzol; carbon oil; coal naphtha

Formula CAS No.: 71-43-2

Molecular Weight: 78.11

Hazardous Ingredients:  
Not applicable.

Chemical Formula: C<sub>6</sub>H<sub>6</sub>

PRECAUTIONARY MEASURES

**DANGER! EXTREMELY FLAMMABLE. CANCER HAZARD. OVEREXPOSURE MAY CREATE CANCER RISK. HARMFUL IF SWALLOWED, INHALED OR ABSORBED THROUGH SKIN. MAY AFFECT BLOOD SYSTEM.**

Keep away from heat, sparks and flame.  
Do not get in eyes, on skin, or on clothing.  
Avoid breathing vapor.  
Keep container closed.  
Use with adequate ventilation.  
Wash thoroughly after handling.

EMERGENCY/FIRST AID

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.  
Aspiration hazard.  
If swallowed, **DO NOT INDUCE VOMITING!** Give large quantities of water or milk if available. Never give anything by mouth to an unconscious person.  
In case of contact, immediately flush skin or eyes with plenty of water for at least 15 minutes.  
In all cases call a physician.  
SEE SECTION 5.

DOT Hazard Class: Flammable Liquid

Physical Data

SECTION 1

Appearance: Clear, colorless liquid.

Odor: Sweet, aromatic odor.

Solubility: 0.1 g/100 g water @ 20°C (68°F).

Boiling Point: 80°C (176°F).

Vapor Density (Air=1): 2.7

Melting Point: 5.5°C (41.9°F).

Vapor Pressure (mm Hg): 100 @ 26°C (79°F).

Specific Gravity: 0.88

Evaporation Rate: (ether=1) 2.8

-2-

Fire and Explosion Information

SECTION 2

Fire:

Extremely flammable liquid.  
Flashpoint: -11°C (12°F) (CC).  
Flammable limits, in air, % by volume:  
lcl: 1.3; ucl: 7.1  
Autoignition temperature 562°C (1044°F).

Explosion:

Above flash point, vapor-air mixtures are explosive within flammable limits noted above.

Fire Extinguishing Media:

Dry chemical, foam or carbon dioxide. Water spray may be used to keep fire exposed containers cool.

Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. This highly flammable liquid must be kept from sparks, open flame, hot surfaces, and all sources of heat and ignition. Vapors can flow along surfaces to distant ignition source and flash back.

Reactivity Data

SECTION 3

Stability:

Stable under ordinary conditions of use and storage.

Hazardous Decomposition Products:

Toxic gases and vapors may be released if involved in a fire.

Hazardous Polymerization:

This substance does not polymerize.

Incompatibilities:

Strong oxidizers such as permanganate, ozone, sulfuric acid, potassium, chromic anhydride, and nitric acid.

Leak/Spill Disposal Information

SECTION 4

Persons not wearing protective equipment or clothing should be restricted from area of spill until clean-up has been completed. Ventilate and dike area of leak or spill. Remove all sources of ignition. Clean-up personnel require protective clothing and respiratory protection from vapors. Contain and recover liquid when possible. Collect as hazardous waste and atomize in a suitable RCRA approved combustion chamber, or absorb with vermiculite, dry sand, earth or similar material for disposal as hazardous waste in a RCRA approved facility. Do not flush to sewer!

Reportable Quantity (RQ)(CWA/RCRA): 1000 lbs.

Ensure compliance with local, state and federal regulations.

Health Hazard Information

SECTION 6

A. EXPOSURE/HEALTH EFFECTS

**Inhalation:** Acute poisoning may cause dizziness, weakness, headache, nausea, visual blurring, abnormal respiration, collapse. May also cause liver and kidney damage.

**Ingestion:** May cause headache, abdominal pain, dizziness, nausea, dullness, unconsciousness.

**Skin Contact:** Irritant. Can be absorbed through the skin. Contact effects may include redness, irritation, scaling, cracking, edema and blistering.

**Eye Contact:** Severe irritant. Effects may include irritation, redness and eye damage.

**Chronic Exposure:** Benzene is a recognized leukemogen. Other chronic effects may include headache, loss of appetite, drowsiness, nervousness, blood cell changes, pallor, abnormal bleeding, bone marrow aplasia.

**Aggravation of Pre-existing Conditions:** Persons with pre-existing skin disorders or eye problems, or impaired liver, kidney or respiratory function may be more susceptible to the effects of the substance.

B. FIRST AID

**Inhalation:** Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.

**Ingestion:** Aspiration hazard. If swallowed, DO NOT induce vomiting. Give large quantities of water or milk if available. Call a physician immediately. Never give anything by mouth to an unconscious person.

**Skin Exposure:** In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Call a physician immediately.

**Eye Exposure:** Wash eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

C. TOXICITY DATA (RTECS, 1982)

Inhalation rat LC50: 10000 ppm/7H.  
 Oral rat LD50: 4894 mg/kg.  
 Irritation data: skin rabbit: 15 mg/24H open wild.  
 Eye rabbit: 2 mg/24H severe.  
 Mutation references cited.  
 Reproductive effects cited.  
 Tumorigenic references cited.  
 Carcinogenic determination: Human positive IARC 29, 93, 82.  
 Listed as a carcinogen by the National Toxicology Program (NTP).

Occupational Control Measures

SECTION 6

**Airborne Exposure Limits:** -OSHA Permissible Exposure Limit (PEL):  
 10 ppm (TWA); 25 ppm (ceiling)  
 50 ppm/10M (peak).  
 -ACGIH Threshold Limit Value (TLV):  
 10 ppm (TWA); 25 ppm (STEL).

**Ventilation System:** A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

**Personal Respirators (NIOSH Approved)** If the TLV is exceeded, wear a supplied air, full-facepiece respirator, attlined hood, or self-contained breathing apparatus.

**Skin Protection:** Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls to prevent skin contact.

**Eye Protection:** Use chemical safety goggles and/or a full face shield where splashing is possible. Contact lenses should not be worn when working with this material.  
  
 Maintain eye wash fountain and quick-drench facilities in work area.

Storage and Special Information SECTION 7

Protect against physical damage. Store in a cool, dry well-ventilated location, away from direct sunlight and any area where the fire hazard may be acute. Store in tightly closed containers (preferably under nitrogen atmosphere). Outside or detached storage is preferred. Inside storage should be in a standard flammable liquids storage room or cabinet. Separate from oxidizing materials. Containers should be bonded and grounded for transfers to avoid static sparks. Storage and use areas should be No Smoking areas. Use non-sparking type tools and equipment. Wear special protective equipment (Sec. 6) for maintenance break-in or where exposures may exceed established exposure levels. Wash hands, face, forearms and neck when exiting restricted areas. Shower, dispose of outer clothing, change to clean garments at the end of the day. Avoid cross-contamination of street clothes. Wash hands before eating and do not eat, drink, or smoke in workplace.

\*\*\*\*\*  
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TOM STOLZENBURG

COST # 937699 DATE: 5/20/87  
P.O. # 14197

MATERIAL SAFETY DATA SHEET PAGE: 1

IDENTIFICATION

PRODUCT # 27009-5 NAME: 2-BUTANONE, 99.9%, HPLC GRADE  
CAS # 78-93-3

*MEK*

TOXICITY HAZARDS

RTECS # EL5475000

2-BUTANONE

IRRITATION DATA

EYE-HMN 350 PPM  
SKN-RBT 500 MG/24H MCD  
SKN-RBT 402 MG/24H MLD  
SKN-RBT 13780 UG/24H OPEN MLD  
EYE-RBT 80 MG

JHTAB 25,282,45  
JHTAB 25,282,45  
TXAPA9 19,276,71  
AIPAAP 23,95,02  
TXAPA9 19,276,71

TOXICITY DATA

ORL-RAT LD50:2737 MG/KG  
ORL-MUS LD50:4050 MG/KG  
IHL-MUS LC50:40 GM/M3/2H  
IPR-MUS LD50:616 MG/KG  
SKN-RBT LD50:13 GM/KG

TXAPA9 19,239,71  
ICLED5 30,13,86  
ESGMAT -.83,82  
SCCUR\* -.8,81  
UCDS\*\* 5/7/70

REVIEWS, STANDARDS, AND REGULATIONS

ACGIH TLV-TWA 200 PPM; STEL 300 PPM 85INAB 5,295,86  
MSHA STANDARD-AIR:TWA 200 PPM (590 MG/M3) DTLVS\* 3,29,71  
OSHA STANDARD-AIR:TWA 200 PPM PEREAC 39,23540,74  
NIOSH REL TO KETONES-AIR:TWA 590 MG/M3 MSHA\*\* 34 (1S), 20S, 35  
EPA GENETOX PROGRAM 1986, INCONCLUSIVE: B SUBTILIS REC ASSAY  
EPA TSCA CHEMICAL INVENTORY, 1980  
EPA TSCA 8(A) PRELIMINARY ASSESSMENT INFORMATION, FINAL RULE PEREAC  
47,26992,82  
EPA TSCA TEST SUBMISSION (TSCATS) DATA BASE, DECEMBER 1986  
NIOSH ANALYTICAL METHODS: SEE 2-BUTANONE, 2500; IN BLOOD, SEE 2-  
BUTANONE, ETHANOL, 8002  
NTP CARCINOGENESIS STUDIES:SELECTED, SEPTEMBER 1986  
MEETS CRITERIA FOR PROPOSED OSHA MEDICAL RECORDS RULE PEREAC 47,30420,  
82

ONLY SELECTED REGISTRY OF TOXIC EFFECTS OF CHEMICAL SUBSTANCES (RTECS)  
DATA IS PRESENTED HERE. SEE ACTUAL ENTRY IN RTECS FOR COMPLETE INFORMATION.

HEALTH HAZARD DATA

ACUTE EFFECTS

MAY BE HARMFUL BY INHALATION, INGESTION, OR SKIN ABSORPTION.  
CAUSES SEVERE EYE IRRITATION.  
CAUSES SKIN IRRITATION.  
MATERIAL IS IRRITATING TO MUCOUS MEMBRANES AND UPPER  
RESPIRATORY TRACT.

EXPOSURE CAN CAUSE:

NAUSEA, DIZZINESS AND HEADACHE  
GASTROINTESTINAL DISTURBANCES  
DERMATITIS  
NARCOTIC EFFECT.

FIRST AID

IN CASE OF CONTACT, IMMEDIATELY FLUSH EYES OR SKIN WITH COPIOUS  
AMOUNTS OF WATER FOR AT LEAST 15 MINUTES WHILE REMOVING CONTAMINATED  
CLOTHING AND SHOES.  
IF INHALED, REMOVE TO FRESH AIR. IF NOT BREATHING GIVE ARTIFICIAL  
RESPIRATION. IF BREATHING IS DIFFICULT, GIVE OXYGEN.  
CALL A PHYSICIAN.

*rev'd 5/24/87*

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M A T E R I A L   S A F E T Y   D A T A   S H E E T

PAGE: 2

CATALOG # 27004-5

NAME: 2-BUTANONE, 99.92, HPLC GRADE

WASH CONTAMINATED CLOTHING BEFORE REUSE.

-----PHYSICAL DATA-----

MELTING POINT: -37 C  
BOILING POINT: 80 C  
SPECIFIC GRAVITY: 0.805

----- FIRE AND EXPLOSION HAZARD DATA -----

FLASH POINT: 26 F  
EXTINGUISHING MEDIA  
WATER SPRAY.  
CARBON DIOXIDE, DRY CHEMICAL POWDER, ALCOHOL OR POLYMER FOAM.  
SPECIAL FIRE FIGHTING PROCEDURES  
WEAR SELF-CONTAINED BREATHING APPARATUS AND PROTECTIVE CLOTHING TO PREVENT CONTACT WITH SKIN AND EYES.  
UNUSUAL FIRE AND EXPLOSION HAZARDS  
DANGER  
FLAMMABLE LIQUID.  
VAPOR MAY TRAVEL CONSIDERABLE DISTANCE TO SOURCE OF IGNITION AND FLASH BACK.

----- REACTIVITY DATA -----

INCOMPATIBILITIES  
OXIDIZING AGENTS  
BASES  
STRONG REDUCING AGENTS  
HAZARDOUS COMBUSTION OR DECOMPOSITION PRODUCTS  
CARBON MONOXIDE, CARBON DIOXIDE

----- SPILL OR LEAK PROCEDURES -----

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED  
SHUT OFF ALL SOURCES OF IGNITION.  
EVACUATE AREA.  
WEAR SELF-CONTAINED BREATHING APPARATUS, RUBBER BOOTS AND HEAVY RUBBER GLOVES.  
ABSORB ON SAND OR VERMICULITE AND PLACE IN CLOSED CONTAINERS FOR DISPOSAL.  
VENTILATE AREA AND WASH SPILL SITE AFTER MATERIAL PICKUP IS COMPLETE.  
WASTE DISPOSAL METHOD  
BURN IN A CHEMICAL INCINERATOR EQUIPPED WITH AN AFTERBURNER AND SCRUBBER BUT EXERT EXTRA CARE IN IGNITING AS THIS MATERIAL IS HIGHLY FLAMMABLE.

OBSERVE ALL FEDERAL, STATE & LOCAL LAWS.

--- PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE ---

WEAR APPROPRIATE NIOSH/MSHA-APPROVED RESPIRATOR, CHEMICAL-RESISTANT GLOVES, SAFETY GOGGLES, OTHER PROTECTIVE CLOTHING.  
SAFETY SHOWER AND EYE BATH.  
AVOID CONTACT WITH EYES, SKIN AND CLOTHING.  
MECHANICAL EXHAUST REQUIRED.  
DO NOT BREATHE VAPOR.  
AVOID CONTACT WITH EYES, SKIN AND CLOTHING.  
WASH THOROUGHLY AFTER HANDLING.  
SEVERE EYE IRRITANT.  
KEEP TIGHTLY CLOSED.  
KEEP AWAY FROM HEAT, SPARKS, AND OPEN FLAME.  
STORE IN A COOL DRY PLACE.

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M A T E R I A L   S A F E T Y   D A T A   S H E E T

PAGE: 2

CATALOG # 27069-5

NAME: 2-BUTANONE, 99.9%, HPLC GRADE

----- ADDITIONAL PRECAUTIONS AND COMMENTS -----

NOT APPLICABLE

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DATE: 01/24/87  
CUST # 92768 P.O. # 13271

## M A T E R I A L   S A F E T Y   D A T A   S H E E T   P A G E : 1

### IDENTIFICATION

PRODUCT # V150-3      NAME: VINYL ACETATE, 99+%  
CAS # 108-05-4

### TOXICITY HAZARDS

RTECS # AK0875000

ACETIC ACID, VINYL ESTER

#### IRRITATION DATA

EYE-HMN 22 PPM

SKN-RBT 10 MG/24H OPEN

EYE-RBT 500 MG OPEN

AIHAAP 30,449,69

JIHTAB 30,63,48

JIHTAB 30,63,48

#### TOXICITY DATA

ORL-RAT LD50:2920 MG/KG

IHL-RAT LC50:4000 PPM/2H

ORL-MUS LD50:1613 MG/KG

IHL-MUS LC50:1550 PPM/4H

IHL-RBT LC50:2500 PPM/4H

SKN-RBT LD50:2335 MG/KG

UCDS\*\* 4/25/58

DUPON\* ES-3574,75

GISAAA 31(8),19,56

DUPON\* ES-3574,75

DTLVS\* 4,426,80

DUPON\* ES-3574,75

#### REVIEWS, STANDARDS, AND REGULATIONS

CARCINOGENIC REVIEW: ANIMAL INDEFINITE IMEMDT 19,341,79

MSHA STANDARD-AIR: TWA 10 PPM (30 MG/M3) DTLVS\* 3,276,71

NIOSH REL TO VINYL ACETATE-AIR: CL 15 MG/M3/15M MMWPP\*\* 34(1S),30S,85

EPA GENETIC TOXICOLOGY PROGRAM, JANUARY 1984

REPORTED IN EPA TSCA INVENTORY, 1983

EPA TSCA SECTION 8(E) STATUS REPORT BEHQ-0478-0124

"NIOSH MANUAL OF ANALYTICAL METHODS" VOL 4 278\* NIM4\*

"NIOSH MANUAL OF ANALYTICAL METHODS" TO BE REVISED BY JUNE, 1985

MEETS CRITERIA FOR PROPOSED OSHA MEDICAL RECORDS RULE FEREC 47,30420.

82

ONLY SELECTED REGISTRY OF TOXIC EFFECTS OF CHEMICAL SUBSTANCES (RTECS) DATA IS PRESENTED HERE. SEE ACTUAL ENTRY IN RTECS FOR COMPLETE INFORMATION.

### HEALTH HAZARD DATA

#### ACUTE EFFECTS

MAY BE HARMFUL BY INHALATION, INGESTION, OR SKIN ABSORPTION.  
VAPOR OR MIST IS IRRITATING TO THE EYES, MUCOUS MEMBRANES AND UPPER  
RESPIRATORY TRACT.

CAUSES SKIN IRRITATION.

PROLONGED EXPOSURE CAN CAUSE:

NARCOTIC EFFECT.

#### CHRONIC EFFECTS

LABORATORY EXPERIMENTS HAVE SHOWN MUTAGENIC EFFECTS.

#### FIRST AID

IN CASE OF CONTACT, IMMEDIATELY FLUSH EYES WITH COPIOUS AMOUNTS OF  
WATER FOR AT LEAST 15 MINUTES.

IN CASE OF CONTACT, IMMEDIATELY WASH SKIN WITH SOAP AND COPIOUS  
AMOUNTS OF WATER.

IF INHALED, REMOVE TO FRESH AIR. IF NOT BREATHING GIVE ARTIFICIAL  
RESPIRATION, PREFERABLY MOUTH-TO-MOUTH. IF BREATHING IS DIFFICULT,  
GIVE OXYGEN.

CALL A PHYSICIAN.

REMOVE AND WASH CONTAMINATED CLOTHING PROMPTLY.

DISCARD CONTAMINATED SHOES.

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re'd 2/4/87



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## M A T E R I A L   S A F E T Y   D A T A   S H E E T

PAGE: 1

CATALOG # V150-3

NAME: VINYL ACETATE, 99+2

### -----PHYSICAL DATA-----

MELTING POINT: -93 C  
BOILING POINT: 72 C TO 73 C  
SPECIFIC GRAVITY: 0.934

### ----- FIRE AND EXPLOSION HAZARD DATA -----

FLASH POINT: 20 F  
EXTINGUISHING MEDIA  
CARBON DIOXIDE, DRY CHEMICAL POWDER, ALCOHOL OR POLYMER FOAM.  
DO NOT USE WATER.  
SPECIAL FIRE FIGHTING PROCEDURES  
WEAR SELF-CONTAINED BREATHING APPARATUS AND PROTECTIVE CLOTHING TO PREVENT CONTACT WITH SKIN AND EYES.  
USE WATER SPRAY TO COOL FIRE-EXPOSED CONTAINERS.  
UNUSUAL FIRE AND EXPLOSION HAZARDS  
DANGER  
EXTREMELY FLAMMABLE.  
VAPOR MAY TRAVEL CONSIDERABLE DISTANCE TO SOURCE OF IGNITION AND FLASH BACK.  
CONTAINER EXPLOSION MAY OCCUR UNDER FIRE CONDITIONS.  
MAY UNDERGO AUTOPOLYMERIZATION.

### ----- REACTIVITY DATA -----

#### INCOMPATIBILITIES

ACIDS  
BASES  
OXIDIZING AGENTS  
PEROXIDES  
HEAT  
MAY POLYMERIZE ON EXPOSURE TO LIGHT.  
HAZARDOUS COMBUSTION OR DECOMPOSITION PRODUCTS  
TOXIC FUMES OF:  
CARBON MONOXIDE, CARBON DIOXIDE

### ----- SPILL OR LEAK PROCEDURES -----

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED  
SHUT OFF ALL SOURCES OF IGNITION.  
EVACUATE AREA.  
WEAR SELF-CONTAINED BREATHING APPARATUS, RUBBER BOOTS AND HEAVY RUBBER GLOVES.  
COVER WITH AN ACTIVATED CARBON ADSORBENT, TAKE UP AND PLACE IN CLOSED CONTAINERS. TRANSPORT OUTDOORS.  
VENTILATE AREA AND WASH SPILL SITE AFTER MATERIAL PICKUP IS COMPLETE.  
WASTE DISPOSAL METHOD  
BURN IN A CHEMICAL INCINERATOR EQUIPPED WITH AN AFTERBURNER AND SCRUBBER BUT EXERT EXTRA CARE IN IGNITING AS THIS MATERIAL IS HIGHLY FLAMMABLE.

OBSERVE ALL FEDERAL, STATE & LOCAL LAWS.

### --- PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE ---

LONG RUBBER OR NEOPRENE GAUNTLET GLOVES.  
CHEMICAL SAFETY GOGGLES.  
RUBBER APRON.  
RUBBER BOOTS.  
SAFETY SHOWER AND EYE BATH.  
USE ONLY IN A CHEMICAL FUME HOOD.  
OSHA/MSHA-APPROVED RESPIRATOR.  
DO NOT BREATHE VAPOR.  
DO NOT GET IN EYES, ON SKIN, ON CLOTHING.  
WASH THOROUGHLY AFTER HANDLING.  
IRRITANT.  
POSSIBLE MUTAGEN.

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M A T E R I A L   S A F E T Y   D A T A   S H E E T   P A G E :   3

CATALOG # V150-3

NAME: VINYL ACETATE, 99+%

USE NONSPARKING TOOLS.  
KEEP AWAY FROM HEAT, SPARKS, AND OPEN FLAME.  
MAY UNDERGO AUTOPOLYMERIZATION.  
STORE IN THE DARK.  
REFRIGERATE.

----- ADDITIONAL PRECAUTIONS AND COMMENTS -----

#### ADDITIONAL INFORMATION

VINYL ACETATE IS INHIBITED WITH 4 PPM HYDROQUINONE AND 300 PPM DIPHENYLAMINE. MAY POLYMERIZE VIOLENTLY UPON LOSS OR REMOVAL OF INHIBITOR. DO NOT STORE FOR MORE THAN 60 DAYS FROM DATE OF SHIPMENT WITHOUT CHECKING INHIBITOR CONTENT.

THE ABOVE INFORMATION IS BELIEVED TO BE CORRECT BUT DOES NOT SUPPORT TO BE ALL INCLUSIVE AND SHALL BE USED ONLY AS A GUIDE. ALDRICH SHALL NOT BE HELD LIABLE FOR ANY DAMAGE RESULTING FROM HANDLING OR FROM CONTACT WITH THE ABOVE PRODUCT. SEE REVERSE SIDE OF INVOICE OR PACKING SLIP FOR ADDITIONAL TERMS AND CONDITIONS OF SALE.

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FORM 001 REV. 1/81

TOLUENE  
TOLUENE  
TOLUENE

## MATERIAL SAFETY DATA SHEET

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## SUBSTANCE IDENTIFICATION

SUBSTANCE: TOLUENE

CAS-NUMBER 108-88-3

## TRADE NAMES/SYNONYMS:

TOLUOL; PHENYL METHANE; METHYL BENZENE; METHYLBENZOL; METHYLBENZENE;  
PHENYLMETHANE; METHACIDE; U220; STCC 4909305; UN 1294; T-290; T-289; T-330;  
T-324; T-324-S; T-324-SK; T-323; T-323-S; BENZENE, METHYL-; ANTISALIA;

CHEMICAL FAMILY:  
HYDROCARBON, AROMATIC

MOLECULAR FORMULA: C7-H8

MOLECULAR WEIGHT: 92.0

CERCLA RATINGS (SCALE 0-3): HEALTH=3 FIRE=3 REACTIVITY=0 PERSISTENCE=1  
NFPA RATINGS (SCALE 0-4): HEALTH=2 FIRE=3 REACTIVITY=0

## COMPONENTS AND CONTAMINANTS

COMPONENT: TOLUENE

PERCENT: 99

## EXPOSURE LIMITS:

TOLUENE:

200 PPM OSHA TWA; 300 PPM OSHA ACCEPTABLE CEILING CONCENTRATION  
500 PPM FOR 10 MINUTES OSHA ACCEPTABLE MAXIMUM PEAK ABOVE THE ACCEPTABLE  
CEILING CONCENTRATION FOR AN 8 HOUR SHIFT  
100 PPM ACGIH TWA; 150 PPM ACGIH STEL  
100 PPM NIOSH RECOMMENDED TWA; 200 PPM NIOSH RECOMMENDED 10 MINUTE CEILING  
50 PPM ROHM AND HAAS RECOMMENDED TWA; 75 PPM ROHM AND HAAS RECOMMENDED STEL

1000 POUNDS CERCLA SECTION 103 REPORTABLE QUANTITY  
SUBJECT TO SARA SECTION 313 ANNUAL TOXIC CHEMICAL RELEASE REPORTING

## PHYSICAL DATA

DESCRIPTION: CLEAR, COLORLESS LIQUID WITH AN AROMATIC ODDOR.

BOILING POINT: 231 F (111 C) , MELTING POINT: -139 F (-95 C)

SPECIFIC GRAVITY: 0.866 VAPOR PRESSURE: 22 MMHG @ 20 C

EVAPORATION RATE: (BUTYL ACETATE=1) 2.24 SOLUBILITY IN WATER: 0.05%

ODOR THRESHOLD: 0.2-5 PPM VAPOR DENSITY: 3.2

SOLVENT SOLUBILITY: ACETONE, BENZENE, ALCOHOL, CHLOROFORM, ETHER, GLACIAL ACETIC ACID, CARBON DISULFIDE, DIMETHYL SULFOXIDE, LIGROIN, OTHER HYDROCARBONS

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FIRE AND EXPLOSION DATA

FIRE AND EXPLOSION HAZARD:  
DANGEROUS FIRE HAZARD WHEN EXPOSED TO HEAT OR FLAME.

VAPORS ARE HEAVIER THAN AIR AND MAY TRAVEL A CONSIDERABLE DISTANCE TO A SOURCE OF IGNITION AND FLASH BACK.

