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OLD CORTLAND COUNTY LANDFILL
REMEDIAL INVESTIGATION/ FEASIBILITY STUDY

FINALWORK PLAN

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ENVIRONMENTAL CONSERVATION
DIV. ENVIRONMENTAL ENFORCEMENT
BUFFALO FIELD UNIT

DECEMBER, 1996

PREPARED FOR

CORTLAND COUNTY DEPARTMENT
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TOWN LINE ROAD
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PROJECT NO. 331.21

OLD CORTLAND COUNTY LANDFILL
REMEDIAL INVESTIGATION/FEASIBILITY STUDY

FINAL WORK PLAN

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1 Site Investigation Layout

1.0 INTRODUCTION

The property within which the Old Cortland County Landfill exists has been the focus of several hydrogeologic investigations since 1972, when the County became interested in the property as a potential waste disposal site. Since that time, a fairly comprehensive database of site geologic and hydrogeologic conditions has been established. In particular, the southwest portion of the property which encompasses the West Side Extension Landfill (the existing County waste disposal facility) has been extensively studied to determine the hydrogeologic and baseline environmental conditions as part of the permit conditions for the development of this landfill extension.

The portion of the property which encompasses the Old Cortland County Landfill, however, has not received the level of investigation given to other areas of the site which meets the goals of a Remedial Investigation and will, therefore, require, at least initially, an investigative approach which is comprehensive. The proposed work plan is structured in a task-by-task progressive manner whereby individual tasks may be scaled back based on the results of the preceding tasks. Structured in this manner, the RI/FS will "tailor" the scope of work during project task implementation to include only those items which will add significantly to the database from which remedial alternatives are to be formulated.

The RI/FS will be conducted in general accordance with the U.S. EPA "A Compendium of Superfund Field Operations Methods" (EPA/540/P-87/001 December, 1987); the U.S. EPA "Guidance on Remedial Investigations and Feasibility Studies Under CERCLA" (EPA/540/G-89/004 October, 1988) ; the U.S. EPA "Conducting Remedial Investigations/Feasibility Studies for CERCLA Municipal Landfill Sites" (EPA/540/P-91/001 February, 1991) and relevant NYSDEC, Division of Hazardous Waste Remediation guidance. The RI will concentrate on characterizing site conditions, determining if surface or subsurface contamination has taken place and estimating potential exposure targets. A specific set of tasks will be performed to accomplish these goals, as discussed in Section 5.0. Based on the finding of the RI, a

Supplemental RI may be implemented to address any issues found during the RI which are beyond the proposed scope of the Work Plan. The Supplemental RI will be scoped to provide detailed investigations to further define the potential human and environmental impacts and provide additional data for the feasibility study.

The Feasibility Study (FS) will evaluate methods to prevent, minimize or eliminate the release of hazardous substances from the site. Within this general framework, emphasis will be placed on technically feasible, low cost solutions that are environmentally sound. The structure of the FS is two staged whereby an initial screening of the remedial alternatives will be conducted followed by a detailed analysis of selected remedial alternatives. The screening stage will enable those alternatives which are shown infeasible, or ineffective to be eliminated. The detailed analysis will enable the selected alternatives to be evaluated in more detail and culminate in a recommendation of the most appropriate site remediation methodology.

This document also comprises three ancillary documents which are appended. A Sampling and Analysis Plan (SAP), Health and Safety Plan (HASP) and Citizen Participation Program (CPP) are provided in Appendix A, B and C, respectively.

The SAP comprises a quality management plan and a data management plan. The quality management plan specifies the procedures for performing the investigation, sampling and laboratory analyses presented in the Work Plan and establishes quality control and quality assurance procedures to be used in the RI/FS. The data management plan establishes document control for the RI/FS including data documentation materials and procedures, project file requirements and report formats.

The HASP establishes procedures to provide for the health and safety of personnel performing the work and identifies the potential hazard to which personnel may be exposed.

The CPP establishes the procedures for providing the public with the opportunity to be present at open meetings, review project documents and comment on project issues.

2.0 BACKGROUND AND PHYSICAL SETTING

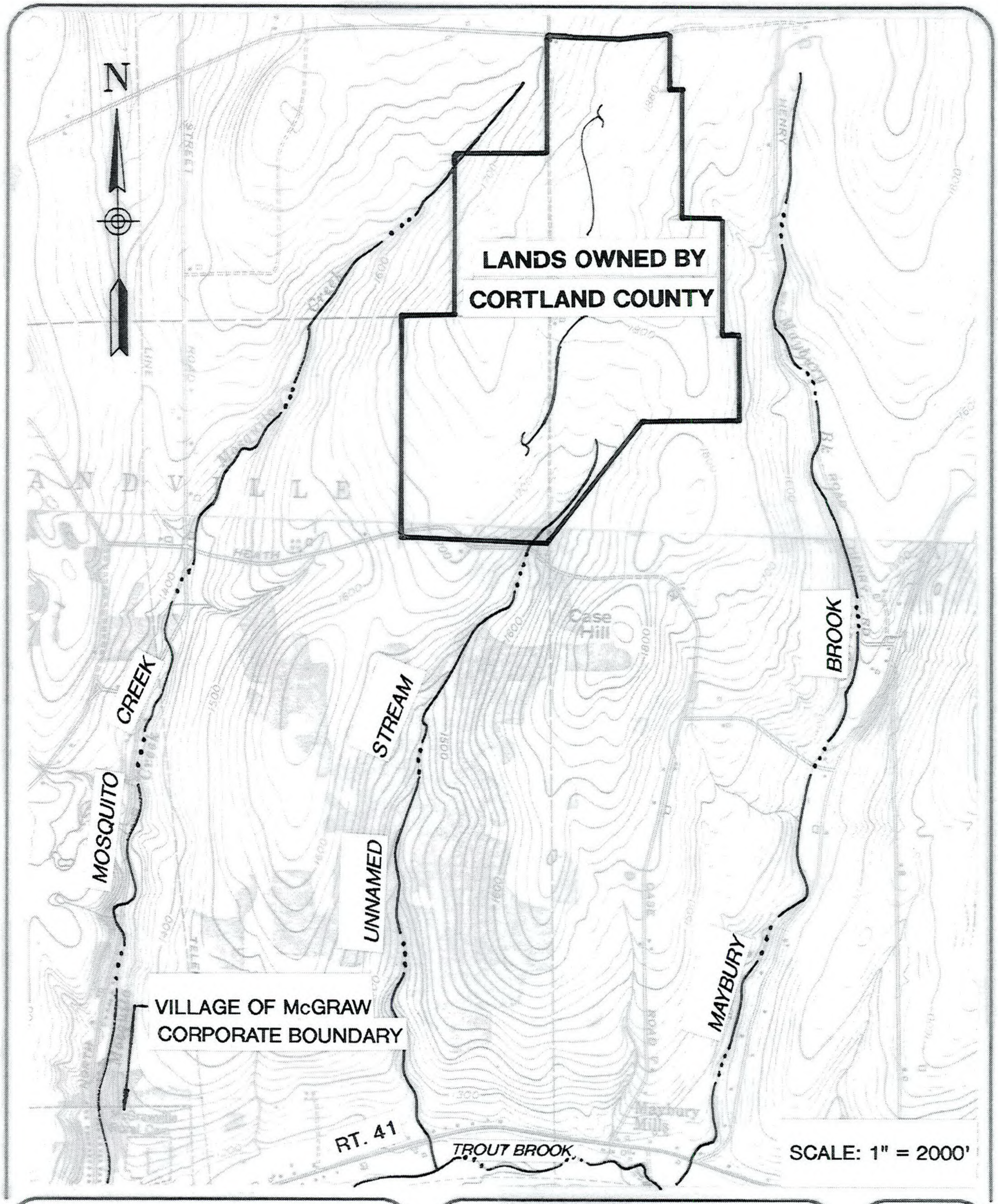
Background:

The Old Cortland County Landfill Site is located on Town Line Road in the Town of Solon, Cortland County, New York. The landfill is part of a 539.9 acre parcel of land currently owned by the County, encompassing the Old County Landfill, the closed Pine Tree Landfill, the Buckbee-Mears sludge disposal areas, the abandoned City of Cortland Dump, and the existing waste disposal facility. The actual landfilled footprint area of the Old County Landfill is approximately 36 acres. Figure 2-1 presents the site location of the Cortland County Landfill Facility.

Landfilling activities began in the early 1950's as a private disposal site operated by the former land owner Fay Towslee. The City of Cortland leased the land from Mr. Towslee in the mid 1960's for use as a landfill. The City's use of the landfill continued until February 10, 1972, when the County purchased the land from Mr. Towslee (Pitman, 1996).

Cortland County operated the landfill as a combined municipal solid waste (MSW) and construction and demolition debris (C&D) landfill from April 1, 1972 until December 3, 1987, and as a C&D disposal site until 1988 (Pitman, 1996). During the first couple years of the County operation, a number of 55-gallon drums were disposed of within a portion of the landfill. These drums reportedly contained liquid and hazardous wastes which had been generated from local industries. An approximate 3-5 acre area to the south of the landfill were used to dispose of ferrous oxide sludge which had been generated by the Buckbee-Mears Corporation.

The NYSDEC has classified the Old Cortland County Landfill as an inactive hazardous waste disposal site and has listed the site in the Registry of Inactive Hazardous Waste Disposal Sites in New York (No. 712001). The NYSDEC has determined that the site



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OLD CORTLAND COUNTY LANDFILL
REMEDIAL INVESTIGATION/FEASIBILTY STUDY

SITE LOCATION AND
SURFACE DRAINAGE MAP

TOWN OF SOLON
CORTLAND COUNTY

Figure
2-1
Project No.
331.21

constitutes a significant threat to the environment. Accordingly, action is required to develop and implement a Remedial Investigation and Feasibility Study program (RI/FS) in order to abate and/or eliminate threats to the environment.

Physical Setting:

The Old Cortland County Landfill is located on a gently sloping hillside approximately 5 miles northeast of the City of Cortland in the northwest corner of the Town of Solon on the east side of abandoned Town Line Road (Figure 2-1). The site area is located in the northern extreme of the Appalachian Plateaus physiographic province known as the Appalachian Uplands (Broughton, 1967). The Uplands were formed as the peneplained surface of the eroded Appalachian Mountains, was uplifted and tilted towards the sea (Broughton, 1967). Erosion of this uplifted plain resulted in the formation of flat-topped divides separated by incised valleys.

All of the surface water drainage from the landfill property flows into tributaries of Trout Brook (Figure 2-1). Mosquito Creek and Maybury Brook form drainage basins on the east and west sides of the landfill property. An unnamed stream originates to the south of the Old County Landfill and collects drainage for surface waters in the existing landfilled areas including the Pine Tree and the West Side Extension Landfill. From the southern landfill property line, the unnamed stream flows approximately 9,500 feet, through undeveloped woodlands and fields, to Trout Brook. The unnamed stream enters Trout Brook approximately 3,700 feet east of the McGraw village limits. Trout Brook joins the Tioughnioga River about 1-3/4 miles south of the Cortland City limits.

3.0 INITIAL EVALUATION

3.1 General Site Conditions

An initial evaluation of general site conditions at the Old County Landfill may be made based on site walkovers, drainage analysis and water quality testing results produced from sampling events performed in accordance with closure of the Pine Tree Landfill and the permit conditions of the existing landfill.

Walkovers undertaken by Barton & Loguidice during August, 1996 produced the following observations:

- The landfill cover soil is a mixture of broken shale and till and supports a vegetative cover.

- Only one leachate seep was found and is located on the southern side of the landfill, within the drainage swale at the toe of the slope.

- The observed leachate seep apparently discharges to the first (northernmost) of the settlement ponds, which eventually discharges to the unnamed tributary to Trout Brook. The leachate in the ditch is an orange-brown color, whereas the ponds appear visibly unaffected by this discharge.

- No evidence of leachate entering Maybury Brook to the east of the landfill was found.

- A pile of scrap metals and tires exists at the northwestern perimeter of the landfill, outside the limits of waste.

- The geologic exposures resulting from the various areas used to obtain borrow materials indicate the likelihood of shallow bedrock overlain by a cobbly glacial till.

Through an evaluation of the drainage conditions at the project site and vicinity, it is apparent that the majority of surface water from the Old County Landfill will enter the ponds and the unnamed stream to the south. However, a small portion of the drainage may enter into Maybury Brook. The impact to these pathways will be investigated during the RI/FS. Specifically, water and sediment quality of the ponds and the unnamed stream to the south of the landfill will be further evaluated, as well as the impact that the landfill may have had on Maybury Brook.

Water quality sampling events of both groundwater and surface water have been undertaken regularly in accordance with the closure of the Pine Tree Landfill and as a permit condition of the West Side Extension Landfill. The results of this testing indicate that a contravention of groundwater standards is present in the overburden to the south of the Old County Landfill in the immediate vicinity of the leachate ponds and the former Buckbee-Mears disposal areas. Existing wells sampled in this area showed a maximum concentration of 38.5 parts per billion (PPB) dichlorodifluoromethane for VOCs detected (see Table 3-1).

Surface water sampling of the unnamed stream is currently performed as part of the permit conditions for the West Side Extension Landfill. The samples results reported for the unnamed stream have shown no indication of contaminants. The sampling program proposed for the Old County Landfill RI/FS will include sampling locations SW-1, SW-2 and the leachate pond closest to the southern perimeter of the landfill. Two locations have also been identified for Maybury Brook, which appears to receive some of the drainage from the Old County Landfill.

3.2 Preliminary Risk Assessment

3.2.1 Background

The area surrounding the Old Cortland County Landfill is rural and sparsely populated. Land use is primarily residential and agricultural. There are no industrial or commercial facilities within the immediate vicinity of the landfill. The nearest village is McGraw, approximately two miles southwest of the site. The property is bordered on the north and south by Warren and Heath Roads, respectively. Private dwellings and farms exist to the east and west of the property. Town Line Road, which separates the Towns of Cortlandville and Solon, runs perpendicular to Warren Road along a portion of the west property boundary. The road had at one time extended southward to Heath Road, but has since been abandoned after the County's acquisition of the 231.1 acre parcel west of former Town Line Road for the development of the West Side Extension Landfill.

There are three drilled artesian municipal water supply wells located in the Village of McGraw. The primary supply well is shallow (approximately 25 feet deep) and is completed in sand and gravel. The two emergency supply wells (both approximately 150 feet deep) are also completed in sand and gravel. Routine water quality analyses performed on the primary supply does not indicate a landfill leachate impact. Potable groundwater wells serve residences along Warren and Parks Roads to the north, Potter Road to the east, Heath Road to the south, and Town Line and North Roads to the west of the site.

Contaminants presumably associated with the Old County Landfill and/or the Buckbee-Mears disposal areas have been detected in specific overburden monitoring wells on the site. The drainage patterns and relief in topography suggests that there is virtually no potential for private wells to be impacted by contaminants migrating from the site if landfill contaminants enter the overburden formation. Contaminants which enter the bedrock system, however, may have the potential to travel greater distances, thereby increasing the potential to impact private residential water supplies.

Surface water at the site flows principally through the unnamed stream to the south of the Old County Landfill. Some of the drainage from the site, however, appears to enter Maybury Brook to the east. Both streams flow to the south and discharge to Trout Brook approximately 1-3/4 miles south of the landfill property. One leachate seep was observed during a site visit conducted on August 14, 1996. The seep enters the ditch along the southern perimeter of the landfill and drains into the settlement ponds and the unnamed steam. Neither of these creeks are used as potable water supplies.

3.2.2 Chemicals and Potential Concern

Table 3-1 summarizes the results of the preliminary groundwater sampling performed by the County in 1992-1993 during the Post-Closure Monitoring Program for the closed Pine Tree Landfill site. Despite their relatively low concentrations, these contaminants will be used to initially represent the chemicals of potential concern during the Remedial Investigation.

3.2.3 Human Exposure and Toxicity

Exposure assessments identify the actual or potential human exposure pathways and characterize the number and complexity of these pathways. They also identify the site conditions which may promote chemical migration and the likely magnitude of the exposures. Potential routes of exposure at the Old Cortland County Landfill site would include:

- Ingestion of contaminated groundwater;
- Inhalation and absorption of volatile chemicals in indoor air and water resulting from domestic use of contaminated groundwater;

TABLE 3-1

OLD CORTLAND COUNTY LANDFILL REMEDIAL INVESTIGATION/FEASIBILITY STUDY

Organic Compounds Detected in the Groundwater Post-Closure Monitoring Program at Pine Tree Landfill (1992-1993)

Compound	Maximum Groundwater Concentration (µg/l)
Chloroethane	15.8
Chloroform	1.7
Chloromethane	1.9
Cis-1,2-dichloroethane	26.9
Dichlorodifluoromethane	38.5
1,1-Dichloroethane	15.5
Toluene	8.3
Trans-1,2-dichloroethane	1.1
1,1,1-Trichloroethane	4.4
Trichloroethene	22.9
Vinyl Chloride	15.0

- Direct contact with contaminated leachate from the site; and

- Methane gas and volatile compounds migrating with methane.

The final identification and assessment of exposure pathways will be quantitatively evaluated as part of the remedial investigation after all pertinent environmental data have been reviewed. For each exposure scenario, the concentrations of the chemicals in relevant environmental media (groundwater, surface water, etc.) at the potential exposure points will be identified. In instances where exposure point concentrations are unknown, estimates from best available data may be used.

3.2.4 Environmental Exposure and Toxicity

To evaluate potential terrestrial and aquatic impacts, published toxicity information concerning effects of the chemical contaminants on biota will be considered in conjunction with observations and inventories of biota made during the ecological evaluation. For those exposure pathways which have been identified, potential, acute and chronic effects and the potential for the contaminants to bioaccumulate in terrestrial and aquatic organisms, will be evaluated.

Since one leachate seep has been identified on the southern boundary of the site, the potential exists for contaminants to discharge to the ponds and the stream which drain this area of the site. Therefore, the potential for toxicity to aquatic and terrestrial biota exists if biota are exposed to those areas of the site impacted by the leachate.

4.0 PROJECT OBJECTIVES AND TECHNICAL APPROACH

The project objectives and technical approach are discussed in the following subsections of this report.

4.1 Project Objectives

The specific objectives of this project will include the following:

- To identify the location and condition of drums disposed within the southern portion of the Old County Landfill, and the feasibility for recovery and relocation of these drums.

- To thoroughly define the extent of the former Buckbee-Mears sludge disposal areas and identify the feasibility of excavation and relocation of these wastes.

- To thoroughly define the nature and extent of groundwater contamination at the landfill and vicinity, specifically identifying: a) the type and concentrations of contaminants; b) the rate of migration of contaminants; and c) the areal extent of contaminants leaving the landfill.

- To thoroughly define the nature and extent of surface water and watercourse sediment contamination as a result of contaminants emanating from the landfill, specifically identifying; a) the types and concentrations of contaminants discharging into and from the settlement ponds identified on the south side of the landfill and to the east of the Buckbee-Mears disposal areas; b) the impact of leachate seepage to downstream surface water quality and watercourse sediments; c) the impact, if any, to the surface water quality and sediments of the unnamed stream which drains the landfill area.

- To develop an understanding of the groundwater vertical and horizontal hydraulic gradients and establish a conceptual three dimensional groundwater flow model of the project site, thereby defining the vertical as well as the horizontal limits of contamination.

- To determine if the landfill is adversely impacting the air quality in the immediate vicinity of the project site.

- To perform a risk assessment to evaluate the extent to which contaminants present may be released from the site and present risks to public health, surface water, aquatic life and terrestrial biota.

- To conduct a feasibility study of source and any off-site areas impacted by the site, and prepare a recommendation for remediating the project site.

4.2 Technical Approach

The subsequent discussion presents the technical approach proposed to achieve the project objectives outlined above. The technical approach has been structured to achieve the project objectives in a progressive, deliberate and cost effective manner. Given the location of the project site and the apparent low risk of human exposure, it is felt that such an approach can be afforded.

The implementation of the various components of remedial investigation will initially emphasize the evaluation of buried drum conditions, and the extent of the former Buckbee-Mears sludge disposal areas. A focused preliminary feasibility study may be performed to evaluate the potential remedial alternatives for these areas. Concurrently, the remaining RI tasks will emphasize defining the extent of surface and subsurface contamination, and contaminant transport via surface water and groundwater movement. Air quality is not believed to be significantly impacted beyond what is typical of landfill sites. However, for completeness, and as a means of confirmation, air quality will be quantified.

Each of the specific components of the proposed technical approach for this project are briefly discussed in the text below.

4.2.1 Limits of Waste Investigation

A test pit investigation will be conducted to identify the limits of the Old Cortland County Landfill and to evaluate the depth of waste within the former Buckbee-Mears sludge disposal areas. Definition of the boundaries will be critical to the overall evaluation of alternative remedial actions which may be feasible for these areas. This activity will not include a delineation of the abandoned City of Cortland Landfill, but will, however, involve the identification of the line which separates the City and County Landfills.

4.2.2 Surface Water and Watercourse Sediment Sampling

To define the nature and extent of contamination in surface water and watercourse sediments, sampling points will be established along two (2) waterways which have been identified as conveying runoff and potential seepage from the project site; the unnamed stream and Maybury Brook. Sampling points will be located at upgradient locations along Maybury Brook to establish background surface water and sediment quality.

Downgradient sampling locations will be established at points immediately downstream from where runoff or where seepage enters the particular watercourse, and at points sufficient to define the limits of environmental impact.

4.2.3 Geophysical Survey

An electromagnetic terrain conductivity (EMC) survey will be conducted along the perimeter of the Old County Landfill and the former Buckbee-Mears disposal areas to provide an initial indication of potential groundwater contamination, and to optimize the location of subsequent groundwater monitoring wells. A magnetometer survey will also be performed over the portion of the landfill in which drums were disposed. The purpose of this survey is to better define the limits of drum disposal area.

4.2.4 Evaluation of Drum Condition

Following the delineation of the buried drum disposal area, an exploratory trenching program will be performed to uncover and evaluate the condition of the drums. Specific objectives of this task are to expose a sufficient number of drums to evaluate their condition, their potential environmental threat, and the practicality of recovering the drums. Observations and findings of the field activities will be documented and recorded by the on-site program supervisor. Trench locations will be surveyed for future reference.

4.2.5 Soil Gas Survey

A soil gas survey will be conducted to confirm and more closely define the limits of possible contaminant plumes identified as a result of the geophysical investigation. The combined results of the geophysical and soil gas survey investigations will be used to adjust the proposed monitoring well locations.

4.2.6 Determination of Site Hydrogeologic Conditions

The existing database of site hydrogeologic conditions within the vicinity of the closed Pine Tree Landfill and the existing landfill indicates a variably thick mantle of glacial till above shale bedrock. The depth to bedrock is extremely shallow within the northern portion of the site, and becomes progressively deeper toward the southern portion of the landfill property. In order to fully characterize the hydrogeologic conditions within the immediate vicinity of the Old County Landfill, several supplemental subsurface investigation locations will be included as part of the remedial investigation. The spacing and number of supplemental investigation locations (see Sheet 1) is subject to initial site data gathered from the limits of waste investigation and the geophysical survey.

Critical to understanding the direction and the rate of soluble contaminant movement is the measurement of the vertical and horizontal hydraulic gradients at the project site and vicinity. To establish these gradients, each supplemental investigation location will be completed as a monitoring well couplet. These couplets would consist of a shallow well which would screen and monitor groundwater conditions at the water table surface, and a deep well which, due to the presence of shallow depths to rock, would most likely monitor groundwater conditions in the bedrock. Based on the identified vertical hydraulic gradient, groundwater quality data obtained from each couplet and the complexity of the stratigraphy, a decision will be made to install a third monitoring well deeper into the bedrock. An upward (discharging) gradient and groundwater contaminant levels within tolerable levels would justify limiting the number of wells at a particular location to couplets. A downward (recharging) gradient and contravening groundwater contaminant levels would necessitate the installation of bedrock wells and an expansion of project scope.

An additional boring will be advanced through the waste mass near the center of the fill area in order to identify the presence and elevation of a potential static water level within the waste. The boring will be advanced to the bottom of waste/top of rock interface. The boring will be completed as a deep gas vent/monitoring well with the vent/well screen extending throughout the depth of waste. The location of this boring is identified on Sheet 1.

4.2.7 Utilization of Existing Monitoring Wells

A number of groundwater monitoring wells have been installed over the County property as a result of investigations performed during the permitting of the Closed Pine Tree Landfill and the existing landfill, and to satisfy the monitoring requirements for these sites. Several of these locations are currently used as environmental monitoring points or have recently been eliminated. An inspection of the location of existing wells indicates that there are four (4) locations within reasonable distance from the perimeter of the Old County Landfill to be potentially included as downgradient monitoring points during the Remedial Investigation. These include well couplets (overburden and bedrock wells) MW-4A/4B, MW-5A/5B, MW-12A/12B and D-1/DO-2. Upon closer inspection of the overburden and bedrock piezometric surfaces, however (Barton & Loguidice, 1988), all but wells D-1 and DO-2 exist beyond the hydrogeologic flow system within which the landfill is located. As a result, it does not appear prudent to utilize well couplets MW-4A/4B, MW-5A/5B and MW-12A/12B as downgradient monitoring points for this investigation. Data which is currently generated from these wells on a quarterly basis, however, will be incorporated as background downgradient water quality.

Existing well couplet CD-1/CD-1RA is located within an area which appears to be upgradient from the Old County Landfill. These wells had been installed in 1988 as part of a County study to locate a C&D Landfill. Wells were constructed in accordance with NYSDEC Part 360 guidelines and are intended to be utilized for upgradient water quality determinations during the remedial investigation.

In summary, it appears that existing wells CD-1, CD-1RA, D-1 and DO-2 are located within the same hydrogeologic flow system as the Old County Landfill and the Buckbee-Mears sludge disposal area and will therefore be utilized as overburden and bedrock water quality monitoring locations during the remedial investigation.

4.2.8 Use of Multi-Cased Wells

For all monitoring well locations which include wells screened within bedrock, it will be necessary to use multi-cased monitoring well construction. Multi-cased wells will ensure that any contaminants confined by less pervious strata do not contaminate underlying water bearing zones. The procedure to be followed will be to drill down to the particular aquitard layer or top of bedrock and install a steel outer casing. The outer casing shall be a minimum of two inches larger in diameter than the monitoring well riser pipe and shall be "keyed" into the bedrock to a minimum depth of one foot. Upon satisfactorily grouting the outer casing into place, thereby sealing off the borehole, drilling and sampling through the top of bedrock may then be advanced.

4.2.9 Soil and Air Quality Monitoring

A photoionization detector (PID) and a combustible gas indicator (CGI) will be used during the exploratory drilling and sampling program. The use of these instruments will serve two functions: a) first as a means of monitoring the air quality during drilling and sampling for the presence of volatile organic contamination and/or explosive conditions; and b) secondly, as a means of detecting contaminated soil conditions.

Air quality monitoring will be conducted in accordance with the Health and Safety Plan. The level of personal protective clothing and equipment will be established by monitoring ambient air quality within the working area of the drilling location. Levels of personal protection established in the Health and Safety Plan will be upgraded or downgraded based on measured organic vapors in the field.

Soil samples collected during exploratory drilling will be screened for contamination using a PID. By inserting the probe of the PID into the headspace of a sample jar containing a soil sample, the relative contamination level of the sample can be determined provided the sample has been allowed to equilibrate within the jar. This use of a PID and method of soil screening has been effective in the selection monitoring well screening depths, locating the depth and soil strata where contaminants are concentrated and in approximating the vertical limits of groundwater contamination.

4.2.10 Ecological Evaluation

An ecological evaluation will be performed to evaluate the ecology of the project site and vicinity. This evaluation will comprise two components which are the terrestrial survey and an aquatic survey. Both components of this evaluation will be qualitative and quantitative surveys of on-site and off-site vegetation and wildlife.

5.0 RI/FS TASKS

In order to accomplish the objectives set forth in Section 4.1, the following task-by-task scope of services is proposed which is based on the technical approach in Section 4.2.

5.1 Project Startup

5.1.1 Task 1 - Data Review and Topographic Mapping

The initial effort of this project will be to review and compile existing data available through the NYSDEC Region 7 Hazardous Waste Group and the Cortland County Department of Solid Waste. It is our understanding that the existing data available for this project site include an abundance of groundwater and surface water quality data obtained from sampling existing monitoring wells and surface water monitoring points in accordance with the Closed Pine Tree Landfill and existing landfill environmental monitoring programs. Furthermore, subsurface hydrogeologic data specific to this site include conditions observed while excavating backhoe pits, and during the advancement of borings used for the installation of the existing groundwater monitoring wells. The extent of specific data which exist for the immediate vicinity of the Old County Landfill, however, is somewhat limited, and is obviously the focus of this work plan. Our data review will also include published geologic literature for the area and existing residential well survey data.

Topographic maps will be prepared from aerial photography to be taken during the Fall of 1996.

5.1.2 Task 2 - Site Access and Reconnaissance

On August 14, 1996, representatives from the Barton & Loguidice, P.C., and Cortland County Department of Solid Waste met at the project site for a preliminary site reconnaissance. This reconnaissance was intended to observe existing site conditions and become familiar with the site layouts.

Prior to the implementation of the hydrogeologic investigation, an additional reconnaissance will be performed. The objective of this visit would be to primarily layout and stake the location of the proposed monitoring wells, locate and stake the proposed geophysical survey alignment, and observe and note all leachate seepage locations. Upon completion of this reconnaissance, the hydrogeologic and geophysical investigation will be initiated.

The majority of field activities to be performed during the Remedial Investigation will be completed within the limits of the County property boundary. Certain tasks, however, including the ecological evaluation and surface water/sediment sampling of Maybury Brook, will require working in off-site areas. Prior to the startup of these activities, authorization to access private properties will be obtained. This task will be performed by coordinating with County officials and formerly requesting access permission from appropriate property owners. Access agreements are paramount to the successful and thorough implementation of the project.

5.1.3 Task 3 - Community Relations

A Citizen Participation Program (CPP) is included as an appendix to the Work Plan. The Plan was prepared to assist Cortland County in disseminating information on the project to the public. The elements of the CPP are as follows:

- Introduction to plan
- Basic site information
- Project description
- Identification of affected/interested public (contact list)
- Identification of Department contacts
- Identification of document repositories
- Specific citizen participation activities
- Glossary of key terms and major program elements

The Citizen Participation Program will establish responsibilities for these activities and provide the names and addresses of authorized representatives for response to public inquiries.

5.2 Geophysical and Hydrogeologic Investigations

5.2.1 Task 4 - Limits of Waste Investigation

A tire- or track-mounted backhoe will be used to excavate shallow test pits for the purpose of identifying the limits of waste of the Old County Landfill. Test pits will be conducted approximately 200 feet apart around the landfill perimeter. Additional excavations may be required in areas where the edge of waste is unclear between the initial locations.

Topsoil and/or cover material above the waste will be placed separate from excavated wastes. Once waste is encountered, the shallow excavation will continue away from the fill area until natural soils are encountered. A stake will be placed at the edge of waste for surveying of the waste limit. Appropriate location data will be marked on the stakes.

Excavations will be backfilled by initially replacing all wastes. Soil, cover material and topsoil will then be replaced and compacted to approximate original conditions. Unless site conditions dictate otherwise, test pits will be backfilled prior to continuing to the next location.

Appropriate air monitoring and hazard recognition will be performed during this investigation in accordance with the Health and Safety Plan (Appendix B).

5.2.2 Task 5 - Magnetic/Electromagnetic Terrain Conductivity Survey

Two separate geophysical surveys are proposed as part of the RI activities. After a preliminary site reconnaissance, an electromagnetic (EM) terrain conductivity survey will be conducted around the perimeter of the waste disposal areas. The survey shall consist of, at a minimum, eight traverses aligned such that preliminary limits of contamination emanating from the landfill can be identified, if present.

Based on our initial reconnaissance of the site, it is apparent that landfill leachate is seeping from the southern side of the landfill as evidenced by the existence of leachate within the ditch at the toe of slope. The ditch empties into the first of four settlement ponds which discharges to an unnamed tributary of Trout Creek. The observance of this discharge area provides for the collection of a leachate sample and to initially focus on this area for the presence of groundwater contamination.

Therefore, six of the geophysical survey traverses, as well as a portion of another, will be aligned to define the potential contaminant plume limits on the southern side of the Old County Landfill and the Buckbee-Mears disposal areas. The remaining traverse(s) will be aligned along the eastern and western limits of the landfill. The six survey traverses positioned south of the study area will be configured to generate an isopleth contour map of the relative conductivity. Such a map will be very useful in finalizing the location of monitoring well couplets and defining the areal extent of potential groundwater contaminant plumes. The anticipated equipment and procedures to be utilized are briefly discussed in the Sampling and Analysis Plan, Section 4.3.

Delineating the location of buried drums within the southern portion of the landfill is a critical element of the Remedial Investigation. Although it has been reported that the drums were buried together, and hence, should produce a large magnetic anomaly, there may be up to 20 feet of mixed municipal solid waste above the elevation of the buried drums. The contents of this waste may include enough metal to block out the intensity of the signal received off the drums, rendering geophysical surveying as a means to locate the drum disposal area ineffective. As a result, it is proposed that a section within the reported drum disposal area be surveyed as a pilot test area and evaluated for the potential to distinguish deeper magnetic anomalies from shallower wastes which may interfere with the signal. The results of this initial screening will dictate whether the magnetometer survey is completed or abandoned.

As a contingency, it may be possible to perform a limited number of test excavations in an attempt to locate the buried drums in the absence of the geophysical data. Task 6 describes the methods to be employed during the excavation within the buried drum area.

5.2.3 Task 6 - Evaluation of Drum Condition

Exploratory trenching will be conducted to assess the condition and potential environmental threat of the drums. Generally, this task will be conducted in sequence with other tasks. Specifically, the surface geophysical survey will be conducted (Task 5) and the results evaluated in conjunction with other existing information (e.g., disposal records and historical photographs) to optimize the locations of the trenches before conducting the exploratory trenching. The nature of the excavation activities requires a methodical, cautious approach; however, flexibility in the field is also critical to the success of the task.

This investigation will include excavation of trenches to a depth of up to approximately 30 feet, through the existing landfill cover and underlying solid waste. Because one of the objectives of the investigation is to evaluate the condition of the drums, the excavation must proceed vertically downward to a depth sufficient to observe the drums without adversely impacting their integrity (roughly to the bottom of the drums). It is anticipated that a large trackhoe will be utilized to perform the exploratory trenching. However, depending upon the actual depth to the drums and the stability of the open excavation, other equipment may be necessary to reach the specified depths. As necessary, shoring or bracing of the excavation may be considered to allow excavation to the specified depth. Alternately, the excavation sides may be sloped back such that adequate sidewall stability is maintained during the investigation. In addition, leachate management may be necessary in the event that water flowing into the open excavation impedes the investigation. Due to the possibility that the drums are not present or may no longer be intact (i.e., they were crushed during filling operations or have deteriorated and the contents emptied), excavation will not proceed below 30 feet from the ground surface. In addition, if the underlying liner or subsoil is exposed during the investigation, excavation of that trench will cease.

No drum removal or sampling and analysis is anticipated for this task. As such, there is no need to enter the open excavation, and such activities will be prohibited. It is likely, however, that the exploratory trenching activities will be conducted under Level B health and safety procedures as specified in the Health and Safety Plan (Appendix B).

5.2.4 Task 7 - Soil Gas Survey

An operating grid will be located over an area, corresponding with possible anomalies identified from the geophysical data. Initially, the survey points will be located at 100-foot spacings along the grid. Once the initial survey has been completed, additional survey points will be concentrated around areas detecting elevated organic readings. The equipment and procedures involved to conduct the soil gas survey are discussed in the Sampling and Analysis Plan, Section 4.3

5.2.5 Task 8 - Surface Water and Sediment Sampling

Surface water and sediment sampling will be conducted at representative background (upstream) and downgradient locations within Maybury Brook, and within the settlement ponds and the unnamed stream. The proposed surface water and sediment sample locations are shown on Sheet 1. All sampling method procedures and analyses are presented in the Sampling and Analysis Plan (SAP).

Surface water and sediment samples will be performed in accordance with the protocol given in Table 5-1. The list of parameters to be analyzed under NYSDEC Part 360 Baseline Leachate Indicators includes hardness and total organic carbon. Hardness concentrations are critical to the calculation of water quality criteria values for certain metals, where TOC provides comparison to NYSDEC sediment screening criteria. The detection limit for PCBs in surface water will be low enough to allow for comparison to the standard for protection of wildlife from bioaccumulation (0.001 μg/L).

The array of sampling locations has been designed to establish water and sediment quality within bodies of water which receive discharge from the Old County Landfill and the former Buckbee-Mears disposal areas, and to evaluate the impact resulting from landfill leachate discharge on these watercourses.

5.2.6 Task 9 - Borehole Drilling and Monitoring Well Construction

To achieve the subsurface exploration objectives established in Section 4.0, the procedures and tasks described in the subsequent paragraphs will be implemented.

Soil Sampling Method:

Critical to achieving the objective of the proposed drilling program is the collection of consistent and good quality split-spoon samples. The quality of the sample will be determined by the amount of recovery obtained by the split-spoon sampler. Good quality samples will have greater than 1.0 feet of recovery for a two-foot split spoon. If recovery consistently falls below 1.0 feet, alternative sampling methods will be considered. Alternative sampling methods will include, but not be limited to:

- over driving the split spoon;
- 3-inch split-spoon sample and heavier hammer;
- core barrel sampling; or
- Denison sampling.

Changes to sampling method will be made only upon discussion with the Barton & Loguidice, P.C. (B&L), geologist and with NYSDEC approval.

Sampling frequency at each drilling location will be continuous; whereby the deepest borehole or a combination of shallow and deep borehole drilling will be sampled from the ground surface to the maximum drilling depth. Any adjacent boreholes at intermediate depths will require sampling only at geologic contacts and at the screening interval.

Record Keeping:

Each sample taken will be entered in a field log kept by the supervising geologist present during all phases of the drilling program. The field log will include the information, descriptions and data outlined below where applicable.

- Each split spoon or representative soil sample will be classified according to the Modified Burmister Soil Classification System and the Unified Soil Classification System. Each classification will include a description of the mineralogy, roundness, color, appearance, odor and behavior of the matrix and clast materials sampled.

- Where undisturbed samples are taken, the field log must indicate sample interval.

- All drilling information such as moisture content, approximate location of water table, water loss, depth to material and rock changes, sample recovery, hammer blow counts and other comments must be entered in the field log.

- All uses and descriptions of drilling fluids and additives are to be noted in the field log and must be pre-approved by the NYSDEC.

Where drilling and sampling during this project encounters large boulders or bedrock, rock cores will be taken and the cores logged. The information, descriptions and data outlined below will be entered in the field log for each drilling location.

- All rock core must be logged with a description of the lithology, mineralogy, degree of cementation, color, grain size and any other physical characteristics of the rock sampled.

- Rock core recovery and rock quality designation (RQD) must be logged for each core.

- All primary and secondary features (i.e., weathering surfaces, joints, fractures, striations, etc.) must be noted and described in the field log.

- Photographs of all cores must be taken.

Borehole Drilling Approach:

The drilling contractor shall utilize the most efficient and cost effective drilling method available. Therefore, the approach to be followed shall be to sample continuously with either a 2 or 3-inch split-spoon sampler and advance the borehole with the most appropriate drilling method for the specific geologic conditions.

Where drilling conditions become unsuitable for the initially selected drilling method and dictate that a more efficient drilling methodology be implemented, then the drilling contractor shall make the necessary adjustments to perform an alternate drilling method. Changes in drilling methods will be subject to the per foot costs established prior to the startup of the drilling program. Footage quantities will begin at the point where the drilling method was changed. Any change in drilling methodology must maintain the same or improve the sampling frequency and quality which was established prior to the drilling method adjustment.

The first boring at any given location will continue until the B&L geologist authorizes the borehole termination or when bedrock is encountered and verified. Upon completion of the deep boring, a decision will be made whether to abandon the borehole or to install a deep monitoring well. The decision whether to install a monitoring well in the deep boring or to abandon it will be based on the condition of the borehole. If acceptable, a monitoring well will be installed. If unacceptable, the borehole will be properly backfilled, grouted and abandoned. A new deep boring shall be advanced nearby using methods appropriate for obtaining an acceptable borehole for monitoring well installation. Samples from this new deep boring will be required only at the geologic contacts and the screening interval.

A borehole will be deemed unacceptable for monitoring well installation if mud or drilling additives have been used. The expected geologic conditions and depth of investigation suggest that the use of drilling muds will be unnecessary.

From the data collected during the initial boring, a determination will be made, by the B&L geologist, as to the depth at which the shallow borings will be advanced. The B&L geologist shall consult and come to an agreement with the NYSDEC Representative regarding borehole termination depths. The shallow borings will be advanced, using a mutually agreed upon drilling method, to their respective depths. Samples from these subsequent borings will be required only at geologic contacts. Upon completion of the shallow borings, monitoring wells shall be constructed.

Any drilling method utilized must not introduce contaminants into the borehole during any phase of the borehole advancement, monitoring well installation and development. All drilling equipment, tools and machines shall be decontaminated upon initially arriving on-site and after each drilling location change.

Upon completion of monitoring well installation, well development will be initiated according to the procedures discussed in Section 4.6 of the SAP (Appendix A).

Monitoring Well Construction and Installation:

Monitoring well construction and installation will be supervised by a B&L geologist or a qualified geologist representing B&L. Overburden monitoring wells will be constructed according to the specifications given on Figure 5-1, while shallow and deep bedrock monitoring wells (if necessary) will be completed in accordance with the details presented in Figures 5-2 and 5-3, respectively.

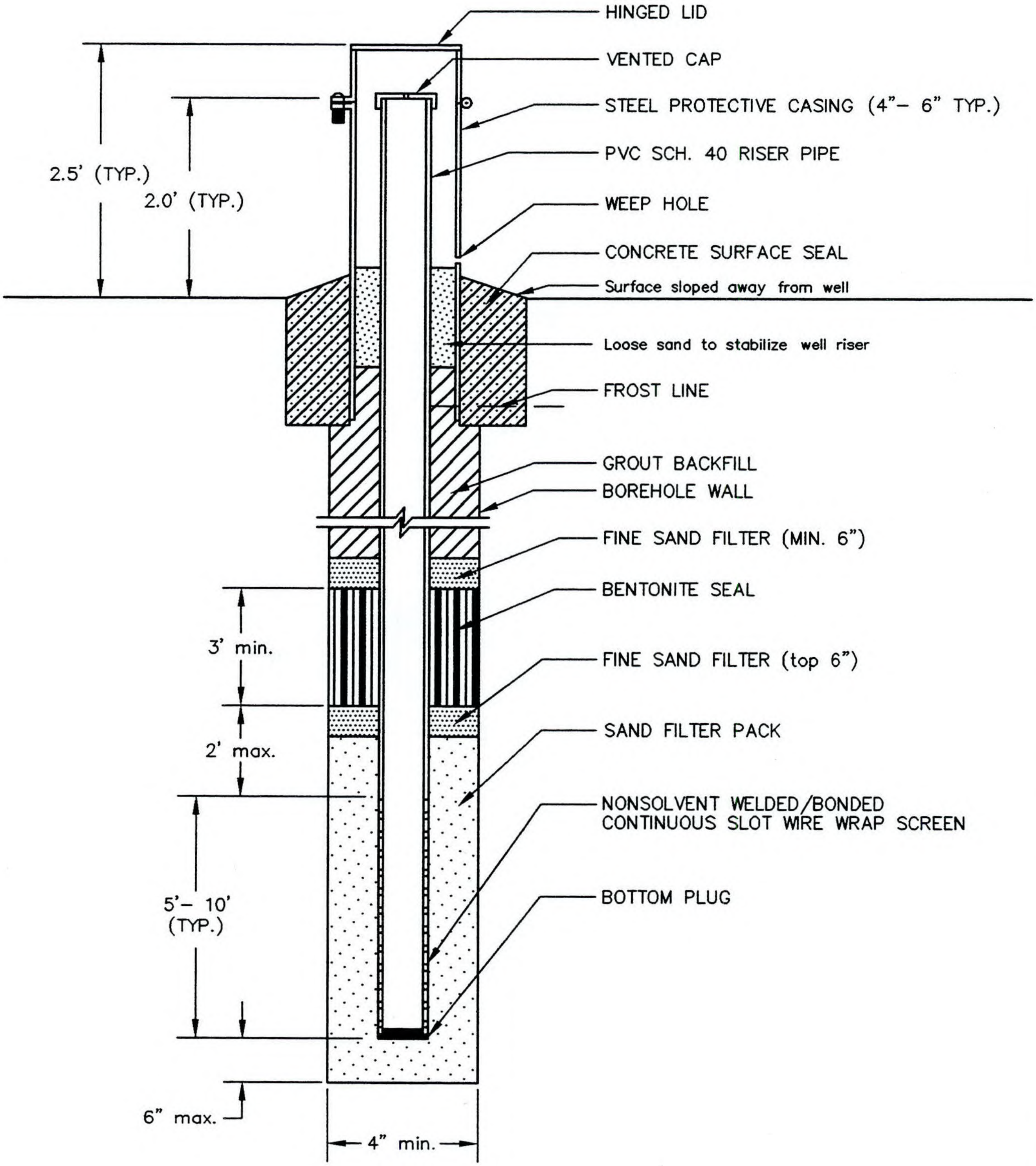
The drilling contractor will have available on-site, prior to commencement of the drilling program, 2-inch diameter PVC threaded riser pipe and continuous wipe wrap well screens, including all fittings, bottom plugs, centralizers, etc. In addition, the drilling contractor must have available all backfill materials necessary for well construction, including graded silicious sand of various sizes for construction of the sand pack around the well screen. The size of sand needed will be determined by a grain size analysis of formation materials in the screened interval. Also, an approved concrete aggregate mixture must be used for constructing the surface seal. The specific types of monitoring well backfill material are discussed in Section 4.5.6 of the SAP (Appendix A).

During construction and installation of the monitoring wells, the supervising geologist's responsibilities will include, but are not limited to, the following:

- construction observation of the entire well assembly;

- installation observation of sand pack, fine sand pack, pelletal or granular bentonite seal and grout backfill placements;

- performing material to certify that the driller's placement of these materials is in compliance with the specification;



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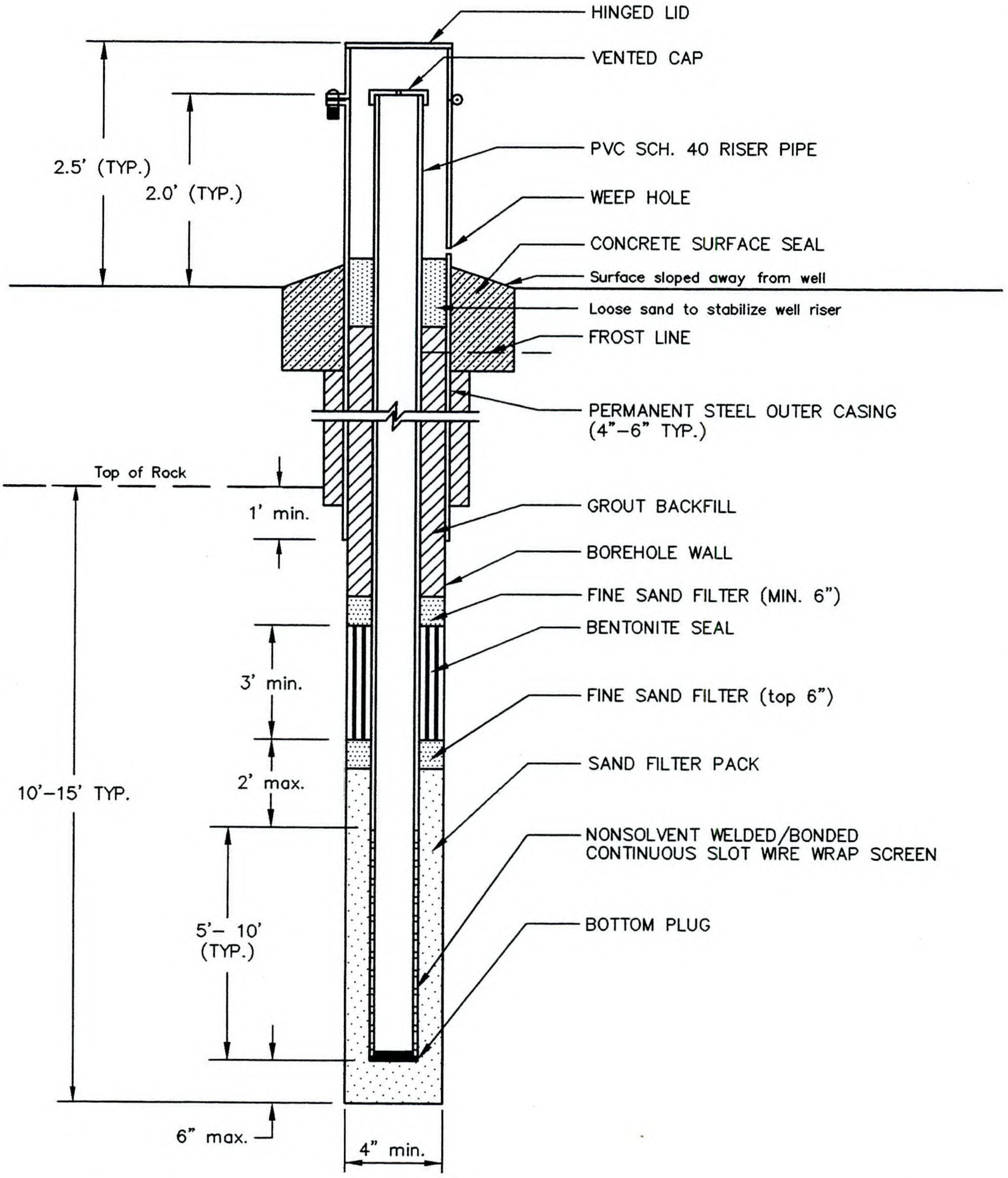
OLD CORTLAND COUNTY LANDFILL
REMEDIAL INVESTIGATION/FEASIBILITY STUDY

TYPICAL OVERBURDEN MONITORING WELL CONSTRUCTION DETAIL

TOWN OF SOLON CORTLAND COUNTY

Figure
5–1

Project No.
331.21



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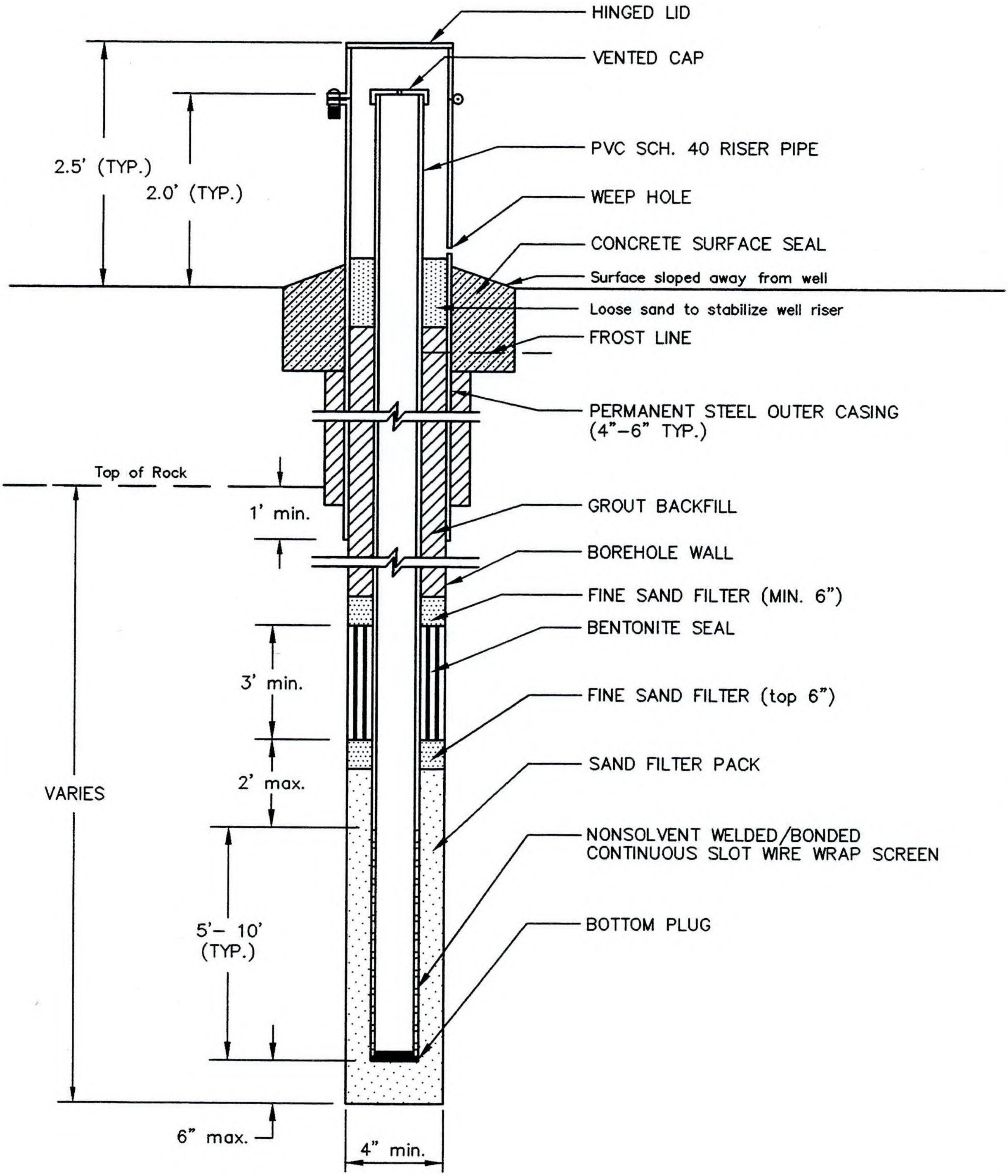
OLD CORTLAND COUNTY LANDFILL
REMEDIAL INVESTIGATION/FEASIBILITY STUDY

TYPICAL SHALLOW BEDROCK MONITORING WELL CONSTRUCTION DETAIL

TOWN OF SOLON CORTLAND COUNTY

Figure
5–2
Project No.
331.21



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OLD CORTLAND COUNTY LANDFILL
REMEDIAL INVESTIGATION/FEASIBILITY STUDY

TYPICAL DEEP BEDROCK MONITORING WELL CONSTRUCTION DETAIL

TOWN OF SOLON CORTLAND COUNTY

Figure
5–3
Project No.
331.21

- observation of the protective monitoring well cover and concrete surface seal construction;

- observation and monitoring of well development where development is performed by the drilling contractor;

- labeling and marking water level monitoring reference point on the protective cover and riser pipe respectively; and

- consultation with on-site NYSDEC Representative.