VAPOR-AIR MIXTURES ARE EXPLOSIVE ABOVE FLASH POINT.

DUE TO LOW ELECTROCONDUCTIVITY OF THE SUBSTANCE, FLOW OR AGITATION MAY GENERATE ELECTROSTATIC CHARGES RESULTING IN SPARKS WITH POSSIBLE IGNITION.

FLASH POINT: 40 F (4 C) (CC) UPPER EXPLOSIVE LIMIT: 7.1%

LOWER EXPLOSIVE LIMIT: 1.2% AUTOIGNITION TEMP.: 896 F (480 C)

FLAMMABILITY CLASS(OSHA): IB

FIREFIGHTING MEDIA:  
DRY CHEMICAL, CARBON DIOXIDE, HALON, WATER SPRAY OR STANDARD FOAM (1987 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.4).

FOR LARGER FIRES, USE WATER SPRAY, FOG OR STANDARD FOAM (1987 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.4).

FIREFIGHTING:  
MOVE CONTAINER FROM FIRE AREA IF POSSIBLE. COOL FIRE-EXPOSED CONTAINERS WITH WATER FROM SIDE UNTIL WELL AFTER FIRE IS OUT. STAY AWAY FROM STORAGE TANK ENDS. FOR MASSIVE FIRE IN STORAGE AREA, USE UNMANNED HOSE HOLDER OR MONITOR NOZZLES, ELSE WITHDRAW FROM AREA AND LET FIRE BURN. WITHDRAW IMMEDIATELY IN CASE OF RISING SOUND FROM VENTING SAFETY DEVICE OR ANY DISCOLORATION OF STORAGE TANK DUE TO FIRE (1987 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.4, GUIDE PAGE 27).

EXTINGUISH ONLY IF FLOW CAN BE STOPPED; USE WATER IN FLOODING QUANTITIES AS FOG, SOLID STREAMS MAY SPREAD FIRE. COOL CONTAINERS WITH FLOODING AMOUNTS OF WATER, APPLY FROM AS FAR A DISTANCE AS POSSIBLE. AVOID BREATHING TOXIC VAPORS, KEEP UPWIND.

WATER MAY BE INEFFECTIVE (NFPA FIRE PROTECTION GUIDE ON HAZARDOUS MATERIALS, EIGHTH EDITION).

## TRANSPORTATION DATA

DEPARTMENT OF TRANSPORTATION HAZARDOUS CLASSIFICATION 49CFR172.101:  
FLAMMABLE LIQUID

DEPARTMENT OF TRANSPORTATION LABELING REQUIREMENTS 49CFR172.101 AND 172.402:  
FLAMMABLE LIQUID

DEPARTMENT OF TRANSPORTATION PACKAGING REQUIREMENTS: 49CFR173.119  
EXCEPTIONS: 49CFR173.118

## TOXICITY

TOLUENE:  
300 PPM EYE-HUMAN IRRITATION; 500 MG SKIN-RABBIT MODERATE IRRITATION; 435 MG SKIN-RABBIT MILD IRRITATION; 2 MG/24 HOURS EYE-RABBIT SEVERE IRRITATION;  
870 UG EYE-RABBIT MILD IRRITATION; 100 MG/30 SECONDS REVERSED EYE-RABBIT MILD IRRITATION; 200 PPM INHALATION-HUMAN LCLO; 100 PPM INHALATION-MAN TCLO;  
50 MG/KG ORAL-HUMAN LDLO; 5000 MG/KG ORAL-RAT LD50; 4000 PPM/4 HOURS INHALATION-RAT LCLO; 12, 124 MG/KG SKIN-RABBIT LD50; 1600 PPM INHALATION-GUINEA PIG LCLO; 800 MG/KG INTRAPERITONEAL-RAT LDLO; 1960 MG/KG INTRAVENOUS-RAT LD50; 5320 PPM/8 HOURS INHALATION-MOUSE LC50; 1126 MG/KG INTRAPERITONEAL-MOUSE LD50; 2000 MG/KG UNREPORTED-MOUSE LD50; 6900 MG/KG UNREPORTED-RAT LD50; MUTAGENIC DATA (RTECS); REPRODUCTIVE EFFECTS DATA (RTECS).

CARCINOGEN STATUS: NONE.  
TOLUENE IS A SKIN, EYE, AND MUCOUS MEMBRANE IRRITANT, CENTRAL NERVOUS SYSTEM DEPRESSANT, AND NEUROTOXIN. POISONING MAY AFFECT THE HEART, LIVER, KIDNEYS, AND BLOOD. STIMULENTS SUCH AS EPINEPHRINE OR EPHEDRINE MAY INDUCE VENTRICULAR FIBRILLATION. TOLUENE INHIBITS MITOCHONDRIAL OXIDATIVE PHOSPHORYLATION. CONSUMPTION OF ALCOHOLIC BEVERAGES MAY ENHANCE THE TOXIC EFFECTS.

EPIDEMIOLOGICAL STUDIES INVOLVING PETROLEUM REFINERY WORKERS INDICATE PERSONS WITH ROUTINE EXPOSURE TO PETROLEUM OR ONE OF ITS CONSTITUENTS MAY BE AT AN INCREASED RISK TO THE DEVELOPMENT OF BENIGN NEOPLASMS, DIGESTIVE SYSTEM CANCERS, AND SKIN CANCER, PARTICULARLY MELANOMA.

## HEALTH EFFECTS AND FIRST AID

## INHALATION:

TOLUENE:  
IRRITANT/MARCOTIC/NEUROTOXIN.  
2000 PPM IMMEDIATELY DANGEROUS TO LIFE OR HEALTH.  
ACUTE EXPOSURE - THE LEVEL REQUIRED TO PRODUCE MARCOSSIS CAN EXIST WITHOUT ASSOCIATED RESPIRATORY IRRITATION. OODR DETECTION IS INSUFFICIENT FOR WARNING DUE TO OLFACTORY FATIGUE. 200-600 PPM FOR UP TO 6 HOURS CAUSED MILD UPPER RESPIRATORY TRACT IRRITATION, FATIGUE, WEAKNESS, CONFUSION, HEADACHE, NAUSEA, IMPAIRED COORDINATION, AND REACTION TIME. PARESTHESIAS OF THE SKIN, EUPHORIA, DIZZINESS, AND DILATED PUPILS. 800 PPM CAUSED RAPID IRRITATION, NASAL MUCOUS SECRETION, METALLIC TASTE, DROWSINESS, AND IMPAIRED BALANCE. AFTEREFFECTS INCLUDING NERVOUSNESS, MUSCULAR FATIGUE, AND INSOMNIA LASTED FOR SEVERAL DAYS. A WORKER FOUND UNCONSCIOUS AFTER EXPOSURE TO HIGH VAPOR CONCENTRATIONS FOR 18 HOURS DEVELOPED HEPATIC AND RENAL DAMAGE WITH MYOGLOBINURIA. RECOVERY WAS COMPLETE WITHIN 6 MONTHS. HEMATOLOGIC EFFECTS OCCUR RARELY WITH EXPOSURE TO HIGH CONCENTRATIONS.

RECOVERY USUALLY FOLLOWS REMOVAL FROM EXPOSURE. CHRONIC EXPOSURE - REPEATED OR PROLONGED EXPOSURE MAY CAUSE MUCOUS MEMBRANE IRRITATION, VOMITING, INSOMNIA, NOSEBLEEDS, CHEST PAIN, EUPHORIA, HEADACHE, VERTIGO, NAUSEA, ANOREXIA, BAD TASTE, MOMENTARY LOSS OF MEMORY, PALPITATIONS, EXTREME WEAKNESS, LOSS OF COORDINATION AND IMPAIRMENT OF REACTION TIME, TINNITUS, ALCOHOL INTOLERANCE, PETECHIAE AND ABNORMAL BLEEDING. LEUKOPENIA WITH BONE MARROW HYPOPLASIA HAS BEEN REPORTED OCCASIONALLY, BUT MAY BE DUE TO BENZENE CONTAMINATION. EXAMINATION OF WORKERS EXPOSED TO 100-1100 PPM REVEALED HEPATOMEGALY, HILD MACROCYTOSIS, MODERATE ERYTHROPENIA, AND ABSOLUTE LYMPHOCYTOSIS, BUT NO LEUKOPENIA. OTHER WORKERS EXPOSED TO TOLUENE FUMES DEVELOPED LEUKOPENIA AND COAGULATION ESPECIALLY NEUTROPENIA. WITHIN 6 MONTHS, THEY SHOWED INCREASED CIRCULATING TIME AND DECREASED PROTHROMBIN LEVEL. PERIODONTAL EFFECTS WERE ALSO NOTED. CARDIAC SENSITIZATION MAY OCCUR AND MAY RESULT IN CARDIAC ARREST DUE TO VENTRICULAR FIBRILLATION. REPEATED INHALATION OF TOLUENE TO THE POINT OF EUPHORIA HAS CAUSED IRREVERSIBLE ENCEPHALOPATHY WITH CEREBELLAR ATAXIA, RHYTHMIC LIMB MOVEMENTS, UNSTEADINESS, BIZZARE BEHAVIOR, EMOTIONAL LABILITY AND OPTIC ATROPHY, AND DIFUSE CEREBRAL ATROPHY. OTHER NEUROPSYCHIATRIC EFFECTS MAY INCLUDE LETHARGY, HALLUCINATIONS, COMA, DIZZINESS, SYNCOPÉ, PARESTHESIAS, AND PERIPHERAL NEUROPATHY. INTENTIONAL SNIFFING CAN PRODUCE RENAL TUBULAR DEFECTS WITH METABOLIC ACIDOSIS, ELECTROLYTE ABNORMALITIES AND POTASSIUM LOSS. SEVERE MUSCLE WEAKNESS LEADING TO LIMB PARALYSIS AND CARDIAC ARRHYTHMIAS MAY RESULT FROM THE HYPOKALEMIA; HOWEVER, SENSORY FUNCTION AND TENDONAL REFLEXES ARE NOT IMPAIRED. GASTROINTESTINAL EFFECTS MAY INCLUDE ABDOMINAL PAIN, NAUSEA, VOMITING, AND HEMATEMESIS. CHROMOSOME CHANGES WERE OBSERVED IN SOME WORKERS UP TO TWO YEARS AFTER CESSATION OF EXPOSURE TO TOLUENE. WOMEN OCCUPATIONALLY EXPOSED TO TOLUENE AND OTHER VARNISH SOLVENTS HAVE REPORTED MENSTRUAL DISORDERS, UNDERWEIGHT OFFSPRING WHO DID NOT NURSE WELL, AND FETAL ASPHYXIA. DYSMENORRHEA HAS BEEN REPORTED IN WOMEN OCCUPATIONALLY EXPOSED TO TOLUENE LEVELS OF 60-100 PPM. EFFECTS ON THE FETUS AND FETAL DEVELOPMENTAL ABNORMALITIES HAVE BEEN REPORTED IN OFFSPRING OF FEMALE RATS AND MICE FOLLOWING REPEATED EXPOSURE DURING GESTATION.

FIRST AID - REMOVE FROM EXPOSURE AREA TO FRESH AIR IMMEDIATELY. IF BREATHING HAS STOPPED, PERFORM ARTIFICIAL RESPIRATION. KEEP PERSON WARM AND AT REST. GET MEDICAL ATTENTION IMMEDIATELY.

SKIN CONTACT:

TOLUENE: IRRITANT  
ACUTE EXPOSURE - CONTACT WITH THE LIQUID MAY CAUSE IRRITATION, SCALING, CRACKING AND DERMATITIS. SKIN ABSORPTION DOES OCCUR, BUT IT IS GENERALLY TOO SLOW TO PRODUCE SIGNS OF ACUTE SYSTEMIC TOXICITY. PARESTHESIAS OF THE SKIN MAY OCCUR FROM VAPOR EXPOSURE.  
CHRONIC EXPOSURE - REPEATED OR PROLONGED CONTACT WITH THE LIQUID MAY CAUSE DEFATTING OF THE SKIN, RESULTING IN A DRY, FISSURED DERMATITIS. TEN TO TWENTY APPLICATIONS TO RABBIT SKIN PRODUCED SLIGHT TO MODERATE IRRITATION AND SLIGHT NECROSIS.

AN EPIDEMIOLOGICAL STUDY OF PETROLEUM REFINERY WORKERS HAS REPORTED ELEVATIONS IN STANDARD MORTALITY RATIOS FOR SKIN CANCER ALONG WITH A DOSE-RESPONSE RELATIONSHIP WHICH INDICATES AN ASSOCIATION BETWEEN ROUTINE WORKPLACE EXPOSURE TO PETROLEUM OR ONE OF ITS CONSTITUENTS AND SKIN CANCER, PARTICULARLY MELANOMA.

ACC23590 PAGE 05 OF 09  
FIRST AID- REMOVE CONTAMINATED CLOTHING AND SHOES IMMEDIATELY. WASH AFFECTED AREA WITH SOAP OR MILD DETERGENT AND LARGE AMOUNTS OF WATER. UNTIL NO EVIDENCE OF CHEMICAL REMAINS (APPROXIMATELY 15-20 MINUTES). GET MEDICAL ATTENTION IMMEDIATELY.

EYE CONTACT:  
TOLUENE:  
IRRITANT

ACUTE EXPOSURE- CONTACT WITH THE LIQUID MAY CAUSE CORNEAL BURNS IF NOT PROMPTLY REMOVED. VAPORS MAY CAUSE NOTICEABLE IRRITATION AND LACRIMATION AT 300-800 PPM, AND EXTREMELY HIGH CONCENTRATIONS MAY CAUSE BLURRING OF VISION. CORNEAL LESIONS, VERY FINE VACUOLES, HAVE BEEN REPORTED IN WORKERS EXPOSED TO A SOLVENT MIXTURE CONTAINING TOLUENE. THE LESIONS SUBSIDED FOLLOWING SEVERAL DAYS OF NON-EXPOSURE. SIMILAR LESIONS HAVE BEEN PRODUCED IN CATS FOLLOWING EXPOSURE TO TOLUENE.  
CHRONIC EXPOSURE- REPEATED OR PROLONGED CONTACT MAY CAUSE CONJUNCTIVITIS. RARELY, SYSTEMIC OCULAR DISTURBANCES, SUCH AS "REDDENING OF THE VISION", HAVE OCCURRED.

FIRST AID- WASH EYES IMMEDIATELY WITH LARGE AMOUNTS OF WATER, OCCASIONALLY LIFTING UPPER AND LOWER LIDS. UNTIL NO EVIDENCE OF CHEMICAL REMAINS (APPROXIMATELY 15-20 MINUTES). GET MEDICAL ATTENTION IMMEDIATELY.

INGESTION:  
TOLUENE:  
NARCOTIC

ACUTE EXPOSURE- MAY CAUSE NAUSEA, VOMITING, COLIC, DIARRHEA, BURNING SENSATION IN THE EPIGASTRIUM, HEADACHE, TINNITUS, DIZZINESS, WEAKNESS, EUPHORIA, DROWSINESS AND INCOORDINATION. IF LARGE AMOUNTS ARE INGESTED, SYMPTOMS MAY PROGRESS TO INCLUDE SHALLOW, RAPID RESPIRATION, TREMORS, VENTRICULAR IRREGULARITIES WITH FIBRILLATION, CONVULSIONS, STUPOR AND UNCONSCIOUSNESS. METABOLIC ACIDOSIS AND LIVER AND KIDNEY DAMAGE MAY OCCUR. APPROXIMATELY 15-30 MILLILITERS IS THE HUMAN LETHAL DOSE. ASPIRATION OF THE LIQUID INTO THE LUNGS MAY CAUSE COUGHING, GAGGING, ACUTE HEMORRHAGIC PNEUMONITIS AND RAPIDLY PULMONARY EDEMA.  
CHRONIC EXPOSURE- NO EFFECTS WERE REPORTED IN RATS FEED UP TO 590 MG/KG/DAY FOR 193 DAYS. EFFECTS ON THE FETUS AND FETAL DEVELOPMENTAL ABNORMALITIES HAVE BEEN REPORTED FOLLOWING REPEATED ADMINISTRATION TO PREGNANT MICE.

FIRST AID- DO NOT INDUCE VOMITING. GET IMMEDIATE MEDICAL ATTENTION.

ANTIDOTE:  
NO SPECIFIC ANTIDOTE. TREAT SYMPTOMATICALLY AND SUPPORTIVELY.

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REACTIVITY

REACTIVITY:  
STABLE UNDER NORMAL TEMPERATURES AND PRESSURES.

INCOMPATIBILITIES:  
TOLUENE:

ALLYL CHLORIDE + DICHLOROETHYL ALUMINUM OR ETHYLALUMINUM SESQUICHLORIDE:  
POSSIBLE EXPLOSION.  
BROMINE TRIFLUORIDE (SOLID): VIOLENT REACTION.  
DINITROGEN TETRAFLUORIDE: FORMS EXPLOSIVE MIXTURE.  
NITRIC ACID: INTENSE REACTION.  
NITRIC ACID + MIXED ACIDS: POSSIBLE RUNAWAY OR EXPLOSIVE REACTION.

NITRIC ACID + SULFURIC ACID: EXPLOSIVE REACTION.  
NITROGEN TETROXIDE: EXPLOSIVE REACTION.  
OXIDIZERS (STRONG): FIRE AND EXPLOSION HAZARD.  
PLASTICS, RUBBER, AND COATINGS: MAY BE ATTACKED.  
SILVER PERCHLORATE: FORMATION OF SHOCK SENSITIVE COMPLEX.  
SULFURIC ACID: EXOTHERMIC REACTION.  
TETRANITROMETHANE: EXTREMELY VIOLENT EXPLOSIVE REACTION.  
URANIUM HEXAFLUORIDE: VIGOROUS REACTION WITH THE SEPARATION OF CARBON.

DECOMPOSITION:  
THERMAL DECOMPOSITION PRODUCTS MAY INCLUDE TOXIC OXIDES OF CARBON.

POLYMERIZATION:  
HAZARDOUS POLYMERIZATION HAS NOT BEEN REPORTED TO OCCUR UNDER NORMAL TEMPERATURES AND PRESSURES.

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#### STORAGE AND DISPOSAL

OBSERVE ALL FEDERAL, STATE AND LOCAL REGULATIONS WHEN STORING OR DISPOSING OF THIS SUBSTANCE.

##### \*\*STORAGE\*\*

STORE IN ACCORDANCE WITH 29 CFR 1910.106.

PROTECT AGAINST PHYSICAL DAMAGE. OUTSIDE OR DETACHED STORAGE IS PREFERABLE. INSIDE STORAGE SHOULD BE IN A STANDARD FLAMMABLE LIQUIDS STORAGE ROOM OR CABINET. SEPARATE FROM OXIDIZING MATERIALS (NFPA 49, HAZARDOUS CHEMICALS DATA, 1975).

BONDING AND GROUNDING: SUBSTANCES WITH LOW ELECTROCONDUCTIVITY, WHICH MAY BE IGNITED BY ELECTROSTATIC SPARKS, SHOULD BE STORED IN CONTAINERS WHICH MEET THE BONDING AND GROUNDING GUIDELINES SPECIFIED IN NFPA 77-1983, RECOMMENDED PRACTICE ON STATIC ELECTRICITY.

STORE AWAY FROM INCOMPATIBLE SUBSTANCES.

##### \*\*DISPOSAL\*\*

DISPOSAL MUST BE IN ACCORDANCE WITH STANDARDS APPLICABLE TO GENERATORS OF HAZARDOUS WASTE, 40CFR 262. EPA HAZARDOUS WASTE NUMBER U220

\*\*\*\*\*  
CONDITIONS TO AVOID

MAY BE IGNITED BY HEAT, SPARKS OR FLAMES. VAPORS MAY TRAVEL TO A SOURCE OF IGNITION AND FLASH BACK. CONTAINER MAY EXPLODE IN HEAT OF FIRE. VAPOR EXPLOSION HAZARD INDOORS, OUTDOORS OR IN SEWERS. RUNOFF TO SEWER MAY CREATE FIRE OR EXPLOSION HAZARD.

\*\*\*\*\*  
SPILL AND LEAK PROCEDURES

## SOIL SPILL:

DIG HOLDING AREA SUCH AS LAGOON, POND OR PIT FOR CONTAINMENT.

DIKE FLOW OF SPILLED MATERIAL USING SOIL OR SANDBAGS OR FOAMED BARRIERS SUCH AS POLYURETHANE OR CONCRETE.

USE CEMENT POWDER OR FLY ASH TO ABSORB LIQUID MASS.

IMMOBILIZE SPILL WITH UNIVERSAL GELLING AGENT.

REDUCE VAPOR AND FIRE HAZARD WITH FLUOROCARBON WATER FOAM.

## AIR SPILL:

KNOCK DOWN VAPORS WITH WATER SPRAY, KEEP UPWIND.

## WATER SPILL:

LIMIT SPILL MOTION AND DISPERSION WITH NATURAL BARRIERS OR OIL SPILL CONTROL BOOMS.

APPLY DETERGENTS, SOAPS, ALCOHOLS OR ANOTHER SURFACE ACTIVE AGENT TO THICKEN SPILLED MATERIAL.

APPLY UNIVERSAL GELLING AGENT TO IMMOBILIZE TRAPPED SPILL AND INCREASE EFFICIENCY OF REMOVAL.

IF DISSOLVED, AT A CONCENTRATION OF 10 PPM OR GREATER, APPLY ACTIVATED CARBON AT TEN TIMES THE AMOUNT THAT HAS BEEN SPILLED.

USE SUCTION HOSES TO REMOVE TRAPPED SPILL MATERIAL.

USE MECHANICAL DREDGES OR LIFTS TO EXTRACT IMMOBILIZED MASSES OF POLLUTION AND PRECIPITATES.

## OCCUPATIONAL SPILL:

SHUT OFF IGNITION SOURCES. STOP LEAK IF YOU CAN DO IT WITHOUT RISK. USE WATER SPRAY TO REDUCE VAPORS. FOR SMALL SPILLS, TAKE UP WITH SAND OR OTHER ABSORBENT MATERIAL AND PLACE INTO CONTAINERS FOR LATER DISPOSAL. FOR LARGER SPILLS, DIKE FAR AHEAD OF SPILL FOR LATER DISPOSAL. NO SMOKING, FLAMES OR FLARES IN HAZARD AREA. KEEP UNNECESSARY PEOPLE AWAY; ISOLATE HAZARD AREA AND RESTRICT ENTRY.

REPORTABLE QUANTITY (RQ): 1000 POUNDS

THE SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT (SARA) SECTION 304 REQUIRES THAT A RELEASE EQUAL TO OR GREATER THAN THE REPORTABLE QUANTITY FOR THIS SUBSTANCE BE IMMEDIATELY REPORTED TO THE LOCAL EMERGENCY PLANNING COMMITTEE AND THE STATE EMERGENCY RESPONSE COMMISSION (40 CFR 355.40). IF THE RELEASE OF THIS SUBSTANCE IS REPORTABLE UNDER CERCLA SECTION 103, THE NATIONAL RESPONSE CENTER MUST BE NOTIFIED IMMEDIATELY AT (800) 424-8802 OR (202) 426-2675 IN THE METROPOLITAN WASHINGTON, D.C. AREA (40 CFR 302.6).

-----  
PROTECTIVE EQUIPMENT

## VENTILATION:

PROVIDE LOCAL EXHAUST OR GENERAL DILUTION VENTILATION TO MEET PUBLISHED EXPOSURE LIMITS. VENTILATION EQUIPMENT MUST BE EXPLOSION-PROOF.

**RESPIRATOR:**

THE FOLLOWING RESPIRATORS AND MAXIMUM USE CONCENTRATIONS ARE RECOMMENDATIONS BY THE U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES, NIOSH POCKET GUIDE TO CHEMICAL HAZARDS OR NIOSH CRITERIA DOCUMENTS; OR DEPARTMENT OF LABOR, 29CFR1910 SUBPART Z.  
THE SPECIFIC RESPIRATOR SELECTED MUST BE BASED ON CONTAMINATION LEVELS FOUND IN THE WORK PLACE AND BE JOINTLY APPROVED BY THE NATIONAL INSTITUTE OF OCCUPATIONAL SAFETY AND HEALTH AND THE MINE SAFETY AND HEALTH ADMINISTRATION.

**TOLUENE:**

1000 PPM- ANY CHEMICAL CARTRIDGE RESPIRATOR WITH ORGANIC VAPOR CARTRIDGE(S).  
ANY SUPPLIED-AIR RESPIRATOR.  
ANY POWERED AIR-PURIFYING RESPIRATOR WITH ORGANIC VAPOR CARTRIDGE(S).  
ANY SELF-CONTAINED BREATHING APPARATUS.

2000 PPM- ANY SUPPLIED-AIR RESPIRATOR OPERATED IN A CONTINUOUS FLOW MODE.  
ANY SELF-CONTAINED BREATHING APPARATUS WITH A FULL FACEPIECE.  
ANY SUPPLIED-AIR RESPIRATOR WITH A FULL FACEPIECE.  
ANY AIR-PURIFYING FULL FACEPIECE RESPIRATOR (GAS MASK) WITH A CHIN-STYLE OR FRONT OR BACK-MOUNTED ORGANIC VAPOR CANISTER.

ESCAPE- ANY AIR-PURIFYING FULL FACEPIECE RESPIRATOR (GAS MASK) WITH A CHIN-STYLE OR FRONT OR BACK-MOUNTED ORGANIC VAPOR CANISTER.  
ANY APPROPRIATE ESCAPE-TYPE SELF-CONTAINED BREATHING APPARATUS.

**FOR FIREFIGHTING AND OTHER IMMEDIATELY DANGEROUS TO LIFE OR HEALTH CONDITIONS:**

SELF-CONTAINED BREATHING APPARATUS WITH FULL FACEPIECE OPERATED IN PRESSURE DEMAND OR OTHER POSITIVE PRESSURE MODE.

SUPPLIED-AIR RESPIRATOR WITH FULL FACEPIECE AND OPERATED IN PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE MODE IN COMBINATION WITH AN AUXILIARY SELF-CONTAINED BREATHING APPARATUS OPERATED IN PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE MODE.

**CLOTHING:**

EMPLOYEE MUST WEAR APPROPRIATE PROTECTIVE (IMPERVIOUS) CLOTHING AND EQUIPMENT TO PREVENT REPEATED OR PROLONGED SKIN CONTACT WITH THIS SUBSTANCE.

**GLOVES:**

EMPLOYEE MUST WEAR APPROPRIATE PROTECTIVE GLOVES TO PREVENT CONTACT WITH THIS SUBSTANCE.

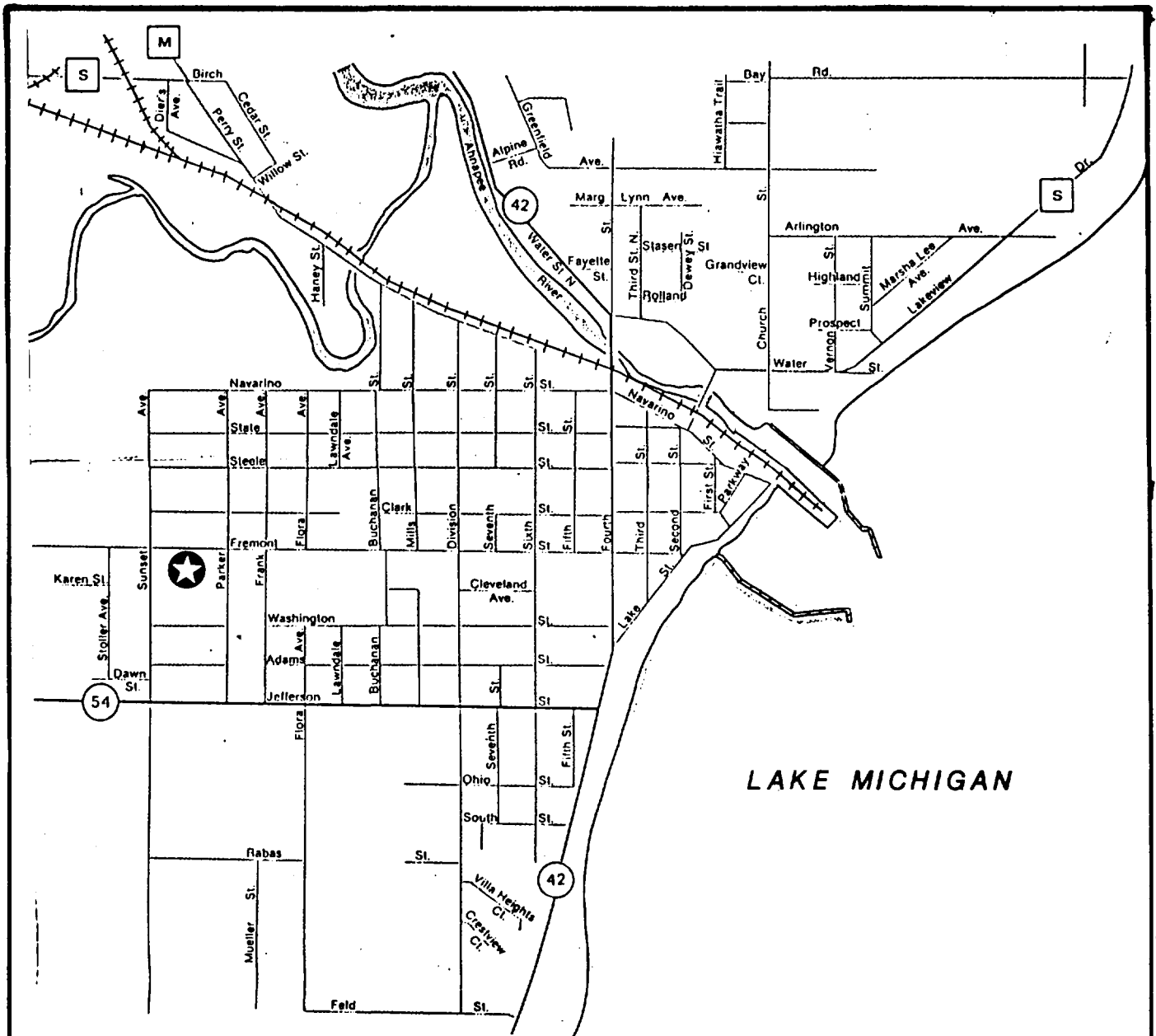
**EYE PROTECTION:**

EMPLOYEE MUST WEAR SPLASH-PROOF OR DUST-RESISTANT SAFETY GOGGLES TO PREVENT EYE CONTACT WITH THIS SUBSTANCE. CONTACT LENSES SHOULD NOT BE WORN.

THE INFORMATION BELOW IS BELIEVED TO BE ACCURATE AND REPRESENTS THE BEST INFORMATION CURRENTLY AVAILABLE TO US. HOWEVER, WE MAKE NO WARRANTY OF MERCHANTABILITY OR ANY OTHER WARRANTY, EXPRESS OR IMPLIED, WITH RESPECT TO SUCH INFORMATION, AND WE ASSUME NO LIABILITY RESULTING FROM ITS USE. USERS SHOULD MAKE THEIR OWN INVESTIGATIONS TO DETERMINE THE SUITABILITY OF THE INFORMATION FOR THEIR PARTICULAR PURPOSES.

**APPENDIX C**

**MAP OF ROUTE TO HOSPITAL**



**ALGOMA, WI**



**ALGOMA MEMORIAL HOSPITAL**

1 MILE



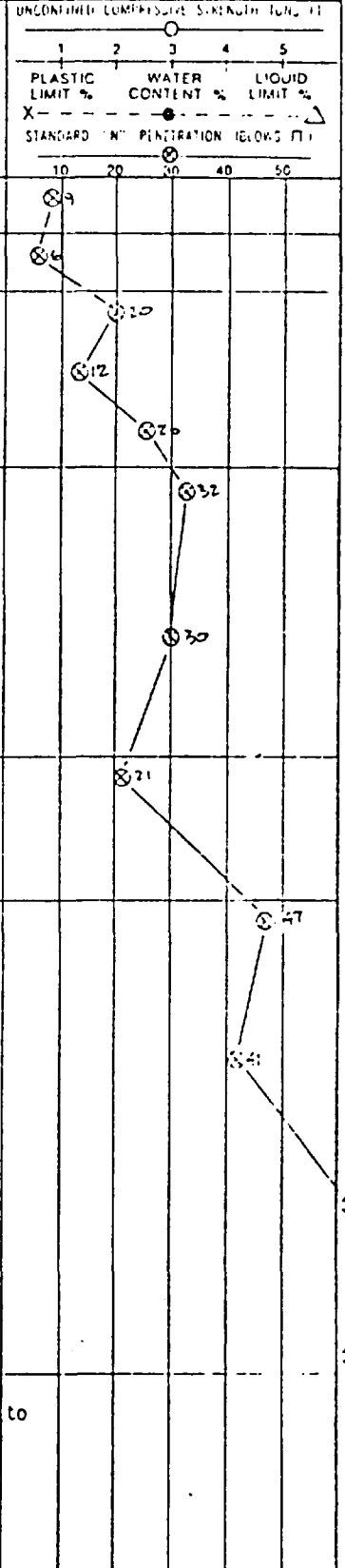
Drawn by:	DRB
Date:	8/5/88
Proj. #	1375.02

AUG 16 1988

**APPENDIX D**  
**EXISTING BOREHOLE LOGS AND MONITORING**  
**WELL CONSTRUCTION SUMMARIES**

OWNER City of Algoma	ARCHITECT-ENGINEER Drey, Stuewe and Braun
SITE Algoma, Wisconsin	PROJECT NAME Algoma Landfill Monitoring Wells

DEPTH ELEVATION	SAMPLE NO	TYPE SAMPLE	SAMPLE DIST RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT. 3	UNCONSOLIDATED COMPRESSIVE STRENGTH (TONS/FT. 2)				
						1	2	3	4	5
				SURFACE ELEVATION 100.73						
	1	SS		Fill - reddish brown silty clay (CL) with trace sand, roots-moist						
	2	SS		Fill-white decomposed wood and sawdust-moist						
	3	SS		Fill-brown sand with wood chips-moist						
	4	SS								
	5	SS								
	6	SS								
	7	SS		Brown silty sand (SM) with trace gravel-moist to 15.0 feet, wet below 15.0 feet						
	8	SS		Brown sand and gravel (SP)-wet						
	9	SS		Brown silty sand (SM)-with trace gravel-wet						
	10	SS								
	11	SS								
	12	SS		End of Boring Boring advanced to 20.0 feet with solid-stem auger and from 20.0 feet to 41.5 feet with roller bit HW casing used to 40.0 feet 2" PVC well installed to 39.8 feet (See well diagram)						



WATER LEVEL OBSERVATIONS		
WL	15.0' WS	
WL	BCR	ACR
WL	16.0' on 11-20-80	

**SOIL TESTING SERVICES OF WIS., INC.**  
540 LAMBEAU STREET  
GREEN BAY, WIS. 54303

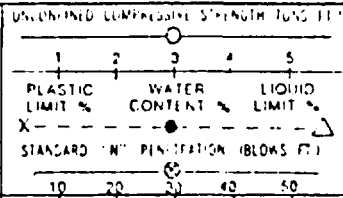
BORING STARTED	11-12-80
BORING COMPLETED	11-12-80
DRAWN BY	MJP
APPROVED	BBK
DATE	11-22-80

The stratification in this report represent the approximate boundary between soil types. The transition may be gradual.

OWNER City of Algona	ARCHITECT-ENGINEER Brey, Stuewer and Braun
SITE Algona, Wisconsin	PROJECT NAME Algona Landfill Monitoring Wells

B-2

DEPTH ELEVATION	SAMPLE NO.	TYPE SAMPLE	SAMPLE DIST FEET	PENETRATION	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT. <sup>3</sup>	UNSATURATED COMPRESSIVE STRENGTH (LBS./FT. <sup>2</sup> )								
							1	2	3	4	5				
					SURFACE ELEVATION 92.15										
	1	ST			Reddish brown clayey gravel (GC) with some sand-moist										
	2	ST													
	3	SS			Brown sand and gravel (SP)-moist										
	4	SS			Brown gravel and sand (GP)-wet										
	5	SS			Brown medium sand (SP) with trace gravel-wet										
	6	SS													
	7	SS													
	8	SS			Brown silty sand (SM)-with trace gravel-wet										
	9	SS			Brown coarse sand and fine gravel (SP)-wet										
	10	SS			Grayish brown clayey silt (ML)-with trace sand-wet										
	End of Boring Boring advanced to 8.0 feet with solid-stem auger and from 8.0 feet to 32.0 feet with roller bit HW casing used to 25.0 feet 2 inch PVC well installed to 31.5 feet (See well diagram)														



WATER LEVEL OBSERVATIONS			
WL	6.0' WS		
WL	DCR	ACR	
WL	7.6' on 11-20-80		

**SOIL TESTING SERVICES**  
 OF WIS., INC.  
 540 LAMBEAU STREET  
 GREEN BAY, WIS. 54303

BORING STARTED	11-14-80		
BORING COMPLETED	11-14-80		
HIG	Bomb.	FOREMAN	PT
DRAWN	MJP	APPROVED	PMK
JOB NO.	11272	SHEET	

The stratification lines represent the approximate boundary between soil types and the transition may be gradual

OWNER City of Algoma ARCHITECT-ENGINEER Brey, Stuewe and Braun E-3

SITE Algoma, Wisconsin PROJECT NAME Algoma Landfill Monitoring Wells

DEPTH ELEVATION	SAMPLE NO	TYPE SAMPLE	SAMPLE DIST RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT. 3	UNCONFIRMED COMPRESSIVE STRENGTH (LBS./FT. 2)				
						1	2	3	4	5
						PLASTIC LIMIT %		WATER CONTENT %		LIQUID LIMIT %
						X - STANDARD		● - N° PENETRATION		▲ - 100 GWS FT.
						10	20	30	40	50
				SURFACE ELEVATION 95.72						
	1	SS		Fill - reddish brown silty clay (CL)-with trace gravel-moist		⊗ 6				
	2	SS		Fill-light brown silty fine sand (SM)-and garbage-moist		⊗ 5				
	3	SS		Fill-brown silty clay (CL) and garbage-moist to wet						
	4	SS								
	5	SS								
	6	SS								
	7	SS		Reddish brown silty clay (CL)-with trace gravel-wet						
	8	SS								
	9	SS								
	10	SS		Grayish brown clayey silt (ML)-with trace sand and trace sand seams-wet						
	11	SS		End of Boring Boring advanced to 10.0 feet with solid-stem auger and from 10.0 feet to 36.5 feet with roller bit H <sub>2</sub> O casing used to 15.0 feet 2" PVC well installed to 35.0 feet (See well diagram)						

WATER LEVEL OBSERVATIONS	
WL	2.0' WS
WL	DCR ACR
WL	12.3' on 11-20-80

**SOIL TESTING SERVICES OF WIS., INC.**  
540 LAMBEAU STREET  
GREEN BAY, WIS 54303

BOHING STARTED	11-17-80
BOHING COMPLETED	11-17-80
DRAWN	MJP
DATE	11-22
FOR MAN	TT
APPROVED	BRK
SOILT	

The stratification lines represent the approximate

LOG OF BORING NO. 4

OWNER City of Algoma	ARCHITECT-ENGINEER Brey, Stuewe and Braun	B-4
SITE Algoma, Wisconsin	PROJECT NAME Algoma Landfill Monitoring Wells	

DEPTH ELEVATION	SAMPLE NO	TYPE SAMPLE	FACTOR LIST	PI CODES	DESCRIPTION OF MATERIAL	UNIT DRY WT. LOGS (FT. 3)	UNSATURATED COMPRESSION STRENGTH (TONS/FT <sup>2</sup> )					
							1	2	3	4	5	
							PLASTIC LIMIT %		WATER CONTENT %		LIQUID LIMIT %	
							STANDARD		N° PENETRATION		BLOWS (FT)	
					SURFACE ELEVATION → 89.36							
	1	SS			topsoil - dark brown clayey silt (ML)-with roots and trace gravel-moist							
	2	SS			Reddish brown silty clay (CL)-with a little gravel and trace sand-trace of cobbles-moist							
	3	SS			Brown sand and gravel (SP)-trace of cobbles-moist							
	4	SS										
	5	SS										
10	6	SS			Brown silty sand (SM)-with some gravel and trace of cobbles-moist-wet below 15.0 feet							
15	7	SS										
20	8	SS										
25	9	SS			Grayish brown clayey silt (ML)-with trace sand and trace gravel-trace of cobbles-wet							
29.5	10	SS										
					End of Boring Boring advanced to 10.0 feet with solid-stem and from 10.0 feet to 29.5 feet with roller bit HW casing used to 25.0 feet 2" PVC well installed to 27.0 feet (See well diagram)							

WATER LEVEL OBSERVATIONS	
WL	5.0' WD
WL	5.0' HGH
WL	7.0' on 11-20-80

<b>SOIL TESTING SERVICES OF WIS., INC.</b>		BORING STARTED		11-14-80
540 LAMBEAU STREET		BORING COMPLETED		11-18-80
GREEN BAY, WIS 54303		DRG. BY		TS
		DRAWN BY		BMF
		DATE		11-17-80
		CHECKED BY		

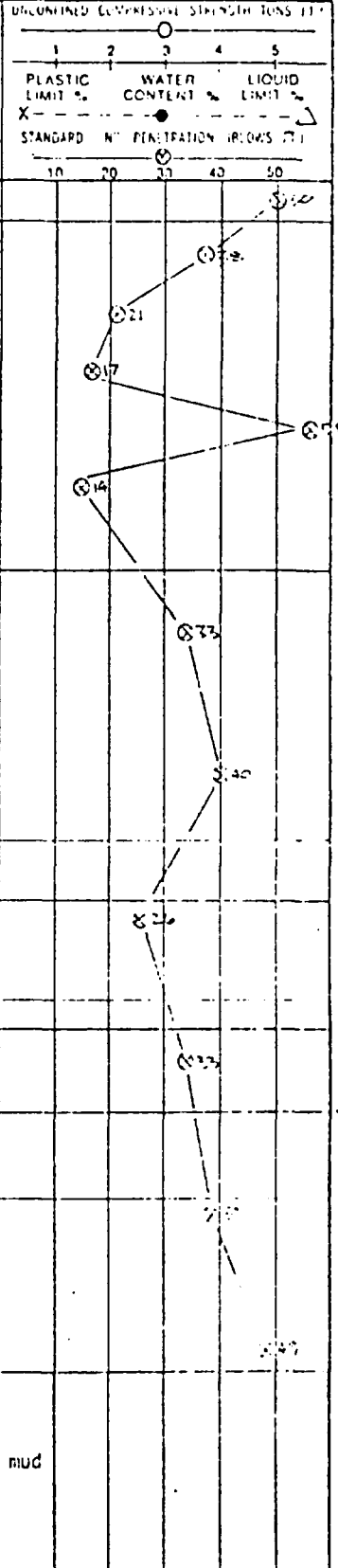
The stratification lines represent the approximate boundary

LOG OF BORING NO. \_\_\_\_\_

OWNER City of Algoma	ARCHITECT-ENGINEER Rey, Stuewe and Braun	E-5
SITE Algoma, Wisconsin	PROJECT NAME Algoma Landfill Monitoring Wells	

DEPTH ELEVATION	SAMPLE NO	TYPE SAMPLE	SAMPLE DIST RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT. 3	UNCONFINED COMPRESSIVE STRENGTH (TONS/FT <sup>2</sup> )				
						1	2	3	4	5
☒				SURFACE ELEVATION → 104.21						
	1	SS		Fill-reddish brown silty clay (CL)-with a little gravel-moist						10
	2	SS		Fill-reddish brown silty sand (SM)-with trace to some garbage, gravel, and clay-moist, wet below 8.0 feet						20
	3	SS								30
	4	SS								40
	5	SS								50
	6	SS								
				Brown silty sand (ML)-with trace to some gravel-wet						
	7	SS								
				Boulder						
	9	SS		Brown silty sand and gravel (GM)-wet						
				Boulder						
	10	SS		Brown medium to coarse sand and gravel (SP)-wet						
				Grayish brown clayey silt (ML)-with trace sand-wet						
	11	SS		Brown sand and gravel (SP)-with trace silt						
	11A	SS								
	12	SS		End of Boring						

End of Boring  
 Boring advanced to 8.0 feet with solid-stem auger  
 Boring advanced from 8 to 28.5 feet with roller bit and wash water  
 Boring advanced from 28.5 to 41.5 feet with roller and Revert drilling mud  
 IW casing used to 28.5 feet  
 IW casing used to 23 feet  
 2 inch PVC well installed to 40.5 feet (See well diagram)




WATER LEVEL OBSERVATIONS	
WL	UCR ACR
WL	16.5' AB

**SOIL TESTING SERVICES**  
 OF WIS., INC.  
 540 LAMBEAU STREET  
 GREEN BAY, WIS 54303

BORING STARTED	11-20-80
BORING COMPLETED	11-20-80
DRAWN	HP
APPROVED	HP
DATE	11-27-80
SHEET	

The stratification lines represent the approximate boundary

 STS Consultants Ltd.	OWNER City of _____na	LOG OF BORING NUMBER B-5R
	PROJECT NAME City of Algoma Landfill	ENGINEER Brey, Stuewe & Braun

SITE LOCATION: Algoma, Wisconsin

DEPTH	ELEVATION	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, N (B/FT)	UNCONFINED COMPRESSIVE STRENGTH, Op (TONS/FT <sup>2</sup> )	WATER CONTENT, %	UNIT DRY WEIGHT (LBS/FT <sup>3</sup> )	LIQUID/PLASTIC LIMIT LL/PL	PERCENT PASSING #200 SIEVE	PERMEABILITY, K (CM/SEC)
						WELL INSTALLATION TOP STANDPIPE EL. + 700.5  SURFACE ELEVATION 698.7							
						Dark brown to gray fine to medium sand (SP) - trace silt - little coarse gravel - dry - auger sample - glacial outwash							
		1	SS			Reddish brown to dark brown to gray very silty fine sand (SM) - trace medium sand - trace fine gravel - trace to a little clay - dry - medium dense - glacial till	12						
		2	SS				26						
		3	SS			Light brown fine to coarse sand (SP) - a little fine to coarse gravel - trace silt - dry - medium dense to dense - glacial outwash	41						
		4	SS				24						
		5	SS			Light brown silty medium to coarse sand (SM) - a little fine to coarse gravel - wet - medium dense - glacial outwash	13						
		6	SS			Gray to light brown fine sand (SP) - trace silt - wet - loose - glacial outwash	9						
		6A	SS				10						
		7	SS			Light brown fine to medium sand (SP) to (SM) - trace coarse sand - increase in fine sand and silt with depth - wet - medium dense - glacial outwash	15						
		8	SS			Light brown fine to coarse sandy fine to coarse gravel - (GP) to (GM) - wet - medium dense - glacial outwash	21						
						End of Boring Boring advanced from 0'-5' by solid-stem auger Boring advanced from 5'-41.1' by hollow stem auger 2" PVC monitoring well installed at 41.1' with protector pipe and lock							

The stratification lines represent the approximate boundary between soil types in situ. The transition may be gradual. Water levels were measured at the times indicated. Water levels may vary seasonally.

WL	21'-22'	WD	BCR	ACR	BORING STARTED	6-18-87	STS OFFICE	540 Lambeau Green Bay, WI 54303	
WL-T. PIPE	DATE	TIME	WL-T. PIPE	DATE	TIME	BORING COMPLETED	DRAWN BY	JJT	SHEET 1 OF 1
22.35	6-26-87					RIG	APP'D BY	JMB	STS JOB NO. 15229XF
						FOREMAN		EVII	

LOG OF BORING NO. B-6

OWNER City of Algona	ARCHITECT-ENGINEER Proy. Stupwe and Brown
SITE Algona, Wisconsin	PROJECT NAME Algona Landfill Monitoring Wells

DEPTH ELEVATION	SAMPLE NO.	TYPE SAMPLE	SAMPLE USE RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT. 3	UNSATURATED COMPRESSIVE STRENGTH (TONS/FT. 2)				
						1	2	3	4	5
						PLASTIC LIMIT %				
						WATER CONTENT %				
						LIQUID LIMIT %				
						STANDARD PENETRATION (BLows)				
						10	20	30	40	50
				SURFACE ELEVATION 100.13						
1	SS			Brown medium sand (SP)-with a little large gravel-moist						
2	SS			Brown sandy silt (ML)-with trace clay-moist						
3	SS									
4	SS									
5	SS									
6	SS									
15	7	SS			Brown sandy silt (ML)-with some gravel and some cobbles-wet					
20	8	SS		Brown coarse sand and fine gravel-with some cobbles (SP)-wet						
25				End of Boring Boring advanced to 25.0 feet with solid-stem auger Boring abandoned because of loss of 5 foot auger section						

WATER LEVEL OBSERVATIONS	
WL	PCR ACR
WL	
WL	

**SOIL TESTING SERVICES**  
OF WIS., INC.  
540 LAMBEAU STREET  
GREEN BAY, WIS 54303

BORING STARTED	11-18-69
BORING COMPLETED	11-18-69
LOG	Bohls
DRAWN	HJG
JOB #	10872
FOR MAN	TT
APPROVED	PKK
SHEET	

The stratification lines represent the approximate boundary

OWNER City of Algoma	ARCHITECT/ENGINEER Prey, Stuewe and Braun	B-6A
SITE Algoma, Wisconsin	PROJECT NAME Algoma Landfill Monitoring Wells	

DEPTH ELEVATION	SAMPLE NO	TYPE SAMPLE	SAMPLE DIST	RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. 100 YR <sup>3</sup>	UNCONSOLIDATED COMPRESSIVE STRENGTH (TONS FT <sup>2</sup> )							
							1	2	3	4	5			
							PLASTIC LIMIT %	WATER CONTENT %	LIQUID LIMIT %					
							X		STANDARD NO. PENETRATION BLOWS (FT)					
									10	20	30	40	50	
					SURFACE ELEVATION → 106.74									
		PA			See Boring 6									
10														
15														
20		RD												
25														
30		RD												
30	10	SS			Gray silty medium sand and gravel with some cobbles (SM)-wet									
	11	SS												
35					Boulder									
35	12	SS			Brown fine sand and gravel (SP)-wet									
39	13	SS												
					End of Boring Boring advanced to 10.0 feet with solid-stem auger and from 10.0 feet to 39.0 feet with roller bit HW casing used to 30.0 feet 2 inch PVC well installed to 38.0 feet (See well diagram)									

WATER LEVEL OBSERVATIONS	
WL	19.2' HD
WL	BCH
WL	22.7' AB
WL	ACH

**SOIL TESTING SERVICES**  
OF WIS., INC.  
540 LAMBEAU STREET  
CORN BAY, WIS. 54803

BORING STARTED	11-12-80
BORING COMPLETED	11-12-80
DRAWN	RJP
APPROVED	PMK

The stippled lines between soil types are not the approximate boundary and may be gradual.