5.2.7 Task 10 - Soil Sample Organic Vapor Screening

Using a photoionization detector (PID), each soil sample logged at a drilling location will be tested for the presence of volatile organic contamination. During sample collection, the geologist will place a representative sample in a sample jar and then carefully seal the jar with aluminum foil and screw-on lid.

Once properly sealed, the sample will be allowed to equilibrate within the sample jar prior to being tested using a PID. Testing will involve carefully removing the sample lid and puncturing the aluminum foil seal with the PID probe. Two measurements will be recorded when apparent contaminants are present: a) the peak concentration measured in parts per million (PPM); and b) a sustained concentration measured in PPM. All measurements will be recorded in the field log for future reference and are to be used in screen interval selection, analytical soil sample selection and definition of the vertical extent of groundwater and sediment contamination.

5.2.8 Task 11 - In-Situ Hydraulic Conductivity Testing

In-situ variable head hydraulic conductivity testing (slug or bail testing) will be performed within each completed monitoring well after sufficient development of well has been performed. The slug and bail testing will provide in-place permeability data of unconsolidated and consolidated geologic units. Slug and bail testing involves the removal of a bail of water or the displacement of water within the well by the insertion of a slug. Upon creating an elevated or depressed head, the water level in the monitoring well is measured and recorded over the time it takes to achieve 90 percent recovery. It is assumed that the rate of inflow to the monitoring well screen after inducing a hydraulic head difference, is proportional to the hydraulic conductivity (k) and to the unrecovered head distance.

The following equation will be used to calculate the in-situ hydraulic conductivity of the saturated materials at the screened interval of the well (Cedergren, 1977).

$$k = \frac{r^2}{2L\,(t_2 - t_1)} \ln\,(L/R)\; x\; \ln\,(h_1/h_2)$$

Where:

r = Screen radius
R = Gravel pack radius
L = Screen length
t_1 = Time interval corresponding to h_1
t_2 = Time interval corresponding to h_2
h_1 = Head ratio at time t_1
h_2 = Head ratio at time t_2
k = Hydraulic conductivity in cm/sec

Critical to the validity of the hydraulic conductivity data obtained from slug tests is the hydraulic communication between the well screen and the formation materials.

5.2.9 Task 12 - Staff Gauges

Surface water staff gauges will be installed at each surface water and sediment sampling point. These staff gauges will consist of a stake driven into the stream or water course sediment bed. Each stake will be surveyed to establish the coordinates and the elevation of each sampling point. During the initial and subsequent sampling events, a staff gauge reading will be taken and recorded for the evaluation of relative stream or watercourse flow.

5.2.10 Task 13 - Water Level Monitoring

As a means of determining the depth of groundwater and thereby the configuration of the groundwater surface, monitoring well water level measurements will be performed. Initially, monitoring well water levels will be taken at a minimum frequency of one per month at each completed monitoring well. This data will be used to generate a database from which seasonal groundwater fluctuation in both vertical and horizontal gradients may be evaluated. Upon obtaining seasonal high and low water table elevations, representative groundwater contour maps will be developed.

5.2.11 Task 14 - Well Sampling and Analysis

Upon completion of the drilling and monitoring well installation program, each of the new monitoring wells installed and selected existing wells will be sampled for laboratory analysis. Monitoring wells will be bailed such that a representative sample may be withdrawn. Sampling of the groundwater will follow immediately after bailing has been completed.

Each well will be sampled by the following general method:

- The static water level in each well will be measured and recorded. These data and the known dimensions of the well would permit the volume of water in the well to be calculated.

- Each well will be purged of at least three volumes of water or evacuated one and one-half times dependent upon the well hydraulics. The method that is employed will be specific to each well. Where rapid well recovery is present, peristaltic or bladder pumps may be utilized to purge the required well volumes.

- Samples will be collected using disposable Teflon bailers.

- pH, temperature, oxidation-reduction potential (Eh) and specific conductivity will be measured in the field upon collection of each sample.

- Groundwater samples collected for metals will be analyzed for "total" metals and "dissolved" metals. Samples for dissolved metals analysis will be field filtered according to the procedures given in Section 4.8.2 of the SAP.

- Samples will be preserved in accordance with USEPA protocol and shipped on ice to a NYSDOH ELAP CLP certified laboratory.

All initial groundwater samples will be tested according to the protocol given in Table 5-1.

TABLE 5–1
OLD CORTLAND COUNTY LANDFILL
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
SUMMARY OF PROPOSED ANALYTICAL PARAMETERS

SAMPLING LOCATION	SAMPLING MEDIUM	NUMBER OF LOCATIONS	NUMBER OF SAMPLES	TCL (1) VOC	TCL (2) BNA	TCL (3) PEST/PCBs	CLP TCL (4) METALS	DEC PART 360 BASELINE LEACHATE INDICATORS	pH (FIELD)	SPEC COND (FIELD)	TEMP (FIELD)	Eh (FIELD)	DO (FIELD)
Groundwater Monit. Wells													
Monitoring Wells	Water	16	32	32	32	20	32	32	32	32	32	32	
Matrix Spike	Water		2	2	2	2	2						
Matrix Spike Duplicate	Water		2	2	2	2	2						
Duplicate Sample	Water		2	2	2	2	2	2					
Total G.water Samples (6)		16	38	38	38	26	38	34	32	32	32	32	
Surface Water													
Surface Water	Water	5	10	10	10	6	10	10	10	10	10	10	10
Matrix Spike	Water		1	1	1	1	1						
Matrix Spike Duplicate	Water		1	1	1	1	1						
Duplicate Sample	Water		1	1	1	1	1	1					
Total S.water Samples (6)		5	13	13	13	9	13	11	10	10	10	10	10
Sediments													
Sediments	Soil	6	6	5	5	4	6	5					
Matrix Spike	Soil		1	1	1	1	1	1					
Matrix Spike Duplicate	Soil		1	1	1	1	1	1					
Duplicate Sample	Soil		1	1	1	1	1	1					
Total Sediment Samples (6)		6	9	8	8	7	9	8					
Waste/Subsurface Soils													
Waste/Soil	Soil	4	4	4	4	4	4						
Matrix Spike	Soil		1	1	1	1	1						
Matrix Spike Duplicate	Soil		1	1	1	1	1						
Total Waste/Soil Samples (7)		4	6	6	6	6	6						
Blank Samples													
Groundwater Field Blanks	Water												
Groundwater Trip Blanks	Water		2	2									
SW/SED Field Blanks	Water		1	1	1	1	1	1					
SW/SED Trip Blanks	Water		1	1									
Waste/Soil Field Blanks	Water		1	1	1	1	1						
Waste/Soil Trip Blanks	Water												
Total Blank Samples			5	5	2	2	2	1					
Total Samples		31	66	65	65	48	66	53	42	42	42	42	10

NOTES: (1) SUPERFUND CLP METHODS, NYSDEC ASP 1991 VOC
(2) SUPERFUND CLP METHODS, NYSDEC ASP 1991 BNA
(3) SUPERFUND CLP METHODS, NYSDEC ASP 1991 PEST/PCBs
(4) SUPERFUND CLP METHODS, NYSDEC ASP 1991 METALS
(5) EPA SW–846 METHOD 9010/9012
(6) NUMBER INDICATES TWO COMPLETE ROUNDS OF SAMPLES
(7) NUMBER INCLUDES SAMPLES COLLECTED FROM FORMER BUCKBEE MEARS SLUDGE DISPOSAL AREA, AND FROM REPRESENTATIVE SOIL BORINGS. ACTUAL NUMBER OF SAMPLES WILL DEPEND UPON FINDINGS IN THE FIELD.

5.2.12 Task 15 - Air Quality Quantification

Air quality quantification will be performed over the landfilled area of the project site. This task will involve a geologist, the use of a combustible gas indicator, and a PID. Air monitoring will be performed during calm atmospheric conditions and include:

1. A methane perimeter survey consisting of surveying the landfill perimeter with a combustible gas indicator (CGI). Readings are to be taken approximately 6 inches below grade in a hole made with a probe. Spacing between readings will be a maximum of 100 feet.

2. A landfill surface survey consisting of surveying the entire landfill on a grid using a PID and a CGI. Readings will be taken at ground surface. Grid spacings will be a maximum of 200 feet. Additional readings will be taken within bare areas or in locations indicating gas burns.

3. In the event that the PID detects an area of apparent impact, an air sample will be taken for analytical testing.

Air sampling will comprise the use of passive dosimeters. At each apparent "hot spot", as determined by the above procedure, a dosimeter will be placed within an inverted vessel for a timed period of approximately 8 hours. After the incubation time, the dosimeters shall be collected and sent to an analytical laboratory for analysis of indicator compounds (i.e., benzene, vinyl chloride and tetrachloroethylene). Knowing the diffusion rates of the indicator compounds and the incubation time, it is possible to determine a chemical concentration of these compounds. With the concentrations known, the area-source model described on Page 21 of Air Guide 1 will be used to calculate the concentration for on-site receptors.

5.2.13 Task 16 - Ecological Evaluation

Terrestrial Survey:

An evaluation of the ecology of the Old Cortland County Landfill site, as well as the surrounding area, will be conducted in accordance with the NYSDEC Fish and Wildlife Impact Analysis (FWIA) for Inactive Hazardous Waste Site. The ecology of the area will be described in terms of on-site and off-site vegetation and wildlife. A specific list of plant and animal species (including mammals, birds and reptiles) occurring in the area will be provided. These lists will be based on field observations (sightings, track counts, nests, etc.), existing ecological surveys (if available), and if necessary, an evaluation of the habitat to determine what species could be found in the area based on individual species habitat requirements.

A general vegetative cover map of the site and surrounding area within 0.5 miles will also be constructed from available aerial photos and field observations. The cover map will delineate vegetative communities by comparing species composition and structural diversity (i.e., foliage height, spatial distribution, percent cover, etc.) of each plant community.

Special resources (regulated wetlands, streams, lakes, significant habitats, endangered species, wild and scenic rivers) will be identified and described within the immediate site vicinity and areas downstream of the site. The evaluating will include discussion of wildlife use of the settlement ponds to the south of the landfill.

Due to the fact that all wastes are presently buried, there appears to be a very limited direct contact route for exposure of wildlife to potential contamination (except leachate). There is undoubtedly a small population of wildlife species occupying the immediate vicinity of the site which could be affected, but their numbers are expected to be small. Subsequently, no provision for tissue analysis, toxicity testing and biotic indexing from on-site wildlife have been included in this work plan. If significant contamination is detected migrating off the site, or the potential for exposure to wildlife is determined to be greater than previously anticipated, tissue analysis, toxicity testing and biotic indexing will be reconsidered.

Aquatic Survey:

To evaluate baseline conditions in aquatic habitats in the vicinity of the site, a qualitative survey of the fisheries resources inhabiting Maybury Brook and the unnamed tributary to Trout Creek will be performed. Aquatic habitats will be characterized by describing chemical and physical features of the habitat (i.e., water chemistry, temperature, DO, depth, substrate, flow, gradient, submergent vegetation, etc.).

Fish sampling will be performed in the event the surface water and sediment sampling data indicate a need to analyze tissue samples for PCBs. Sampling locations will be in similar habitats upstream and downstream, or where leachate outbreaks are known to contact the subject surface waters. Where appropriate, three sampling locations are proposed (one upstream, one adjacent to landfill and one downstream). Fish captured would be identified by species and measured. Data will be presented in tabular form and will contain an assessment of the aquatic habitat in each sampling location.

A quantitative benthic macroinvertebrate survey will be conducted in the tributary both upstream and downstream of the identified leachate outbreak. Parameters to be measured include taxonomic composition, abundance, species diversity and richness. Any invertebrate sampling will be conducted in accordance with NYSDEC Division of Water "Methods for Rapid Biological Assessment of Streams (Bode et al., 1991).

The reporting format for the aquatic inventory will consist, in part, of species lists by taxon of invertebrates and vertebrates observed on the site and in the surrounding areas. Designations of general abundance (i.e., abundant, common, uncommon) will be given to each species. Special attention will be given to determining the status of any Federal- or State-listed endangered or threatened species.

Textural material will consist of descriptions of the faunal communities and an assessment of the species richness on the site. Any gross deviations in species composition from what might be expected in the existing available habitats will be discussed.

To aid in the assessment of the aquatic environments in the vicinity of the site, sediment criteria will be developed to evaluate the analytical results. Sediment criteria will be developed in accordance with procedures outlined in NYSDEC Technical Guidance for Screening Contaminated Sediments (1993).

During the course of this investigation, it is possible that the presence of significant contamination, combined with utilization of the site by wildlife species, may result in the discovery of a significant route of exposure and migration. In the event that contamination of biological communities is suspect, collection of terrestrial and aquatic biota samples for tissue analysis may be recommended. NYSDEC will be apprised of any developments regarding the need for biota sampling. In the event that biota sampling is deemed appropriate at the Old County Landfill, a separate work plan and budget will be submitted for approval.

As part of the ecological evaluation, identification of fish and wildlife Applicable or Relevant and Appropriate Requirements (ARAR's) will be performed. A fish and wildlife risk assessment will be performed to address the following:

- Identification of potential fish and wildlife exposure pathways including upper level consumers.

- Identification of critical toxicity values to assess acute and chronic effects in fish and wildlife.

- Potential for bio-accumulation of site contaminants.

- Potential for reduction in recreational values.

- Potential for reduction in habitat uses.

5.2.14 Task 17 - Data Validation and Evaluation

Data Validation:

Chemical analysis results obtained as part of Tasks 8, 14 and 16 will be subjected to third party data validation. The data validation task will verify that the analytical results were obtained following the protocols specified in NYSDEC Contract Laboratory Protocols. Data validation ensures that the analytical results can be relied upon in performing the risk assessment, evaluating potential remedial action alternatives and supporting a Record of Decision (ROD).

Data validation will be performed by a NYSDEC-approved third party subcontractor. Selection and approval of the data validator will be made prior to the initial sampling event. The selected subcontractor will ensure that the data analyses and documentation meet NYSDEC specifications. The scope of work for data validation is presented in Attachment C of the Sampling and Analysis Plan.

Data Evaluation:

Barton & Loguidice, P.C., will conduct an analysis of all data gathered in the remedial investigation to provide the necessary input to the Feasibility Study. The data collected to characterize the site will be organized and analyzed to identify the extent and nature of contamination, determine groundwater flow direction(s), and identify potential on-site source(s) of the contaminants. Field data and data resulting from laboratory analysis will be entered into a database. Boring logs will be prepared for all completed borings, and stratigraphic information developed from the site borings will be displayed in geologic cross sections. Both the horizontal and vertical hydraulic gradients will be determined, which together with permeability data will enable the calculation of groundwater flow rates at each location. Water level elevations measured at the wells will be used to develop plot(s) of the piezometric surface in the aquifer. Plan view groundwater contour maps, cross-sectional piezometric profiles and flow nets will be developed as applicable and appropriate. For all plans representing groundwater flow conditions, water elevation data will be noted adjacent to each monitoring location to facilitate review.

Test pit logs, soil and/or waste sampling results, air quality survey data and ecological survey results will be evaluated and plotted where appropriate. The water quality and sediment data will be evaluated and mapped to illustrate the areal extent of detected contaminants. The breakdown products of contaminants detected will be considered to help evaluate potential sources of the contaminants and their environmental behavior.

Tables summarizing the results of the various phases of the Remedial Investigation will be prepared and evaluated. The results of the evaluation will be discussed in the Remedial Investigation Report.

5.2.15 Task 18 - Baseline Risk Assessment

Based on the data obtained during the field investigation, specific parameters/ contaminants will be identified which may represent significant environmental and human health threats to the surrounding area. A computerized literature search will be conducted on these contaminants, and a report focusing on potential human health effects will be prepared. Chemical contaminants identified at the site will be evaluated with respect to their toxic properties and their critical toxicity values. Brief toxicity profiles will be developed for each of these chemicals. This report will characterize and assess potential exposure routes, fate and transport of contaminants, human and environmental receptors, and current and potential risks.

5.3 Document Preparation

5.3.1 Task 19 - Remedial Investigation Report

The Remedial Investigation (RI) report preparation will assemble information on the nature and extent of the landfill contaminants and will generally characterize the site environmental conditions sufficiently to perform a preliminary risk assessment. The information and data will then be used to develop preliminary remedial alternatives.

This report will characterize the extent and nature of landfill contaminants and will discuss the degree of known air, soil, sediment, surface water and groundwater contamination. The hydrogeological characteristics at the site will be summarized and related to detected contamination problems.

5.3.2 Task 20 - Development of Alternatives

Based on the findings reported in the RI, site problem statements of each contaminated environmental medium will be established. Using this list of environmental problems, potential remedial responses will be reviewed. A second list of appropriate remedial responses will be developed utilizing the following criteria.

- Does the technology remediate the problem?

- Does the technology comply with existing regulations, and can it be permitted?

- How do the capital and operating costs for the technology compare to other alternatives?

It is anticipated that the following preliminary alternatives will be developed from this evaluation:

- Treatment for source control that would eliminate the need for long-term management (including monitoring).

- Treatment as a principal element to reduce the toxicity, mobility, or volume of site waste.

- Containment of waste with little or no treatment, but providing protection of human health and the environment, primarily by controlling potential exposure or reducing the mobility of the waste.

- A no action alternative.

5.3.3 Task 21 - Review Meeting/Supplemental Remedial Investigation Report

The RI will have broadly defined the characteristics of the project site and vicinity in terms of the nature and extent of the on-site sources, presence or absence of contaminant pathways and potential exposure targets. Upon the completion of the RI report and the development of preliminary alternatives, a review meeting will be held. During the meeting, the database generated to this stage of the RI/FS will be reviewed for completeness. If unacceptable gaps in the database exist, a Supplementary RI will be performed to complete the site data.

The information collected during the Supplemental RI will be detailed and specific, focusing on the requirements necessary to complete the risk assessment and input into the latter phases of the FS. Such data might include deep wells to detect the presence or absence of contamination in the lower parts of the aquifer, chemical analyses for other chemical species, treatability studies, or other investigations not performed initially. The need for and scope of the Supplemental RI studies will be defined at the conclusion of the RI.

5.3.4 Task 22 - Feasibility Study/Initial Screening of Preliminary Alternatives

The set of preliminary alternatives selected as a result of the RI are intended to generally meet the remedial objectives. The purpose of this initial screening is to provide sufficient information on each preliminary alternative to enable rejection of those which are shown to be infeasible, ineffective, or too costly. Alternatives will be evaluated in greater detail than during the screening process, by addressing actual operating characteristics and technology combinations, and comparing against remediation requirements.

This stage of the Feasibility Study will also introduce various design concepts for capping the landfill in accordance with U.S. EPA "Presumptive Remedy for CERCLA Municipal Landfill Sites" (1993). Capping alternatives will be evaluated on the basis of implementability, effectiveness at reducing rain water infiltration, appropriateness at meeting applicable ARARs, and cost. Cap effectiveness will be evaluated using the HELP (Hydrologic Evaluation of Landfill Performance) Model Version 3.04A (June, 1995).

Additional field data collected during the Supplemental RI will be incorporated. Results from the risk assessment will be used to; specify remediation requirements for each environmental medium that does not have regulatory cleanup standards, evaluate cumulative effects and ensure protection of human health and the environment. Soils remediation requirements, if any, will be formulated by this approach.

Evaluation categories are summarized as follows:

- Effectiveness: Alternatives will be evaluated as to whether they adequately protect human health and the environment; attain Federal and State Applicable or Relevant and Appropriate Requirements (ARARs) or other criteria, advisories, or guidance; significantly and permanently reduce the toxicity, mobility, or volume of hazardous constituents; are technically reliable, or are effective in other respects. Reliability includes the potential for failure and the need for replacement of the remedy.

- Implementation: 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.

- Cost: Capital and long-term Operational & Maintenance (O&M) costs will be determined for each alternative to determine its total present worth. Net Present Values for the O&M component will be determined using appropriate percentage rates for investment returns and annual inflation.

It may be necessary to implement remedial measures (e.g., drum removal) prior to completion of the Feasibility Study. If such measures are required, assessment of technology options and design alternatives will be performed at this time in accordance with NYSDEC Technical and Administrative Guidance Memorandum #4044, "Accelerated Remedial Actions at Class 2, Non-RCRA Regulated Landfills", dated January, 1992.

5.3.5 Task 23 - Review Meeting

Upon completion of the FS Initial Screening, a review meeting will be held to discuss the conclusions and recommendations made in this report. During the meeting, any alterations to the initial screening will be made final, and the detailed analysis on selected alternatives will be initiated.

5.3.6 Task 24 - Feasibility Study/Detailed Analysis of Selected Alternatives

The alternatives which survive the initial screening process will be evaluated against the broad factors of effectiveness, implementability and cost, using appropriate and more specific measures such as protectiveness, compliance with ARARs, reliability and technical feasibility. The detailed analysis of each alternative will include overall protection of human health and the environment; overall compliance with chemical-specific, action-specific and location-specific Standards, Criteria and Guidances; both short-term and long-term considerations for effectiveness; reduction of toxicity, mobility or volume; implementability and cost.

The most appropriate alternatives for each environmental medium will be selected based upon its attainment of the goal of implementing a feasible and practical action that meets performance goals at minimum present worth. The selection will be made by ranking each alternative under the categories of effectiveness, implementation and economics.

The most appropriate alternatives will be recommended among those alternatives that meet the following four criteria:

- The alternative must utilize treatment technologies and permanent solutions to the maximum extent practicable as determined by technological feasibility, availability and cost effectiveness.

- The alternative must 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.

- Except under those circumstances listed in the National Contingency Plan (NCP), the alternative must attain applicable or relevant and appropriate Federal and State public health and environmental requirements that have been identified for a specific site.

- The alternative must be cost effective, accomplishing a level of protection that cannot be achieved by less costly methods.

The preferred remedies will reflect two preferences:

- Remedies that involve treatments that significantly reduce the toxicity, mobility, or volume of hazardous constituents as a principal element.
- Remedies that minimize the requirement for long-term management of residuals.

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:

- 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.
- Compliance with the requirement will result in greater risk to human health and the environment than alternative options.
- Compliance with the requirements is technically impractical.

The recommended site remedial action will be chosen based upon the results of the selection of the most appropriate alternatives for each environmental medium. The combination of these alternatives will be reviewed to ensure that the site remedial action meets or exceeds ARARs or other health-based levels. Additional technical information required prior to further development of the site remediation will be listed.

The results of the detailed analysis will be included in the final draft FS report, which will also include the development of alternatives and the initial screening.

6.0 PROJECT MANAGEMENT STRUCTURE

6.1 Project Organization

Barton & Loguidice, P.C. (B&L), is the prime engineering contractor for the Old Cortland County Landfill RI/FS project. B&L will report directly to the Cortland County Department of Solid Waste for all services required on the project. With approval from the Cortland County Department of Solid Waste, B&L will have direct liaison with the New York State Department of Environmental Conservation (NYSDEC) throughout the duration of the project.

The Project Officer will be Paul F. Dudden, P.E. Mr. Dudden is a Principal at B&L with the authority to commit B&L's resources and resolve scheduling conflicts.

The Site Manager will be Mark J. Chauvin, P.G. The Site Manager will have primary responsibility for planning and implementation of the RI/FS project. The Site Manager will be the primary contact for all project-related communications with Cortland County and NYSDEC.

In addition, the Site Manager will be responsible for scheduling and implementing all Remedial Investigation tasks, including preparation of the RI report, the management of subcontractors for the field investigations, including drilling, surveying, laboratory analysis and data validation as needed.

Finally, the Site Manager will be responsible for implementing all Feasibility Study tasks, including the management of all subcontractors.

The Project Quality Assurance Officer will be John A. Benson. His responsibilities will include performing periodic field and sampling audits, interfacing with the analytical laboratory to make requests or resolve problems, interfacing with the data validator and developing a project specific data usability report.

The Firm of Eckenfelder, Inc., of Mahwah, New Jersey, will be a prime subcontractor and will perform the following project and potential future tasks:

- Evaluation of Drum Condition and Recovery Potential
- Coordination of Removal and Disposal of Buried Drums (if determined feasible)

Analytical data QA/QC will be performed by NYSDEC approved personnel. QA/QC responsibilities include certifying that the field sampling procedures, analytical work, and data validation are performed in accordance with the approved Sampling and Analysis Plan (Appendix A). Eckenfelder, Inc., has had considerable direct involvement at similar inactive hazardous waste sites and may be contracted to perform these tasks pending approval of qualified B&L personnel.

For any given field activity, a field operations leader will be designated. The designated leader will be responsible for on-site management of their respective site operations, including all on-site activities conducted by subcontractors.

6.2 Project Schedule

The project schedule for the Old Cortland County Landfill RI/FS is presented in Figure 6-1. The estimated duration of the project is 26 months. The schedule is based on preliminary assumptions concerning initiation and duration of field investigations as indicated in Figure 6-1, receipt of laboratory results within four weeks of sample collection, completion of data validation within four weeks following receipt of laboratory results and NYSDEC review of formal draft report submittals within 60 days of submittal.

FIGURE 6–1
OLD CORTLAND COUNTY LANDFILL
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
PROJECT SCHEDULE

PROJECT TASK YEAR :	1996						1997												1998											
MONTH :	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
1. Project Planning																														
a. Draft Workplan Development		■		■																										
b. NYSDEC Review & Comment			■		■																									
c. Final Workplan & Revisions						■																								
2. Community relations					■																									
3. Field Investigations																														
a. Subcontracting			■		■	■	■	■	■	■	■	■																		
b. Site Survey/Base Map			■																											
c. Limits of Waste Investigation							■																							
d. Geophysical Survey											■																			
e. Soil Gas Survey											■																			
f. Evaluation of Drum Disposal Options											■																			
g. Test Borings/Well Installation												■																		
h. Groundwater/Surface Water Sampling													■																	
i. Laboratory Analysis														■	■															
j. Ecological Evaluation											■	■	■	■																
k. Air Screening											■																			
l. Data Validation																■														
m. Risk Assessment																	■	■	■											
4. Remedial Investigation Report																														
a. Report Writing													■	■	■	■	■	■	■											
b. NYSDEC Review & Comment																				■	■									
c. Final Report & Revisions																						■								
5. Feasibility Study Report																														
a. Report Writing																					■	■	■							
b. NYSDEC Review & Comment																								■	■					
c. Final Report & Revisions																										■				
6. Citizen's Participation Meeting																											■			

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APPENDIX A

SAMPLING AND ANALYSIS PLAN (SAP)

The SAP is submitted under a separate cover.