LOG OF BORING NO. 7

OWNER City of Algoma	ARCHITECT-ENGINEER Brey, Stuewe and Braun	B-7
SITE Algoma, Wisconsin	PROJECT NAME Algoma Landfill Monitoring Wells	

DEPTH ELEVATION	SAMPLE NO	TYPE SAMPLE	SAMPLE DIST	RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT. 3	UNCONSOLIDATED COMPRESSIVE STRENGTH (TONS/FT. 2)							
							1	2	3	4	5			
					SURFACE ELEVATION 104.48									
5					Fill - garbage and wood chips									
10		PA												
15	1	SS												
20	2	SS			Brown silty sand (SM)-wet									
20.5					End of Boring Boring advanced to 20.5 feet with solid-stem auger									

WATER LEVEL OBSERVATIONS	
WL	16.5' to 19.0' WD
WL	DCR
WL	ACH

**SOIL TESTING SERVICES**  
OF WIS. INC.  
540 LAMBU AU STREET  
GREEN BAY, WIS. 54303

BORING STARTED	11-13-80
BORING COMPLETED	11-13-80
LOG	WDB
DRAWN	MSP
DATE	11/22/80
FOR	10000
APPROVED	RMK
SHEET	

The stratification lines represent the approximate boundary

OWNER City of Algoma	ARCHITECT-ENGINEER Brey, Stuewe and Braun	B-8
SITE Algoma, Wisconsin	PROJECT NAME Algoma Landfill Monitoring Wells	

DEPTH ELEVATION	SAMPLE NO	TYPE SAMPLE	SAMPLE DIST RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT. 3	UNCONFINED COMPRESSIVE STRENGTH (TONS/FT. 2)				
						1	2	3	4	5
						PLASTIC LIMIT %		WATER CONTENT %		LIQUID LIMIT %
						STANDARD 1" PENETRATION (BLDGWS PI)				
						10	20	30	40	50
				SURFACE ELEVATION 103.76						
10				Fill-garbage and wood chips						
19.0	2	SS		Brown silty sand (SM)-wet						
20	2A	SS		End of Boring Boring advanced to 19.0 feet with solid-stem auger						

WATER LEVEL OBSERVATIONS	
WL	13.0' WD
WL	BCR ACR
WL	11.5' AB

**SOIL TESTING SERVICES**  
OF WIS., INC.  
540 LAMBEAU STREET  
GREEN BAY, WIS. 54303

BOILING STARTED	11-13-80
BOILING COMPLETED	11-13-80
FIG. Bomb.	FOREMAN TT
DRAWN MJP	APPROVED RSK
JOB 10872	SHEET

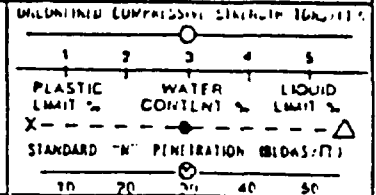
The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

LOG OF BORING NO. 5

DIVISION City of Algona	ARCHITECT-ENGINEER Brey, Stowe and Braun
SILL Algona, Wisconsin	PROJECT NAME Algona Landfill Monitoring Wells

B-9

DEPTH ELEVATION	SAMPLE NO	TYPE SAMPLE	SAMPLE DIST. RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. (LBS./FT. 3)	UNLIMITED COMPRESSION STRENGTH (KIPS)
				SURFACE ELEVATION 7 108.41		
	1	SS		Topsoil		
	2	SS				
	3	SS				
	4	SS		Brown silty fine to coarse sand (SM) - with some gravel - dry to 6.5 feet, wet below 10.0 feet - medium dense to extremely dense		
	5	SS				
	6	SS				
	7	SS				
	8	SS				
	9	SS				
	10	SS		Brown fine to coarse sand (SM) - with a little to some gravel - trace of silt - wet - dense to extremely dense		
	11	SS				
	12	SS				



CONTINUED

WATER LEVEL OBSERVATIONS: W1 23.0' B.C.F. A.C.F. W1 8.0' before leaving site	<b>SOIL TESTING SERVICES OF WIS., INC.</b> 500 LAMARCAU STREET GREEN BAY, WIS 54303	BORING STARTED 5-22-81 BORING COMPLETED 5-22-81 DIG. JOY 120 FOREMAN [VH] DRAWN JPJ APPROVED RPK JOB # 10872 SHEET 1 of 2
--	---	---

LOG OF BORING NO 3 Continued

OWNER City of Algoma	ARCHITECT-ENGINEER Broy, S... and Braun
SITE Algoma, Wisconsin	PROJECT NAME Algoma Landfill Monitoring Wells

B-9

DEPTH ELEVATION	SAMPLE NO	TYPE SAMPLE	SAMPLE DIST	RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT. 3	UNCONSOLIDATED COMPRESSION STRENGTH (LBS./FT. 2)							
							1	2	3	4	5			
					SURFACE ELEVATION 108.41									
					CONTINUED									
50	13	SS			Brown fine to coarse sand (SM) - with a little to some gravel - trace of silt - wet - dense to extremely dense									
55	14	SS												
60	15	SS			Brown sandy gravel (GP) - with trace to some cobbles - trace of silt - wet - extremely dense									
65	16	SS												
70	17	SS			Grayish brown fine sand (SP) - moist - extremely dense									
71.5					End of Boring Boring advanced to 7.5 feet with solid stem auger Boring advanced from 7.5 to 71.5 feet with roller bit and bentonite drilling fluid 10.0 feet of HW casing used Cobbles from 38.5 to 69.0 feet 2 inch PVC observation well installed to 70.8 feet Protector pipe installed									

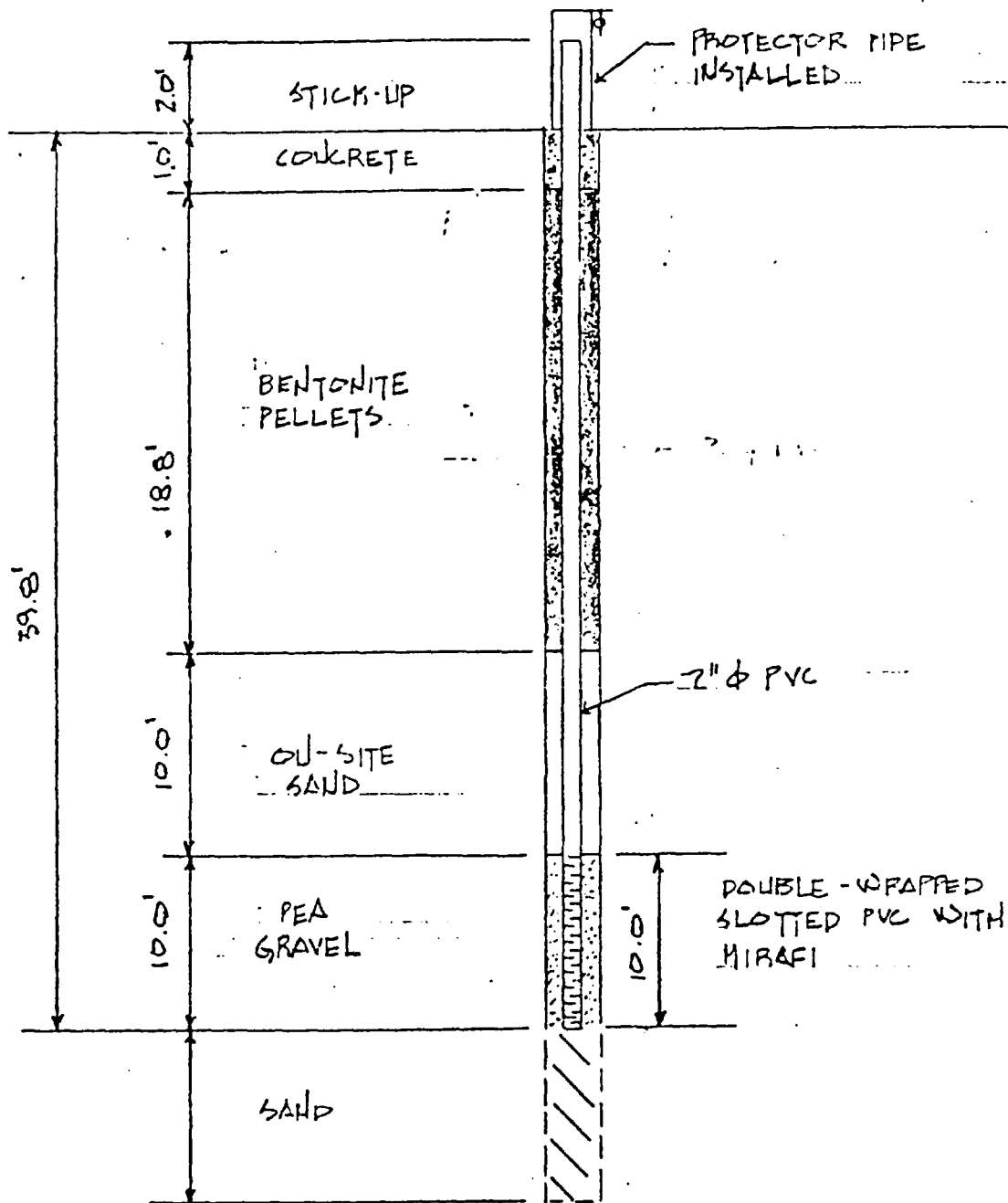
10' 20' 30' 40' 50' 60' 70' 80'

WATER LEVEL OBSERVATIONS			
WI			
WI	23.0'	HCH	ACH
WI	8.0'	before leaving site	

**SOIL TESTING SERVICES**  
 OF WIS. INC.  
 540 LAMARCA STREET  
 GREEN BAY, WIS 54303

BORING STARTED	5-22-61
BORING COMPLETED	5-22-61
ENG. Job 126	FOREMAN LVH
DRAWN JPJ	APPROVED RMK
NO. 10672	SHEET 2 of 2

B-1



OBSERVATION WELL DIAGRAM  
ALGOMA LANDFILL, ALGOMA, WI.

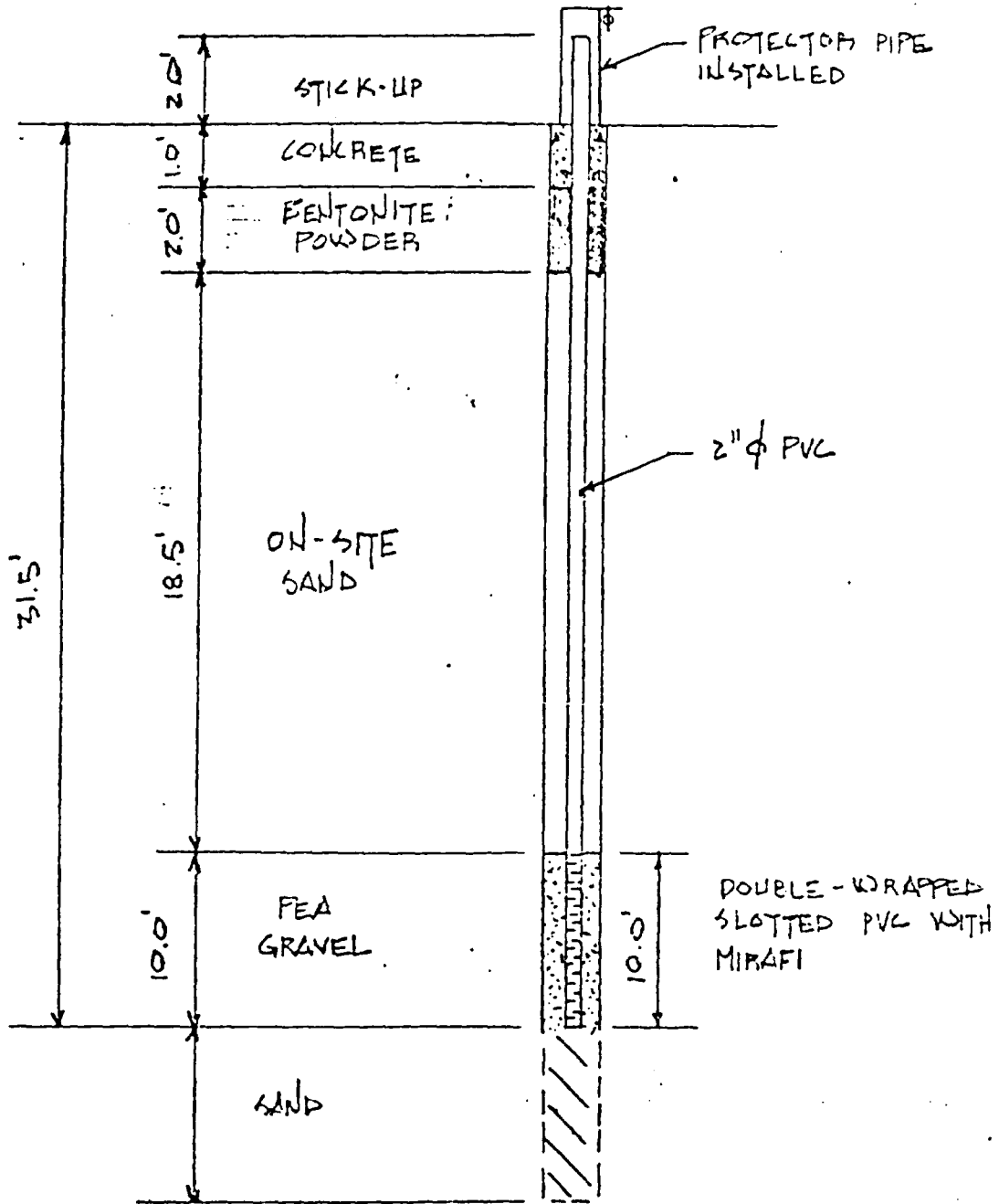


SOIL TESTING SERVICES  
OF WISCONSIN, INC.

240 LAMBEAU ST. GREEN BAY, WISCONSIN 54303

MP 11-26-FA VTS 10972

B-2



OBSERVATION WELL DIAGRAM  
ALGOMA LANDFILL, ALGOMA, WI.

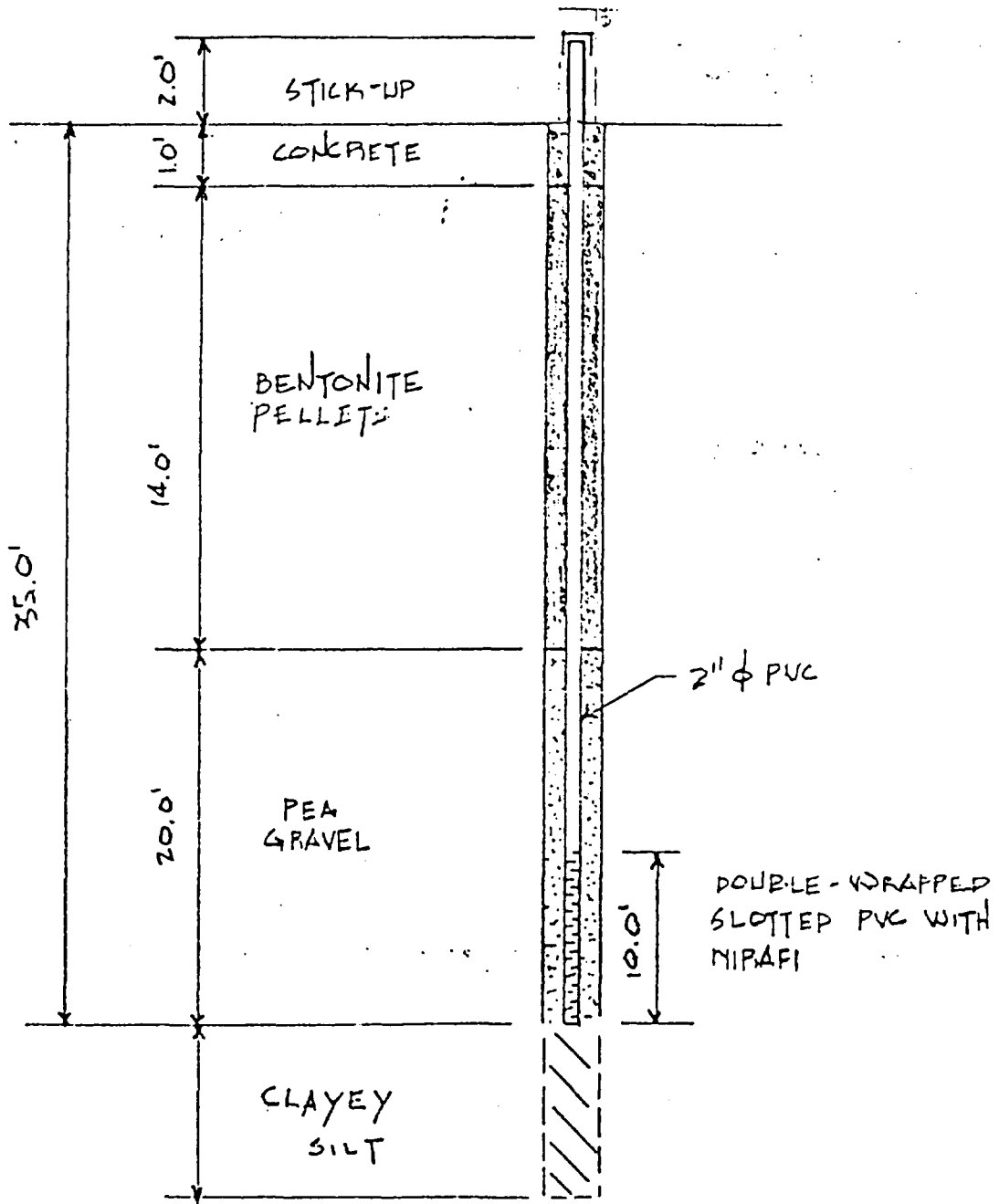


SOIL TESTING SERVICES  
OF WISCONSIN, INC.

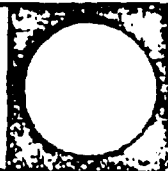
340 LAMBEAU ST. GREEN BAY, WISCONSIN 54303

NY	WEL	NTS	12-577
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B-7



OBSERVATION WELL DIAGRAM  
ALGOMA LANDFILL, ALGOMA, WI.

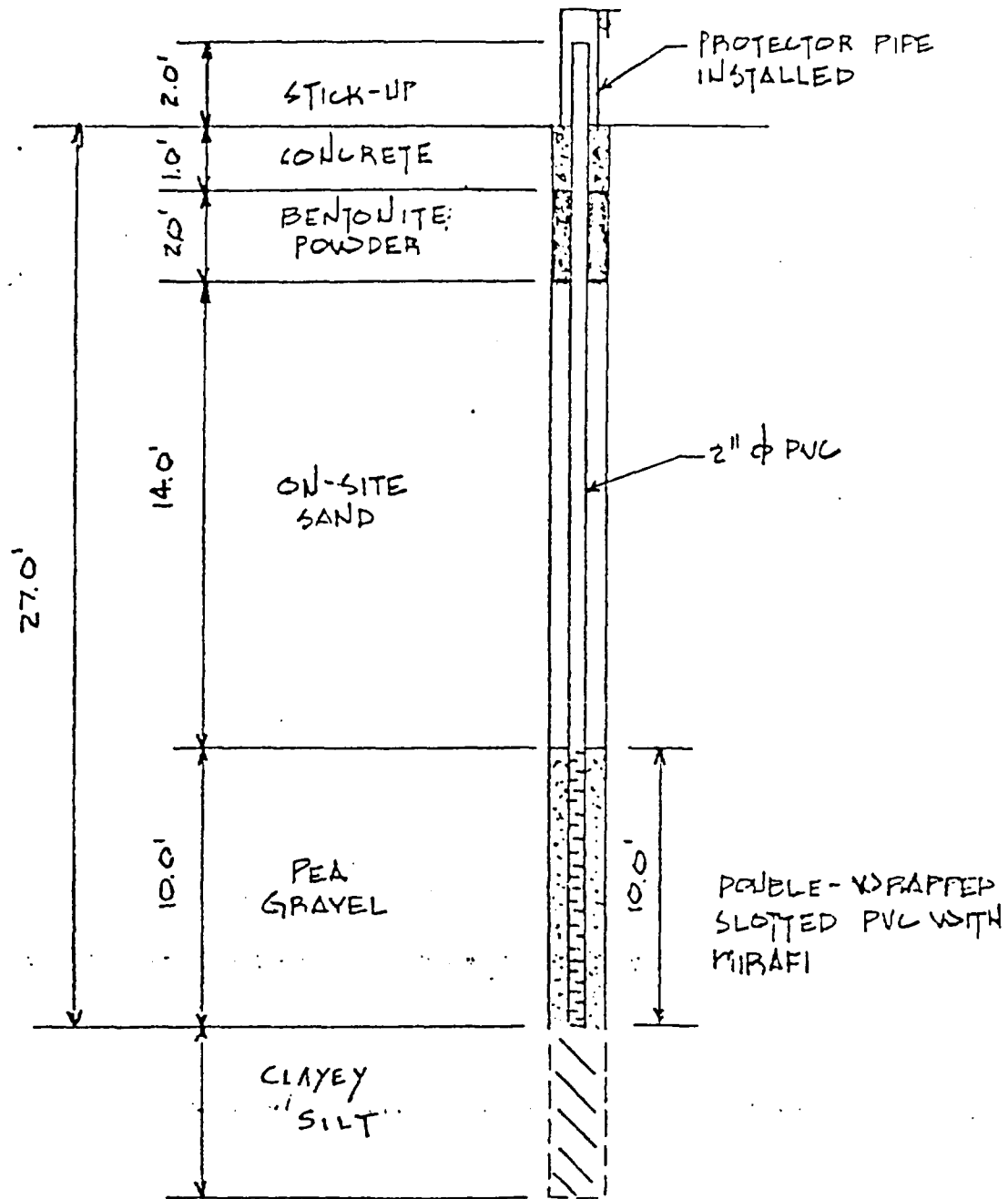


SOIL TESTING SERVICES  
OF WISCONSIN, INC.

540 LAMBEAU ST. GREEN BAY, WISCONSIN 54303

MJP	11-26-95	NLS	10672
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B-4



OBSERVATION WELL DIAGRAM  
ALGOMA LANDFILL, ALGOMA, WI.



SOIL TESTING SERVICES  
OF WISCONSIN, INC.

340 LAMBEAU ST.

GREEN BAY, WISCONSIN 54303

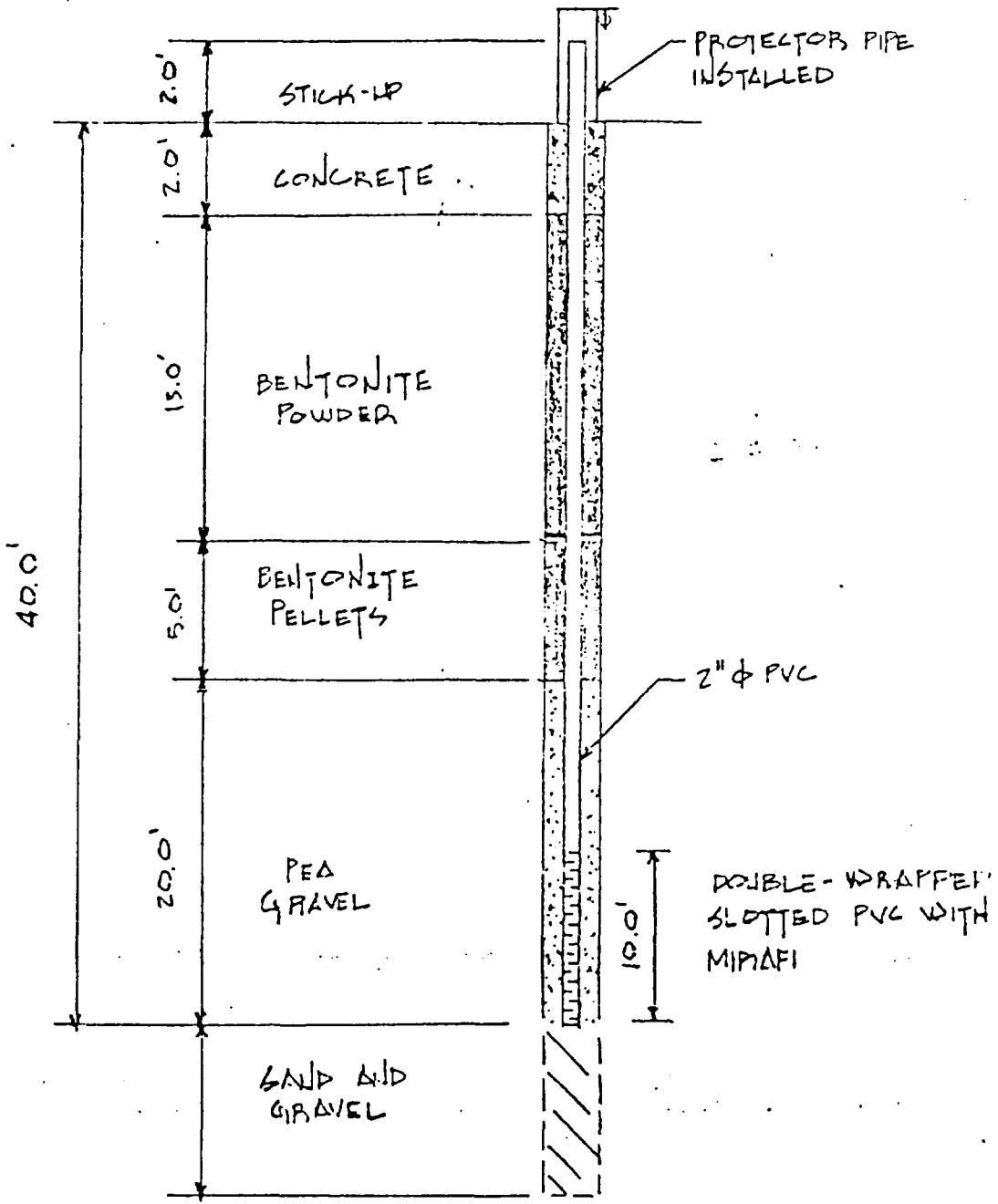
NJP

11-25-72

RTS

103-712

B-5



OBSERVATION WELL DIAGRAM  
ALGOMA LANDFILL, ALGOMA, WI.



SOIL TESTING SERVICES  
OF WISCONSIN, INC.

540 LAMBEAU ST. GREEN BAY, WISCONSIN 54303

MJT	11-26-88	UTS	10372
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STS Consultants Ltd.