APPENDIX B

HEALTH AND SAFETY PLAN (HASP)

The HASP is submitted under a separate cover.

APPENDIX C

CITIZEN PARTICIPATION PROGRAM (CPP)

The CPP is submitted under a separate cover.

LEGEND:

● D-1	EXISTING MONITORING WELL
⊕ RI-MW-1A	PROPOSED NEW MONITORING WELL
△ SW-1 SED-1	SURFACE WATER / SEDIMENT SAMPLING LOCATION
△ LS-1	LEACHATE SAMPLING LOCATION
⌖ RI-EB-1	EXPLORATORY BORING

NOTES:

1. TOPOGRAPHY SHOWN AT 10 FOOT CONTOURS TAKEN FROM 1982 DATA.
2. TOPOGRAPHY SHOWN AT 2 FOOT COUNTOURS TAKEN FROM AERIAL PHOTOGRAPHY OBTAINED APRIL, 1987.
3. SURFACE WATER / SEDIMENT SAMPLES SW-4 / SED-4 AND SW-5/SED-5 TO BE COLLECTED IN MAYBURY BROOK.

In charge of	PFD
Designed by	MJC
Drawn by	SMH
Checked by	MJC

N24907

Date NOVEMBER, 1996

Scale 1" = 200'

NO ALTERATION PERMITTED HEREON EXCEPT AS PROVIDED UNDER SECTION 7209 SUBDIVISION 2 OF THE NEW YORK STATE EDUCATION LAW.

REVISIONS

COMPLETED CONSTRUCTION

Significant Construction Changes Are Shown

By ______ Date ______

Ck'd ______ Date ______

B&L
BARTON & LOGUIDICE, P.C.
CONSULTING ENGINEERS
290 ELWOOD DAVIS ROAD / BOX 3107, SYRACUSE, NEW YORK 13220

OLD CORTLAND COUNTY LANDFILL
REMEDIAL INVESTIGATION / FEASIBILITY STUDY

SITE INVESTIGATION LAYOUT

TOWN OF SOLON
CORTLAND COUNTY, N.Y.

Sheet Number
1

File Number
331.21

OLD CORTLAND COUNTY LANDFILL REMEDIAL INVESTIGATION/ FEASIBILITY STUDY

FINAL WORK PLAN - APPENDIX A SAMPLING AND ANALYSIS PLAN

DECEMBER, 1996

RECEIVED

DEC 0 9 1996

N.Y.S. DEPT. OF
ENVIRONMENTAL CONSERVATION
DIV. ENVIRONMENTAL ENFORCEMENT
BUFFALO FIELD UNIT

PREPARED FOR

CORTLAND COUNTY DEPARTMENT
OF SOLID WASTE
TOWN LINE ROAD
McGRAW, NEW YORK 13101

PREPARED BY

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PROJECT NO. 331.21

OLD CORTLAND COUNTY LANDFILL
REMEDIAL INVESTIGATION/FEASIBILITY STUDY

FINAL WORK PLAN - APPENDIX A
SAMPLING AND ANALYSIS PLAN

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1.0 INTRODUCTION

This document presents the Sampling and Analysis Plan (SAP) for the Remedial Investigation/Feasibility Study (RI/FS) of the Old Cortland County Landfill to be undertaken by Barton & Loguidice, P.C., on behalf of the Cortland County Department of Solid Waste.

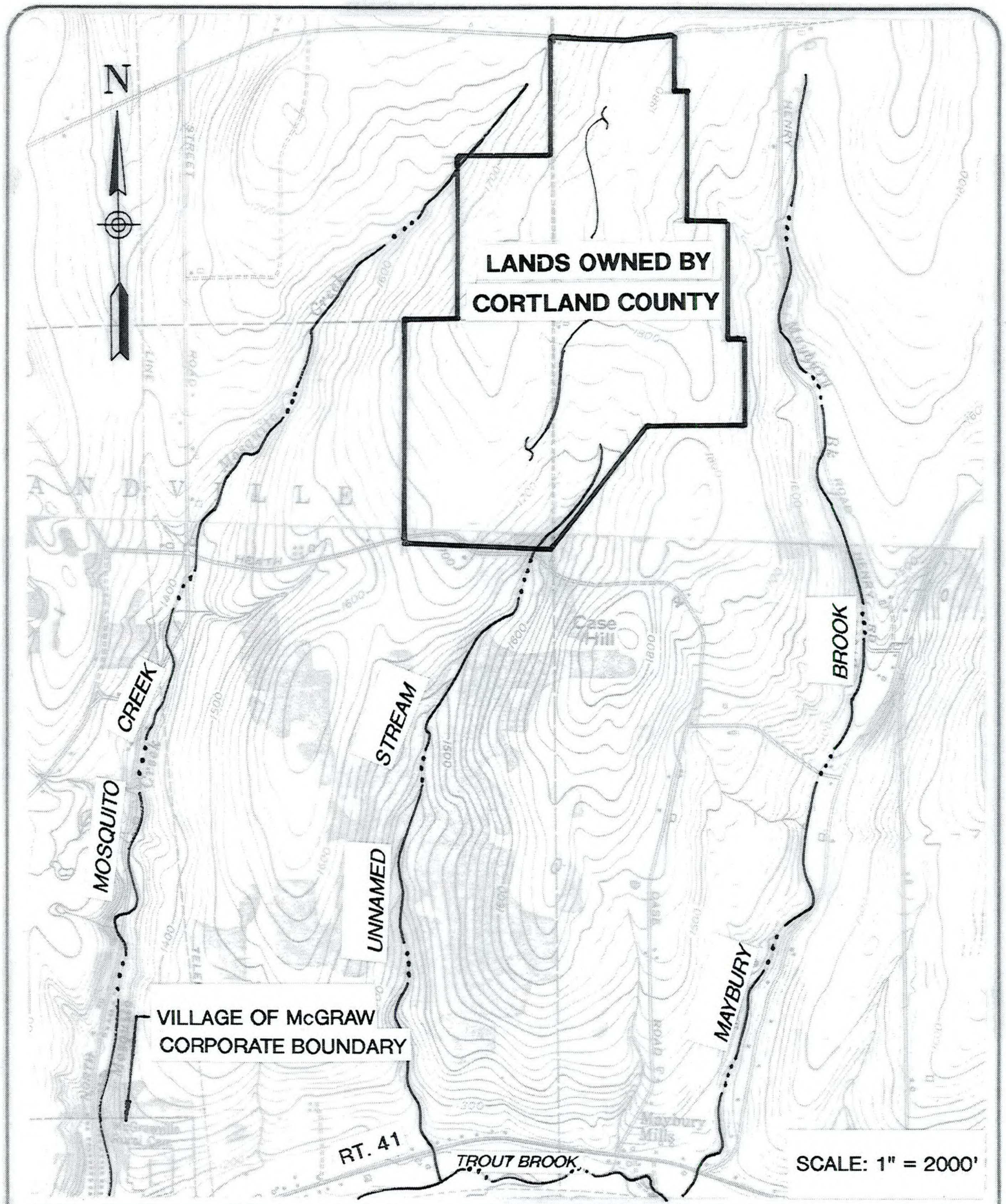
The SAP defines the procedures to be followed during all field investigation activities.

The SAP contains five sections including this Introduction, Section 1.0. Section 2.0 outlines the sampling objectives of the RI/FS. Section 3.0 provides a description of the field investigation and sampling program, including sample designation, sample handling, and analysis procedures. Section 4.0 details the field investigation procedures. Section 5.0 outlines the field sampling and sample analysis quality assurance/quality control procedures.

1.1 Site History

The Old Cortland County Landfill site covers an area of approximately 36 acres of a 539.9-acre tract of land owned by Cortland County, located on Town Line Road in the Town of Solon in northern Cortland County (Figure 1-1). An approximate 3-5 acre area to the south of the Old County Landfill was used to dispose of ferrous oxide sludge generated by Buckbee-Mears.

The landfill has not been in operation since 1988. A number of drums containing liquid hazardous wastes were reportedly landfilled at the site between 1972 and 1974. Subsequently, the NYSDEC has classified the Old Cortland County Landfill as an inactive hazardous waste site, and has listed the site in the Registry of Inactive Hazardous Waste Disposal Sites in New York (No. 712001).



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OLD CORTLAND COUNTY LANDFILL
REMEDIAL INVESTIGATION/FEASIBILTY STUDY

**SITE LOCATION AND
SURFACE DRAINAGE MAP**

TOWN OF SOLON CORTLAND COUNTY

Figure
2-1
Project No.
331.21

Leachate seeps have been observed in the drainage ditch to the south of the landfill. Drainage from a portion of the landfill flows into the settlement ponds and then to the unnamed tributary of Trout Creek, while the remainder flows east to Maybury Brook. None of the surface waters are known to be used directly as potable water supplies.

There are no municipal wells within the vicinity of the Old County Landfill. Private groundwater wells have been identified along all roads surrounding the County property.

2.0 SAMPLING OBJECTIVES

2.1 Chemical Characterization

Table 3-1 of the Work Plan summarizes the results of the preliminary groundwater sampling performed by the County in accordance with the closure requirements of the Pine Tree Landfill. From this list, a number of chemicals of concern can be identified. Despite their relatively low concentrations, the following chemicals of concern have been tentatively identified:

- Chloroethane
- Chloroform
- Chloromethane
- Cis-1,2-dichloroethane
- Dichlorodifluoromethane
- 1,1-Dichloroethane
- Toluene
- Trans-1,2-dichloroethane
- 1,1,1-Trichloroethane
- Trichloroethene
- Vinyl Chloride

2.2 Data Quality Objectives

Data quality objectives (DQO) are based on the concept that different data uses may require different levels of data quality. Data quality can be defined as the degree of uncertainty in the data with respect to precision, accuracy, and completeness. The five levels of data quality are:

1. Screening (Level 1) - This provides the lowest data quality but the most rapid results. It is often used for health and safety monitoring at the site, preliminary comparison to ARARs, initial site characterization to locate areas for subsequent

and more accurate analyses, and for engineering screening of alternatives (bench-scale tests). These types of data include those generated on-site through the use of HNU, pH, conductivity, and other field monitoring equipment.

2. Field Analyses (Level 2) - This provides rapid results and better quality than in Level 1. Analyses include mobile lab generated data.

3. Engineering (Level 3) - This provides an intermediate level of data quality and is used for site characterization. Engineering analyses may include mobile lab generated data and some analytical lab methods (e.g., laboratory data with quick turnaround used for screening but without full quality control documentation).

4. Confirmational (Level 4) - This provides the highest level of data quality and is used for purposes of risk assessment, engineering design, and cost analyses. These analyses require full Contract Laboratory Program (CLP) analytical and data validation procedures in accordance with USEPA or NYSDEC-recognized protocols.

5. Non-Standard (Level 5) - This refers to analyses by non-standard protocols, for example, when exacting detection limits, or analysis of an unusual chemical compound is required. These analyses often require method development or adaption. The level of quality control is usually similar to Level 4 data.

Barton & Loguidice will contract with a NYSDOH ELAP certified laboratory to generate either Level 4 or Level 5 CLP analytical data for all leachate, groundwater, surface water, and sediment samples collected at the Old Cortland County Landfill site. In addition, Level 1 data will be generated which includes field HNU readings gathered during well drilling, sampling, and other routine field activities. Field measurements of sample parameters such as pH, Eh, temperature, or specific conductivity are also examples of Level 1 may be used to demonstrate the adequacy of well development/purging procedures or, in the case of HNU readings, to help protect the health and safety of workers, or provide data for the design of groundwater monitoring wells.

DQO Level 3 would be utilized in any treatability studies (if required), not during the field investigation.

3.0 FIELD INVESTIGATION

3.1 Field Investigation and Sampling Program

The objective of this task is to conduct the necessary remedial investigations to characterize the site and its actual or potential hazard to public health and environment, and to identify both contaminant sources and receptors. The field investigation is designed to provide data of adequate technical content to support the development and evaluation of remedial alternatives during the Feasibility Study. The objectives of the field investigation are to:

- Characterize groundwater flow conditions and delineate the groundwater contamination in the overburden as related to the landfill.
- Gather data to evaluate the probability of contamination in the deep groundwater system.
- Characterize surface water and sediment contamination.
- Gather data to support a public health risk assessment and environmental impact assessment.
- Gather data to adequately evaluate potential remedial action technologies/ alternatives.

The field investigation will consist of the following subtasks:

1. Subcontracting
2. Mobilization and Demobilization

3. Site Survey and Base Map
4. Limits of Waste Investigation
5. Geophysical Survey
6. Evaluation of Buried Drum Condition
7. Drilling/Installation of Groundwater Monitoring Wells
8. Staff Gauge Placement and Stream Flow Measurements
9. Groundwater Sampling
10. Leachate, Surface Water and Sediment Sampling
11. Ecological Survey

A limits of waste investigation will be performed to delineate the extent of the Old Cortland County Landfill. This will also include an investigation of the depth of the buried sludge in the former Buckbee-Mears disposal area.

A geophysical field investigation is proposed at the Old Cortland County Landfill to characterize potential leachate migration pathways from the landfill using an electromagnetic conductivity survey. Data obtained from the geophysical survey will aid the location of the monitoring wells.

A pilot study will be performed over a portion of the reported drum disposal area to evaluate the potential to use a magnetometer survey to define the location of the buried drums. A supplemental excavation program will be conducted to verify the condition and potential for recovery of the buried drums.

Sampling will include groundwater from the newly-installed and existing monitoring wells, and surface water and sediment locations from two streams in the vicinity of the site to determine the extent of surface water and stream bed contamination. Discrete leachate samples will also be obtained from the drainage ditch to the south of the landfill. In addition, soil samples will be collected from split spoons obtained during the installation of the groundwater monitoring wells. Table 3-1 provides a summary of the proposed analytical parameters for the sampling program including all required QA/QC samples to be collected in the field.

An ecological investigation will be conducted, including a macroinvertebrate survey, to gather information on the existing wildlife found in the area, vegetative composition, hydrographic features, and the potential existence of critical and significant habitats. A determination of the impact of the site on the surrounding ecosystem will also be made.

3.2 Sample Designation

Each sample will be designated by an alpha-numeric code which will identify the site, matrix sampled, and contain a location-specific number.

The site code will be CL for Cortland Landfill. Location types (matrix sampled) will be identified by a two letter code, for example: SD (Sediment), MW (Monitoring Well), etc. Each matrix sampling location will be identified by a two digit number. Sample numbers at each location for each sample matrix type will begin with 01 and increase sequentially.

The following is a general guide for sample identification:

First Segment	Second Segment	Third Segment
AA	AA	NN
Site	Location Type	Specific Location

Character Type

A = Alpha
N = Numeric

TABLE 3-1
OLD CORTLAND COUNTY LANDFILL
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
SUMMARY OF PROPOSED ANALYTICAL PARAMETERS

SAMPLING LOCATION	SAMPLING MEDIUM	NUMBER OF LOCATIONS	NUMBER OF SAMPLES	TCL (1) VOC	TCL (2) BNA	TCL (3) PEST/PCBs	CLP TCL (4) METALS	DEC PART 360 BASELINE LEACHATE INDICATORS	pH (FIELD)	SPEC COND (FIELD)	TEMP (FIELD)	Eh (FIELD)	DO (FIELD)
Groundwater Monit. Wells													
Monitoring Wells	Water	16	32	32	32	20	32	32	32	32	32	32	
Matrix Spike	Water		2	2	2	2	2						
Matrix Spike Duplicate	Water		2	2	2	2	2						
Duplicate Sample	Water		2	2	2	2	2	2					
Total G.water Samples (6)		16	38	38	38	26	38	34	32	32	32	32	
Surface Water													
Surface Water	Water	5	10	10	10	6	10	10	10	10	10	10	10
Matrix Spike	Water		1	1	1	1	1						
Matrix Spike Duplicate	Water		1	1	1	1	1						
Duplicate Sample	Water		1	1	1	1	1	1					
Total S.water Samples (6)		5	13	13	13	9	13	11	10	10	10	10	10
Sediments													
Sediments	Soil	6	6	5	5	4	6	5					
Matrix Spike	Soil		1	1	1	1	1	1					
Matrix Spike Duplicate	Soil		1	1	1	1	1	1					
Duplicate Sample	Soil		1	1	1	1	1	1					
Total Sediment Samples (6)		6	9	8	8	7	9	8					
Waste/Subsurface Soils													
Waste/Soil	Soil	4	4	4	4	4	4						
Matrix Spike	Soil		1	1	1	1	1						
Matrix Spike Duplicate	Soil		1	1	1	1	1						
Total Waste/Soil Samples (7)		4	6	6	6	6	6						
Blank Samples													
Groundwater Field Blanks	Water												
Groundwater Trip Blanks	Water		2	2									
SW/SED Field Blanks	Water		1	1	1	1	1	1					
SW/SED Trip Blanks	Water		1	1									
Waste/Soil Field Blanks	Water		1	1	1	1	1						
Waste/Soil Trip Blanks	Water												
Total Blank Samples			5	5	2	2	2	1					
Total Samples		31	66	65	65	48	66	53	42	42	42	42	10

NOTES: (1) SUPERFUND CLP METHODS, NYSDEC ASP 1991 VOC
(2) SUPERFUND CLP METHODS, NYSDEC ASP 1991 BNA
(3) SUPERFUND CLP METHODS, NYSDEC ASP 1991 PEST/PCBs
(4) SUPERFUND CLP METHODS, NYSDEC ASP 1991 METALS
(5) EPA SW-846 METHOD 9010/9012
(6) NUMBER INDICATES TWO COMPLETE ROUNDS OF SAMPLES
(7) NUMBER INCLUDES SAMPLES COLLECTED FROM FORMER BUCKBEE MEARS SLUDGE DISPOSAL AREA, AND FROM REPRESENTATIVE SOIL BORINGS. ACTUAL NUMBER OF SAMPLES WILL DEPEND UPON FINDINGS IN THE FIELD.

Site

CL = Cortland Landfill

Location Type

BI = Biota Sample
MW = Monitoring Well Water
SB = Soil Boring
SD = Sediment
SW = Surface Water
TB = Trip Blank
FB = Field Blank
MS = Matrix Spike
MSD = Matrix Spike Duplicate

A cumulative sampling master log will be maintained as the field program progresses. The samples taken will be referenced to each sampling location in the master log and on a site map. These data will be maintained in the site logbook and on PC disk.

3.3 Sample Handling

3.3.1 Sample Container Requirements and Holding Times

Table 3-2 specifies the number of samples and duplicates, type of sample matrix, sample container requirements, sample preservation required, holding times, and laboratory and field analyses to be performed on each sample type. Table 3-3 lists the individual requirements for the leachate indicator samples.

TABLE 3-2
OLD CORTLAND COUNTY LANDFILL
FIELD SAMPLING AND ANALYTICAL PROGRAM

MATRIX	NUMBER OF SAMPLES AND DUPLICATES	SAMPLE CONTAINER (ICHEM 300 OR EQUIVALENT)	SAMPLE PRESERVATION	HOLDING TIME[1]	CLP LABORATORY ANALYSIS	FIELD ANALYSIS
Sediments	8	(2) 40 ml glass vials	Cool to 4°C	7 days	TCL VOC Superfund CLP Method 91-1 NYSDEC ASP 1991	--
	9	(1) 8 oz. wide mouth glass jar	Cool to 4°C	6 months Hg (26 days)	TCL Metals Superfund CLP Method CLP-M NYSDEC ASP 1991	--
	8	(1) 8 oz. wide mouth glass jar	Cool to 4°C	5 days extract; 40 days analyze	TCL BNAs Superfund CLP Method 91-2 NYSDEC ASP 1991	--
	7	(1) 8 oz. wide mouth glass jar	Cool to 4°C	5 days extract; 40 days analyze	TCL Pest/PCB Superfund CLP Method 91-3 NYSDEC ASP 1991	--
	8	See Table 3-3	See Table 3-3	See Table 3-3	NYSDEC Part 360 Baseline Leachate Indicators	--
Soil and Waste	6	(2) 40 ml glass vials	Cool to 4°C	7 days	TCL VOC Superfund CLP Method 91-1 NYSDEC ASP 1991	--
	6	(1) 8 oz. wide mouth glass jar	Cool to 4°C	6 months Hg (26 days)	TCL Metals Superfund CLP Method CLP-M NYSDEC ASP 1991	--
	6	(1) 8 oz. wide mouth glass jar	Cool to 4°C	5 days extract; 40 days analyze	TCL BNAs Superfund CLP Method 91-2 NYSDEC ASP 1991	--

TABLE 3-2 (Continued)
OLD CORTLAND COUNTY LANDFILL
FIELD SAMPLING AND ANALYTICAL PROGRAM

MATRIX	NUMBER OF SAMPLES AND DUPLICATES	SAMPLE CONTAINER (ICHEM 300 OR EQUIVALENT)	SAMPLE PRESERVATION	HOLDING TIME[1]	CLP LABORATORY ANALYSIS	FIELD ANALYSIS
	6	(1) 8 oz. wide mouth glass jar	Cool to 4°C	5 days extract; 40 days analyze	TCL Pest/PCB Superfund CLP Method 91-3 NYSDEC ASP 1991	--
Groundwater and Surface Water	51	(2) 40 mil glass vials	Cool to 4°C	7 days	TCL VOC Superfund CLP Method 91-1 NYSDEC ASP 1991	--
	51	(1) one-liter polyethylene bottle	HNO_3 to pH <2 Cool to 4°C	6 months Hg (26 days)	TCL Metals (Total) Superfund CLP Method CLP-M NYSDEC ASP 1991	--
	51	(2) one-liter amber bottles	Cool to 4°C	5 days extract; 40 days analyze	TCL BNAs Superfund CLP Method 91-2 NYSDEC ASP 1991	--
	35	(2) one-liter amber bottles	Cool to 4°C	5 days extract; 40 days analyze	TCL Pest/PCB Superfund CLP Method 91-3 NYSDEC ASP 1991	--
	51	(1) one-liter polyethylene bottle	NaOH to pH >12; 0.6 g ascorbic acid Cool to 4°C	12 days	Cyanide-EPA SW Superfund CLP Methods from NYSDEC ASP 1991	--
	42					pH, Temp, Eh Specific Cond.
	10					Dissolved Oxygen

TABLE 3-2 (Continued)
OLD CORTLAND COUNTY LANDFILL
FIELD SAMPLING AND ANALYTICAL PROGRAM

MATRIX	NUMBER OF SAMPLES AND DUPLICATES	SAMPLE CONTAINER (ICHEM 300 OR EQUIVALENT)	SAMPLE PRESERVATION	HOLDING TIME[1]	CLP LABORATORY ANALYSIS	FIELD ANALYSIS
	45	See Table 3-3	See Table 3-3	See Table 3-3	NYSDEC Part 360 Baseline Leachate Indicators	--
Field Blanks	2	(2) 40 ml glass vials	Cool to 4°C	7 days	TCL VOC Superfund CLP Method 91-1 NYSDEC ASP 1991	--
	2	(1) one liter polyethylene bottle	HNO_3 to pH 2; Cool to 4°C	6 months, Hg (26 days)	TCL Metals (Total) Superfund CLP Method CLP-M NYSDEC ASP 1991	--
	2	(2) one liter amber bottles	Cool to 4°C	5 days extract; 40 days analyze	TCL BNAs Superfund CLP Method 91-2 NYSDEC ASP 1991	--
	2	(2) one liter amber bottle	Cool to 4°C	5 days extract; 40 days analyze	TCL Pest/PCB Superfund CLP Method 91-3 NYSDEC ASP 1991	--
	1	See Table 3-3	See Table 3-3	See Table 3-3	NYSDEC Part 360 Baseline Leachate Indicators	--
Trip Blanks	3	(2) 40 ml glass vials	Cool to 4°C	7 days	TCL VOC Superfund CLP Method 91-1 NYSDEC ASP 1991	--

NOTE:

1. All CLP holding times are from verified time of sample receipt.

TABLE 3-3
OLD CORTLAND COUNTY LANDFILL
SAMPLING REQUIREMENTS FOR LEACHATE INDICATORS

TEST METHOD	PRESERVATION	HOLD TIME (analysis)
TKN	H2SO4 pH <2 Chill 4°C	26 Days
Ammonia	H2SO4 pH <2 Chill 4°C	26 Days
Nitrate	Chill 4°C	24 Hours
COD	H2SO4, pH <2 Chill 4°C	26 Days
BOD	Chill 4°C	24 Hours
TOC	H2SO4 or HC1 pH <2 Chill 4°C	26 Days
Solids (TDS)	Chill 4°C	Immediate
Sulfate	Chill 4°C	26 Days
Alkalinity	Zero Headspace Chill 4°C	12 Days
Phenols	H2SO4 pH <2 Chill 4°C Glass Container	26 Days
Chloride	None	26 Days
Bromide	Chill 4°C	Analyze ASAP
Hardness	None	6 Months
Color	Chill 4°C	24 Hours
Boron	Chill 4°C	N/A
Cyanide	Chill 4°C NaOH pH >12 (0.6g Ascorbic Acid)	12 Days
Chromium VI	Chill 4°C	24 Hours

3.3.2 Sample Packaging and Shipping

Samples will be packaged and shipped according to the procedures outlined in Section 5.1. Samples will be shipped for next-day delivery to the contract laboratory within 24 hours of collection.

3.3.3 QA/QC Samples

The proposed analytical program includes QA/QC samples. Matrix spike and duplicate matrix spike samples will be analyzed at a frequency of 1 set in 20 per individual sample matrix. Duplicate samples will be collected to demonstrate the reproducibility of sampling technique and laboratory analysis. Duplicate samples will be taken at a frequency of 1 set in 20 per sample matrix. Field blanks will be taken during sampling of surface water, sediments, soils and waste during each sampling period. Field blanks will not be required for groundwater sampling as disposable Teflon bailers will be used to extract the samples. Field blanks will be analyzed for the same parameters as the original samples. A trip blank will accompany each daily sample group which includes water samples requiring analyses for TCL volatiles, and will be analyzed for TCL volatiles only.

Category B deliverables will be provided with the laboratory data package to allow for subsequent data validation.

4.0 FIELD INVESTIGATION PROCEDURES

4.1 Preparation for Field Entry

Prior to the initiation of field activities, the following tasks will be performed:

1. Kick-off meeting with all involved personnel to review the scope of work to be performed, and the Sampling and Analysis Plan.
2. Review of the Health and Safety Plan by all on-site personnel.
3. Operational checkout and pre-calibration of all equipment to be taken into the field.
4. Location, flagging and labeling of all proposed borings and sampling locations.
5. Arrange access for drill rig at proposed drilling locations.
6. Mobilization of equipment and personnel to site.

4.2 Decontamination Procedures

4.2.1 Decontamination of Sampling Equipment

All reusable sampling equipment (scoops, beakers, trowels, bowls, etc.) will be pre-cleaned prior to field entry. The following cleaning procedures will be used:

1. Alconox detergent and potable water scrub.

2. Potable water rinse.

3. Ten percent nitric acid rinse (when sampling for heavy metals). Carbon steel split spoons will be rinsed with a one percent nitric acid solution (when sampling for heavy metals).

4. Deionized water rinse or potable water rinse.

5. Methanol or hexane rinse.

6. Deionized water rinse.

7. Air dry.

Following this decontamination procedure, equipment will be wrapped in aluminum foil or stored in sealed polyethylene bags for on-site use. Whenever possible, pre-cleaned equipment will be used; however, if the need arises, equipment will be cleaned in the field according to the general procedures described above.

Preparation for Sampling On Site

Prior to any field activity, the required Health and Safety procedures will be followed. Background and downwind HNU (HNU Systems Photoionization Analyzer Model P1-101) readings will be recorded for site-specific work zones. In the event of adverse weather conditions, outside sampling events will be postponed so that the integrity of the samples is maintained. A general overview of the site will be made to foresee possible hazards or delays. If applicable, the site manager will be informed of the field team's intention.

4.2.2 Decontamination of Drilling Equipment and Reusable Tools

All drilling and excavation equipment and reusable tools will undergo complete decontamination procedures. The purpose of these procedures is to ensure that all equipment utilized at the site is contaminant free. Through these procedures, problems resulting from the introduction of contamination into a test boring or monitoring well, or cross-contamination between borings and wells, can be eliminated.

Decontamination Pad and Staging Area

To facilitate steam cleaning of the drill rig, associated hardware, and sampling equipment, a decontamination pad will be constructed. The decontamination pad will consist of a layer of gravel or crushed stone. The pad will be constructed within the limits of waste, adjacent to the access road running to the north of the settlement ponds. Drainage from the decontamination pad will be temporarily impounded to allow sediments to settle, and then discharged downslope into the first settlement pond.

A staging area outside the area of contamination will be designated for the storage of well construction materials and newly-cleaned equipment and tools. All decontaminated materials will be placed on clean surfaces of trucks or trailers, or stored on saw horses or plastic sheeting in the staging area.

Equipment Condition

1. All drilling and excavation equipment entering the site will be inspected for integrity of hydraulic and oil fluid handling systems and general overall cleanliness. Leaking hoses, tanks, hydraulic lines, etc., shall be replaced or repaired prior to entering the site.

2. All well casing screening and other construction materials must be in new condition. Used materials shall not be permitted in well construction.

3. All observations regarding the condition of equipment and materials entering or leaving the site will be recorded daily in a field book by the site operations manager or supervising geologist.

Equipment Cleaning and Handling

<u>Initial Cleaning</u>

1. Following initial inspection, all drilling and excavation equipment and associated tools will be taken to the decontamination pad and steam-cleaned upon arrival at the site. Typical tools and equipment to be cleaned include:

    - Drilling rods, bits
    - Augers (clips, pins, and associated hardware)
    - Samplers (i.e., split-spoon, Denison, etc.)
    - Casing materials (both temporary and permanent)
    - Wrenches
    - Hammers
    - Other hand tools and tool boxes
    - Mud tub/pan
    - Hoses, tanks
    - Cable clamps and other holding devices in direct contact with drilling rods
    - Drill rig and undercarriage, wheel wells, chassis, and any other items that may come in contact with work area

2. During the cleaning operation, equipment shall be handled only with clean gloves. A new set of gloves will be utilized between successive cleanings for each new location.

3. Cleaned materials shall be protected from contamination during transport to the staging area by such means as the Supervising Geologist or Site Operations Manager deems necessary.

4. The Site Operations Manager will document equipment decontamination.

On-Site Cleaning Between Borings/Test Pits

1. Following each well installation, all drilling equipment (listed above under "initial cleaning") shall be steam cleaned between borings.

4.3 Geophysical and Soil Gas Survey Equipment and Procedures

Geophysical Survey

Both magnetometer and terrain geophysical surveys are proposed at the Old Cortland County Landfill pending a site evaluation to determine the suitability of geophysical surveying within the alleged drum disposal area. The scope of each of the proposed surveys is described in the RI/FS Work Plan.

All geophysical survey work will be subcontracted, and the selected subcontractor will provide for approval of quality assurance and quality control procedures in meeting the geophysical program objectives and scope of work.

At the planning stage it is anticipated that the following instrument and survey method below will be appropriate for the given site conditions:

EM-34-3

For performing a multi-depth terrain conductivity survey, a Geonics EM-34-3 is used. This EM device is a two-man instrument that has variable intercoil spacings of 33, 66 and 132 feet (10, 20 and 40 meters). This allows the operators to collect data to depths of approximately 25, 50 and 100 feet (7.5, 15 and 30 meters) in the horizontal dipole mode and to depths of approximately 50, 100 and 200 feet (15, 30 and 60 meters) in the vertical dipole mode. By collecting data in both dipole modes and/or by varying the intercoil spacing (sounding), data can be generated of the subsurface stratigraphy. The success of this method is dependent upon sufficient contrasts in the electrical properties of the stratified subsurface material. By collecting data at constant intercoil spacings (profiling), information regarding lateral changes in stratigraphy and the presence of contaminated soils and groundwater. This method is commonly used to map subsurface stratigraphy, contaminated soils and contaminant plumes.

Soil Gas Survey

The equipment involved to conduct the soil gas survey will include a power auger fitted with a small diameter auger bit; 4-foot lengths of small diameter (approximately 1-2 inches) PVC pipe; parafilm; and a Photoionization Detector (PID).

The PID instrument measures airborne vapors that are detectable by photoionization. The PID comes equipped with a 11.7 electron volts (ev) ionization source which will charge any compound, having an ionization potential below 11.7 ev, to an exited state from which the compound's relative concentration in ppm (parts per million) can be read (all compounds expected to be encountered at the site have ionization potentials less than 11.7 ev). The PID instrument is not designed to identify individual compounds but is meant to quantify the concentration of total ionizable compounds present. The PID will be calibrated at least twice a day in order to maintain a degree of accuracy and to record the daily drifting of the instrument between calibration.

Once the operating grid has been located over the survey area, each survey point will be drilled as a small diameter borehole, using the power auger, open to a depth of approximately four feet (it is expected that the soil conditions present at the site will allow the shallow boreholes to remain open throughout the survey). Once the borehole has been drilled, one length of PVC pipe will be inserted into the borehole to approximately one foot below grade, and sealed at the surface by backfilling around the pipe with the auger cuttings. An adequate seal is essential in creating a preferential path for volatilized compounds that have diffused from the walls of the open borehole to collect within the headspace of the pipe. The top of the pipe is then fitted with parafilm to prevent the collected vapors from escaping into the air.

The collection pipes will be allowed to stabilize for at least one hour before any readings are taken. Vapors are then measured by inserting the tip of the PID through the parafilm and into the PVC pipe. The pump inside the PID, which becomes activated once the instrument is turned on, will draw the air from within the pipe and the open borehole into the ionization chamber. The recorded measurements will reflect both the highest attained instrument reading and the concentration (if encountered) at which it appears to represent a constant state. After the initial readings have been recorded, the collection pipes will be resealed and monitored in order to confirm the first round readings.

The soil gas survey points will be marked and identified with flags to help in locating the position of monitoring wells once the geophysical and soil gas data have been studied and interpreted.

4.4 Exploratory Trenching Investigation Methods

Approximately 2 or 3 trenches will be excavated into the landfill to gather information regarding the condition of the drums, as well as of the waste fill, soil, and groundwater or leachate conditions. The exact number of trenches will be based on the results of the surface geophysical survey and on other existing information (i.e., historical information and photographs), and on field observations made during excavation of each trench. At least one of the proposed trenches will be located coincident with a geophysical survey transect. The exact trench locations will be verified in the field by ECKENFELDER, INC., personnel prior to the actual work. During trenching, if conditions are found to vary widely from trench to trench, or physical limitations prohibit excavation of certain trenches, field personnel may elect to change trench locations or excavate additional trenches. Changing trench locations or the number of trenches excavated will not occur without prior approval from the client.

The trenches will be excavated using a trackhoe and will extend down to the anticipated depth of the drums, the maximum extended reach for the trackhoe, or until groundwater or leachate interferes with excavation or visual inspection. Additional equipment may be necessary when excavation reaches the drums to minimize the potential for sparking. Exploratory trenching will be performed by an operator that has received proper OSHA training in potential hazardous waste and/or material activities. The subcontractor will ensure that the trackhoe is properly cleaned in accordance with minimum decontamination procedures before being allowed on-site and before leaving the project area. The trenches will be approximately 10 feet in length at their base, and 4 to 6 feet in width (wider, if necessary). At least one end of each trench will be sloped to facilitate visual inspection at different depths by field personnel outside the trench. To keep the excavation open, it may be necessary to shore or brace the trench or slope the sides in accordance with OSHA standards.

The excavated material will be placed entirely on plastic sheeting of adequate thickness to minimize tearing and puncturing (e.g., 20 mil PVC) and will be segregated, as necessary, to allow proper backfilling. The plastic will be placed such that leachate seeping out of the waste, if any, flows back into the open excavation. In addition, the area where the excavated waste is placed will be bermed using temporary means (e.g., sand bags or hay bales) and the berms covered by the plastic. The excavated material will be placed an adequate distance from the open excavation so as not to cause additional stability problems. If groundwater or leachate is encountered, the relative point of entry into the trench and its depth below grade will be measured and noted. Encountering large volumes of leachate may prevent completion of the trench.

An appropriately trained professional will be on-site during trenching activities to observe the excavation and to visually classify the waste material and soil with depth and to look for evidence of saturated zones. The length of the trench will be observed for indications of spatial variation. To the extent possible, the visual classification will be performed by observing a side wall of each trench. Field personnel will not be allowed to enter the trench. The trackhoe operator will be instructed to excavate each trench such that, if the drums are present and intact, they will not be damaged. The on-site professional will visually classify excavated material from each trench to confirm observations of the trench walls. Photographs will be taken, as necessary, to help document trenching activities, and written logs will be prepared as discussed below.

Once each trench is completed (i.e., notes made, photographs taken, measurements obtained, etc.), the excavated material will be placed back into the trench in approximately the same order it was removed. In general, waste material encountered during trenching will be placed back into the trench first, with the protective plastic being placed on top. The trackhoe bucket will be used to compact the fill material as much as possible as backfilling progresses. Once the waste material has been replaced, the cover soil will be replaced to match, as close as practicable, conditions prior to excavation. Additional, clean soil may be required to provide at least two feet of cover over the waste in the excavation area if insufficient soil exists at the completion of the trench. Work areas will be graded appropriately to match surrounding grade and seeded to establish vegetation similar to existing conditions.

All health and safety precautions, as described in the Health and Safety Plan (see Appendix B of the Work Plan), will be strictly adhered to during exploratory trenching operations. In general, an exclusion zone, contamination reduction zone, and support zone will be set up and clearly marked around each trench. The ambient air in the exclusion zones will be monitored continuously, and the soil excavated from each trench will be screened frequently for organic vapor concentration using an Organic Vapor Analyzer (OVA) or Photoionization Detector (PID) and combustible gas indicators to monitor for explosive conditions. For stability and safety reasons, no trench will be allowed to remain open overnight. This will also minimize odor problems and control vector problems. Because excavated material will be returned to the trenches, investigation-derived waste is expected to include only personal protective equipment and decontamination wastes. Disposable personal protective equipment will be placed in garbage bags and disposed of with general site refuse.

The trackhoe and other equipment that comes into contact with the waste or drums will be cleaned prior to arrival at the site and prior to leaving the site. The subcontractor will be required to provide a sufficient quantity of potable water for cleaning purposes, a high pressure steam cleaner or pressure washer (2,500 psi and producing hot water and/or steam at 200°F), and to perform the following procedures.

1. Wash equipment thoroughly with phosphate-free laboratory detergent using a pressure washer and brush to remove any particulate matter or surface film.

2. Rinse equipment thoroughly with tap water.

3. Rinse trackhoe bucket thoroughly with deionized water.

4. Double rinse trackhoe bucket and soil boring auger with pesticide grade isopropanol.

5. Allow equipment to air dry.

All rinseates will be collected using a temporary cleaning pad to be constructed at a designated area on the site.

After completion of the exploratory trenching activities, the horizontal and vertical locations of the trenches will be surveyed in relationship to a permanent control point(s). Wooden survey stakes will be placed at each trench after backfilling, wrapped with fluorescent flagging for easy identification, and will be surveyed for both horizontal and vertical control (ground shot at bottom of stake). Exploratory trench locations will be labeled on survey stakes. This information will be included in the field log book. A steel tape will be used to measure excavation depths within the trench relative to the ground surface at the staked control point. These elevations, depths, or thicknesses can then be calculated directly from the ground surface elevation.

Prior to initiation of field work for the exploratory trenches, a more detailed operations plan will be prepared by the oversight contractor. The Operations Plan will detail the minimum requirements for excavation shoring or bracing, waste material and leachate management, spill response and control, environmental protection, landfill cover repair, health and safety considerations, and contingency measures. Consideration will be given in the Operations Plan to leachate handling capabilities at the landfill. In addition, permit and other regulatory requirements will be addressed, as appropriate, in the Plan.

Field measurements, etc., conducted during these investigations will be performed according to the protocols specified earlier in this Work Plan. A field log book will be used to record pertinent information which will include daily information collected during field activities, such as the date, weather conditions, site personnel, activities, and field measurements and observations. Field observations may address the general landfill conditions and setting; soil and fill material thickness, composition, and characteristics; presence of groundwater or leachate; odor; and drum information. Pertinent drum information may include notes regarding its condition (i.e., rusted, crushed, bulging, etc.) or markings. Each daily entry will be signed by at least one member of the observation team. Photographs will be marked on the back with indelible ink with the following information: photographer's name, date, project name and location, and a brief description of the photograph including orientation.

4.5 Drilling Program

The anticipation of both overburden and bedrock drilling conditions and potential subsurface contamination at the Old County Landfill warrants the implementation of a flexible two staged drilling program. The first stage of the program will initially confirm the existing geologic and environmental conditions using a drilling method and equipment which will efficiently advance a borehole and provide good quality continuous soil sampling. A decision to install a monitoring well in the exploratory borehole will be made based on the borehole's condition. If the exploratory borehole is judged to be unsuitable for monitoring well installation, a second stage of the drilling program will be initiated. The second stage of the program may involve the use of a water well drilling rig which can drill and install single or multi-cased monitoring wells without introducing drilling additives and the uncertainties to groundwater quality associated with these materials. A borehole will be judged unsuitable for monitoring well installation if it cannot be demonstrated, to the satisfaction of Barton & Loguidice, P.C., and the NYSDEC, that the drilling methodology and equipment has negligible impact on water quality of samples extracted from the monitoring well.

4.5.1 Exploratory Borings

The following drilling procedures will be utilized to complete the exploratory borings.

1. The boreholes will be advanced utilizing hollow stem augers or rotary methods of advancement until the requisite depth is encountered.

2. Drilling will proceed in a manner to permit continuous split-spoon sampling, and/or undisturbed sampling through the overburden materials until the required depth is achieved.

3. No drilling fluids other than potable water from an approved source will be used unless prior approval is received from the NYSDEC.

4. If, in the case of rotary drilling, difficulties arise in washing coarse materials out of the casing with water, drilling fluid additives mixed with potable water will be used to drill. Prior approval from the NYSDEC will be required and documented before utilizing any drilling additive.

5. All pertinent information and boring logs will be recorded by the observing geologist.

4.5.2 Multi-Cased Wells

When bedrock (or intermediate confining soil layers) are encountered during the investigation, the installation of permanent steel casing may be necessary. This method is the recommended procedure to minimize the risk of creating a contaminant pathway when drilling to a deeper strata.

1. The borehole will be advanced as described in Section 4.5.1. Upon identification of bedrock or other confining units, drilling will be temporarily suspended.

2. A four-inch flush joint/single permanent steel casing will be installed into the borehole. The steel will be driven into the confining layer a minimum of one-foot below the bottom of the existing borehole.

3. The borehole annular space will be grouted from the bottom by injecting a cement-bentonite grout mixture via the tremie method or an approved alternate method.

4. The grout will then be allowed to set, up to a minimum of 12 hours, or as determined by the supervising geologist.

5. Following the set-up period, drilling will be continued.

6. The drilling and sampling method will be in accordance with Section 7.1.1.

4.5.3 Shallow and Deep Monitoring Well Boreholes

1. Boreholes for the monitoring well installations will be advanced utilizing an appropriate drilling method of advancement until the requisite depth is encountered.

2. The monitoring wells will be drilled and located within a radial distance no greater than 15 feet away and no less than eight feet from the exploratory boring and/or adjacent monitoring well installation.

3. As with the drilling for the exploratory borings, should rotary drilling be required, only potable water from an approved source will be used unless prior approval is received from the NYSDEC for use of a drilling additive for removal of drill cuttings from the borehole.

4. The monitoring well boreholes adjacent to an exploratory borehole will be sampled in accordance with the procedures of the Standard Penetration Test (ASTM D1586-84) across geologic contact zones and in the screened interval.

4.5.4 Material Sampling/Analysis

4.5.4.1 Split Spoon

1. At each exploratory boring location, continuous split-spoon samples will be taken through the overburden in accordance with the procedures of the Standard Penetration Test (ASTM D1586-84). Before each sample is taken, depth will be confirmed by the supervising geologist.

2. Soils will be classified in accordance with the Modified Burmister Classification System. Field classification will include color, grain size, lithology, relative density, moisture content, soil texture and structure, relative permeability, and local geologic name. Classification will be based on the soils' identification key presented in Table 4-1.

3. HNU readings will be recorded from each split spoon as soon as the sampler is opened.

4. If VOC concentrations are observed to be greater than 5 ppm on the HNU, samples will be collected for laboratory analysis.

Table 4-1
OLD CORTLAND COUNTY LANDFILL RI/FS
KEY TO SOILS IDENTIFICATON

GRANULAR SOILS – PARTICLE SIZE CLASSIFICATION

Material		Fractions	Passing	Retained On
BOULDERS	Material retained on the 9-inch sieve			9 inch
COBBLES	Material passing the 9-inch sieve and retained on the 3-inch sieve		9 inch	3 inch
GRAVEL	Material passing the 3-inch sieve and retained on the No. 10 sieve	coarse (c) medium (m) fine (f)	3 inch 1 inch 3/8 inch	1 inch 3/8 inch No. 10
SAND	Material passing the No. 10 sieve and retained on the No. 200 sieve	coarse (c) medium (m) fine (f)	No. 10 No. 30 No. 60	No. 30 No. 60 No. 200
SILT	Material passing the No. 200 sieve that is non-plastic in character and exhibits little or no strength when air-dried		No. 200	

CLAY SOILS – PLASTICITY CLASSIFICATION

Material*	Degree of Overall Plasticity	Overall Plasticity Index Sand-Silt-Clay Components
Clayey SILT	Slight	1 to 5
SILT & CLAY	Low	5 to 10
CLAY & SILT	Medium	10 to 20
Silty CLAY	High	20 to 40
CLAY	Very High	40 and greater

* Soils passing the No. 200 sieve that can be made to exhibit plasticity and clay qualities within a certain range of moisture content, and that exhibit considerable strength when air-dried.

PENETRATION RESISTANCE AND SOIL PROPERTIES ON BASIS OF THE STANDARD PENETRATION TEST (AFTER PECK, HANSON, AND THORNBURG, 1974)

Sands (Fairly Reliable)		Clays (Rather Unreliable)	
Number of blows per foot, N	Relative Density	Number of blows per foot, N	Consistency
		Below 2	Very Soft
0 – 4	Very Loose	2 – 4	Soft
4 – 10	Loose	4 – 8	Medium
10 – 30	Medium	8 – 15	Stiff
30 – 50	Dense	15 – 30	Very Stiff
Over 50	Very Dense	Over 30	Hard

TERMS IDENTIFYING COMPOSITION OF SOIL

Written*	Defining Range of Percentage by Weight
and	35 to 50
some	20 to 35
little	10 to 20
trace	0 to 10

* Plus (+) or minus sign (–) used after identifying term denotes extremes of range; e.g., "some (–) Gravel" indicates 20 to 24% Gravel; "some (+) Gravel" indicates 31 to 35% Gravel.

5. Samples for volatile analysis will be transferred directly to 40 ml vials. The remaining soil will be transferred to soil jars for the analysis of the remaining parameters.

6. Follow record keeping and chain-of-custody procedures as detailed in Section 5.1.

7. Soil samples not sent for laboratory analysis will be placed in eight-ounce, wide-mouth, moisture-tight glass jars, and sealed with a foil liner and a screw-on cap.

8. Sample jars will be labeled with the following information: project name, project number, well identification, depth interval represented by the sample, blow counts, and date taken. This information will also be recorded in the field notebook.

9. The organic vapor levels in the headspace above the soil sample in each jar will be monitored using a HNU photoionization detector (samples placed in jars should allow a minimum of 1-inch of headspace for analysis). After allowing for some consistent equilibration time, the cap will be gently opened, and the HNU tip immediately inserted through the foil liner. This HNU reading and equilibration time will be recorded by the supervising geologist.

10. Split-spoon samples will be decontaminated following the procedures below when soil samples are to be collected for laboratory analysis.

    - Detergent wash with alconox
    - Potable water rinse

- 1% Nitric acid rinse
- Deionized or potable water rinse
- Hexane or methanol (pesticide grade) rinse
- Air dry
- Triple deionized water rinse
- Air dry

11. Laboratory geotechnical tests will be performed on selected soil samples to include: grain size distribution, moisture content, Atterberg limits, particle specific gravity, bulk unit weight and permeability (remolded and undisturbed). Test methods will conform to applicable ASTM Standards or approved equivalent NAVFAC or U.S. Army Corps of Engineers testing protocols.

4.5.4.2 Undisturbed Soil Sampling

1. Undisturbed samples will be attempted if conditions are appropriate. Sampling methods may include coring, Denison Tube sampling or large diameter split spoons with inserts.

2. The borehole will be "cleaned out" to the sample target depth and confirmed by the supervising geologist.

3. Only equipment which is free of rust or dents will be used to collect undisturbed samples. Each sample media will conform to appropriate American Society of Testing Materials requirements.

4. The sampling device will be advanced a maximum of 24 inches beyond the bottom of the hole at the time of sampling to avoid sample consolidation.

5. The Denison sample will be hydraulically pressed if possible. If soils are hard, the sample will be rotated using minimum down pressure. The supervising geologist will determine when to stop attempting a sample in dense soils.

6. Prior to withdrawal, the sample will be allowed to sit undisturbed for two minutes. The tube will then be rotated to shear the sample from the formation. Care will be taken during borehole removal to limit sample disturbance to a minimum.

7. The undisturbed sample will be sealed airtight immediately upon collection, using wax, plastic end caps, and tape. If the sample does not completely fill the sample tube, the extra space will be filled with a material that will not remove moisture from the sample.

8. The sample will be measured for recovery, and a line drawn directly onto the outside of the sample container with an indelible marker. The container will be labeled with project name, project number, boring location, sample number, depth interval, recovery, and a brief description of the material.

9. Specially designed shipping boxes will be used for disposition of the undisturbed samples to the offices of Barton & Loguidice, P.C., in Syracuse, New York.

10. All pertinent data will be recorded daily by the supervising geologist on the appropriate forms and field book.

11. Vertical permeability will be determined in the laboratory in a constant volume permeameter.

4.5.4.3 <u>NX Core</u>

1. A 15-foot continuous NX core will be taken in each of the deep test borings to confirm the bedrock surface and lithology.

2. All NX coring will be performed by rotary drilling methods using clean water as a drilling fluid.

3. Before coring, the bedrock will be reamed, using a 3-7/8-inch roller bit to at least 1 foot below the top of the bedrock to ensure a clean, competent surface to begin the coring procedure.

4. Individual core runs will not exceed 10 feet in length.

5. Starting depth for every core run will be verified prior to core drilling by the supervising geologist.

6. Core samples will be collected, examined, and logged immediately upon retrieval, and stored in specially-designed wooden boxes.

7. Visual field classification of the rock core will include: lithology and texture, color, hardness, degree of weathering, bedding/joint/fracture spacing, discontinuities, and local geologic name.

8. Rock Quality Designation (RQD) will be recorded for all core samples using USGS recommended procedures.

9. Each core box will be labeled with the project name, project number, boring location, depth interval, run number, recovery, RQD, the top and bottom of the run, and the date.

10. In addition to visual classification, the supervising geologist will record all observations during core drilling, including coring rate in minutes per foot, fluid gain or loss, drill rig reactions, and types of casing and drilling fluid used.

11. The core samples will be stored at a suitable location provided by Cortland County Department of Solid Waste.

4.5.5 Installation of Monitoring Wells

The procedures to be utilized for each type of well installation are outlined below.

4.5.5.1 Monitoring Wells

1. A minimum four-inch diameter borehole will be advanced via hollow stem augers or rotary drilling with split-spoon and/or "undisturbed" sampling. For bedrock monitoring wells, the NX core hole will be reamed to a diameter of approximately four inches.

2. The monitoring well will be constructed of two-inch Schedule 40 PVC riser with continuous wire-wrap PVC well screen.

3. Using only potable water, the boreholes will be flushed to remove drilling fluid and cuttings by injecting water through the well and out the screen.

4. A six-inch bottom sand pack will be installed upon which the well will rest.

5. Following proper backfill, the well screen and riser will be installed.

6. The well screens will be placed in accordance with Section 4.2.4 of the Work Plan.

7. A clean, coarse sand pack will be placed in the annular space surrounding that portion of the well occupied by the screen, and for a minimum of two feet above the top of the screen.

8. A six-inch fine sand filter will be placed above the coarse sand pack.

9. A two-foot minimum bentonite seal will be placed above the fine sand filter.

10. An additional six-inch fine sand filter will be placed above the bentonite seal.

11. The remaining annular space will be filled to within 2-3 feet of the ground surface with cement-bentonite grout using the Tremie installation method.

12. A concrete surface seal no less than 18 inches in diameter and approximately 2-3 feet below ground surface will be constructed around the PVC riser and protective casing.

13. A steel locking cap will be fitted to the six-inch ID steel casing extending aboveground to secure the location.

14. The steel protective casing will be clearly and permanently marked with the well identification number.

4.5.6 Sand Pack, Bentonite Pellet Seal, and Cement-Bentonite Grout

4.5.6.1 Sand Pack

1. The sand pack will consist of uniformly-graded, clean inert sand, suitable at minimizing the amount of fine materials entering the well. The sand size must not inhibit water from entering the well. The fine sand filter layer above the sand pack will exhibit 100 percent by weight passing the No. 30 sieve, and less than two percent by weight passing the No. 200 sieve.