GREEN BAY  
Phone (414) 494-9656

MILWAUKEE  
Phone (414) 354-1100

WAUSAU  
Phone (715) 845-8386

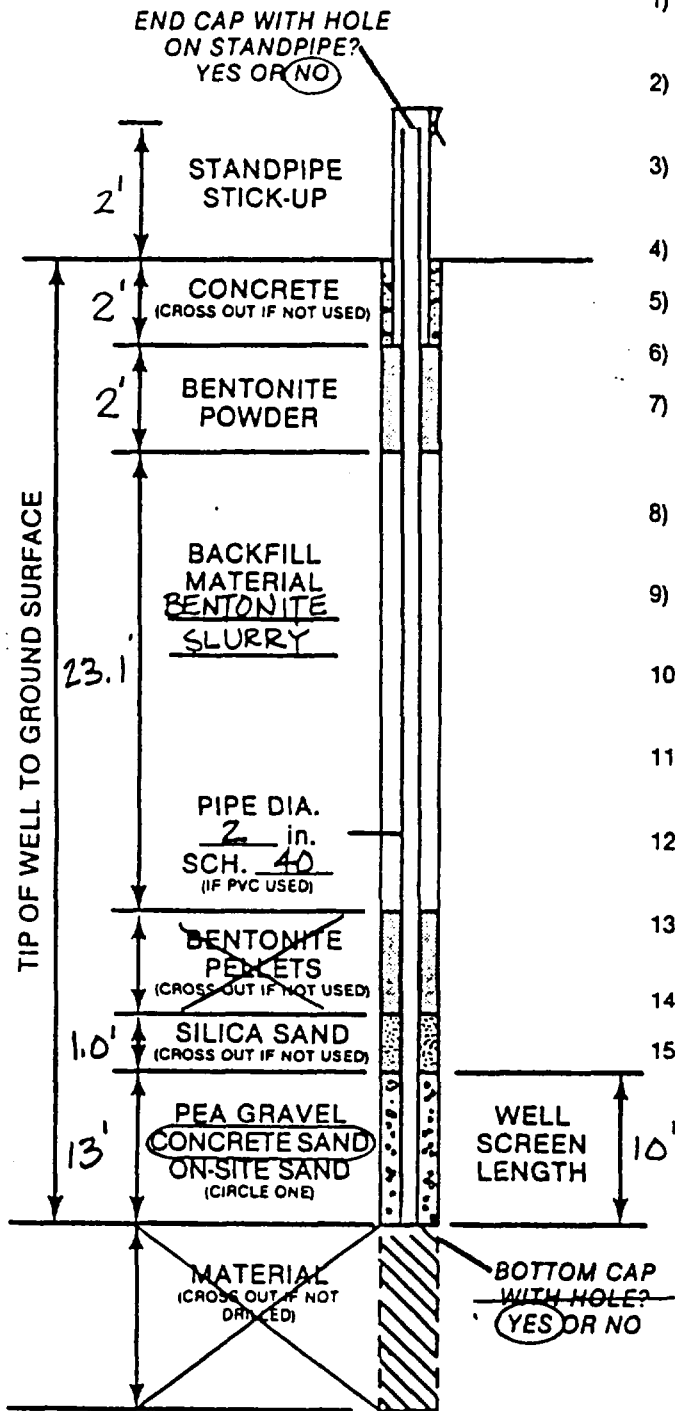
OSHKOSH  
Phone (414) 235-0270

Facility Name <b>CITY OF ALGOMA LANDFILL</b>		Permit or License Number	
Facility Well Number <b>B-5</b>		Permanent Well Number (To Be Assigned By DNR Staff)	
Date Abandoned <b>6-18-87</b>			
Well/Boring Location <b>1/4 1/4 NE 1/4 NE Section 33 Township 25 N/S Range 25 E/W</b>		Grid Location (If Applicable) <b>N/A</b>	
Reference Point _____ N/S _____ Ft. E/W _____ Ft.			
County <b>KEWAUNEE</b>		Name of Civil Town <b>ALGOMA</b>	
Depth of Well (From Ground Surface) <b>40.5</b> Feet		Depth of Boring/Drillhole (From Ground Surface) <b>45</b> Feet	
Well Casing Diameter (ID) <b>2</b> Inches		Length of Casing Removed <b>32</b> Feet	
Is This a Bedrock Well? Yes <input type="radio"/> No <input checked="" type="radio"/>		Is This an Unconsolidated Formation Well? Yes <input checked="" type="radio"/> No <input type="radio"/>	
Sealant Mixture Bentonite Slurry Neat Cement Grout Concrete (sand-cement) Grout (can be used only in 4-inch diameter wells or larger) Granular Bentonite Bentonite Pellets <input checked="" type="radio"/> Other			
Comments <b>BENTONITE/CEMENT GROUT</b>			
Volume of Mixture Used <b>~ 1</b> Ft. <sup>3</sup>			
How Added: <input checked="" type="radio"/> Tremie Pipe <input type="radio"/> From Surface <input type="radio"/> Other			
Was abandoned well/boring examined 24 hours later to note settlement?		Yes <input type="radio"/> No <input checked="" type="radio"/>	
If yes, was settlement evident?		Yes <input type="radio"/> No <input type="radio"/>	
Was the well/boring retopped?		Yes <input type="radio"/> No <input checked="" type="radio"/>	
Problem(s) Encountered <b>PULLED PROTECTOR PIPE, NENT DOWN PVC PIPE WITH AW ROD TO REMOVE CAP ON BOTTOM. GROUTED PVC WITH TREMIE PIPE FROM BOTTOM UP. PULLED 32.0' OF PVC - PUMPED DOWN MORE GROUT, THEN DRILLED OUT WITH HOLLOW STEM TO 45', PUMPED HOLE FULL OF GROUT, PUT CEMENT CAP ON TOP WITH NATIVE SOIL OVER CAP</b>			
Name of Person Performing Abandonment <b>ELMER VAN DE HEY STS CONSULTANTS LTD. JOB #15229 XF</b>		Client <b>CITY OF ALGOMA</b>	



STS Consultants Ltd.

# FIELD WELL INSTALLATION DIAGRAM

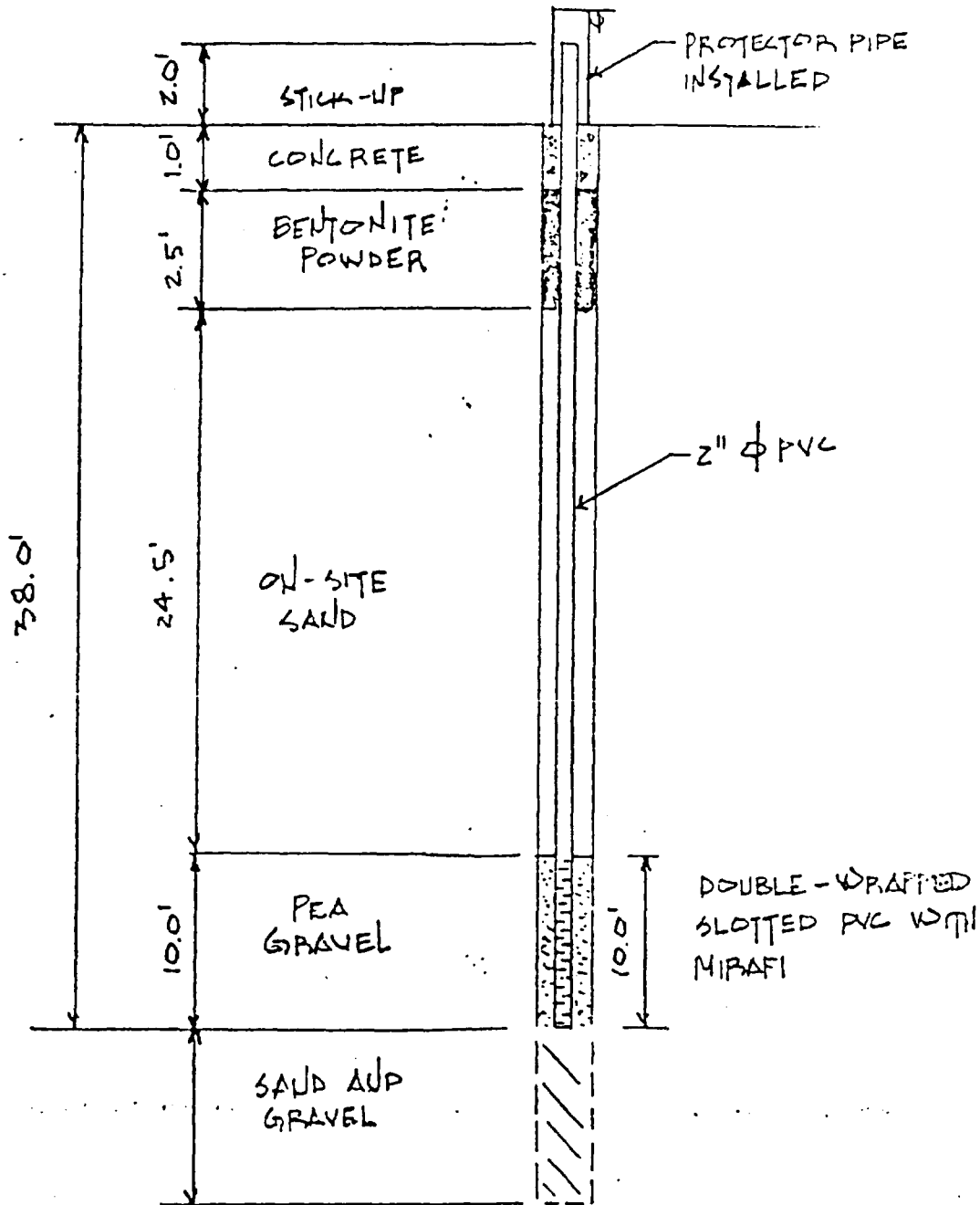


- 1) TYPE OF PIPE? PVC GALVANIZED, STAINLESS, OTHER \_\_\_\_\_
- 2) TYPE OF PIPE JOINTS? BELLED, COUPLINGS, THREADED, OTHER \_\_\_\_\_
- 3) TYPE OF WELL SCREEN PVC GALVANIZED, STAINLESS, OTHER \_\_\_\_\_
- 4) SCREEN SIZE .010
- 5) INSTALLED PROTECTOR PIPE W/LOCK? YES OR NO
- 6) WAS SOLVENT USED? YES OR NO
- 7) WAS DRILLING MUD USED? SOLID AUGER, HOLLOW STEM AUGER, WATER, REVERT, BENTONITE
- 8) DID STANDPIPE COME UP WHEN CASING WAS PULLED? YES OR NO
- 9) HOW WAS WELL DEVELOPED? BAILING, PUMPING, SURGING, COMPRESSED AIR
- 10) TIME SPENT FOR WELL DEVELOPMENT? 5 min., 15 min., 30 min., OTHER \_\_\_\_\_
- 11) APPROXIMATE WATER VOLUME REMOVED OR ADDED? 5 gal., 10 gal., 15 gal., OTHER 150 gal.
- 12) WATER CLARITY BEFORE DEVELOPMENT? CLEAR, TURBID, OPAQUE
- 13) WATER CLARITY AFTER DEVELOPMENT? CLEAR, TURBID, OPAQUE
- 14) DID THE WATER SMELL? YES OR NO
- 15) WATER LEVEL SUMMARY
  - 1) DEPTH FROM T. STANDPIPE AFTER DEVELOPMENT? 22.3 Ft. or DRY
  - 2) OTHER MEASUREMENTS:
 

DATE _____	_____	Ft. FROM T, ST. PIPE
DATE _____	_____	Ft. FROM T, ST. PIPE
DATE _____	_____	Ft. FROM T, ST. PIPE
DATE _____	_____	Ft. FROM T, ST. PIPE

Well No. 5R DATE INSTALLED 6-18-87 DRILL RIG #40  
 DRILLER EVH DRILL CREW JB  
 JOB/CLIENT CITY OF ALGOMA LANDFILL STS JOB No. 15229 XF  
 FW: 1-983

B-6A



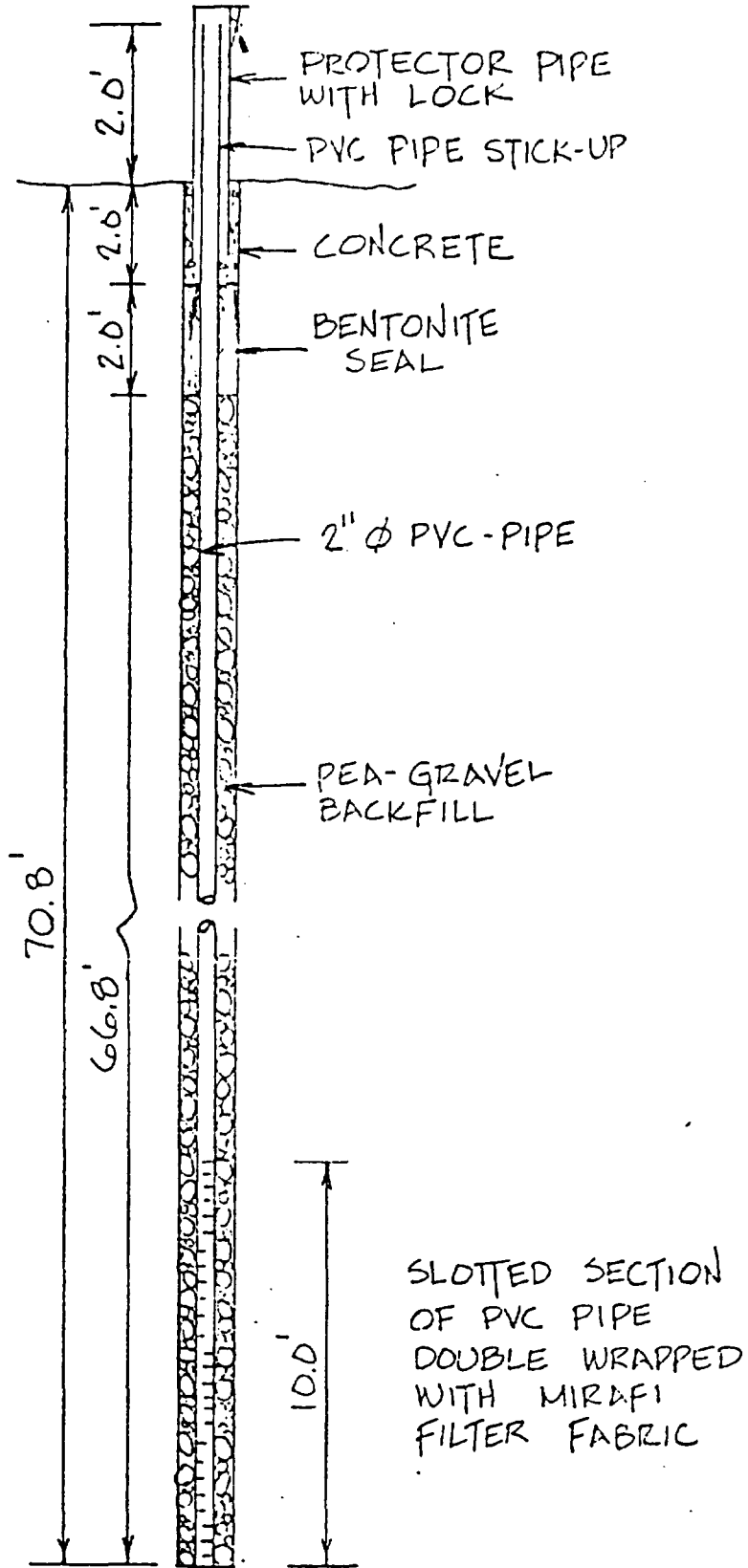
OBSERVATION WELL DIAGRAM  
ALGOMA LANDFILL, ALGOMA, WI.



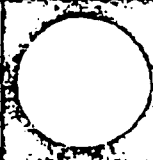
SOIL TESTING SERVICES  
OF WISCONSIN, INC.  
540 LAMBEAU ST. GREEN BAY, WISCONSIN 54303

MJP 11-20-84 UTS 100720

B-9



OBSERVATION WELL INSTALLATION  
ALGOMA LANDFILL  
ALGOMA, WISCONSIN



SOIL TESTING SERVICES  
OF WISCONSIN, INC.

540 LAMDEAU ST. GREEN BAY, WISCONSIN 54303

JPI 5-19-8 1105212 10872

**APPENDIX E**  
**WASTE CHARACTERISTICS AND VOLUME**

RICHARD H. DEQUELLE, MAYOR  
CHARLOTTE BOETTCHER, CLERK-TREASURER  
HENRY STEHULA, ASSESSOR-GENERAL INSPECTOR  
JAMES P. PIES, CITY ATTORNEY  
WILLIAM C. ENGLEBERT, FIRE CHIEF  
MARK HOPPE, CHIEF OF POLICE

# CITY OF ALGOMA

WISCONSIN 54201

March 1, 1974

To:

Dear

The Department of Natural Resources has asked the City to furnish information on the amounts and types of toxic and hazardous wastes that are disposed of at the city dump.

As far as I know the possible toxic or hazardous wastes disposed of at our dump site are paint, paint thinner, lacquer and maybe some varnish.

If during the year you will be disposing of any of the above mentioned material or anything similar to it would you please give me the following information;

1. The type of waste
2. The chemical make-up and trade name
3. The quantities of each type of waste  
( If you cannot determine the exact amounts please estimate)
4. The name of the industry from which the waste comes from
5. The names of the individuals transporting the waste

If you do not have any of the above wastes would you let me know anyhow so we have the information from all the industries.

Could you also furnish the following information on the amounts of solid waste that you dispose of at the dump during the year:

1. The type of waste ( wood, paper, weldrock, etc.)
2. The estimated quantities of each type of waste either in yardage or tonnage.

Where there are large amounts of material transported could you break these down into a weekly, monthly and yearly estimates?

Thanks for your cooperation on this matter.

Respectfully Yours

*Alan Groll*  
Alan Groll  
City Eng.

Algoma, Wis.



A CITY COOL IN CLIMATE, WARM IN HOSPITALITY

... WITH AN OUTSTANDING YOUTH PROGRAM

1312 Perry Street  
Algoma, Wisconsin 54201  
Phone 414/487-3426

March 5, 1974

City of Algoma  
Alan Groll  
City Engineer  
Algoma, Wisconsin  
54201

Re: Waste hauled to City Dump.

Our chemical waste is composed of lacquer, lacquer thinner and paint. This waste is mixed together and piped into a 55 gallon barrel, when we accumulate 2 or 3 barrels, they are taken to the dump with our truck, driven by Cecil Pavlick.

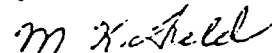
Our paints and laquers are purchased from Sheboygan Paint Co., Sheboygan, Wisconsin.

The total chemical waste dumped for the year is approximately 25 barrels.

Our waste wood is hauled and sold to the U.S. Plywood Corp., Algoma, Wisconsin.

Our other solid waste hauled to the dump consists of paper, sand paper and wire, this amounts to approximately 1500 lbs. a month.

Maynard K. Feld



General Manager  
ALGOMA INDUSTRIES

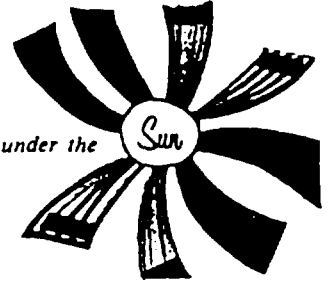
MKF/al  
cc:

# Algoma

NET COMPANY

310 FOURTH STREET, ALGOMA, WISCONSIN 54201

the best Hammocks under the



TELEPHONE 414 - 487 - 5577

3/20/1974

Mr. Alan Groll  
City Engineer  
City of Algoma  
Algoma, Wi. 54201

Dear Mr. Groll:

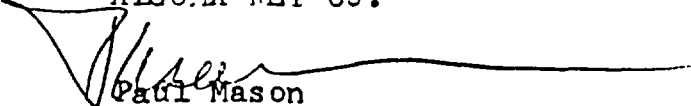
In response to your letter of March 1, 1974, we will not be disposing of any waste material of a toxic nature as you describe.

Our waste will consist of the following:

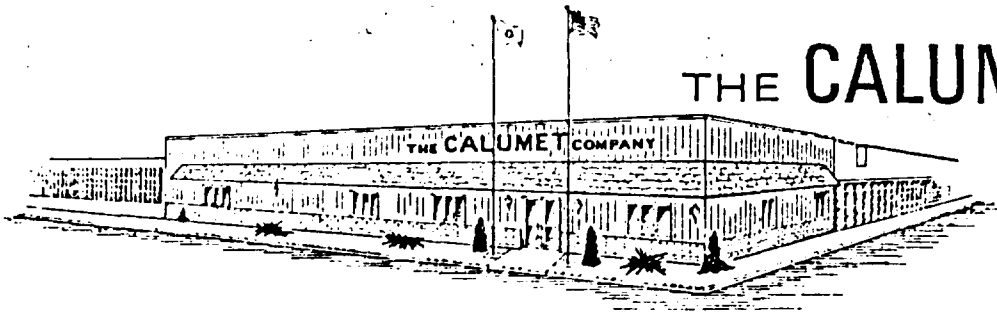
<u>Type</u>	<u>Approximate Quantity</u>
Cardboard	1500 lbs.
Paper	1000 lbs.
Wood	50 lbs.
Cotton/mix material	500 lbs.

These amounts are transported on a weekly basis from November through May by Mr. Larry Massart.

Sincerely yours,  
ALGOMA NET CO.

  
Paul Mason  
Assistant Plant Mgr.

PM/cn



# THE CALUMET COMPANY, INC.

340 NORTH WATER STREET  
ALGOMA, WISCONSIN 54201

PHONE: 414-487-5251

March 22, 1974

Mr. Alan Groll  
City Engineer  
City of Algoma  
Algoma, WI 54201

Dear Alan:

Sorry we did not respond quicker to your letter, but we do have the information now.

## TOXIC WASTE

1. Type - Paint & paint thinner
2. Chemical Make-up - Acrylic base paint & Xylol thinner
3. Quantities, Annual - 15 Gallons paint, 15 Gallons Xylol
4. Name of Industry - Sheboygan Paint Co.
5. Name of Individual Transporting - Various employees

## SOLID WASTE

1. Type - Wood & paper
2. Quantities, Annual - Wood, 7000 lbs.  
Paper, 7000 lbs.

March 12, 1974



Algoma City Hall  
225 Steele St.  
Algoma, Wis. 54201

Attn: Mr. Alan Groll  
City Engineer

Dear Al:

In response to your inquiry for the DNR regarding the disposal of waste material at the city dump, our Company does not and will not during the year dispose of any of the hazardous or toxic substances referred to in your letter.

To the best of my knowledge the type of waste now being disposed consists of floor sweepings, woodflour dust, paper, cardboard, and on occasion scrap plastic toilet seats. Frequency would be about two truck loads per day or approximately 20 yards per day.

If you have any questions Al, just give me a call.

Sincerely,

PLUMBERS WOODWORK CO.

Larry Jones  
Plant Mgr.

LJ/bp



1001 Perry Street, Algoma, Wisconsin 54201 Telephone 414-487-5221

March 11, 1974  
(Dictated 3-8-74)

Alan Groll  
City Engineer  
City of Algoma  
Algoma, Wisconsin 54201

Dear Mr. Groll:

In response to your letter of March 1, 1974, the following estimate of waste materials has been made:

Type: Finishing materials (varnish, thinners, etc.)  
Chemical Makeup: Relvar - Alkyd Urea conversion type varnish  
Polyvinyl Acetate  
Lacquer Thinner  
VM & P Naptha  
Methanol  
Filler - SC 150 solvent  
Silicate  
Pigments  
Paint Primer - Oil Alkyd  
Quantity: 750 gal./year total for all of the above - Relvar  
and lacquer thinner by far make up the largest percentage.

Type: Glue wastes  
Chemical Makeup: Melurac - Melamine and Urea blend  
Urea Formaldehyde  
Quantity: 1875 Gal./year total for both above

Type: Weldrok Dust  
Quantity: Present 9100 lbs./day; future 11,200 lbs./day

Type: Wood waste, paper, cardboard, etc.  
Quantity: 2 tons/day

Industry: U.S. Plywood

Transporters: Lester Paape and Milton Duerst

Sincerely,

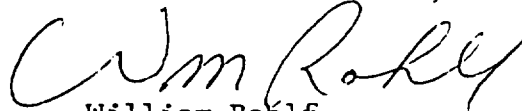
Raymond M. Tabar  
Project Engineer

Mr. Alan Groll  
March 22, 1974  
Page: 2

If we can be of any further help, please  
let me know.

Sincerely,

THE CALUMET COMPANY, INC.

A handwritten signature in cursive script, appearing to read "Wm Rohlf".

William Rohlf  
Purchasing Manager

mjk



Häch VI  
VII

Oct. 1 - Dec. 31, 1974

City Algoma  
Sud Pg. 1

ACCOUNTING FORM - TOXIC & HAZARDOUS LANDFILL OPERATORS

Date	Quantity of Waste Received	Description of the Waste Received	Name of Firm From Which Waste was Collected	Name of Firm Which Collected Waste
				RECEIVED DNR
10/4/74	275 gal.	paint, thinner, lacquer	U.S. Plywood	JAN 15 1975
10/5/74	150 "	glue	"	Lake Mich. Dist.
10/6/74	30 "	paint, thinner	"	
10/9/74	50 "	paint, thinner	"	
10/14/74	200 "	glue	"	
	35 "	paint, thinner	"	
10/17/74	260 "	glue	"	SBG -> Paint
	25 "	paint, thinner	"	1495 -> Glue
10/19/74	100 "	glue	"	57 yds. weldrook
10/21/74	250 "	glue	"	<del>2008</del>
	40 "	paint, thinner	"	
10/31/74	295 "	glue	"	57 yds.
	8 "	paint	"	2008 gal.
11/3/74	50 "	paint	"	
	60 "	glue	"	
11/1/74	140 "	glue	"	2008 liquid
	38 yds.	weldrook Dust	"	
11/2/74	40 gal.	glue	"	
	15 yds.	weldrook Dust	"	

ACCOUNTING FORM - TOXIC & HAZARDOUS LANDFILL OPERATORS

Ps. 2

Date	Quantity of Waste Received	Description of the Waste Received	Name of Firm From Which Waste was Collected	Name of Firm Which Collected Waste
4/74	30 gal.	glue	U.S. Plywood	
	5 "	paint	"	
	15 yds.	weldrok dust	"	
5/74	37 yds.	weldrok dust	"	
6/74	125 gal.	glue	"	
	54 yds.	weldrok dust	"	
7/74	150 gal.	glue	"	
	30 yds.	weldrok dust	"	
8/74	60 gal.	glue	"	
	45 "	paint, thinner	"	
	38 yds.	weldrok dust	"	
9/74	30 gal.	glue	"	
	24 yds.	weldrok dust	"	
10/74	38 yds.	weldrok dust	"	
	45 gal.	glue	"	
11/74	60 gal.	glue	"	
	38 yds.	weldrok - dust	"	
12/74	40 yds.	weldrok - dust	"	

RECEIVED  
 JAN 13 1975  
 Lake Mich. Dist.

500 glue  
 50 paint.  
 314 Dust  
 550 gal  
 774 yds

ACCOUNTING FORM - TOXIC & HAZARDOUS LANDFILL OPERATORS

pg. 3

Date	Quantity of Waste Received	Description of the Waste Received	Name of Firm From Which Waste was Collected	Name of Firm Which Collected Waste
1/6/74	60 gal.	glue	O.S. Plywood	
1/11/74	36 gals.	weld rot Dust	"	
1/17/74	42 "	" "	"	
	85 gal.	glue	"	RECEIVED BY
	25 "	paint, thinner	"	JAN 13 1975
1/16/74	15 gals.	weld rot Dust	"	Lake Mich. Dist.
1/18/74	17 gals.	" "	"	
1/19/74	30 gals.	" "	"	340 gal glue
	115 gal.	glue	"	297 yd Dust
	15 "	paint, thinner	"	40 gal paint
2/20/74	35 gals.	weld rot Dust	"	
2/11/74	20 "	" "	"	380 gal
2/27/74	<del>32</del> 32 gals.	" "	"	297 yd.
	80 gal.	glue	"	
2/27/74	30 gals.	weld rot Dust	"	
2/27/74	15 "	" "	"	
1/30/74	25 "	" "	"	

RECEIVED

JAN 1 1975

306 yds  
glue

## ACCOUNTING FORM - TOXIC &amp; HAZARDOUS LANDFILL OPERATORS

Lake Mich. Dist.

Pg. 4

Date	Quantity of Waste Received	Description of the Waste Received	Name of Firm From Which Waste was Collected	Name of Firm Which Collected Waste
1-3-74	80 gal.	glue	U.S. Plywood	U.S. Plywood
-	22 gals.	weld rnk dust	" "	" "
-4	30 gals.	weld rnk dust	" "	" "
-5	30 gals.	weld rnk dust	" "	" "
2-6	38 gals.	weld rnk dust	" "	" "
2-7	60 gal.	glue	" "	" "
	7 gals.	weld rnk dust	" "	" "
2-9	30 gals.	weld rnk dust	" "	" "
2-10	30 gals.	weld rnk dust	" "	" "
2-11	37 gals.	weld rnk dust	" "	" "
2-12	140 gal.	glue	" "	" "
	30 gals.	weld rnk dust	" "	" "
2-13	30 gal.	glue	" "	" "
	30 gals.	weld rnk dust	" "	" "
2-14	30 gals.	weld rnk dust	" "	" "
2-15	75 gal.	glue	" "	" "
	22 gals.	weld rnk dust	" "	" "
2-16	20 gals.	weld rnk dust	" "	" "

R I I F - R



City of Algoma 1/4 Rpt  
1/1/75 - 3/30/75

March 1975

ACCOUNTING FORM - TOXIC & HAZARDOUS LANDFILL OPERATORS

Date	Quantity of Waste Received	Description of the Waste Received	Name of Firm From Which Waste was Collected	Name of Firm Which Collected Waste
1-6	90 gals.	Glue	U.S. Plywood	U.S. Plywood
1-6	15 gals.	Weldrook Dust	" "	" "
1-7	29 gals.	" "	" "	" "
1-8	22 gals.	" "	" "	" "
1-9	31 gals.	" "	" "	" "
1-10	100 gals.	Glue	" "	" "
1-11	7 gals.	Weldrook Dust	" "	" "
1-10	18 gals.	" "	" "	" "
1-13	30 gals.	" "	" "	" "
1-14	25 gals.	" "	" "	" "
1-15	50 gals.	Glue	" "	" "
1-15	8 gals.	Paint	" "	" "
1-16	22 gals.	Weldrook Dust	" "	" "
1-17	15 gals.	" "	" "	" "
1-18	8 gals.	" "	" "	" "
1-20	100 gals.	Glue	" "	" "
1-20	10 gals.	Paint	" "	" "
1-20	15 gals.	Weldrook Dust	" "	" "

340 gal glue

237 yd<sup>3</sup> weldrook dust

18 gal paint

ACCOUNTING FORM - TOXIC & HAZARDOUS LANDFILL OPERATORS

Date	Quantity of Waste Received	Description of the Waste Received	Name of Firm From Which Waste was Collected	Name of Firm Which Collected Waste
-21	7 yds.	weldrock dust	U.S. Plywood	U.S. Plywood
-22	15 yds.	" "	" "	" "
-23	15 yds.	" "	" "	" "
-24	100 gals.	Glue	" "	" "
-24	23 yds.	weldrock dust	" "	" "
-25	22 yds.	" "	" "	" "
-27	15 yds.	" "	" "	" "
-28	21 yds.	" "	" "	" "
-29	110 gals.	Glue	" "	" "
-29	25 gals.	Paint	" "	" "
-29	24 yds.	weldrock dust	" "	" "
-30	37 yds.	" "	" "	" "
-31	15 yds.	" "	" "	" "

210 gal glue      25 gal paint      194 yd<sup>3</sup> weldrock

ACCOUNTING FORM - TOXIC & HAZARDOUS LANDFILL OPERATORS

Date	Quantity of Waste Received	Description of the Waste Received	Name of Firm From Which Waste was Collected	Name of Firm Which Collected Waste
2-1	100 gals.	Glue	U. S. Plywood	U. S. Plywood
2-1	25 gals.	Paint	" "	" "
2-1	16 gals.	Weldrook Dust	" "	" "
2-5	22 gals.	" "	" "	" "
2-4	80 gals.	Glue	" "	" "
2-4	37 gals.	Weldrook Dust	" "	" "
2-5	200 gals.	Glue	" "	" "
2-5	40 gals.	Paint	" "	" "
2-5	38 gals.	Weldrook Dust	" "	" "
2-6	30 gals.	Glue	" "	" "
2-6	37 gals.	Weldrook Dust	" "	" "
2-7	30 gals.	Glue	" "	" "
2-7	30 gals.	Weldrook Dust	" "	" "
2-8	25 gals.	Glue	" "	" "
2-8	15 gals.	Weldrook Dust	" "	" "
2-10	30 gals.	" "	" "	" "
2-11	35 gals.	" "	" "	" "
2-12	90 gals.	Glue	" "	" "

605 gal glue 260 yd<sup>3</sup> weldrook dust 65 gal paint

ACCOUNTING FORM - TOXIC & HAZARDOUS LANDFILL OPERATORS

Date	Quantity of Waste Received	Description of the Waste Received	Name of Firm From Which Waste was Collected	Name of Firm Which Collected Waste
-12	25 gals.	Paint	U.S. Plywood	U.S. Plywood
-12	21 gals.	Weldrok Dust	" "	" "
-13	36 gals.	" "	" "	" "
-14	30 gals.	Glue	" "	" "
-14	60 gals.	Paint	" "	" "
-14	22 gals.	Weldrok Dust	" "	" "
-15	80 gals.	Glue	" "	" "
-15	15 gals.	Weldrok Dust	" "	" "
-17	22 gals.	" "	" "	" "
-18	29 gals.	" "	" "	" "
-19	22 gals.	" "	" "	" "
-20	80 gals.	Glue	" "	" "
-20	30 gals.	Weldrok Dust	" "	" "
-21	21 gals.	" "	" "	" "
-22	150 gals.	Glue	" "	" "
-22	80 gals.	Paint	" "	" "
-22	15 gals.	Weldrok Dust	" "	" "
-24	15 gals.	" "	" "	" "

340 gal glue

248 Weldrok dust

165 gal paint



ACCOUNTING FORM - TOXIC & HAZARDOUS LANDFILL OPERATORS

Date	Quantity of Waste Received	Description of the Waste Received	Name of Firm From Which Waste was Collected	Name of Firm Which Collected Waste
-1	125 gals	glue	H.S. Plywood	H.S. Plywood
-1	3.2 yds	weldrook dust	" "	" "
3	15 yds	" "	" "	" "
ref	10 gals	paint	" "	" "
-4	35 yds	weldrook dust	" "	" "
-5	15 yds	" "	" "	" "
-6	30 yds	" "	" "	" "
3-6	150 gals	glue	" "	" "
3-7	15 gals	paint	" "	" "
3-7	45 yds	weldrook dust	" "	" "
3-8	7 yds	" "	" "	" "
3-8	100 gals	glue	" "	" "
3-10	14 yds	weldrook dust	" "	" "
3-11	30 yds	" "	" "	" "
3-13	33 yds	" "	" "	" "
3-13	25 gals	glue	" "	" "
-14	58 yds	weldrook dust	" "	" "
3-15	15 yds	" "	" "	" "

150 gal glue      304 yd<sup>3</sup> weldrook      25 gal paint

ACCOUNTING FORM - TOXIC & HAZARDOUS LANDFILL OPERATORS

Algotto

Date	Quantity of Waste Received	Description of the Waste Received	Name of Firm From Which Waste was Collected	Name of Firm Which Collected Waste
2-15	20 gals	glue	U.S. Plywood	U.S. Plywood
-17	30 yds	weldrock dust	" "	" "
3-18	22 yds	" "	" "	" "
3-18	10 gals	paint	" "	" "
-19	35 yds	weldrock dust	" "	" "
3-20	22 yds	" "	" "	" "
3-21	22 yds	" "	" "	" "
3-22	7 yds	" "	" "	" "
3-22	500 gals	glue	" "	" "
3-24	15 yds	weldrock dust	" "	" "
3-25	38 yds	" "	" "	" "
3-26	38 yds	" "	" "	" "
3-27	38 yds	" "	" "	" "
3-27	120 gals	glue	" "	" "
3-29	8 yds	weldrock dust	" "	" "
<del>3-30</del>				

10 gal paint

275 yd<sup>3</sup> weldrock

240 gal glue

ANDRÉ H. DEQUELLE, MAYOR  
FLOTT BOETTCHER, CLERK-TREASURER  
STENHULA, ASSESSOR-GENERAL INSPECTOR  
WIES, CITY ATTORNEY  
ENGLEBERT, FIRE CHIEF  
OPPE, CHIEF OF POLICE

# CITY OF ALGOMA

WISCONSIN 54201

Alan Groll  
City Eng.  
Algoma, Wis.

*Attachment IX*

RECEIVED DNR

APR 12 1974

Lake Mich. Dist.

April 11, 1974

To: Mr. Gary Kulibert  
Dept. of Natural Resources  
Division of Environmental Protection  
Green Bay, Wis.

Dear Gary;

This is the reply to your letter of Jan. 25, 1974 in which you requested information on the type and amounts of toxic and hazardous wastes that are deposited in our dump site.

We receive this type of waste from three of our local industries and they are as follows;

Algoma Industries	1312 Perry St.	
Lacquer, Lacquer Thinner and Paint		1375 gal.
Manufactured by Sheboygan Paint Co.		per year
Cecil Pavlik, Driver		

Calumet Co.	340 No. Water St.	
Paint and Paint Thinner		30 gal. per year
Acrylic Base Paint and Xylol Thinner		
Manufactured by Sheboygan Paint Co.		
No drivers names given		

U.S. Plywood Co.	1001 Perry St.	
Varnish and Thinner		750 gal. per year
Relvar- Alkyd Urea conversion type varnish		
Polyvinyl Acetate	Methanol	
Lacquer Thinner	Filler- SC 150 Solvent	
VM & P Naptha	Silicate,	Pigments



A CITY COOL IN CLIMATE. WARM IN HOSPITALITY

... WITH AN OUTSTANDING YOUTH PROGRAM

DEQUELLE, MAYOR  
BOETTCHER, CLERK-TREASURER  
EHULA, ASSESSOR-GENERAL INSPECTOR  
PIES, CITY ATTORNEY  
ENGLEBERT, FIRE CHIEF  
PPE, CHIEF OF POLICE

# CITY OF ALGOMA

WISCONSIN 54201

Glue Wastes 1875 gal. per year  
Melurac- Melamine and Urea Blend  
Urea Formaldehyde

Drivers are Lester Paape and Milton Duerst

This totals out to 4,030 gal. of this type waste per year.

If you need any more information let me know and I will try to get it to you as soon as I am able.

Respectfully Yours

*Alan Groll*  
Alan Groll



---

A CITY COOL IN CLIMATE, WARM IN HOSPITALITY

... WITH AN OUTSTANDING YOUTH PROGRAM

---

REPORT OF INTERIM PLAN AND ABANDONMENT PLAN FOR CITY OF ALGOMA, TOWN OF  
AHNAPEE SANITARY LANDFILL SITE IN SEC. 32, T25N, R25E, KENOSHA COUNTY, WIS.

Dec. 15, 1975

INTERIM PLAN OF OPERATION ( 15 Mo. Life )

In order to prevent surface water infiltration drainage is provided over the entire area, the drainage running to the East, West and North.

The order of filling the four (4) separate areas is in a South to North direction with the last area to be filled being the one closest to the access road, the filling beginning on the high end of the area to the South and moving North to the lower part of the landfill.

The borrow area South of the landfill site is conveniently located for areas 1 and 2 but for areas 3 and 4 most of the cover material will have to be brought in from outside the leased area.

The City of Algoma leases the landfill area from Duman Realty of Algoma for \$1200 annually.

The earthwork calculations are as follows:

Annual garbage amounts and source;

U.S. Plywood Corp.	500 yds. weekly	x 52	=	26,000 cu. yds.
City of Algoma	120 "	"	x 52	= 6,240
All Other Hauling	200 "	"	x 52	= <u>10,400</u>

				42,640
less 20% compaction				<u>8,528</u>

Total Annual Garbage                    34.112 cu. yds.

The following volume comp. are derived from the contour map which was

REFERENCE 30

SITE NAME Algoma Landfill  
SITE ID WI 020480610380



POTENTIAL HAZARDOUS WASTE SITE  
SITE INSPECTION REPORT  
PART 1 - SITE LOCATION AND INSPECTION INFORMATION

II. SITE NAME AND LOCATION			
01 SITE NAME (Type common or proper name of site) <u>Algoma Landfill</u>		02 STREET, ROUTE NO., OR SPECIFIC LOCATION IDENTIFIER <u>W. Hwy 54 ; T25N, R25E Sect. 32</u>	
03 CITY <u>Algoma</u>		04 STATE <u>WI</u>	05 ZIP CODE <u>54201</u>
06 COORDINATES LATITUDE <u>44° 35' 42"</u> LONGITUDE <u>87° 29' 28"</u>		07 COUNTY <u>Kewaunee</u>	
08 TYPE OF OWNERSHIP (check one) <input type="checkbox"/> A PRIVATE <input type="checkbox"/> B FEDERAL <input type="checkbox"/> C STATE <input type="checkbox"/> D COUNTY <input checked="" type="checkbox"/> E MUNICIPAL <input type="checkbox"/> F OTHER		09 COUNTY USE CODE <u>061</u>	
III. INSPECTION INFORMATION			
01 DATE OF INSPECTION <u>8/14/84</u>		02 SITE STATUS <input type="checkbox"/> ACTIVE <input checked="" type="checkbox"/> INACTIVE	
03 YEARS OF OPERATION <u>1969</u>   <u>1993</u>		UNKNOWN	
04 AGENCY PERFORMING INSPECTION (Name of agency) <input type="checkbox"/> A EPA <input checked="" type="checkbox"/> B EPA CONTRACTOR <u>Ecology &amp; Environment</u> <input type="checkbox"/> C MUNICIPAL <input type="checkbox"/> D MUNICIPAL CONTRACTOR <input type="checkbox"/> E STATE <input type="checkbox"/> F STATE CONTRACTOR <input type="checkbox"/> G OTHER			
US CHIEF INSPECTOR			
05 NAME OF INSPECTOR <u>Anne C. Sause</u>		06 TITLE <u>Team Leader / Biologist</u>	
07 ORGANIZATION <u>Ecology &amp; Environment</u>		08 TELEPHONE NO. <u>(312) 663-9415</u>	
09 OTHER INSPECTORS			
10 NAME OF INSPECTOR <u>Kurt Sims</u>		11 TITLE <u>Earth Scientist</u>	
12 ORGANIZATION <u>Ecology &amp; Environment</u>		13 TELEPHONE NO. <u>(312) 663-9415</u>	
14 NAME OF INSPECTOR <u>Bounce Supniewski</u>		15 TITLE <u>Geologist</u>	
16 ORGANIZATION <u>Ecology &amp; Environment</u>		17 TELEPHONE NO. <u>(312) 663-9415</u>	
18 NAME OF INSPECTOR <u>Terry Hegeman</u>		19 TITLE <u>Hazardous Waste Specialist</u>	
20 ORGANIZATION <u>LMD / Wisc. Dept. of Natural Resources</u>		21 TELEPHONE NO. <u>(414) 497-4061</u>	
22 SITE REPRESENTATIVES INTERVIEWED			
23 NAME OF REPRESENTATIVE <u>Mr. Norbert Dier</u>		24 TITLE <u>Director of Streets</u>	
25 ADDRESS <u>City Garage</u>		26 TELEPHONE NO. <u>(414) 497-2391</u>	
27 NAME OF REPRESENTATIVE <u>Mr. Gene Hojman</u>		28 TITLE <u>Professional Engineer</u>	
29 ADDRESS <u>Bry, Sturac &amp; Braun, Inc. 709 Washington St. Manitowish, WI 54220-4501</u>		30 TELEPHONE NO. <u>(414) 684-5583</u>	
17 ACCESS GAINED BY <input checked="" type="checkbox"/> PERMISSION <input type="checkbox"/> WARRANT			
18 TIME OF INSPECTION <u>7:00 am</u>		19 WEATHER CONDITIONS <u>Warm, Sunny, light breeze</u>	
IV. INFORMATION AVAILABLE FROM			
01 CONTACT <u>Terry Hegeman</u>		02 OF (Agency/Organization) <u>Lake Mich. Dist. Wisc. Dept. of Natural Resources</u>	
03 TELEPHONE NO. <u>(414) 497-4061</u>		04 PERSON RESPONSIBLE FOR SITE INSPECTION FORM <u>Anne C Sause</u>	
05 AGENCY <u>FIT / USEPA</u>		06 ORGANIZATION <u>Ecology &amp; Environment</u>	
07 TELEPHONE NO. <u>312/663-9415</u>		08 DATE <u>10/9/84</u>	



POTENTIAL HAZARDOUS WASTE SITE  
SITE INSPECTION REPORT  
PART 2 - WASTE INFORMATION

I. IDENTIFICATION  
D1 STATE: WI D2 SITE NUMBER: WID980610350

II. WASTE STATES, QUANTITIES, AND CHARACTERISTICS

D1 PHYSICAL STATES (Check all that apply) <input checked="" type="checkbox"/> A SOLID <input type="checkbox"/> B POWDER/FINES <input type="checkbox"/> C SLUDGE <input type="checkbox"/> D OTHER _____ (Specify)	D2 WASTE QUANTITY AT SITE (Measure of waste quantities must be provided) TONS _____ CUBIC YARDS: <u>~135,000*</u> NO OF DRUMS _____	D3 WASTE CHARACTERISTICS (Check all that apply) <input type="checkbox"/> A TOXIC <input type="checkbox"/> B CORROSIVE <input type="checkbox"/> C RADIOACTIVE <input type="checkbox"/> D PERSISTENT <input checked="" type="checkbox"/> E SOLUBLE <input type="checkbox"/> F INFECTIOUS <input type="checkbox"/> G FLAMMABLE <input type="checkbox"/> H IRRITABLE <input checked="" type="checkbox"/> I VOLATILE <input type="checkbox"/> J EXPLOSIVE <input type="checkbox"/> K REACTIVE <input type="checkbox"/> L INCOMPATIBLE <input type="checkbox"/> M NOT APPLICABLE
---	---	---

III. WASTE TYPE

CATEGORY	SUBSTANCE NAME	D1 GROSS AMOUNT	D2 UNIT OF MEASURE	D3 COMMENTS
SLU	SLUDGE			
OLW	OILY WASTE			
SOL	SOLVENTS			
PSD	PESTICIDES			
OCC	OTHER ORGANIC CHEMICALS	~135,000	cu yds.	*See Note Below
IOC	INORGANIC CHEMICALS			
ACD	ACIDS			
BAS	BASES			
MES	HEAVY METALS			

IV. HAZARDOUS SUBSTANCES (See also Section III for identification and CAS numbers)

D1 CATEGORY	D2 SUBSTANCE NAME	D3 CAS NUMBER	D4 STORAGE/DEPOSIT. METHOD	D5 CONCENTRATION	D6 MEASURE OF CONCENTRATION

\*Note: This amount represents total volume of waste disposed in fill over its 14 year existence. No records exist for individual waste quantities disposed.  
Industrial wastes disposed include:  
(1) Wood Products - paper, boxes, scrap wood.  
(2) Kalo Dust - a mixture of lime and cement. (Allegedly this waste contained asbestos, but Mr. Dier denied this.)  
(3) Varnish & Thinner - Unknown constituents and characteristics.  
(4) Glue Wastes - A Urea Blend (Urea-Formaldehyde), and Melamine.  
Mr. Dier stated that liquid wastes were burned elsewhere; but file indicates some liquids brought to site.

V. FEEDSTOCKS (See also Section III for CAS numbers)

CATEGORY	D1 FEEDSTOCK NAME	D2 CAS NUMBER	CATEGORY	D1 FEEDSTOCK NAME	D2 CAS NUMBER
FDS	N/A		FDS		
FDS			FDS		
FDS			FDS		
FDS			FDS		

VI. SOURCES OF INFORMATION (Cite specific references e.g. state files, lab/anal. reports)

Interview with site representatives during site inspection, 8-14-84.  
File information from Wisc. Dept. of Natural Resources, Madison, and Green Bay Offices.