2. Samples of the sand pack and fine sand filter materials are to be retained and placed in eight-ounce wide-mouth glass jars, sealed and stored by Barton & Loguidice for a one year period.

4.5.6.2 Bentonite Seal

1. Pure Wyoming sodium bentonite pellets or chips will be used, and will be less than one-half the width of the annular space. An alternative method could be the use of a granular bentonite slurry which would be installed by pressure grouting with tremie rods.

2. After the seal is installed, there will be a minimum of a 30-minute waiting time period. This will allow for proper swelling and action of the bentonite before placement of the grout.

4.5.6.3 Cement-Bentonite Grout

1. Cement shall be Portland cement Type I, in conformance with ASTM C150.

2. Bentonite will be a powdered Wyoming sodium bentonite.

3. Proportions of cement/bentonite/water in the grout mix will be approximately 94 pounds/3 to 5 pounds/7.0 gallons, respectively.

4. The grout mix will be installed by pressure grouting through tremie rods.

5. The grouting will be complete when the grout mixture returns to the ground surface.

4.5.7 Boring Logs and Record Keeping

During the drilling of each borehole and installation of each monitoring well, an accurate log will be kept and include the following:

1. Date and time of construction/drillers and helper's name, and Barton & Loguidice supervising geologist.

2. Drilling method utilized.

3. The reference point for all depth measurements (i.e., ground surface).

4. The depth at which each change of formation is identified.

5. The depth at which the first water bearing zone is defined.

6. The thickness of each stratum.

7. The description of the material of which each stratum is composed, including:

    a. Depth, sample number
    b. Grain size, as defined by the Modified Burmister System
    c. Color
    d. Degree of weathering cementation, and density
    e. Other physical characteristics

8. The depth interval from which each formation sample was taken.

9. The depth at which hole diameters (bit sizes) change, if applicable.

10. The depth to the static water level (SWL) and changes in SWL with well depth, if possible.

11. Total depth of completed well.

12. The depth and description of the well casing materials, screen and riser lengths, sand pack, pellets, and grout.

13. Depth or location of any lost drilling materials or tools.

14. The nominal hole diameter of the well bore above and below the casing seal.

15. The amount of cement and bentonite (number of bags) installed for the seal.

16. Screen materials and design.

17. Casing and screen joint type.
18. Screen slot size/length.
19. Pack, seal, and grout material used.
20. Type of protective well cap.
21. HNU readings

Figure 4-1 presents the test boring log to be utilized by Barton & Loguidice.

A daily report will be prepared and will give a complete description of all formations encountered, number of feet drilled, number of hours on the job, standby or shutdown time, the water level in the well at the beginning and end of each shift, water level at each change of formation (if readily measurable with the drilling method used), feet of casing installed, and other pertinent data. Figure 4-2 presents the daily log to be used.

4.6 Well Development

The purpose of well development is to remove fine materials from the area of the screen and prepare a monitoring well for future groundwater measurement and sampling activities. This is achieved by various development methods until such time as the water quality obtained from the well is consistent with water quality in the formation from which the water is obtained, usually determined by measurement of pH, specific conductivity, or turbidity. Well development shall be performed using the following outlined field procedures.

FIGURE 4-1

B&L

BARTON & LOGUIDICE, P.C.

SUBSURFACE LOG

Boring No.

Sheet of

PROJECT:
CLIENT:
LOCATION:

PROJECT No.

DRILL RIG:
CASING:
SOIL SAMPLER:
SAMPLE HAMMER: Wt: lbs. Fall: inches
ROCK SAMPLER:
OTHER:

ELEVATION: feet
DATUM: NGVD
LOC. (COORDS): N, E
START DATE:
FINISH DATE:
CONTRACTOR:
DRILLER:
GEOLOGIST:

DEPTH IN FEET	SAMPLE	Rec. (ft)	Blows per 6 ins	N or RQD (%)	Lith.	MATERIAL DESCRIPTION	Remarks
0							
5							
10							
15							
20							
25							
30							
35							
40							

FIGURE 4-2

BARTON & LOGUIDICE, P.C.

DAILY ACTIVITY RECORD
SUBSURFACE INVESTIGATION

PROJECT No. ______
DATE: ______
B&L Form No. 141
12/94

PROJECT: ______ HOLE No. ______
CONTRACTOR: ______ WEATHER: ______
RIG TYPE: ______ DRILLER: ______

QUANTITIES LOG

ITEM	ITEM SIZE	From (ft.)	To (ft.)	QUANTITY
AUGERS	3¼" ☐ 4¼" ☐ 6¼" ☐ 8¼" ☐ Other___			
CASING	3" ☐ 4" ☐ 5" ☐ 6" ☐ Other___			
OPEN HOLE	2⅝" ☐ 3⅞" ☐ 4½" ☐ Other______			
ROCK CORE	AX ☐ BX ☐ NX ☐ HX ☐ Other___			
REAMING	2⅝" ☐ 3⅞" ☐ 4½" ☐ Other______			
CUTTING RETURN	Air ☐ Water ☐ Mud ☐ Other______			
SPLIT SPOON SAMPLES	2"x18" ☐ 2"x24" ☐ 3"x24" ☐ Other___			(No.)
WELL SCREEN	1¼" ☐ 2" ☐ 4" ☐ .01 slt☐ .02 slt☐ Otr__			
WELL RISER	1¼" ☐ 2" ☐ 4" ☐ Other______			
GUARD PIPE	Length______ Diameter______			(No.)
OTHER ______	______			

TIME LOG

ACTIVITY	6 A.M.	7	8	9	10	11	12	1	2	3	4	5	6	7	8 P.M.	REMARKS
ADVANCEMENT ______																
(open hole, ______																
aug,cas,etc) ______																
DECONTAMINATION																
HOLE-TO-HOLE ACCESS																
WELL INSTALLATION																
WELL DEVELOPMENT																
WATER RUN																
SET UP/SHUT DOWN																DAILY ITEMS
STANDBY																
LUNCH BREAK																
OTHER ______																
		7	8	9	10	11	12	1	2	3	4	5	6	7		

B&L REP. TOTAL HOURS ______ CONTRACTOR REP. TOTAL HOURS ______

SIGNED ______ SIGNED ______

4.6.1 Development Field Procedures

1. Inspect locking casing and surface concrete seal for integrity.

2. Open the well.

3. Measure static water level from top of the well casing and the well bottom depth; and calculate water volume from the formula:

$$V = \pi R^2H$$

   Where:

   V = volume, (ft^3)
   R = well ID radius, (ft)
   H = length of water column, (ft).
   π = 3.14

4. Lower a pre-cleaned Teflon bailer connected to new solid braid nylon rope to the bottom of the well.

5. Bail the well until all fines are removed from the well and there is no solid sediment in the bottom of the well.

6. Continue bailing or install a well pumping system to complete well development. Pumps should be equipped with a backflow prevention valve.

7. If a pumping system is used, activate the pump, record time and flow rate.

8. At 15-minute intervals during development, record temperature, pH, specific conductivity, and turbidity, utilizing calibrated instruments (see Attachment A for specific instrument calibration procedure).

9. The pump shall be periodically raised and lowered throughout the water column to ensure the screened interval is completely developed.

10. If, as anticipated, low yield and slow recovery do not permit continuous pumping, the well will be pumped or bailed at periodic intervals.

11. Development shall be considered complete when the following conditions are achieved for three successive measurement intervals:

    - Temperature and conductivity are within ±10% of the previous readings.

    - pH to ±0.3 pH units.

    - Turbidity has reached 50 NTU. In the event that 50 NTU cannot be achieved because of the nature of the formation, the NYSDEC will be notified and an alternative criteria will be mutually agreed upon (e.g., purging to continue until NTU readings have stabilized to within ±10%).

12. When the preceding conditions are met, remove the pump, measure the water level, secure and lock the well.

13. Record all pertinent information in a field book.

4.7 In-Situ Hydraulic Conductivity Testing

In-situ variable head hydraulic conductivity testing will be performed within each completed piezometer and monitoring well after sufficient development work has been accomplished. Also known as the slug or bail test, this method involves either the removal of a bail of water or the displacement of water within the well by the insertion of a slug. Upon creating an elevated or depressed head, the water level in the well is measured and recorded periodically over the recovery time.

The underlying assumption in the analyses of these tests is that the rate of inflow to the well, after inducing a hydraulic head difference, is a function of the hydraulic conductivity (k) and the unrecovered head distance. The analytical method, typically relying on graphical solution techniques (time vs. head or head ratio), rearranges the flow equation to solve for parameter k. For unconfined groundwater conditions, the Hvorslev and Bouwer-Rice methods will be used. Details of these methods are given, respectively, in publications by Hvorslev (1951) and Cedergren (1977), and by Bouwer & Rice (1976) and Bouwer (1989). For confined groundwater conditions, if any are encountered, the Cooper-Bredehoeft-Papadopulos method will be used (Cooper et al. 1967; Papadopulos et al. 1973).

It is important to observe whether the static water level recorded prior to starting the variable head test occurs within the screened interval of the well or piezometer; if so, the use of the slug test (falling head) is inappropriate due to drainage into the vadose zone above the water table. A bail test (rising head) is preferred in such circumstances.

Depending on the rate of recovery, the water levels are recorded during the test either with an electronic probe and/or a tape equipped with a sounding "popper", or with an immersed pressure transducer connected to a HERMIT-type (In-Situ, Inc.) automatic data logger. The latter device is appropriate for rapid recovery conditions, since considerable data are recorded during the first few seconds and minutes of the test, with a greater accuracy than is possible using the manual observation method.

4.8 Groundwater Sampling

4.8.1 Monitoring Well Sampling Procedure

The primary objective of field personnel in obtaining groundwater samples is to collect and preserve representative samples, and adhere to proper custody procedures in their prompt shipment to the certified laboratory for analyses within the specified holding times. Upgradient wells will be sampled prior to downgradient wells in the following manner:

1. Monitoring wells will be purged prior to sampling using disposable Teflon bailers or properly decontaminated pumping equipment. A minimum of three well volumes will be purged where possible. For wells that bail dry, purging will consist of complete evacuation. Specific conductance, pH, Eh, temperature and turbidity will be monitoring during purging to confirm stable water quality conditions.

2. Following adequate recovery, obtain sample with a disposable Teflon bailer suspended on new, solid-braid nylon rope. Transfer sample directly from the Teflon bailer to the parameter-specific sample vessels labeled appropriately (sample ID Number and preservative), and place in coolers with ice or ice packs. Fill sample bottles in the following order: VOAs, metal filtration flask, inorganics, indicator parameters, and organics. A specific procedure for metals filtration, should it be required, appears in Section 4.8.2.

3. Record duplicate measurements of pH, Eh, temperature, and specific conductivity at this time, along with the date and the time the sample was obtained. Sample appearance such as color, odor, and turbidity will also be recorded.

4. Calibrate all field chemistry equipment every four hours (see Attachment A). Details on the calibration and calibration frequency will be recorded.

5. Follow record keeping and chain-of-custody procedures as detailed in Section 5.1.

6. Replace all well caps, and lock protective well cover.

7. At the end of the sampling day, the coolers will be taped shut with the custodian's initials placed on the tape at the points of entry. Samples will be shipped via Federal Express to the contract laboratory for morning delivery or delivered directly to the laboratory by the field personnel at the end of the sampling day.

8. Contact with the laboratory will be made within 24 hours after each sampling event to ensure that samples arrived safely and with proper integrity preserved.

4.8.2 Metals Filtration

Samples for dissolved metals analysis will be field-filtered should a turbidity of 50 NTU not be achieved following well purging. The following procedure will be used:

1. Assemble pre-cleaned filter flask, funnel sections, and vacuum hand pump.

2. Insert a new 0.45 um pore size/47 mm diameter cellulose nitrate membrane filter between the two sections of the filter funnel.

3. Transfer water from bailer to top section of filter funnel. Fill funnel completely or partially, depending on water clarity.

4. Operate pump until 50 to 76 cm of mercury vacuum is achieved.

5. Replace filter when top section of funnel is empty, or when filter becomes clogged. With very turbid samples, it may be necessary to change the filter after every 100 mls of water.

6. When sufficient filtered sample is obtained, transfer sample from filter flask to sample bottle containing appropriate preservative, taking care that no sample water enters into the tubing leading to the vacuum hand pump.

7. Between wells, thoroughly field-clean assembly as described in Section 4.2.1.

8. Following field cleaning of the filter assembly, repeat Steps 2 through 7 on next sample.

4.9 Surface Water Sampling

Surface water samples will be collected from various locations on or around the site. Mid-depth samples will be obtained from each station, where possible. Samples will not be collected immediately after periods of heavy rains.

1. Immerse sample bottle in stream with cap on to desired depth.

2. While keeping bottle upright, remove cap, allowing bottle to fill.

3. When bottle is full, replace cap and remove from stream.

4. If stream to be sampled is not sufficient depth to allow full immersion, bottle may be tilted. However, care must be taken to ensure that the preservative in the sample bottle (if any) does not spill out.

5. Place filled bottles in coolers with ice or ice packs as soon as possible.

6. Record duplicate measurements of temperature, pH, Eh and conductivity. Dissolved oxygen measurements will be done at this time. Sample appearance such as color, odor and turbidity will also be recorded.

7. Field notes will include a description of sample location, field measurements, sample descriptions, and general flow conditions.

8. Record the flow rate of the stream.

9. Follow record keeping and chain-of-custody procedures as followed as detailed in Section 5.1.

10. At the end of the sampling day, the coolers will be taped shut with the custodian's initials placed on the tape at points of entry. Samples will be shipped via Federal Express to the contract laboratory for morning delivery, or delivered directly to the laboratory by the field personnel at the end of the sampling day.

11. Contact with the laboratory will be made within 24 hours after each sampling event to ensure that samples arrive safely and with proper integrity preserved.

4.10 Sediment Sampling

Sediment samples will be collected from the stream bed in various locations. A stainless steel hand corer or scoop will be utilized to extract the sediment in the following manner:

1. Vertically line up the sampler, and push the sampler in a smooth and continuous movement through the sediments to the desired penetration (maximum six inches). If stream depth or conditions prohibit the use of the corer, a scoop will be used to extract sediments.

2. If the corer has not been completely submerged, close the flutter valve by hand, and press it shut while the sample is retrieved.

3. Extract the sample into the parameter-specific sample bottle, label appropriately (sample ID Number), and store on ice or ice packs as soon as possible.

4. Follow record keeping and chain-of-custody procedures as detailed in Section 5.1.

5. Thoroughly field clean corer or scoop as described in Section 4.2.1.

6. At the end of the sampling day, the coolers will be taped shut with the custodian's initials placed on the tape at points of entry. Samples will be shipped via Federal Express to the contract laboratory for morning delivery, or delivered directly to the laboratory by the field personnel at the end of the sampling day.

7. Contact with the laboratory will be made within 24 hours after each sampling event to ensure that samples arrived safely and with proper integrity preserved.

4.11 Leachate Sampling

Leachate samples will be collected from select locations on the site where active leachate seeps are observed. Samples will be obtained in the following manner:

1. If the leachate seep is of sufficient depth, submerge mouth of appropriate sample container in seep so that discharge leachate will flow undisturbed directly into the sample container. Care must be taken to ensure that the preservative in the sample bottle (if any) does not spill out.

2. If there is not sufficient depth, a small space may be excavated for the sample container with a pre-cleaned steel hand shovel so that undisturbed leachate will flow into the bottle. If unsuccessful, a glass or stainless steel beaker will be used to collect leachate sample and transfer to appropriate container.

3. Place filled sample containers in coolers with ice or ice packs as soon as possible.

4. Record duplicate measurements of temperature, pH, Eh and specific conductivity.

5. Field notes will include a description of sample location, field measurements, sample descriptions, and general flow conditions.

6. Record the flow rate of the seep.

7. Follow record keeping and chain-of-custody procedures as detailed in Section 5.1.

8. Steps 1 through 7 will be accomplished at each leachate sampling location.

9. At the end of the sampling day, the coolers will be taped shut with the custodian's initials placed on the tape at points of entry. Samples will be shipped via Federal Express to the contract laboratory for morning delivery or delivered directly to the laboratory by the field personnel at the end of the sampling day.

10. Contact with the laboratory will be made within 24 hours after each sampling event to ensure that samples arrived safely and with proper integrity preserved.

4.12 Air Quality Screening

Air screening will be conducted in all areas of the landfill where vegetation burnouts indicate the presence of methane migration through cover soils. A qualitative survey will be performed by establishing a 100-foot by 100-foot grid over the area and walking along it with a photoionization detector (HNU, 10.2 eV lamp), which records total VOCs (volatile organic compounds). Readings will be taken every 10 feet, approximately two feet above ground surface. All readings will be recorded and plotted on sketches of the surveyed areas. The perimeter of the landfill will also be surveyed.

A reference stake will be placed in all areas monitored to allow later surveying and inclusion in the base map.

4.13 Ecological Evaluation

Terrestrial Survey

An evaluation of the ecology of the Old Cortland County Landfill site, as well as the surrounding area, will be conducted. The ecology of the area will be described in terms of on-site and off-site vegetation and wildlife. Where possible, a specific list of plant and animal species (including mammals, birds, and reptiles) occurring in the area will be provided. These lists will be based on field observations (sightings, track counts, nests, etc.), existing ecological surveys (if available), and if necessary, an evaluation of the habitat to determine what species could be found in the area based on individual species habitat requirements.

A general vegetative cover map of the site and surrounding area within 0.5 miles will also be constructed from aerial photos and field observations. The cover map will delineate vegetative communities by comparing species composition and structural diversity (i.e., foliage height, spatial distribution, percent cover, etc.) of each plant community.

Due to the fact that all wastes are presently buried, there appears to be a very limited direct contact route for exposure of wildlife to potential contamination (except leachate). There may be a small population of wildlife species occupying the immediate vicinity of the site which could be affected, but their numbers are expected to be small. Subsequently, no provision for tissue analysis from on-site wildlife have been included in this Work Plan. If significant contamination is detected migrating off the site, or the potential for exposure to wildlife is determined to be greater than previously anticipated, biotic sampling and tissue analysis will be reconsidered.

Aquatic Survey

To evaluate baseline conditions in aquatic habitats in the vicinity of the site, a qualitative survey of the fisheries resources inhabiting settlement ponds, the unnamed stream of Trout Creek (located south of the site) and in the Maybury Brook, will be performed. Fish sampling will be performed using an electroshocker and/or seine to obtain a representation of the species present in each water body. Sampling locations will be in similar habitats upstream and downstream, or where leachate outbreaks are known to contact the subject surface waters. A total of four sampling locations are proposed; two in Maybury Brook (one upstream and one downstream, one in the settlement ponds, and one at a downstream location in the unnamed stream).

Fish captured would be identified by species and measured. Data will be presented in tabular form and will contain an assessment of the aquatic habitat in each sampling location.

A quantitative benthic macroinvertebrate survey will be conducted within the previously mentioned aquatic survey locations. Parameters to be measured include taxonomic composition, abundance, species diversity, and richness.

The reporting format for the ecological inventory will consist, in part, of species lists by taxon of invertebrates and vertebrates observed on the site and in the surrounding areas. Designations of general abundance (i.e., abundant, common, uncommon) will be given to each species. Special attention will be given to determining the status of any Federal- or State-listed endangered or threatened species.

Textural material will consist of descriptions of the faunal communities and an assessment of the species richness on the site.

Direct interrelationships (i.e., food chains) between species will be discussed, if relevant. Any gross deviations in species composition from what might be expected in the existing available habitats will be discussed.

During the course of this investigation, it is possible that the presence of significant contamination, combined with utilization of the site by wildlife species, may result in the discovery of a significant route of exposure and migration. In the event that contamination of biological communities is suspected, collection of terrestrial and aquatic biota samples for tissue analysis may be recommended. NYSDEC will be notified of any developments regarding the need for biota sampling. In the event that biota sampling is deemed appropriate at the Old County Landfill, a separate work plan and budget will be submitted for approval.

4.14 Staff Gauges

Surface water staff gauges will be installed at each surface water and sampling location.

1. Steel fence posts will be driven into the soils until refusal.

2. The staff gauges will be labeled and flagged for future identification.

3. Each gauge will be surveyed to establish its coordinates and vertical elevation (0.01-foot accuracy).

4. The top of the water surface will be measured from the top of the gauge (0.01-foot accuracy).

5. Surface water elevation readings will be taken:

   - Upon initial construction
   - During sampling events
   - Concurrent with any water level readings on the monitoring wells.

4.15 Water Level Monitoring

In order to determine the vertical and horizontal groundwater conditions, water level measurements will be recorded.

1. After noting the general conditions of the well (surface seal, lock, etc.), the bottom will be sounded by lowering a decontaminated probe to the bottom of the screen.

2. Bottom conditions will be noted (silty, foam). The distance from the base of the screen to the top of the casing will be recorded (0.1 inch).

3. The static water level will be measured and noted by sounding with a steel tape or "popper" (0.01 foot accuracy). This method can also be supplemented by recording the water level with an electric water level probe.

4. The water level readings will always be taken from a marked point on the protective casing.

5. Other measurements to be taken are:

   - Stick up of protective casing from ground surface/surface seal.
   - Depth to bottom of well from the top of the riser and top of the casing (protective).

6. The date and time will be recorded for these measurements. Also, any pertinent weather conditions will be noted (i.e., significant recent precipitation).

7. Upon completion, the wells will be secured, and all down hole equipment will be decontaminated with methanol and deionized water.

5.0 QUALITY ASSURANCE/QUALITY CONTROL

5.1 Record Keeping and Chain-of-Custody

The sampler's field records will contain sufficient information such that someone else can reconstruct the sampling situation without reliance on the sampler's memory. Entries in the field records will include, at a minimum, the following:

- Site name and location
- Project number
- Name and affiliation of Project Manager and samplers involved
- Sampling point name and description
- Type of sample container(s) used
- Preservative(s) used
- Well purging procedure and equipment
- Well specific(s) such as static water level, depth, and volume purged
- Sample collection procedure and equipment
- Date and time of collection
- Collector's sample identification number(s)
- Laboratory's sample identification number(s)
- References such as maps or photographs of the sampling site, if available
- Field observations
- Pertinent weather factors such as temperature, wind direction, and precipitation
- Any field measurements made, such as pH, specific conductivity, or appearance

A sample field sampling data sheet is presented in Figure 5-1.

Chain-of-custody records for all samples shall be maintained.

FIGURE 5-1

B&L
BARTON & LOGUIDICE, P.C.

SAMPLING DATA SHEET

SITE: ____________________ SAMPLE LOCATION: ____________
CLIENT: ____________________ JOB #: ____________
Weather Conditions: ____________________ Temp: ____________

SAMPLE TYPE: Groundwater ☐ Surface Water ☐ Leachate ☐
Sediment ☐ Other (specify): ____________

WATER LEVEL DATA

Static Water Level (feet)*:	
Measured Well Depth (feet)*:	
Well Casing Diameter (inches):	
Volume in Well Casing (gallons):	

* depth from measuring point

Measuring Point: Top of Riser ☐
Other (specify) ____________
Measured by: ____________
Time: ________ Date: ________

PURGING METHOD
Equipment: Bailer ☐ Submersible Pump ☐ Air Lift System ☐
Bladder Pump ☐ Foot Valve ☐ Peristaltic Pump ☐
Dedicated ☐ Non-dedicated ☐

Volume of Water Purged (gallons): ________
Did well purge dry? No ☐ Yes ☐
Did well recover? No ☐ Yes ☐ Recovery Time : ____________

SAMPLING METHOD
Equipment: Bailer ☐ Submersible Pump ☐ Air Lift System ☐
Bladder Pump ☐ Foot Valve ☐ Peristaltic Pump ☐
Dedicated ☐ Non-dedicated ☐

Sampled by: ____________ Time: ________ Date: ________

SAMPLING DATA
Sample Appearance
Color ____________ Sediment ____________
Odor ____________ Product: No ☐ Yes ☐ Thickness ________

Field Measured Parameters

pH (Standard Units)			Sp. Conductivity (umhos/cm)	
Temperature (°F)			Eh-Redox Potential (mV)	
Turbidity (NTUs)			Dissolved Oxygen (mg/l)	
Explosive Gases	%LEL	ppm	Total Organic Vapors (ppm)	

Samples Collected (Number/Type) ____________________
____
____

Samples Delivered to: ____________ Time: ________ Date: ________

COMMENTS: ____________________
____
____

B&L Form No. 127 Rev. 7/93

A sample shall be considered to be "in custody" of an individual if said sample is either in direct view of or otherwise directly controlled by that individual. Storage of samples during custody shall be accomplished according to established preservation techniques, in appropriately sealed and numbered storage containers. Chain-of-custody shall be accomplished when the samples or sealed sample shuttles are directly transferred from one individual to the next, with the first individual witnessing the signature of the recipient upon the chain-of-custody record.

The chain-of-custody records will contain the following information:

- Respective sample numbers of the laboratory and Barton & Loguidice, if available
- Signature of collector
- Date and time of collection
- Sample type (e.g., groundwater, surface water)
- Identification of well or sampling point
- Number of containers
- Parameters requested for analysis, if appropriate
- Signature of person(s) involved in the chain of possession
- Description of sample bottles and their condition
- Problems associated with sample collection (i.e., breakage, no preservatives), if any

A sample chain-of-custody record is presented in Figure 5-2.

Chain Of Custody Record

Client:		Client Project # / Project Name	
Client Contact:	Phone #	Site Location (city/state)	

Special Turnaround Time__________ (Lab Notification required)

Sample Location:	Date	Time	Matrix	Grab or Comp.	ULI Internal Use Only	No. of Containers	1)	2)	3)	4)	5)	6)	7)	8)	9)	10)	Remarks

parameter and method	sample bottle: type	size	pres.
1)			
2)			
3)			
4)			
5)			
6)			
7)			
8)			
9)			
10)			

Note: The numbered columns above cross-reference with the numbered columns in the upper right-hand corner.

Sampled by: (Please Print) Company:			ULI Internal Use Only Delivery (check one): ☐ ULI Sampled ☐ Pickup ☐ Dropoff ☐ CC __________
Relinquished by: (Signature)	Date	Time	Received by: (Signature)
Relinquished by: (Signature)	Date	Time	Received by: (Signature)
Relinquished by: (Signature)	Date	Time	Received by: (Signature)
Relinquished by: (Signature)	Date	Time	Rec'd for Lab by: (Signature)

FIGURE 5–2

5.2 Field Sample QA/QC Procedures

5.2.1 Field and Trip Blanks

To check the integrity of field sampling and equipment cleaning techniques, the following field quality assurance/quality control (QA/QC) procedures will be adhered to for this effort.

A field blank will be performed on-site each sampling day during surface water/sediment and soil/waste sampling, and utilize the identical equipment pre-cleaning and sampling techniques. A trip blank for water samples to be analyzed for VOCs will accompany sample containers through all phases of the sampling event to ensure proper bottle preparation and laboratory integrity. Trip blank and field blank samples will receive identical handling and custody procedures as on-site samples.

Field and trip blanks are used as control or external QA/QC samples to detect contamination that may be introduced in the field (either atmospheric or from sampling equipment), in transit to or from the sampling site, or in the bottle preparation, sample log-in, or sample storage stages within the laboratory. The blanks will also show any contamination that may occur during the analytical process.

The trip blanks are samples of analyte-free water, prepared at the same location and time as the preparation of bottles which are to be used for sampling. They remain with the sample bottles while in transit to the site, during sampling, and during the return trip to the laboratory. At no time during these procedures are they opened. Upon return to the laboratory, they are analyzed as if they were another sample, receiving the same QA/QC procedures as ordinary field samples. If these samples are accidentally opened, it will be noted on the chain-of-custody.

Field blanks are prepared in the field (at the sampling site) using empty bottles and analyte-free water supplied separately (prepared at the same time and place as the bottles used in the sampling). The preferred procedure for non-dedicated sampling equipment is used for sampling, and then into the empty sample bottles supplied for the field blank.

Field and trip blanks are not considered part of the laboratory QA/QC procedures. The latter, used to detect contamination during analytical steps, are only included as part of the laboratory service, and assess the validity of the laboratory analytical procedures. Field and trip blanks are required as part of QA/QC procedures for the overall sampling and analytical program.

5.3 **Field Instrument Calibration**

The Field Operations Leader is responsible for assuring that a master calibration/ maintenance log will be maintained for each measuring device. Each log will include at least the following information where applicable:

- Name of device and/or instrument calibrated
- Device/instrument serial and/or I.D. number
- Frequency of calibration
- Date of calibration
- Results of calibration
- Name or person performing the calibration
- Identification of the calibration gas (HNU only)
- Buffer solutions (pH meter only)

Preparation and operational check-out and pre-calibration procedures for sampling and safety equipment are contained in Attachment A.

5.4 Sample Analysis QA/QC Procedures

5.4.1 Overview

The purpose of the laboratory QA/QC program is to establish and maintain laboratory practices that will ensure the scientific reliability and compatibility of the data generated in support of the project.

Quality assurance (QA) is the system for ensuring that all information, data, and resulting decisions compiled under an investigation are technically sound, statistically valid, and properly documented. Quality control (QC) is the mechanism through which quality assurance achieves its goals. Quality control programs define the frequency and methods of checks, audits, and reviews necessary to identify problems and dictate corrective action, thus ensuring high quality data.

The laboratory QA/QC program will outline the purpose, policies, organization, and operations established to support the chemical analysis.

The laboratory quality assurance and quality control (QA/QC) procedures will be submitted as part of the laboratory selection process. The QA/QC document submitted by the contracted laboratory will be appended to this document as Attachment B. The laboratory selected will be familiar with NYSDEC ASP 1991 and maintain NYSDOH ELAP certification for all sub-categories of solid and hazardous waste.

5.4.2 Laboratory Selection Criteria

A laboratory will be selected that is qualified to do work required for the site. Examples of selection criteria are as follows:

1. Capabilities (facilities, personnel, instrumentation)

    a. previous use
    b. certifications (as required)
    c. references (recommendations by other uses of the laboratory)

2. Services

    a. turnaround time
    b. completeness of reports
    c. compliance with holding times

3. QA/QC Programs

All laboratories must have a detailed written QA/QC program meeting the minimum requirements of the NYS Department of Environmental Conservation and the NYS Department of Health, and must be NYSDOH ELAP certified for CLP and all analyses being performed.

4. Approvals

All laboratories used will be approved by Barton & Loguidice prior to the analysis of samples. The selected analytical laboratory will be committed to providing analytical services for groundwater, soil and hazardous materials which are commensurate with current state-of-the-art analytical procedures, laboratory practices and instrumentation.

5.4.3 Data Validator Selection Criteria

A data validator will be selected based on the required qualifications presented in Attachment C, and must meet Department requirements for performing data validation.

6.0 REFERENCES

American Society for Testing and Materials (1984). Penetration Test and Split-Barrel Sampling of Soils. ASTM D1586-84.

Bouwer, H. & R.C. Rice (1976). "A Slug Test for Determining Hydraulic Conductivity of Unconfined Aquifers with Completely or Partially Penetrating Wells". Water Resources Research, 12 (3), pp. 423-428.

Bouwer, H. (1989). "The Bower & Rice Slug Test - An Update". Ground Water, 27 (3), pp. 304-309.

Cedergren, H.R. (1977). Seepage Drainage and Flow Nets, John Wiley and Son, Inc., New York.

Cooper, H.H., Jr., J.D. Bredehoeft, and I.S. Papadopoulos (1967). Response of a finite diameter well to an instantaneous charge of water. Water Resources Res., 3, pp 263-269.

Ferris, J.G., and D.B. Knowles (1963). The Slug Injection Test for Estimating the Coefficient of Transmissibility of an Aquifer in Methods of Determining Permeability, Transmissibility and Drawdown, Geological Survey Water-Supply Paper 1536-I

Hvorslev, M.J. (1951). Time Lag and Soil Permeability in Ground-Water Observations, Bulletin 36, Waterways Experiment Station, U.S. Army Corps of Engineers.

Papadopoulos, I.S., J.D. Bredehoeft, and H. H. Cooper (1973). On the Analysis of Slug Test Data. Water Resources Res., 9, pp. 1087-1089.

ATTACHMENT A

FIELD EQUIPMENT CALIBRATION

ATTACHMENT A

FIELD EQUIPMENT CALIBRATION

This Attachment includes manufacturer's literature for all field equipment referenced in the Standard Operating Procedures. These documents have been included to insure that calibration, operational and trouble shooting procedures are available to all project personnel.

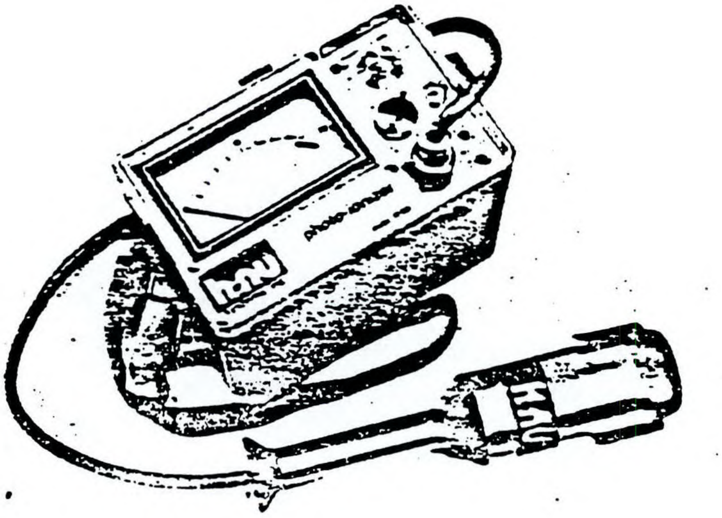
LIST OF INSTRUMENTS

INSTRUMENT NO.	DESCRIPTION
1	Photoionization Analyzer (PID)
2	Combustible Gas Meter
3	Temperature/Conductivity/pH Meters
4	Dissolved Oxygen Meter
5	Oxidation Reduction Potential Tester
6	Water Level Meter

1

hnu
systems inc.

INSTRUCTION MANUAL
FOR
MODEL PI 101
PHOTOIONIZATION ANALYZER



the photo-ionizer is a portable trace gas analyzer that can be used to measure a wide variety of organic vapors including chlorinated hydrocarbons, heterocyclics and aromatics, aldehydes and ketones as well as several inorganic gases including hydrogen sulfide and ammonia.

The instrument uses the principle of photoionization as the analytical technique and overcomes many of the problems inherent in current trace gas analysis instrumentation. These problems presently include poor limits of detection, slow and sluggish time response, background electronic noise or drift and a lengthy series of precise technical operations necessary to properly use the instrumentation. In addition, many of today's portable analyzers remain heavy, cumbersome instruments that require additional portable equipment such as sample pumps or compressed fuel and zero gases or bulky power packs for operation.

The advanced technology employed in the photo-ionizer successfully overcomes these disadvantages. For example, the limit of detection for most species is extended down to 0.1 ppm—an increase of 10–100 fold over many conventional instruments—while still maintaining a wide dynamic operating range (0.2 to 2000 ppm). This improved sensitivity allows industrial hygienists to make measurements at or below the TLV's (threshold limit values) established by OSHA.

Time response is greatly improved by several design advances. The location of the sensing chamber at the sampling point in the hand-held probe, the fabrication of all sample contact areas with inert fluorocarbon materials and a rapid sample flow through a small analyzing chamber eliminate sample hang up (adsorption) and minimize sample transit time in the instrument. The problems of delayed time response and instrument sluggishness are eliminated. Total time response to 90% of a full scale concentration change (0–2000 ppm) is less than five seconds—a significant feature when the instrument is used to locate plant "hot spots" or to detect leaks.

All solid state electronics and state-of-the-art circuit design have virtually eliminated conventional instrument drift and background noise. Zero drift is less than 1% over 10 hours. The excellent stability and drift free electronics allow accurate measurements, even at very low concentrations.

The Model PI 101 is one of the simplest analytical instruments to use since it has only three operating controls and unskilled personnel are easily and quickly trained to operate it. An easy to read 4½" *linear* scale provides a readout directly in units of concentration (ppm). Other features include an electronic zero that eliminates the use of a zero gas, and instrument calibrations that hold for weeks. The elimination of a flame, igniters and compressed hydrogen fuel make the photo-ionizer simpler to use than a flame ionization analyzer while providing an unusually safe instrument.

This lightweight (less than nine pounds) instrument was designed primarily as a portable analyzer for survey work and leak detection. However, the unit can also be set up as a continuous stationary monitor powered by 110V through its battery recharger/converter system. A strip chart recorder can be attached to the outputs (0–5V) provided.

Further details about the principle of operation and the significant technical advances this instrument provides are described in the following pages. Additional technical literature regarding your particular application and the photo-ionizer's response and sensitivity to the particular species of interest is available upon request.

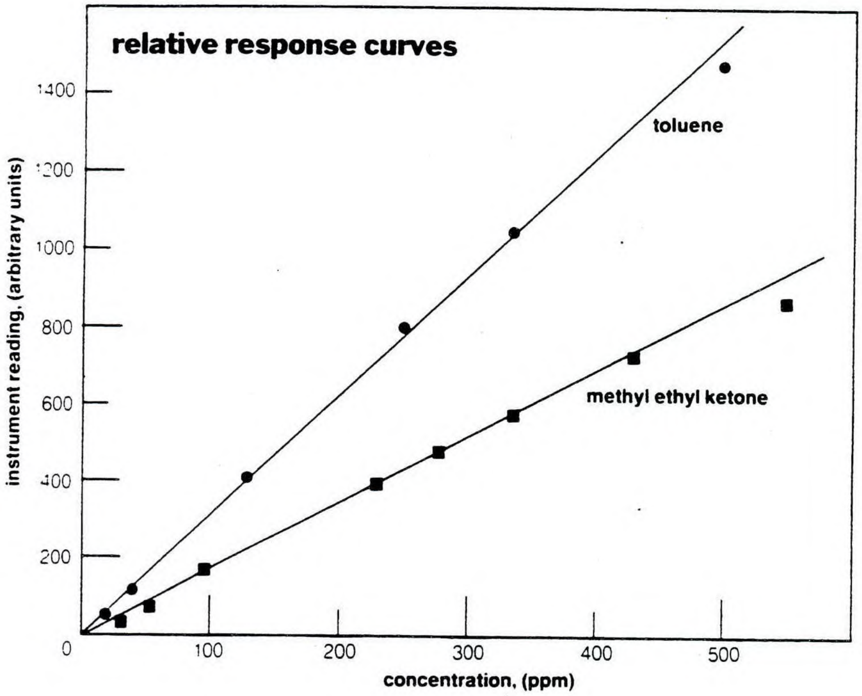
Write, call, or use the attached postage paid reply card for further information.

principle of operation

The photo-ionizer is a trace gas analyzer used to measure the concentration of a wide variety of species in industrial atmospheres. The analyzer employs the principle of photoionization for detection. The process is termed photoionization since the absorption of ultraviolet light by a molecule leads to ionization via: $R + h\nu - R^+ + e^-$ where R^+ is the ionized species and $h\nu$ represents a photon which has an energy ≥ the ionization potential of the species.

The sensor consists of a sealed ultraviolet light source that emits photons which are energetic enough to ionize many trace species (particularly organics) but do not ionize the major components of air such as O_2, N_2, CO, CO_2, or H_2O. A chamber adjacent to the ultraviolet source contains a pair of electrodes. When a positive potential is applied to one electrode the field created drives any ions formed by the absorption of UV light to the collector electrode where the current (proportional to the concentration) is measured. Typical calibration curves showing the relative response of toluene and methyl ethyl ketone (at the same gain setting) are shown below.

Information on the relative response factors for other species is available upon request.



the photo-ionizer – accurate measurements, easily obtained

photo courtesy of Ecology and Environment, Inc

Intrinsically
Hazardous
and Genera
versions als

sensitivity A maximum sensitivity of 0–2 ppm. full scale. can be obtained for many species. This scale is readable to 1% (100 division scale).

limits of detection Typical limits of detection are 0.2 ppm. In many cases these lower limits represent a 10–100 fold improvement over conventional portable analyzers.

operating range The linear range for most compounds is from 0.1 ppm to 600 ppm while the useful range typically extends to 2000 ppm.

stability Zero drift is extremely low, normally 1% or less over 10 hours, on battery operation On AC operation, zero drift is less than 1% over 24 hours. Semiweekly span calibrations (100 ppm toluene) over a one month period give a relative standard deviation of ±4.5%. This long term stability of both zero and span is due to the solid state electronics and stable ultraviolet light source.

specificity Specificity in photoionization analysis depends on the sensitivity of the detector to the species being measured, the number of interfering species present, and the concentration of the species being measured relative to interferences. The optimum specificity can be obtained by choosing the light source (9.5 eV, 10.2 eV, 11.7 eV) to suit the application, maximizing sensitivity to the species being analyzed and minimizing any possible interference. Return the postcard for details on your application.

rapid response Response to changes in concentration is extremely rapid. A 90% of full scale change (0–2000 ppm) takes less than five seconds. In addition, the sensor is located at the sampling point rather than inside the instrument. This eliminates the problems of hydrocarbon adsorption and transit time through a sampling tube, all of which can delay the real time response by 30–45 seconds or more.

AC/DC operation—The instrument power is supplied from a 12 VDC rechargeable battery which gives a *minimum* of 10 operating hours before recharging is necessary. The AC recharger provides the option of operating the unit continuously from 110V AC so that the instrument can be used either as a portable unit for industrial hygiene surveys and leak detection work or as a continuous stationary monitor. An optional HNU Recorder can also be operated with the 101 battery.

The instrument is equipped with an automatic solid state battery protection circuit to prolong battery life by preventing deep discharging. Both the analyzer and the recorder can be operated during the recharge cycle.

portability The instrument is truly portable, with a total weight of less than 9 pounds (4.1 Kg) complete. No additional bulky power packs, sample pumps or cylinders of fuel gas or zero gas are needed. When not in use, the hand-held sensor is stored in the instrument cover and the total package measures 21 cm wide x 13 cm deep x 24 cm high.

direct reading Concentration (ppm) is read out directly on an easy to read 4.5″ (11.3 cm) *linear* scale.

three simple operating controls

Function and Range Switch This switch puts the instrument into the STANDBY, BATTERY CHECK, MEASUREMENT modes or OFF position. The MEASUREMENT position allows the choice of a 0–2 ppm, 0–20 ppm, 0–200 ppm or 0–2000 ppm full scale range. The STANDBY mode reduces power consumption between measurements. The BATTERY CHECK allows a manual power check before use while an LED (red indicator light) adjacent to the function switch provides an automatic battery check indicator during operation.

Zero Adjust The zero control allows electronic calibration of the instrument at the zero concentration point without requiring the use of a zero gas.

Span To calibrate the instrument for a particular gas, this control is adjusted to the gain setting which will match the value of a calibration gas to that same reading on the instrument scale. This control also provides the 10 fold increase in gain that allows the 0–2 ppm full scale range.

recorder outputs A signal output of 0—5V full scale is provided on the front panel for the attachment of a strip chart recorder.

sically Safe (IS-101),
rdous Waste (HW-101),
General Purpose (GP-101)
ons also available.

electronic zero Zero calibration is done completely electronically. The instrument is switched to the STANDBY mode where the UV light source is turned off but the other electronics remain on. The zero control is adjusted until the meter indication is zero. No zero gas or regulators are needed: no further adjustments are required. Verification tests for this technique against hydrocarbon-free zero gas show perfect agreement.

safety ***The photo-ionizer is extremely safe to use, requiring no flames, igniters, or hydrogen fuel. Versions are available for use in General Purpose, Hazardous Waste; Class I, Division II and Class I, Division I, Group ABCD areas.***

instant warmup Solid state electronics produce stable readings within 20 seconds after turning the instrument on.

selected list of species detected

NR: no response
H: high response
L: low response

class species	**photoionization response** 9.5 eV lamp	10.2 eV lamp	11.7 eV lamp
paraffins and unsaturated hydrocarbons			
methane	NR	NR	NR
ethylene	NR	L	H
acetylene	NR	NR	H
1-butene	H	H	H
hexane	NR	L	H
chlorinated hydrocarbons			
methyl chloride	NR	NR	H
carbon tetrachloride	NR	NR	H
chloroform	NR	NR	H
dichloroethane	NR	NR	H
vinylidene chloride	L	H	H
vinyl chloride	L	H	H
trichloroethylene	H	H	H
heterocyclics & aromatics			
phenol	H	H	H
pyridine	H	H	H
benzene	H	H	H
toluene	H	H	H
xylene	H	H	H
styrene	H	H	H
aniline	H	H	H
chlorobenzene	H	H	H
nitrobenzene	NR	L	H
nitrogen compounds			
formamide	NR	H	H
ammonia	NR	L	H
hydrazine	H	H	H
methyl amine	H	H	H
acetonitrile	NR	NR	NR
acrylonitrile	NR	NR	H
sulfur compounds			
sulfur dioxide	NR	NR	NR
hydrogen sulfide	NR	H	H
carbonyl sulfide	NR	NR	H
carbon disulfide	H	H	H
methyl mercaptan	H	H	H
dimethyl sulfide	H	H	H
dimethyl disulfide	H	H	H
aldehydes, ketones, alcohols, acids, esters			
formaldehyde	NR	NR	H
acetaldehyde	NR	H	H
propionaldehyde	L	H	H
acrolein	L	H	H
crotonaldehyde	L	H	H
acetone	L	H	H
methanol	NR	NR	H
ethanol	NR	L	H
formic acid	NR	NR	H
acetic acid	NR	L	H
methyl methacrylate	L	H	H
others			
ethylene dibromide	NR	H	H
ethylene oxide	NR	L	H
tetraethyl lead	H	H	H
phosphine	NR	H	H
arsine	NR	H	H
iodine	H	H	H

hnu **HNU Systems, Inc.,** 160 Charlemont Street, Newton, Massachusetts, 02161-9987 **chemical instrumentation**

specifications

performance (benzene referred)
range 0.2 to 2000 ppm
detection limit 0.2 ppm
sensitivity (max) 0–2 ppm FSD over 100 division meter scale
repeatability ±1% of FSD
linear range 0.1 to 600 ppm
useful range 0.1 to 2000 ppm
response time < 5 sec to 90% of full scale

physical
size: probe 6.3 DIA x 28.5L (cm) (2½ x 11¼")
readout 21W x 13D x 16.5H (cm) (8¼ x $5\frac{3}{16}$ x 6½")
stowed 21W x 13D x 24H (cm) (8¼ x $5\frac{3}{16}$ x 9½")
cable 80 cm long (32")
weight probe .55kg (20 ounces)
readout 3.2kg (7 pounds)
total (shipping) 5.4 kg (12 pounds)

controls and functions
mode switch Off. Battery check. Standby (zero). 0–2000. 0–200. 0–20 ppm
low battery indicator light
zero (10 turn ±300% FSD max)
span (10 turn counting dial 1.0 to 10 times nominal sensitivity)
readout 4½" (11.3 cm) meter Taut Band movement graduated 0–5–10–15–20. divisions
outputs recorder 0–5 VDC

power requirements of operating times
continuous use with battery > 10 hours
with HNU Recorder > 6 hours
recharge time. max < 14 hours. 3 hours to 90% of full charge
recharge current. max .4 amps @ 115 VAC

construction Designed to withstand the shock and abuse to which portable instruments are often subjected. The readout is housed in a two piece aluminum case. and finished with a solvent resistant baked acrylic textured paint.
The probe is fabricated from extruded aluminum sections and machined plastic.

serviceability The probe and readout are of a modular design allowing rapid servicing and/or replacement of mechanical and electrical components. All module interwiring includes quick disconnects.

maintenance The instrument contains only one moving part. and consumes no gases or reagents. The only routine maintenance procedure is cleaning the light source window every several weeks.

applications

industrial hygiene surveys of toxic gases for OSHA (TLV) compliance can be rapidly accomplished with this portable. direct reading instrument. Hood ventilation rates can also be measured accurately because of the sensitivity and wide operating range of the unit.

leak detection is facilitated by the rapid instrument response and extreme sensitivity. This enables the user to locate even small leaks very rapidly.

residual solvent vapors such as trichloroethylene in decaffeinated coffee or degreasing operations. hexane from soybean extraction and other vapors from **food, chemical processing, paint spraying** or coating can be easily and rapidly measured.

benzene concentrations as low as .1 ppm can be selectively measured using a 9.5 eV lamp. This lamp eliminates most common interferences.

non methane hydrocarbons in the atmosphere can be **measured directly** since the photo-ionizer does not respond to methane.

vinyl chloride measurements in monomer plants can be made without interference from major starting materials or by-products such as ethylene and ethylene dichloride (dichloroethane). Low level vinyl chloride measurements in PVC fabrication processes do not have the 1–2 ppm methane background interference seen in other portable instruments.

For additional information on specific applications. please fill out the attached postage-paid reply card or call us at (617)964-6690. To place an order. call us toll-free at (800)527-4566.

SECTION 3

CALIBRATION

Static or dynamic gas generation systems can be utilized for calibration of the instrument. A number of such systems for generating test atmospheres for various gases have been described by G. O. Nelson in "Controlled Test Atmospheres," Ann Arbor Science Publishers, Ann Arbor, Michigan (1971).

The most convenient packages for calibration are the non-toxic analyzed gas mixtures available from HNU Systems in pressurized containers (Catalogue #101-350).

A rapid procedure for calibration involves bringing the probe and readout in close proximity to the calibration gas, cracking the valve on the tank and checking the instrument reading. This provides a useful spot check for the instrument.

The recommended and most accurate procedure for calibration of the instrument from a pressurized container is to connect one side of a 'T' to the pressurized container of calibration gas, another side of the 'T' to a rotameter and the third side of the 'T' directly to the 8" extension to the photoionization probe (see Figure 5). Crack the valve of the pressurized container until a slight flow is indicated on the rotameter. The instrument draws in the volume of sample required for detection, and the flow in the rotameter indicates an excess of sample. Now adjust the span pot so that the instrument is reading the exact value of the calibration gas. (If the instrument span setting is changed, the instrument should be turned back to the standby position and the electronic zero should be readjusted, if necessary.)

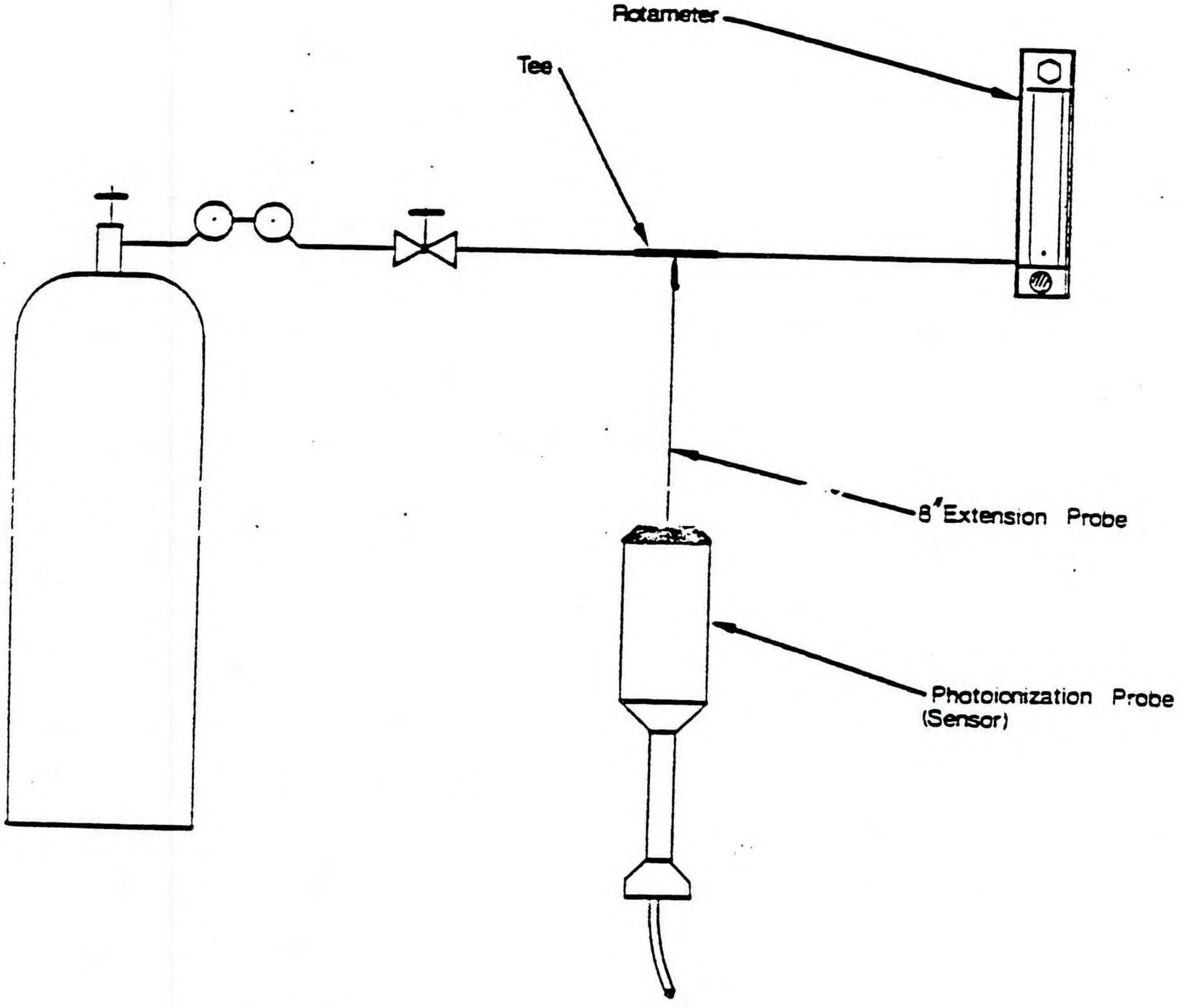


Figure 5. Recommended Calibration Procedure for Photoionization Analyzer

The calibration gas* should be prepared in the same matrix (air, nitrogen, hydrogen, etc.) in which it is to be measured, otherwise an inaccurate reading may be obtained. The increased response which is seen in oxygen free gases can be attributed to a reduction in the quenching of ions by oxygen (actually O_2^-) and is typical of any ionization detector. The quenching effect of oxygen is constant from about ten percent O_2 to very high levels.