**APPENDIX F**  
**SUMMARY OF EXISTING GROUND WATER CHEMISTRY**

TABLE II  
WATER QUALITY - ALGOMA LANDFILL SITE

Sample Period 1 = 12-10-80	6 = 7-14-81	11 = 11-10-82
2 = 1-15-81	7 = 8-17-81	12 = 2-16-83
3 = 2-2-81	8 = 11-9-81	13 = 5-11-83
4 = 5-14-81	9 = 5-3-82	14 = 9-12-83
5 = 6-10-81	10 = 8-6-82	15 = 12-12-83

Parameter	Sample Period	Sampling Location						
		1	2	3	4	5	6	9
Field pH	1	---	---	---	---	---	---	---
	2	---	---	---	---	---	---	---
	3	7.4	7.2	7.9	7.3	7.4	7.6	---
	4	6.5	6.5	7.0	6.5	6.2	6.2	---
	5	---	---	---	---	---	---	6.4
	6	---	---	---	---	---	---	6.4
	7	6.6	6.6	6.6	6.9	6.9	6.6	6.6
	8	7.2	7.2	7.2	7.6	8.0	7.6	7.2
	9	7.0	7.0	7.0	7.0	7.0	7.0	6.8
	10	---	---	---	---	---	---	---
	11	6.6	6.7	7.3	7.2	6.6	7.1	6.9
	12	7.28	7.26	7.60	7.32	6.92	7.29	6.94
	13	---	---	---	---	---	---	---
	14	6.34	6.98	6.01	6.12	6.97	6.42	6.46
	15	7.14	7.42	7.73	7.23	6.79	7.26	6.98
pH	1	7.3	6.9	6.8	6.0	6.4	7.0	---
	2	---	---	---	---	6.65	---	---
	3	7.06	7.31	7.46	7.02	6.85	7.14	---
	4	7.13	7.39	7.58	6.96	6.78	7.03	---
	5	---	---	---	---	---	---	7.34
	6	---	---	---	---	---	---	6.79
	7	6.97	7.16	7.23	6.96	6.83	7.05	6.88
	8	7.37	7.53	7.75	7.32	7.03	7.39	7.02
	9	7.01	7.36	7.68	7.24	7.08	7.37	6.96
	10	7.34	7.78	7.92	7.47	7.13	7.49	7.12
	11	7.45	7.63	7.74	7.33	6.95	7.37	7.03
	12	7.36	7.44	7.99	7.49	7.24	7.64	7.27
	13	7.17	7.52	7.89	7.37	7.23	7.47	7.19
	14	7.39	7.88	8.03	7.60	7.29	7.59	7.47
	15	7.42	7.68	7.91	7.44	7.03	7.52	7.20
Field Conductivity	1	---	---	---	---	---	---	---
	2	---	---	---	---	---	---	---
	3	650	298	271	605	1030	355	---
	4	600	300	350	670	1480	450	---
	5	---	---	---	---	---	---	590
	6	---	---	---	---	---	---	890
	7	600	380	380	560	1400	460	950
	8	415	300	292	415	1200	355	920
	9	480	260	310	360	1400	320	900
	10	800	365	325	600	1350	380	1000
	11	350	450	230	320	950	285	700
	12	500	305	260	380	1150	320	650
	13	700	275	265	335	1150	300	730
	14	355	250	260	420	1115	305	650
	15	---	---	---	---	---	---	---

TABLE II  
WATER QUALITY - ALGOMA LANDFILL SITE

Sample Period	16	3-12-84	21	6-6-85	26	9-24-86
	17	6-21-84	22	9-19-85	27	12-4-86
	18	9-10-84	23	12-16-85	28	3-19-87
	19	12-12-84	24	4-21-86	29	6-26-87
	20	3-26-85	25	6-12-86	30	9-25-87

Parameter	Sample Period	Sampling Location						
		1	2	3	4	5	6	9
Field pH	16	7.11	7.50	7.56	---	---	7.55	7.36
	17	7.70	8.12	8.31	---	7.68	7.94	7.71
	18	7.08	7.45	7.63	7.24	7.32	7.24	7.24
	19	6.68	7.02	7.36	7.12	6.80	6.94	6.80
	20	7.01	7.37	7.41	---	6.53	7.17	6.74
	21	7.49	8.50	7.82	7.83	7.00	7.36	7.25
	22	6.81	7.21	7.65	7.02	6.54	6.95	6.86
	23	7.50	7.40	7.15	7.25	6.50	7.08	6.85
	24	7.98	8.45	7.93	7.46	6.42	6.87	6.19
	25	6.80	7.03	6.45	6.70	5.65	6.83	6.26
	26	6.75	7.05	7.25	6.85	6.70	6.70	6.60
	27	7.40	7.70	7.90	7.70	7.00	7.60	7.30
	28	6.55	6.80	6.85	6.55	6.55	6.20	6.15
	29**	6.65	6.80	7.0	6.50	6.35	6.50	6.35
30**	6.70	7.05	7.10	6.80	6.55	6.85	6.60	
pH	16	7.19	7.46	7.94	---	---	7.40	7.49
	17	7.01	7.61	7.79	---	6.90	7.41	7.03
	18	7.40	7.67	7.91	7.58	7.22	7.66	7.26
	19	7.10	7.41	7.59	7.84	6.80	7.18	7.11
	20	7.48	7.83	8.00	8.05	6.84	7.64	7.26
	21	7.04	7.40	7.69	7.20	6.95	7.14	7.05
	22	7.08	7.36	7.67	7.39	6.85	7.21	6.95
	23	7.46	7.64	7.87	7.71	6.88	7.36	7.16
	24	6.99	7.37	7.64	7.15	6.88	7.11	6.96
	25	7.40	7.61	7.66	7.33	6.81	7.19	7.01
	26*	---	---	---	---	---	---	---
	27	---	---	---	---	---	---	---
	28	---	---	---	---	---	---	---
	29							
30								
Field Conductivity	16	402.4	275.6	280.8	---	---	292.2	509.1
	17	454.3	254.0	243.4	---	854.0	282.5	467.4
	18	471.2	297.6	248.0	504.0	1464.0	365.4	868.0
	19	975.0	468.0	462.3	938.4	2620.0	625.1	1196.0
	20	1152.0	440.2	457.2	---	2739.0	589.5	1161.0
	21	782.6	458.6	474.2	791.7	2998.8	717.6	1147.0
	22	720	372	408	750	2268	585.6	1044.0
	23	251.6	238.0	277.4	370.0	1872.0	360.0	569.4
	24	690.0	441.6	528.0	804.0	3036.0	777.2	1056.0
	25	565.0	487.5	480.0	882.0	3392.0	774.0	1152.0
	26	610	455	465	720	3140	550	900
	27	420	490	400	680	2990	570	930
	28	440	480	400	790	3000	490	860
	29**	390	400	410	820	490	490	890
30**	490	470	490	890	300	490	910	
			10-B					

**TABLE II**  
**WATER QUALITY - ALGOMA LANDFILL SITE**

Sample Period	31 12-9-87	36	41
	32 3-28-88	37	42
	33 7-1-88	38	43
	34	39	44
	35	40	45

Parameter	Sample Period	Sampling Location						
		1	2	3	4	5 R	6A	9
Field pH	31	6.4	6.75	6.35	6.95	6.40	6.90	6.40
	32	6.7	6.95	6.7	7.35	6.75	7.20	6.8
	33	6.45	6.8	6.4	6.8	6.5	6.8	6.5
	34							
	35							
	36							
	37							
	38							
	39							
	40							
	41							
	42							
	43							
	44							
	45							
pH	31							
	32							
	33							
	34							
	35							
	36							
	37							
	38							
	39							
	40							
	41							
	42							
	43							
	44							
	45							
Field Conductivity	31	590	490	2400	700	1210	450	900
	32	620	470	1650	630	1190	490	820
	33	690	410	1010	890	1180	500	890
	34							
	35							
	36							
	37							
	38							
	39							
	40							
	41							
	42							
	43							
	44							
	45							
				10-B				

TABLE II - CONTINUED  
WATER QUALITY - ALGOMA LANDFILL SITE

Parameter	Sample Period	Sampling Location						
		1	2	3	4	5	6	9
Conductivity	1	1023	522	512	1125	1841	716	---
	2	---	---	---	---	488.8	---	---
	3	1022.5	567.3	551.2	1126.3	1653.5	719.6	---
	4	863.5	536.0	525.1	996.3	2045.1	647.6	---
	5	---	---	---	---	---	---	642.4
	6	---	---	---	---	---	---	1079.1
	7	801.2	539.7	507.9	826.8	1895.5	681.7	1295.3
	8	713	504.6	507.9	765.7	2045.1	664.2	1466.3
	9	1079.4	528.7	559.1	765.7	2428.6	684.7	1538.2
	10	1000.0	400.0	446.4	719.4	1724.1	595.2	1388.6
	11	800.0	526.3	436.7	666.7	1930.5	578.0	1183.4
	12	769.2	495.0	390.6	595.2	1666.7	502.5	943.4
	13	1092.9	529.1	448.4	578.0	1923.1	549.5	1052.6
	14	694.4	448.7	432.9	706.7	2000.0	581.4	1063.8
	15	743.5	463.0	460.8	738.0	2079.0	595.2	1081.1
C.O.D.	1	10	10	10	10	76	14	---
	2	---	---	---	---	85.8	---	---
	3	4.0	43.9	2.0	35.9	136.7	95.8	---
	4	12.0	4.0	16.0	16.0	337.3	2.0	---
	5	---	---	---	---	---	---	43.9
	6	---	---	---	---	---	---	78.4
	7	36.4	39.2	58.8	21.0	137.2	47.6	74.2
	8	28.5	14.3	23.3	25.9	108.1	13.0	80.3
	9	28.4	15.5	33.5	10.3	340.2	30.9	92.8
	10	17.3	7.3	12.2	2.4	119.6	9.7	61.4
	11	15.5	15.5	21.3	9.7	147.3	56.2	110.5
	12	25.2	15.5	11.6	21.4	130.1	9.7	66.0
	13	17.7	3.5	6.9	3.5	123.1	5.2	55.5
	14	11.9	11.9	15.8	7.9	120.6	7.9	51.4
	15	38.9	3.5	15.9	15.9	259.7	5.3	51.2
Dissolved Iron	1	0.1	0.1	0.1	0.1	0.15	0.1	---
	2	---	---	---	---	0.47	---	---
	3	0.24	0.18	0.24	0.18	0.12	0.18	---
	4	0.05	0.09	0.17	0.05	0.05	0.05	---
	5	---	---	---	---	---	---	0.26
	6	---	---	---	---	---	---	0.05
	7	0.05	0.05	0.05	0.05	0.05	0.05	0.05
	8	0.05	0.05	0.05	0.05	0.16	0.05	0.22
	9	0.05	0.05	0.05	0.05	1.02	0.05	0.18
	10	0.05	0.05	0.10	0.15	0.09	0.08	0.19
	11	0.06	0.05	0.05	0.06	0.10	0.06	0.24
	12	0.06	0.05	0.05	0.05	0.25	0.05	0.08
	13	0.10	0.01	0.03	0.02	0.52	0.01	0.11
	14	0.12	0.20	0.29	0.15	2.34	0.69	1.57
	15	0.09	0.13	0.17	0.13	4.74	0.19	1.53

TABLE II - CONTINUED  
WATER QUALITY - ALGOMA LANDFILL SITE

Parameter	Sample Period	Sampling Location						
		1	2	3	4	5	6	9
Conductivity	16	781.3	436.7	523.6	---	---	552.5	1041.7
	17	1010.1	476.2	500.0	---	2381.0	595.2	1250.0
	18	862.1	477.3	487.8	806.5	2247.2	617.3	1123.6
	19	862.1	475.1	471.6	909.1	2500.0	666.7	1092.9
	20	1197.6	469.5	451.5	729.9	2597.4	607.9	1117.3
	21	735.3	452.5	505.1	854.7	2898.6	781.3	1136.4
	22	729.9	478.5	490.2	785.4	2857.1	680.3	1047.1
	23	671.1	457.7	495.0	775.2	3144.7	692.0	1047.1
	24	769.2	507.6	502.5	843.9	3021.1	684.9	1012.1
	25	512.8	929.2	436.7	709.2	2857.1	678.0	956.9
	26 *	---	---	---	---	---	---	---
	27	---	---	---	---	---	---	---
	28	---	---	---	---	---	---	---
	29							
	30							
C.O.D.	16	77.2	50.1	78.6	---	---	73.6	127.4
	17	66.1	26.1	98.2	---	170.3	38.1	78.2
	18	24.6	8.2	20.5	18.4	213.1	20.5	77.9
	19	34.5	56.0	56.0	25.9	198.3	21.6	51.7
	20	41.0	1.9	39.1	18.6	221.6	11.2	44.7
	21	30.0	3.3	56.7	16.7	221.7	16.7	41.7
	22	3.8	11.4	19.1	7.6	202.2	11.4	26.7
	23	7.9	4.0	13.8	4.0	201.6	35.6	35.6
	24	19.3	9.7	25.1	3.9	288.2	17.4	38.7
	25	21.0	3.5	14.0	10.5	207.0	10.5	43.9
	26	16.5	4.1	10.3	6.2	196.3	10.3	22.7
	27	19.7	2.2	24.1	11.0	203.9	13.2	50.4
	28	1.9	1.9	17.0	9.4	201.6	1.9	18.8
	29 *	16.7	24.3	18.2	4.0	52.6*	16.2	24.3
	30 *	37.4	3.9	5.9	15.7	39.4	3.9	21.7
Dissolved Iron	16	0.57	0.50	2.50	---	---	1.95	5.69
	17	0.03	<0.01	<0.01	---	0.27	<0.01	0.14
	18	0.04	0.06	0.08	0.07	0.29	0.07	0.47
	19	0.14	0.28	0.28	0.32	0.67	0.21	0.30
	20	0.02	<0.01	<0.01	<0.01	2.78	0.08	0.10
	21	<0.01	<0.01	<0.01	<0.01	0.79	0.03	0.60
	22	<0.01	<0.01	<0.01	<0.01	0.42	<0.01	0.28
	23	<0.01	<0.01	0.15	<0.01	0.31	<0.01	0.16
	24	<0.01	<0.01	<0.01	<0.01	1.04	<0.01	0.15
	25	<0.01	<0.01	<0.01	<0.01	0.44	<0.01	0.36
	26	<0.01	<0.01	<0.01	<0.01	0.21	<0.01	0.06
	27	<0.01	<0.01	0.11	<0.01	0.28	<0.01	0.15
	28	<0.01	<0.01	<0.01	<0.01	0.22	<0.01	<0.01
	29**	<0.01	<0.01	<0.01	<0.01	0.83	<0.01	1.33
	30**	<0.01	<0.01	<0.04	<0.01	0.07	<0.01	0.91

**TABLE II - CONTINUED**  
**WATER QUALITY - ALGOMA LANDFILL SITE**

Parameter	Sample Period	Sampling Location						
		1	2	3	4	5R	6A	9
Conductivity	31							
	32							
	33							
	34							
	35							
	36							
	37							
	38							
	39							
	40							
	41							
	42							
	43							
	44							
	45							
C.O.D.	31	20.1	8.0	188.8	20.1	40.2	16.1	150.6
	32	44.2	8.8	132.7	19.5	58.4	28.3	35.4
	33	41.7	47.6	152.8	51.6	152.8	57.5	91.3
	34							
	35							
	36							
	37							
	38							
	39							
	40							
	41							
	42							
	43							
	44							
	45							
Dissolved Iron	31	<0.01	<0.01	0.58	<0.01	0.21	<0.01	0.06
	32	<0.01	<0.01	0.19	<0.01	9.03	<0.01	4.35
	33	<0.01	<0.01	0.12	<0.01	1.76	<0.01	<0.01
	34							
	35							
	36							
	37							
	38							
	39							
	40							
	41							
	42							
	43							
	44							
	45							

TABLE II - CONTINUED  
WATER QUALITY - ALGOMA LANDFILL SITE

Parameter	Sample Period	Sampling Location						
		1	2	3	4	5	6	9
Hardness	1	570	290	250	580	880	440	---
	2	---	---	---	---	300	---	---
	3	515	310	263	583	920	355	---
	4	420	140	320	380	1040	270	---
	5	---	---	---	---	---	---	270
	6	---	---	---	---	---	---	610
	7	450	305	285	430	1055	365	660
	8	345	300	210	355	920	350	525
	9	575	720	290	370	1095	365	640
	10	370	210	240	280	660	250	520
	11	505	346	255	404	1068	362	610
	12	499	375	268	434	1084	348	602
	13	661	342	267	384	1052	342	586
	14	440	282	266	422	1092	352	584
	15	472	294	278	452	1168	370	616
Chloride	1	12	16	10	56	144	24	---
	2	---	---	---	---	53.0	---	---
	3	18.4	17.2	15.1	60.4	154.6	24.5	---
	4	10.8	14.4	5.5	89.1	260.9	16.6	---
	5	---	---	---	---	---	---	31.6
	6	---	---	---	---	---	---	53.1
	7	12.8	15.9	4.8	27.7	198.2	20.4	52.7
	8	9.5	13.5	4.6	19.9	167.7	19.4	59.2
	9	15.6	13.4	6.8	19.8	175.4	18.0	67.2
	10	13.9	13.9	7.9	22.8	177.4	21.8	71.5
	11	22.5	20.7	5.6	20.4	212.7	21.8	56.2
	12	21.8	21.4	6.0	25.1	206.2	21.1	55.7
	13	25.0	16.2	8.7	18.0	174.9	20.5	63.0
	14	13.0	16.3	6.5	27.9	183.0	20.4	57.1
	15	13.5	12.5	6.0	33.0	225.7	17.6	46.4
Alkalinity	1	300	220	250	450	700	320	---
	2	---	---	---	---	260	---	---
	3	350	255	288	553	788	305	---
	4	140	200	310	450	1080	140	---
	5	---	---	---	---	---	---	70
	6	---	---	---	---	---	---	730
	7	330	270	315	435	705	405	790
	8	235	190	280	280	780	225	415
	9	355	260	310	350	1185	285	800
	10	305	230	295	320	795	265	750
	11	306	298	314	334	751	289	731
	12	291	306	299	345	1002	274	684
	13	344	304	310	332	990	258	684
	14	274	242	300	318	988	286	690
	15	296	248	300	342	1000	283	682

TABLE II - CONTINUED  
WATER QUALITY - ALGOMA LANDFILL SITE

Parameter	Sample Period	Sampling Location						
		1	2	3	4	5	6	9
Hardness	16	392	254	228	---	---	282	388
	17	380	286	266	---	996	320	556
	18	518	308	280	468	1104	360	540
	19	504	272	265	458	980	350	484
	20	649	282	249	388	1236	326	242
	21	474	284	263	480	1340	394	508
	22	432	269	284	414	1190	344	494
	23	396	288	294	472	1416	368	472
	24	447	315	273	480	1284	418	460
	25	326	285	262	466	1220	394	460
	26	413	295	292	506	1308*	372	472
	27	317	290	282	501	1172*	376	492
	28	274	284	280	582	1152*	340	450
	29**	274	272	258	520	1248*	323	437
30**	302	270	286	563*	558	316	418	
Chloride	16	10.4	13.9	14.9	---	---	16.3	61.8
	17	12.5	13.9	7.4	---	211.8	16.3	54.3
	18	14.4	13.0	9.8	34.8	215.5	19.5	55.7
	19	17.7	14.7	12.5	49.5	263.9	19.7	49.5
	20	15.7	13.5	6.7	46.5	273.9	17.2	48.2
	21	16.5	11.7	6.7	40.5	259.9	19.5	45.5
	22	9.7	14.2	7.5	40.2	281.9	15.0	43.0
	23	8.0	12.7	7.2	31.0	271.9	14.0	38.0
	24	13.5	11.5	7.5	32.0	231.9	15.0	38.0
	25	10.5	12.7	7.0	42.7	245.9	15.5	38.0
	26	8.0	8.5	8.5	35.5	283.9	12.5	37.0
	27	6.2	12.2	6.4	31.7	238.0	12.5	38.0
	28	7.0	13.5	6.5	30.7	226.6	11.2	31.6
	29**	7.0	19.2	2.0	39.5	85.2	10.0	35.5
30**	9.7	11.4	6.3	41.3	61.7	8.4	32.0	
Alkalinity	16	229	208	260	---	---	216	501
	17	336	240	306	---	1056	264	702
	18	250	256	314	326	1217	284	676
	19	260	242	296	269	1145	270	609
	20	228	210	256	187	1099	244	564
	21	274	257	308	341	1277	340	626
	22	278	234	302	282	1276	292	570
	23	284	250	306	348	1558	314	568
	24	290	276	306	374	1598	344	562
	25	256	247	293	365	1626	309	561
	26	284	254	302	392	1440	298	536
	27	242	243	306	428	1538	308	584
	28	220	239	300	514	1468	291	517
	29**	212	231	305	510	842	288	526
30**	253	247	316	506	746	283	539	

\* - Lab ph and Conductivity not required  
 \*\* - Well 5 Abandoned and Well 5R installed 6/18/87

TABLE II - CONTINUED  
WATER QUALITY - ALGOMA LANDFILL SITE

Parameter	Sample Period	Sampling Location						
		1	2	3	4	5 R	6 A	9
Hardness	31	388	289	1170	470	594	308	467
	32	460	296	910	508	604	352	448
	33	442	294	1010	548	552	344	444
	34							
	35							
	36							
	37							
	38							
	39							
	40							
	41							
	42							
	43							
	44							
	45							
Chloride	31	8.5	16.7	130.2	13.2	56.0	9.7	37.2
	32	9.7	14.5	81.0	11.0	54.0	9.0	31.0
	33	8.0	15.5	88.5	32.5	51.0	14.5	34.5
	34							
	35							
	36							
	37							
	38							
	39							
	40							
	41							
	42							
	43							
	44							
	45							
Alkalinity	31	260	214	1398	439	708	272	513
	32	291	230	1065	453	704	291	493
	33	278	244	1110	494	682	297	523
	34							
	35							
	36							
	37							
	38							
	39							
	40							
	41							
	42							
	43							
	44							
	45							

EPA CONTRACT LABORATORY PROGRAM  
PEOPLE MANAGEMENT OFFICE  
C.B.CX 818 - ALEXANDRIA, VA 22313  
2/557-2450 FTS: 8-557-2490

SITE NAME 1100 LIND  
SITE ID 0980610300

84MS07R11  
EPA SAMPLE NO. :  
: ME 4691

DATE RECEIVED  
ANALYSIS CODES

DATE 9-12-84

INORGANIC ANALYSIS DATA SHEET

B NAME VESSAR INC.  
B SAMPLE ID. NO. 7667

CASE NO. 3136  
CC REPORT NO. 131

OBJECT-TASK 834.CCCG

BATCH 131

ELEMENTS IDENTIFIED AND MEASURED

UG/L

RECEIVED SEP 26 1984

1. ALUMINUM	25.	13. MAGNESIUM	NR
2. ANTIMONY	< 6.	14. MANGANESE	2.
3. ARSENIC	< 8.	15. MERCURY	< 0.2
4. BARIUM	< 1.	16. NICKEL	< 15.
5. BERYLLIUM	< 1.	17. POTASSIUM	NR
6. CADMIUM	< 0.5	18. SELENIUM	< 2.
7. CALCIUM	NR	19. SILVER	< 3.
8. CHROMIUM	< 4.	20. SODIUM	NR
9. COBALT	< 10.	21. THALLIUM	< 2.
10. COPPER	42.	22. TIN	O.ND/B
11. IRON	O.ND/B	23. VANADIUM	< 4.
12. LEAD	< 2.	24. ZINC	27.C
CYANIDE	NR	PERCENT SULFIDES	NR

REMARKS: SEE COVER PAGE.

COMMENTS:

LAB MANAGER

FORM 1

STEFERY E. MAXFIELD

DATE 9-12-84

INORGANIC ANALYSIS DATA SHEET

CLIENT NAME VERSAR INC.

CASE NO. 3136

CLIENT SAMPLE ID. NO. 7668

QC REPORT NO. 131

PROJECT-TASK 834.CCCO

BATCH 131

ELEMENTS IDENTIFIED AND MEASURED

UG/L

RECEIVED SEP 26 1984

1. ALUMINUM	643.	13. MAGNESIUM	NR
2. ANTIMONY	<6.	14. MANGANESE	156.
3. ARSENIC	<8.	15. MERCURY	<0.2
4. BARIUM	32.	16. NICKEL	< 15.
5. BERYLLIUM	< 1.	17. POTASSIUM	NR
6. CADMIUM	0.53	18. SELENIUM	< 2.
7. CALCIUM	NR	19. SILVER	< 3.
8. CHROMIUM	< 4.	20. SODIUM	NR
9. COBALT	< 10.	21. THALLIUM	< 2.
10. COPPER	28.	22. TIN	ND/B
11. IRON	1890.C	23. VANADIUM	< 4.
12. LEAD	< 2.	24. ZINC	21.C
CYANIDE	NR	PERCENT SOLIDS	NR

FOOTNOTES: SEE COVER PAGE.

COMMENTS:

LAB MANAGER

ROBERT E. MAXFIELD

DATE 9-12-84

INORGANIC ANALYSIS DATA SHEET

NAME VEFSAR INC.  
SAMPLE ID. NO. 7669  
PROJECT-TASK 834.CCCC

CASE NO. 3136  
QC REPORT NO. 131  
BATCH 131

ELEMENTS IDENTIFIED AND MEASURED

UG/L

RECEIVED SEP 26 1984

1. ALUMINUM	1270.	13. MAGNESIUM	NR
2. ANTIMONY	< 6.	14. MANGANESE	69.
3. ARSENIC	< 8.	15. MERCURY	< 0.2
4. BARIUM	23.0	16. NICKEL	< 15.
5. BERYLLIUM	< 1.	17. POTASSIUM	NR
6. CADMIUM	< 0.5	18. SELENIUM	< 2.
7. CALCIUM	NR	19. SILVER	< 3.
8. CERIUM	< 4.	20. SODIUM	NR
9. COBALT	< 10.	21. THALLIUM	< 2.
10. COPPER	15.	22. TIN	C.ND/B
11. IRON	2890.C	23. VANADIUM	< 4.
12. LEAD	4.6	24. ZINC	23.C
13. CYANIDE	NR	PERCENT SOLIDS	NR

REMARKS: SEE COVER PAGE.

COMMENTS:

LAB MANAGER

ROBERT E. MAXFIELD



EPA CONTRACT LABORATORY PROGRAM  
SAMPLE MANAGEMENT OFFICE  
PO BOX 818 - ALEXANDRIA, VA 22313  
7557-2490 FTS: B-557-2490

27 MSU  
: EPA SAMPLE NO. :  
: ME 4695 : (B-6A)  
: .....

DATE 9-12-84

INORGANIC ANALYSIS DATA SHEET

1 NAME VERSTAR INC.  
-----  
3 SAMPLE ID. NO. 7671  
-----  
PROJECT-TASK 834.CCCC  
-----

CASE NO. 3136  
-----  
CC REPORT NO. 131  
-----  
BATCH 1E1  
-----

ELEMENTS IDENTIFIED AND MEASURED

UG/L

RECEIVED SEP 26 1984

1. ALUMINUM	254.	13. MAGNESIUM	NR
2. ANTIMONY	<6.	14. MANGANESE	49.
3. ARSENIC	<8.	15. MERCURY	<0.2
4. BARIUM	29.	16. NICKEL	< 15.
5. BERYLLIUM	< 1.	17. POTASSIUM	NR
6. CADMIUM	0.53	18. SELENIUM	< 2.
7. CALCIUM	NR	19. SILVER	< 3.
8. CHROMIUM	< 4.	20. SODIUM	NR
9. COBALT	< 10.	21. THALLIUM	< 2.
10. COPPER	31.	22. TIN	0.ND/B
11. IRON	643.C	23. VANADIUM	< 4.
12. LEAD	< 2.	24. ZINC	12.C
CYANIDE	NR	PERCENT SOLIDS	NR

REMARKS: SEE COVER PAGE.

COMMENTS:

LAB MANAGER

ROBERT E. MAXFIELD

EPA CONTRACT LABORATORY PROGRAM  
SAMPLE MANAGEMENT OFFICE  
PO BOX 818 - ALEXANDRIA, VA 22313  
7557-2490 FTS: 8-557-2490

.....  
: EPA SAMPLE NO. :  
: PE 4696 :  
: .....

DATE 9-12-84 (B-9)

INORGANIC ANALYSIS DATA SHEET

1 NAME VEFSAR INC.  
-----  
3 SAMPLE ID. NO. 7672

CASE NO. 3136  
-----  
QC REPORT NO. 131

PROJECT-TASK 834.CCCG  
-----

BATCH 131  
-----

ELEMENTS IDENTIFIED AND MEASURED  
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UG/L

RECEIVED SEP 26 1984

1. ALUMINUM	511.
2. ANTIMONY	< 6.
3. ARSENIC	< 8.
4. BARIUM	103.200
5. BERYLLIUM	< 1.
6. CADMIUM	< 0.5
7. CALCIUM	NR
8. CHROMIUM	< 4.
9. COBALT	< 10.
10. COPPER	7.
11. IRON	7300.0
12. LEAD	< 2.
CYANIDE	NR

13. MAGNESIUM	NR
14. MANGANESE	121.
15. MERCURY	< 0.2
16. NICKEL	< 15.
17. POTASSIUM	NR
18. SELENIUM	< 2.
19. SILVER	< 3.
20. SODIUM	NR
21. THALLIUM	< 2.
22. TIN	0. ND/B
23. VANADIUM	< 4.
24. ZINC	52.0
PERCENT SOLIDS	NR

REMARKS: SEE COVER PAGE.

COMMENTS:

LAB MANAGER

ROBERT E. MAXFIELD

ORGANICS ANALYSIS DATA SHEET

RECEIVED  
04 1984

Laboratory Name: Gulf South Research Institute  
 Sample ID No: FM06  
 Matrix: Water  
 Case Authorized By: Victor Kowalski

Case No: 3136  
 QC Report No: C04-36  
 Contract No.: 68-01-6867  
 Date Sample Received: 8/16/84

VOLATILES

CONCENTRATION: LOW MEDIUM HIGH (circle one)  
 DATE EXTRACTED/PREPARED: 8/23/84  
 DATE ANALYZED: 8/23/84  
 PERCENT MOISTURE: NA  
 CONC./DILUTION FACTOR: 1

PESTICIDES

CONCENTRATION: LOW MEDIUM HIGH (circle one)  
 DATE EXTRACTED/PREPARED: 8/20/84  
 DATE ANALYZED: 9/11  
 PERCENT MOISTURE: NA  
 CONC./DILUTION FACTOR: 100

PP #	CAS #	NAME	CONC.	UNIT
VI	107-57-3	acrolein	10	u
VI	107-13-1	acrylonitrile	10	u
VI	71-43-2	benzene	1.0	u
VI	56-23-5	carbon tetrachloride	1.0	u
VI	105-92-7	chlorobenzene	1.0	u
VI	107-06-2	1,2-dichloroethane	1.0	u
VI	71-55-6	1,1,1-trichloroethane	1.0	u
VI	75-34-3	1,1-dichloroethane	1.0	u
VI	79-05-5	1,1,2-trichloroethane	1.0	u
VI	79-35-5	1,1,2,2-tetrachloroethane	2.2	LOU CP
VI	75-05-3	chloroethane	2.0	u
VI	110-75-8	2-chloroethylvinyl ether	5.0	u
VI	67-66-3	chloroform	1.0	u
VI	75-35-4	1,1-dichloroethene	1.0	u
VI	156-62-5	trans-1,2-dichloroethene	1.0	u
VI	75-37-5	1,2-dichloropropane	2.0	u
VI	10561-02-6	trans-1,3-dichloropropene	1.0	u
VI	10061-01-05	cis-1,3-dichloropropene	1.0	u
VI	105-41-4	ethylbenzene	1.0	u
VI	75-09-7	methylene chloride	ND "B"	LOU CP
VI	74-87-3	chloromethane	3.0	u
VI	74-83-9	bromomethane	2.0	u
VI	75-25-2	bromoform	1.0	u
VI	75-27-6	bromodichloromethane	1.0	u
VI	75-69-4	fluorotrichloromethane	1.0	u
VI	75-71-8	dichlorodifluoromethane	-	
VI	126-43-1	chlorodibromomethane	1.0	u
VI	127-18-6	tetrachloroethene	1.0	u
VI	105-33-3	toluene	1.0	u
VI	79-71-6	trichloroethene	2.2	LOU CP
VI	75-01-6	vinyl chloride	2.0	u
VI	67-64-1	acetone	2.0	u
VI	75-93-3	2-butanone	1.0	u
VI	75-15-0	carbon disulfide	2.0	u
VI	519-73-6	2-hexanone	1.0	u
VI	103-10-1	4-methyl-2-pentanone	1.0	u
VI	105-67-5	styrene	1.0	u
VI	105-25-4	vinyl acetate	2.0	u

PP #	CAS #	NAME	CONC.	UNIT
(89P)	309-00-2	aldrin	0.029	u
(90P)	60-57-1	dieldrin	0.023	u
(91P)	57-74-9	chlorocane	0.5	u
(92P)	50-29-3	4,4'-DDT	0.075	u
(93P)	72-55-9	4,4'-DDE	0.034	u
(94P)	72-54-8	4,4'-DDD	0.039	u
(95P)	115-29-7	$\alpha$ -endosulfan	0.039	u
(96P)	115-29-7	$\beta$ -endosulfan	0.022	u
(97P)	1031-07-3	endosulfan sulfate	0.050	u
(98P)	72-20-8	endrin	0.033	u
(99P)	7421-93-4	endrin aldehyde	0.048	u
(100P)	76-44-8	heptachlor	0.041	u
(101P)	1024-57-3	heptachlor epoxide	0.022	u
(102P)	319-84-6	$\alpha$ -BHC	0.048	u
(103P)	319-85-7	$\beta$ -BHC	0.067	u
(104P)	319-86-8	$\delta$ -BHC	0.051	u
(105P)	58-89-9	$\gamma$ -BHC (lindane)	0.036	u
(106P)	53469-21-9	PCB-1242	0.5	u
(107P)	11097-69-1	PCB-1234	1.0	u
(108P)	11104-25-2	PCB-1221	1.0	u
(109P)	11141-16-5	PCB-1232	1.0	u
(110P)	12672-29-6	PCB-1245	1.0	u
(111P)	11096-82-5	PCB-1260	2.0	u
(112P)	12674-11-2	PCB-1016	0.5	u
(113P)	8001-35-2	toxaphene	2.5	u

DIOXINS

CONCENTRATION: LOW MEDIUM HIGH (circle one)  
 DATE EXTRACTED/PREPARED: \_\_\_\_\_  
 DATE ANALYZED: \_\_\_\_\_  
 PERCENT MOISTURE: \_\_\_\_\_  
 CONC./DILUTION FACTOR: \_\_\_\_\_

PP #	CAS #	NAME	CONC.	UNIT
(129B)	1746-01-6	2,3,7,8-tetrachlorodibenzo-p-dioxin	0.003	u

Sample Name  
**EP315**

Laboratory Name: Gulf South Research Institute Case No: 3136  
QC Report No: C04-36

RECEIVED OCT 04 1984

B. Toxicologically Important Compounds

CAS #	Compound Name	Fraction	Scan No. or Retention Time	% Maximum Score Attained Mass Matching Routine: (Specify: <u>1000</u> )	Estimated Concentration: ( <u>μg/g</u> or <u>μg/g</u> )
1. NA	None found	VOL	NA	NA	NA
2. NA	Unknown Alkene	SV	267	NA	16
3. NA	Unknown Alkene	SV	1652	NA	840
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Vicente Kowalski  
Lab Manager

ORGANICS ANALYSIS DATA SHEET

Story Name: Gulf South Research Institute  
 Sample ID No: FM09  
 Matrix: Water  
 Authorized By: Victor Kozak

Case No: 3136  
 QC Report No: C04-36  
 Contract No.: 68-01-6867  
 Date Sample Received: 8/16/84

VOLATILES

CONCENTRATION: (LOW) MEDIUM HIGH (circle one)  
 DATE EXTRACTED/PREPARED: 8/23/84  
 DATE ANALYZED: 8/23/84  
 PERCENT MOISTURE: NA  
 CONC./DILUTION FACTOR: 1

PESTICIDES

CONCENTRATION: LOW MEDIUM HIGH (circle one)  
 DATE EXTRACTED/PREPARED: 9/20/84  
 DATE ANALYZED: 9/11/84  
 PERCENT MOISTURE: NA  
 CONC./DILUTION FACTOR: 200/500

CAS #	NAME	CONC. (circle one) or ug/kg
107-02-5	acrolein	1.0 U
107-13-1	acrylonitrile	1.0 U
71-43-2	benzene	1.0 U
56-23-5	carbon tetrachloride	1.0 U
105-90-7	chlorobenzene	1.0 U
107-06-2	1,2-dichloroethane	1.0 U
71-55-6	1,1,1-trichloroethane	1.0 U
75-34-3	1,1-dichloroethane	1.0 U
79-00-5	1,1,2-trichloroethane	1.0 U
79-31-5	1,1,2,2-tetrachloroethane	1.0 U
75-02-3	chloroethane	2.0 U
15-75-3	2-chloroethylvinyl ether	5.0 U
67-66-3	chloroform	1.0 U
75-35-4	1,1-dichloroethene	1.0 U
136-65-5	trans-1,2-dichloroethene	1.0 U
75-37-5	1,2-dichloropropane	2.0 U
10561-02-6	trans-1,3-dichloropropene	1.0 U
10061-01-05	cis-1,3-dichloropropene	1.0 U
105-61-4	ethylbenzene	1.0 U
75-09-7	methylene chloride	4.5 "C" 1.0 U CP
74-87-3	chloromethane	3.0 U
74-83-9	bromomethane	2.0 U
75-25-2	bromoform	1.0 U
75-27-4	bromodichloromethane	1.0 U
75-69-4	fluorotrichloromethane	1.0 U
75-71-8	dichlorodifluoromethane	-
124-43-1	chlorodibromomethane	1.0 U
127-13-4	tetrachloroethene	1.0 U
105-33-3	toluene	1.0 U
79-01-6	trichloroethene	1.0 U
75-01-3	vinyl chloride	2.0 U
67-64-1	acetone	2.0 U
5-93-3	2-butanone	1.0 U
75-15-0	carbonylsulfide	2.0 U
319-73-6	2-hexanone	1.0 U
863-10-1	4-methyl-2-pentanone	1.0 U
105-47-5	styrene	1.0 U
105-25-4	vinyl acetate	2.0 U
111-22-7	1,4-dioxane	1.0 U

PP #	CAS #	NAME	CONC. (circle one) or ug/kg
(89P)	309-00-2	aldrin	0.029 U
(90P)	60-57-1	dieldrin	0.023 U
(91P)	57-74-9	chloroane	0.5 <del>5.0</del> U
(92P)	50-29-3	o,p'-DDT	0.075 U
(93P)	72-55-9	o,p'-DDE	0.034 U
(94P)	72-54-8	o,p'-DDD	0.039 U
(95P)	115-29-7	α-endosulfan	0.039 U
(96P)	115-29-7	β-endosulfan	0.022 U
(97P)	1031-07-3	endosulfan sulfate	0.050 U
(98P)	72-20-8	endrin	0.033 U
(99P)	7421-93-4	endrin aldehyde	0.048 U
(100P)	76-44-8	heptachlor	0.041 U
(101P)	1024-57-3	heptachlor epoxide	0.022 U
(102P)	319-84-6	α-BHC	0.048 U
(103P)	319-85-7	β-BHC	0.067 U
(104P)	319-86-8	δ-BHC	0.051 U
(105P)	58-89-9	γ-BHC (lindane)	0.036 U
(106P)	53469-21-9	PCB-1242	0.5 U
(107P)	11097-69-1	PCB-1254	1.0 U
(108P)	11104-25-2	PCB-1271	1.0 U
(109P)	11141-16-5	PCB-1232	1.0 U
(110P)	12672-29-6	PCB-1245	1.0 U
(111P)	11096-82-5	PCB-1260	2.0 U
(112P)	12674-11-2	PCB-1016	0.5 U
(113P)	8021-35-2	toxaphene	2.5 U

DIOXINS

CONCENTRATION: LOW MEDIUM HIGH (circle one)  
 DATE EXTRACTED/PREPARED: \_\_\_\_\_  
 DATE ANALYZED: \_\_\_\_\_  
 PERCENT MOISTURE: \_\_\_\_\_  
 CONC./DILUTION FACTOR: \_\_\_\_\_

PP #	CAS #	NAME	CONC. (circle one) or ug/kg
(129B)	1746-01-6	2,3,7,8-tetrachlorodibenzo-p-dioxin	0.053

Sample Name  
E 8316

Library Name: Gulf South Research Institute Case No: 3136  
 X Report No: CO2-36

RECEIVED OCT 04 1984

B. Tentatively Identified Compounds

CAS #	Compound Name	Fraction	Scan No. or Retention Time	% Maximum Score Attained Mass Matching Routine: (Specify: <u>1000</u> )	Estimated Concentration: (% of total)
1. NA	None Found	VGA	NA	NA	NA
2. NA	Unknown alkene	SV	273	NA	17
3. 42451-32-P	Benzoamide, N-t-Methyl	SV	1122	773	250
4. NA	Not Identified	SY	1137	NA	18
5. NA	Not Identified	SV	1470	NA	20
6. NA	Not Identified	SV	1487	NA	24
7. NA	Not Identified	SY	1659	NA	150
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Victor Kowalek

Lab Manager

RECEIVED OCT 7 4 1984

E8317

ORGANICS ANALYSIS DATA SHEET

Story Name: Gulf South Research Institute  
 Sample ID No: FM14  
 Title: Water  
 Name/Use Authorized By: Victor Kowalek

Case No: 3136  
 QC Report No: CO4-36  
 Contract No.: 68-01-6867  
 Date Sample Received: 8/16/84

VOLATILES

CONCENTRATION: LOW MEDIUM HIGH (circle one)  
 DATE EXTRACTED/PREPARED: 8/23/84  
 DATE ANALYZED: 8/23/84  
 PERCENT MOISTURE: NA  
 CONC./DILUTION FACTOR: 1

PESTICIDES

CONCENTRATION: LOW MEDIUM HIGH (circle one)  
 DATE EXTRACTED/PREPARED: 9/26/84  
 DATE ANALYZED: 9/11/84  
 PERCENT MOISTURE: NA  
 CONC./DILUTION FACTOR: SD 5100

#	CAS #	NAME	CONC. (circle one) or ug/kg
1)	107-02-8	acrolein	1.0 U
2)	107-13-1	acrylonitrile	1.0 U
3)	71-43-2	benzene	NP "B" 1.0 U CP
4)	96-23-5	carbon tetrachloride	1.0 U
5)	103-95-7	chlorobenzene	1.0 U
6V)	107-56-2	1,2-dichloroethane	1.0 U
7V)	71-55-6	1,1,1-trichloroethane	1.0 U
8V)	75-34-3	1,1-dichloroethane	1.0 U
9V)	79-00-5	1,1,2-trichloroethane	1.0 U
10V)	79-32-5	1,1,2,2-tetrachloroethane	1.0 U
	75-09-3	chloroethane	2.0 U
11V)	110-73-8	2-chloroethylvinyl ether	5.0 U
12V)	67-66-3	chloroform	1.0 U
13V)	75-35-4	1,1-dichloroethene	1.0 U
14V)	156-60-5	trans-1,2-dichloroethene	1.0 U
15V)	75-87-5	1,2-dichloropropane	2.0 U
16V)	10561-07-6	trans-1,3-dichloropropene	1.0 U
	10061-01-05	cis-1,3-dichloropropene	1.0 U
17V)	100-41-0	ethylbenzene	1.0 U
18V)	75-09-2	methylen chloride	4.4 "C" 1.0 U CP
19V)	74-87-3	chloromethane	3.0 U
20V)	74-83-9	bromomethane	2.0 U
21V)	75-25-2	bromoform	1.0 U
22V)	75-27-4	bromodichloromethane	1.0 U
23V)	75-69-4	fluorotrichloromethane	1.0 U
24V)	75-71-8	dichlorodifluoromethane	-
25V)	124-43-1	chlorodibromomethane	1.0 U
26V)	127-13-6	tetrachloroethene	1.0 U
27V)	105-33-3	toluene	1.0 U
28V)	79-21-6	trichloroethene	1.0 U
29V)	75-01-0	vinyl chloride	2.0 U
	67-66-1	acetone	2.0 U
	75-93-3	2-butanone	1.0 U
	75-15-0	carbon disulfide	2.0 U
	519-73-6	2-hexanone	1.0 U
	103-10-1	4-methyl-2-pentanone	1.0 U
	105-67-3	styrene	1.0 U
	105-33-6	vinyl acetate	2.0 U
			1.0 U

PP #	CAS #	NAME	CONC. (circle one) or ug/kg
(89P)	309-00-2	aldrin	0.029 U
(90P)	60-57-1	dieldrin	0.023 U
(91P)	57-74-9	chlorthane	0.5 0.55 U
(92P)	50-29-3	4,4'-DDT	0.075 U
(93P)	72-35-9	4,4'-DDE	0.034 U
(94P)	72-56-8	4,4'-DDD	0.039 U
(95P)	115-29-7	α-endosulfan	0.039 U
(96P)	115-29-7	β-endosulfan	0.022 U
(97P)	1031-07-3	endosulfan sulfate	0.050 U
(98P)	72-20-8	endrin	0.033 U
(99P)	7421-93-4	endrin aldehyde	0.048 U
(100P)	76-64-8	heptachlor	0.041 U
(101P)	1024-57-3	heptachlor epoxide	0.022 U
(102P)	319-84-6	α-BHC	0.048 U
(103P)	319-85-7	β-BHC	0.067 U
(104P)	319-86-8	δ-BHC	0.051 U
(105P)	58-89-9	γ-BHC (lindane)	0.036 U
(106P)	53469-21-9	PCB-1242	0.5 U
(107P)	11097-69-1	PCB-1254	1.0 U
(108P)	11104-23-2	PCB-1221	1.0 U
(109P)	11141-16-5	PCB-1232	1.0 U
(110P)	12672-29-6	PCB-1245	1.0 U
(111P)	11096-82-5	PCB-1260	2.0 U
(112P)	12674-11-2	PCB-1016	0.5 U
(113P)	8001-33-2	toxaphene	2.5 U

DIOXINS

CONCENTRATION: LOW MEDIUM HIGH (circle one)  
 DATE EXTRACTED/PREPARED: \_\_\_\_\_  
 DATE ANALYZED: \_\_\_\_\_  
 PERCENT MOISTURE: \_\_\_\_\_  
 CONC./DILUTION FACTOR: \_\_\_\_\_

PP #	CAS #	NAME	CONC. (circle one) or ug/kg
(129B)	1746-21-6	2,3,7,8-tetrachlorodibenzo-p-dioxin	0.00

Lab Manager

*Victor Kowalski*

CAS I	Compound Name	Fraction	Scan No. or Retention Time	% Maximum Score Attained	His Making Reference: Specific: /	Empirical Constitution
1.	N/A	N/A	N/A	N/A	N/A	N/A
2.	N/A	N/A	N/A	N/A	N/A	N/A
3.	N/A	N/A	N/A	N/A	N/A	N/A
4.	N/A	N/A	N/A	N/A	N/A	N/A
5.	N/A	N/A	N/A	N/A	N/A	N/A
6.	N/A	N/A	N/A	N/A	N/A	N/A
7.	N/A	N/A	N/A	N/A	N/A	N/A
8.	N/A	N/A	N/A	N/A	N/A	N/A
9.	N/A	N/A	N/A	N/A	N/A	N/A
10.	N/A	N/A	N/A	N/A	N/A	N/A
11.	N/A	N/A	N/A	N/A	N/A	N/A
12.	N/A	N/A	N/A	N/A	N/A	N/A
13.	N/A	N/A	N/A	N/A	N/A	N/A
14.	N/A	N/A	N/A	N/A	N/A	N/A
15.	N/A	N/A	N/A	N/A	N/A	N/A
16.	N/A	N/A	N/A	N/A	N/A	N/A
17.	N/A	N/A	N/A	N/A	N/A	N/A
18.	N/A	N/A	N/A	N/A	N/A	N/A
19.	N/A	N/A	N/A	N/A	N/A	N/A
20.	N/A	N/A	N/A	N/A	N/A	N/A
21.	N/A	N/A	N/A	N/A	N/A	N/A
22.	N/A	N/A	N/A	N/A	N/A	N/A
23.	N/A	N/A	N/A	N/A	N/A	N/A
24.	N/A	N/A	N/A	N/A	N/A	N/A
25.	N/A	N/A	N/A	N/A	N/A	N/A
26.	N/A	N/A	N/A	N/A	N/A	N/A
27.	N/A	N/A	N/A	N/A	N/A	N/A
28.	N/A	N/A	N/A	N/A	N/A	N/A
29.	N/A	N/A	N/A	N/A	N/A	N/A
30.	N/A	N/A	N/A	N/A	N/A	N/A

B. Tentatively Identified Compounds

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3136

Lab Name: Gulf South Research Institute  
 GC Run No: 606-26

Exhibit B  
 Page 20 of 42  
 Sample No: E8317

GC/MS ANALYSIS DATA SHEET - Page 3

ORGANICS ANALYSIS DATA SHEET

Laboratory Name: Gulf South Research Institute  
 Sample ID No: FM17  
 Matrix: Water  
 Authorized By: Victor Kowalski

Case No: 3736  
 QC Report No: C04-36  
 Contract No: 68-01-6867  
 Date Sample Received: 8/16/84

VOLATILES

CONCENTRATION: (LOW) MEDIUM HIGH (circle one)  
 DATE EXTRACTED/PREPARED: 8/23/84  
 DATE ANALYZED: 8/23/84  
 PERCENT MOISTURE: NA  
 CONC./DILUTION FACTOR: 1

PESTICIDES

CONCENTRATION: (LOW) MEDIUM HIGH (circle one)  
 DATE EXTRACTED/PREPARED: 8/20/84  
 DATE ANALYZED: 9/11/84  
 PERCENT MOISTURE: NA  
 CONC./DILUTION FACTOR: 100

CAS #	NAME	CONC. (circle one) ug/l or ug/kg
107-02-3	acrolein	1.0 U
107-13-1	acrylonitrile	1.0 U
71-43-2	benzene	1.0 U
56-23-5	carbon tetrachloride	1.0 U
103-92-7	chlorobenzene	1.0 U
107-56-2	1,2-dichloroethane	1.0 U
71-55-6	1,1,1-trichloroethane	1.0 U
73-34-3	1,1-dichloroethane	1.0 U
79-50-5	1,1,2-trichloroethane	1.0 U
79-31-5	1,1,2,2-tetrachloroethane	1.0 U
73-02-3	chloroethane	2.0 U
110-73-8	2-chloroethylvinyl ether	5.0 U
67-66-3	chloroform	1.0 U
75-35-4	1,1-dichloroethene	1.0 U
136-65-5	trans-1,2-dichloroethene	1.0 U
73-37-5	1,2-dichloropropane	2.0 U
10261-07-6	trans-1,3-dichloropropene	1.0 U
10061-01-05	cis-1,3-dichloropropene	1.0 U
100-41-4	ethylbenzene	1.0 U
75-59-2	methylene chloride	5.2 U
74-87-3	chloromethane	3.0 U
74-33-9	bromomethane	2.0 U
75-25-2	bromoform	1.0 U
75-27-4	bromodichloromethane	1.0 U
75-69-4	fluorotrichloromethane	1.0 U
75-71-8	dichlorodifluoromethane	—
124-43-1	chlorodibromomethane	1.0 U
127-13-6	tetrachloroethene	1.0 U
103-35-3	toluene	1.0 U
79-71-6	trichloroethene	1.0 U
75-01-4	vinyl chloride	2.0 U
67-64-1	acetone	2.0 U
75-93-3	2-butanone	1.0 U
75-15-0	carbon disulfide	2.0 U
519-73-6	2-hexanone	1.0 U
863-10-1	4-methyl-2-pentanone	1.0 U
105-47-5	styrene	1.0 U
103-55-4	vinyl acetate	2.0 U
108-90-7	toluene	1.0 U

PP #	CAS #	NAME	CONC. (circle one) ug/l or ug/kg
(89P)	309-00-2	aldrin	0.029 U
(90P)	60-57-1	dieldrin	0.023 U
(91P)	57-74-9	chloroane	0.5 U
(92P)	50-29-3	γ,γ'-DDT	0.075 U
(93P)	72-33-9	γ,γ'-DDE	0.034 U
(94P)	72-34-8	γ,γ'-DDD	0.039 U
(95P)	115-29-7	α-endosulfan	0.039 U
(96P)	115-29-7	β-endosulfan	0.022 U
(97P)	1031-07-3	endosulfan sulfate	0.050 U
(98P)	72-20-8	endrin	0.033 U
(99P)	7421-93-4	endrin aldehyde	0.048 U
(100P)	76-44-8	heptachlor	0.041 U
(101P)	1024-57-3	heptachlor epoxide	0.022 U
(102P)	319-84-6	α-BHC	0.048 U
(103P)	319-85-7	β-BHC	0.067 U
(104P)	319-86-8	δ-BHC	0.051 U
(105P)	55-89-9	γ-BHC (lindane)	0.036 U
(106P)	53469-21-9	PCB-1242	0.5 U
(107P)	11057-69-1	PCB-1234	1.0 U
(108P)	11104-23-2	PCB-1221	1.0 U
(109P)	11161-16-5	PCB-1232	1.0 U
(110P)	12672-29-6	PCB-1245	1.0 U
(111P)	11096-82-5	PCB-1260	2.0 U
(112P)	12674-11-2	PCB-1016	0.5 U
(113P)	8001-35-2	toxaphene	2.5 U

DIOXINS

CONCENTRATION: LOW MEDIUM HIGH (circle one)  
 DATE EXTRACTED/PREPARED: \_\_\_\_\_  
 DATE ANALYZED: \_\_\_\_\_  
 PERCENT MOISTURE: \_\_\_\_\_  
 CONC./DILUTION FACTOR: \_\_\_\_\_

PP #	CAS #	NAME	CONC. (circle one) ug/l or ug/kg
(129B)	1746-31-6	2,3,7,8-tetrachlorodibenzo-p-dioxin	0.003

Sample Name  
**ER319**

Lab Name: Gulf South Research Institute Case No: 3136  
 GC Report No: CO6-36

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B. Tentatively Identified Compounds

CAS #	Compound Name	Fraction	Scan No. or Retention Time	% Maximum Score Attained Mass Matching Routine: (Specify: <u>1000</u> )	Estimated Concentration: (ug/g or ug/g)
1. NA	None found	VCH	NA	NA	NA
2. NA	Unknown Alkene	SV	269	NA	17
3. NA	Yukene	SV	290	NA	18
4. NA	Not Identified	SI	373	NA	5.3-32
5. 627-08-7	Propane, 1,1-dimethyl-	SY	390	603	11
6. 2203-06-3	1-Propane, 3,3-dimethyl-	SV	412	871	11
7. 334-48-5	Decanoic Acid	SV	1111	904	46
8. 42451-32-8	Pentanoic Acid, 4-methyl-	SV	1118	792	18
9. NA	Unknown Alkene	SI	1133	NA	32-47
10. NA	Unknown Alkene	SV	1657	NA	92
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Vicki Karalich  
 Lab Manager