If a gas standard prepared in nitrogen is to be used for measurements in air, fill a 0.5 or 1 liter bag with the standard then add 50 or 100 cc of pure oxygen to bring the level to 10-12%.

Any error between this value and 20% oxygen is quite small.

If the sample to be measured is in nitrogen, standards should be prepared in nitrogen. This will result in an increase in sensitivity of approximately 4.

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* Calibration with toxic gases should be performed in a hood since the 101 is a non-destructive analyzer.

2

SNIFFER® 503A

Portable Area Monitor

Description

The SNIFFER® 503A (FM) provides 10-hour continuous monitoring for oxygen deficiency (0-25% O_2 range) and combustible gases (0-100% LEL range). It also offers two survey ranges, 0-2,000 PPM and 0-10,000 PPM combustible gas. The function switch offers a battery test position and selects the combustible gas range desired.

The integral pump draws the sample to the catalytic combustible sensor and the electrochemical O_2 sensor. Combustible gases will oxidize when they come in contact with the heated catalytic bead. The resulting increase in bead temperature and resistance causes a signal change across a balanced Wheatstone bridge. The oxygen cell is a transducer that produces a millivolt output in direct proportion to the partial pressure of oxygen present. These signals are then amplified and used to drive the meters and alarm circuits.

The alarm system features a high output (100 dBA at 1 foot), high frequency (3,200 Hz) audible alarm. The latching alarms are activated at user-adjustable levels. A steady tone indicates an oxygen deficient condition and an alternating tone indicates a high combustible gas concentration. The oxygen alarm is the priority alarm. A non-latching alarm with a short duration, rapid pulse tone is provided for low flow and low battery conditions. Visual alarm LED's are also provided for oxygen and combustible gas alarms and an optional remote audible alarm (25 feet) can be connected to provide dual audible outputs (local and remote).

The sealed lead acid battery pack offers dependable service over a long period of time. It tolerates variable usage and charging patterns, eliminating the memory problems of NiCads. It is the most practical power source for a field instrument.

5 CALIBRATION AND MAINTENANCE

5.1 SCOPE

This section describes calibration and maintenance procedures necessary to maintain safe, accurate and reliable operation of the Sniffer 503A. Troubleshooting information is also given if malfunctions should occur.

5.2 OPERATIONAL CHECKOUT

5.2.1 Equipment Required

Flowmeter, tubing and connector from Calibration Kit 51-7297. (See Fig. 5-1).

5.2.2 Battery Charging

Check battery charge by turning the FUNCTION switch on the BATTERY TEST position and observe the indication on the combustible gas/battery test meter. If meter indication is in the RECHARGE zone, select the proper charger from Table 5-1 and plug it into the instruments's charging socket. Allow the battery pack to charge for 14-16 hours, prior to operation.

TABLE 5-1. CHARGERS

Operating Voltage	Charger Part Number
120 VAC 60 Hz	51-2141
220 VAC 50 Hz	51-2142
12 VDC	51-2143

WARNING!

Do not operate the Sniffer 503A in any potentially explosive or hazardous location with a charger attached to it. Disconnect the charger from the instrument before entering the hazardous area. The instrument is designed to be intrinsically safe for operation in Class I, Div. 1, Groups A, B, C and D locations with all chargers disconnected. The instrument is not intrinsically safe with the external charger attached.

CAUTION:

Use of any other type of battery pack may cause the instrument not to meet all of the performance and/or safety specifications published by certain agencies concerning operation in hazardous environments.

5.2.3 Flow System Checkout

Turn the FUNCTION switch to the BATTERY TEST position and verify that the pump is running. To verify approximate flow, use the flowmeter, tubing and connector from Calibration Kit 51-7297. Connect the tubing between the top port of the flowmeter and the connector as shown in Fig. 5.1. Plug the connector onto the Sniffer 503A's SAMPLE INLET fitting and observe that the flowmeter should indicate 1.0 SCFH (500 cc/min.) or more; if not, refer to Table 5-2 for troubleshooting hints. Now simulate a blockage in the probe by placing your finger over the bottom port of the flowmeter. The low battery alarm should sound.

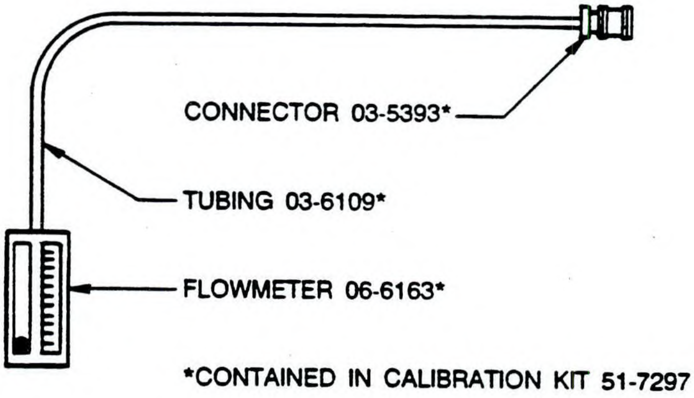


Figure 5-1. Set-Up for Checking Air Flow

5.2.4 General Checkout

1. Make sure the instrument is clean and free from dirt that will obstruct flow or otherwise impair its operation.
2. The audible alarm, located on the side of the instrument, has a 5 to 15 second alarm lockout during warm-up. The alarm function is latching, which means it must be manually reset after the alarm condition has been cleared.
3. Set FUNCTION switch to %LEL and verify that the O_2 meter indication in fresh air can be adjusted to the CAL mark using the OXYGEN CALIB knob.
4. Verify that the combustible gas meter indication can be set to zero using the ZERO ADJ knob.
5. Press the TEST switch. The audible alarm and both visual alarms should activate. Press the RESET switch to clear all alarms.
6. Turn the ZERO ADJ knob. This should produce smooth movement of the combustible gas meter with no signs of the needle sticking. Re-zero the combustible gas meter.
7. Turn the OXYGEN CALIB knob. This should produce smooth movement of the O_2 meter with no signs of the needle sticking. Reset the O_2 meter to its CAL mark.
8. If any steps above produced abnormal results, refer to Table 5-2 for troubleshooting hints.

CAUTION:

Do not use oil or lubricants on the mechanical or electrical parts of this instrument. Some potentiometer lubricants contain silicones, which will permanently impair operation of the combustibles sensor.

5.3 CALIBRATION AND ADJUSTMENT

5.3.1 Scope

Subsections 5.3 thru 5.6 define the procedures necessary for calibrating and adjusting the circuits in the Sniffer 503A. The instrument is designed for direct reading when sampling methane-in-air mixtures. Therefore, to calibrate the ranges of the instrument, a methane-in-air mixture is used. Consult Appendix "A" for conversion factors when a methane calibrated Sniffer 503A is used on combustibles other than methane.

NOTE: *If detection of combustible solvents comprises the bulk of the Sniffer 503A's applications, calibration should be based on hexane for increased sensitivity. Consult Appendix B.*

5.3.2 Equipment Required

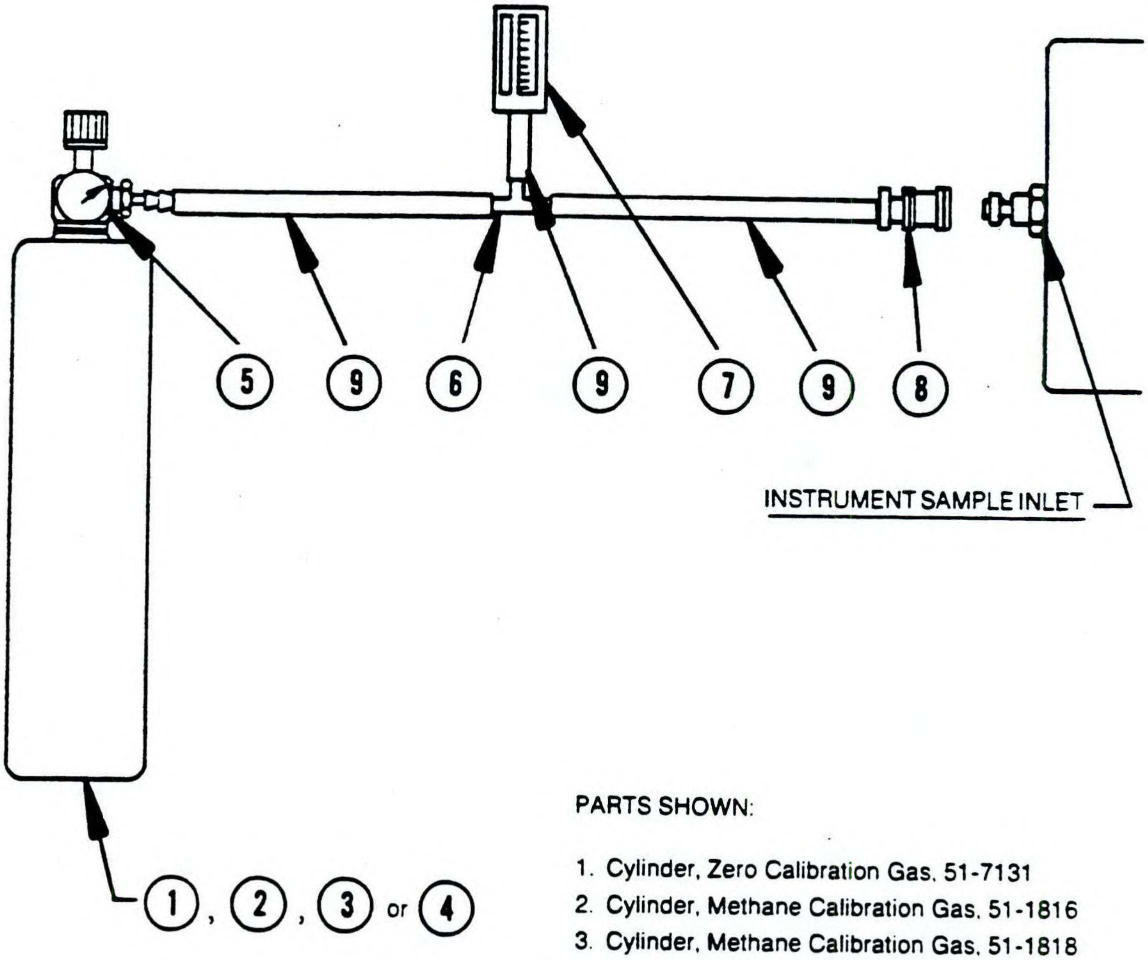
- Calibration Kit - Part No. 51-7297 (See Fig. 5-2).
- Gas Cylinder, 500 PPM Methane-In-Air - Part No. 51-1816
- Gas Cylinder, 1.0% Methane-In-Air - Part No. 51-1818
- Gas Cylinder, 2.5% Methane-In-Air - Part No. 51-1121
- Gas Cylinder, Zero Calibration Gas - Part No. 51-7131
- Small Screwdriver, 3/32" Blade, Xcelite R3323 or equivalent
- Digital Voltmeter, ±0.5% Accuracy or Better*

*Needed only when performing the optional sensor voltage adjustment procedure as described in Paragraph 5.3.3.

5.3.3 Adjusting Sensor Voltage

The sensor voltage is factory adjusted to 3.70 ±0.10 VDC and should never need further adjustment, unless components on the printed circuit board are replaced or the adjustment itself (R25) has been tampered with. If it becomes necessary to make this adjustment, proceed as follows:

1. Loosen the four thumbscrews retaining front panel. First lift up right-hand side of panel, then lift entire panel clear of case.



PARTS SHOWN:

1. Cylinder, Zero Calibration Gas, 51-7131
2. Cylinder, Methane Calibration Gas, 51-1816
3. Cylinder, Methane Calibration Gas, 51-1818
4. Cylinder, Methane Calibration Gas, 51-1121
5. Regulator, 03-4318 *
6. Tee, 03-5532 *
7. Flowmeter, 06-6163 *
8. Connector, 03-5393 *
9. Tubing, 03-6109 *

* CONTAINED IN CALIBRATION KIT 51-7297

Figure 5-2. Calibration Set-Up Block Diagram

2. See Fig. 5-3 and connect a digital voltmeter as follows: positive lead to TP-6, negative lead to TP-9.

3. Turn the FUNCTION switch to the BATTERY TEST position and observe the digital voltmeter indication. If the indication is not 3.70 ±0.10 volts, adjust Sensor Voltage pot R25 (Fig. 5-4) to obtain this value.

4. Remove voltmeter.

5. Re-position the front panel and tighten the thumbscrews.

5.4 CALIBRATION OF OXYGEN DETECTOR

5.4.1 Oxygen Zero Adjustment

1. Turn the FUNCTION switch to the BATTERY TEST position. Press the TEST switch and observe the O_2 meter indication. If the indication is zero, no further adjustment is necessary. If not, proceed with Step 2.

2. Loosen the four thumbscrews retaining the front panel. First lift up the right-hand side of the panel, then lift the entire panel clear of the case.

3. While pressing the TEST switch, adjust Oxygen Zero pot R22 (see Fig. 5-4) for an O_2 meter indication of zero.

4. Re-position the front panel and tighten the thumbscrews.

5.4.2 Oxygen Calibrate Adjustment

1. Turn the FUNCTION switch to the BATTERY TEST position.

2. Place the instrument in fresh air. If there is doubt about the quality of the surrounding air, proceed with Step 3. If not, proceed to Step 5.

3. Connect a Zero Calibration Gas Cylinder (Part No. 51-7131) and the Calibration Kit (Part No. 51-7297) together as shown in Fig. 5-2. Connect the gas output of this setup to the instrument's SAMPLE INLET.

4. Adjust the regulator on the calibration setup for a flowmeter indication of 2 SCFH.

5. Unlock the OXYGEN CALIB knob and adjust it for an O_2 meter indication of 21 or at the CAL mark. Relock OXYGEN CALIB knob.

6. If using the gas cylinder, disconnect the calibration setup and unscrew the cylinder from the regulator.

7. Re-position the front panel and tighten the thumbscrews.

5.5 CALIBRATION OF THE COMBUSTIBLES DETECTOR

5.5.1 Disabling the Audible Alarm

To eliminate the annoyance of the audible alarm sounding during the calibration of the combustibles detector circuits, the audible alarm can be disabled. Note that all meter functions and visual alarms will continue to operate normally.

To disable the alarm, proceed as follows:

1. Loosen the four thumbscrews retaining the front panel. First lift up the right-hand side of the panel, then lift the entire panel clear of the case.

2. See Fig. 5-5 and connect a jumper wire between TP-1 and TP-2.

3. Proceed with the calibration of the PPM x 20, PPM x 100, and the % LEL ranges as described in Paragraphs 5.5.2 thru 5.5.4.

4. After calibration, remove the jumper. Press the TEST switch to verify operation of the audible alarm.

5.5.2 Calibrating the PPM x 20 Range

1. Turn the FUNCTION switch to the BATTERY TEST position. Verify that the batteries have a sufficient charge. If not, refer to Paragraph 5.2.2 and charge the batteries.

2. Allow 15 minutes for the instrument to warm up.

3. Turn the function switch to the PPM x 20 position.

4. See Fig. 5-2 and connect the zero calibration gas cylinder 51-7131 to the instrument. Adjust the regulator for a flowmeter indication of 2 SCFH.

5. Allow the zero calibration gas to flow for 1 minute and use the ZERO ADJ control to zero the combustibles meter.

6. Unscrew the calibration gas cylinder from the regulator and replace it with the 500 PPM Methane-in-Air cylinder 51-1816. Adjust the regulator for a flowmeter indication of 2 SCFH.

7. Allow the gas to flow for 1 minute and read the combustibles meter.

8. The methane cylinder has a concentration value stamped on its label. This is the desired calibration value.

9. Compare the combustibles meter indication in Step 7 to the calibration value in Step 8. If the meter indication is within ±50 PPM of the calibration value, no further adjustment is required. Otherwise proceed with Step 10.

10. Loosen the four thumbscrews retaining the front panel. Lift up the right-hand side of the panel, without disconnecting the calibration setup, to gain access to the Combustibles PPM x 20 SPAN pot R6 shown in Fig. 5-4.

11. Adjust pot R6 using a small screwdriver until the meter indication matches the calibration value from Step 8.

12. Re-position the front panel and secure the four thumbscrews. Remove the calibration setup and disconnect the gas cylinder from the regulator.

5.5.3 Calibrating the PPM x 100 Range

1. Turn the FUNCTION switch to the BATTERY TEST position. Verify that the batteries have a sufficient charge. If not, refer to Paragraph 5.2.2 and charge the batteries.

2. Allow 5 minutes for the instrument to warm up.

3. Turn the function switch to the PPM x 100 position.

4. See Fig. 5-2 and connect the zero calibration gas cylinder 51-7131 to the instrument. Adjust the regulator for a flowmeter indication of 2 SCFH.

5. Allow the zero calibration gas to flow for 1 minute and use the ZERO ADJ control to zero the combustibles meter.

6. Unscrew the calibration gas cylinder from the regulator and replace it with the 1.0% Methane-in-Air cylinder 51-1818. Adjust the regulator for a flowmeter indication of 2 SCFH.

7. Allow the gas to flow for 1 minute and read the combustibles meter.

8. The methane cylinder has a concentration value stamped on its label. To determine the desired meter indication, use the formula:

   % Methane x 10,000 PPM = Calibration Value.

9. Compare the combustibles meter indication in Step 7 to the calibration value in Step 8. If the meter indication is within ±500 PPM of the calibration value, no further adjustment is required. Otherwise proceed with Step 10.

10. Loosen the four thumbscrews retaining the front panel. Lift up the right-hand side of the panel, without disconnecting the calibration setup, to gain access to the Combustibles PPM x 100 SPAN pot, R8, shown in Fig. 5-4.

11. Adjust pot R8 using a small screwdriver until the meter indication matches the calibration value from Step 8.

12. Re-position the front panel and secure the four thumbscrews. Remove the calibration setup and disconnect the gas cylinder from the regulator.

5.5.4 Calibrating the % LEL Range

1. Turn the FUNCTION switch to the BATTERY TEST position. Verify that the batteries have a sufficient charge. If not, refer to Paragraph 5.2.2 and charge the batteries.

2. Allow 5 minutes for the instrument to warm up.

3. Turn the function switch to the % LEL position.

4. See Fig. 5-2 and connect the zero calibration gas cylinder 51-7131 to the instrument. Adjust the regulator for a flowmeter indication of 2 SCFH.

5. Allow the zero calibration gas to flow for 1 minute and use the ZERO ADJ control to zero the combustibles meter.

6. Unscrew the calibration gas cylinder from the regulator and replace it with the 2.5% Methane-in-Air cylinder 51-1121. Adjust the regulator for a flowmeter indication of 2 SCFH.

7. Allow the gas to flow for 1 minute and read the combustibles meter.

8. The methane cylinder has a concentration value stamped on its label. To determine the desired meter indication, use the formula:

   % Methane x 20% LEL =
   % LEL Calibration Value.

9. Compare the combustibles meter indication in Step 7 to the calibration value in Step 8. If the meter indication is within ±5% LEL of the calibration value, no further adjustment is required. Otherwise proceed with Step 10.

10. Loosen the four thumbscrews retaining the front panel. Lift up the right-hand side of the panel, without disconnecting the calibration setup, to gain access to the Combustibles % LEL SPAN pot, R10, shown in Fig. 5-4.

11. Adjust pot R10 using a small screwdriver until the meter indication matches the calibration value from Step 8.

12. Re-position the front panel and secure the four thumbscrews. Remove the calibration setup and disconnect the gas cylinder from the regulator.

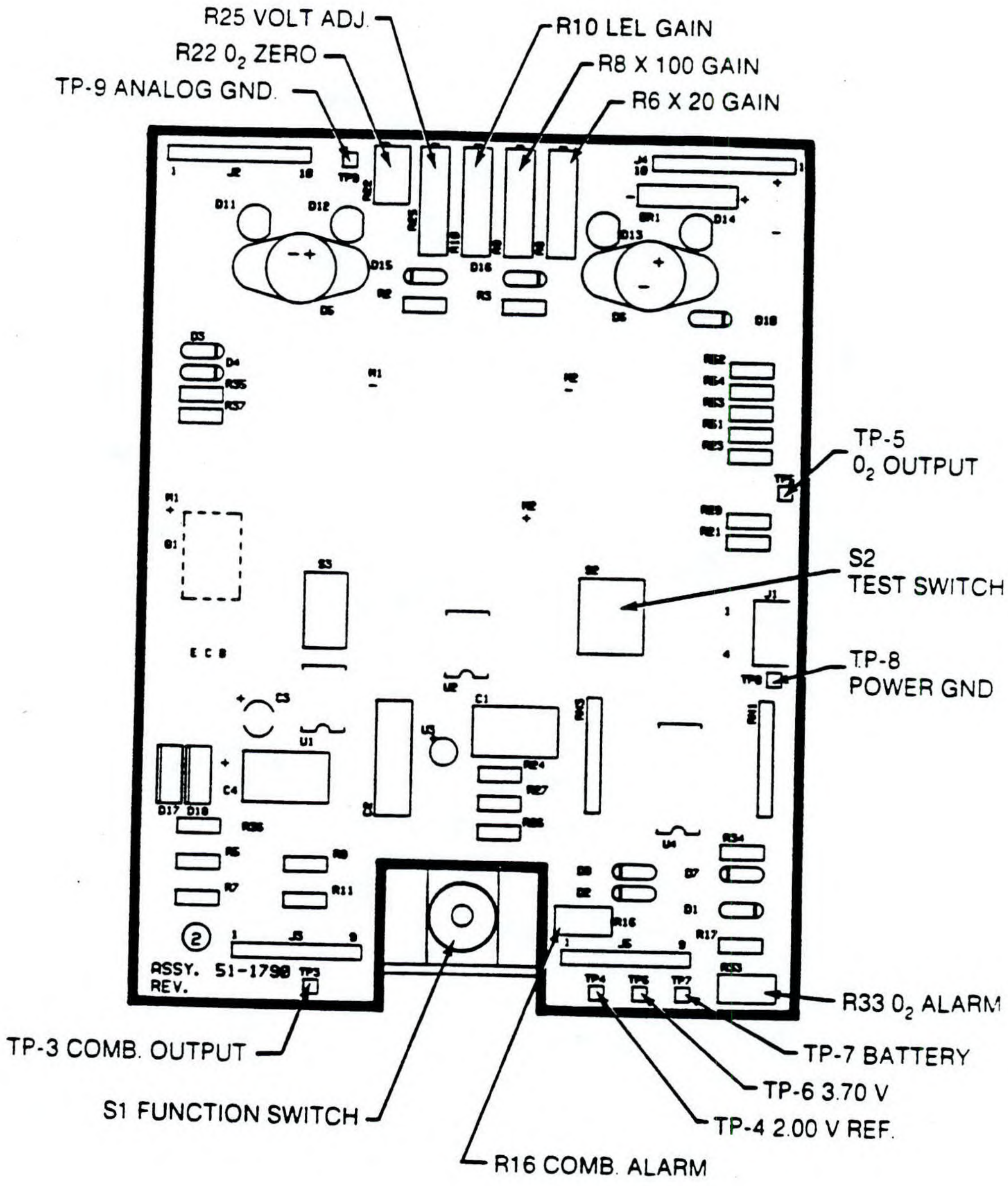


Figure 5-3. Test Point and Potentiometer Layout

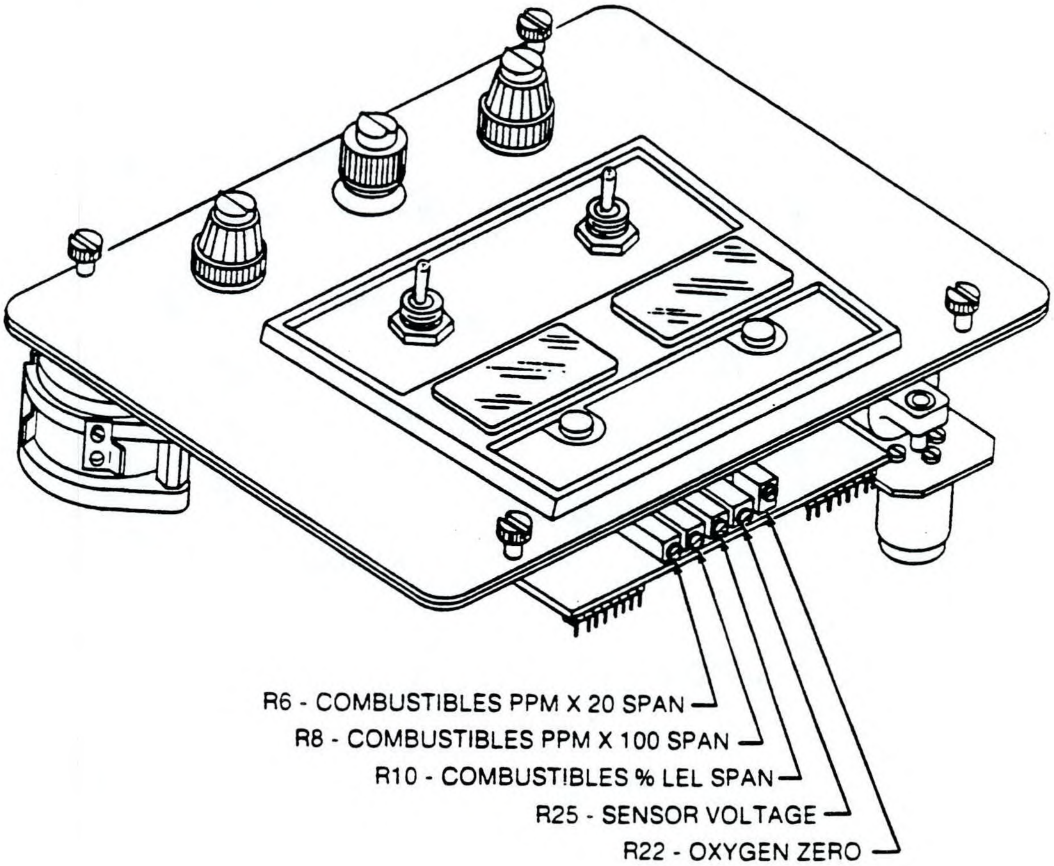
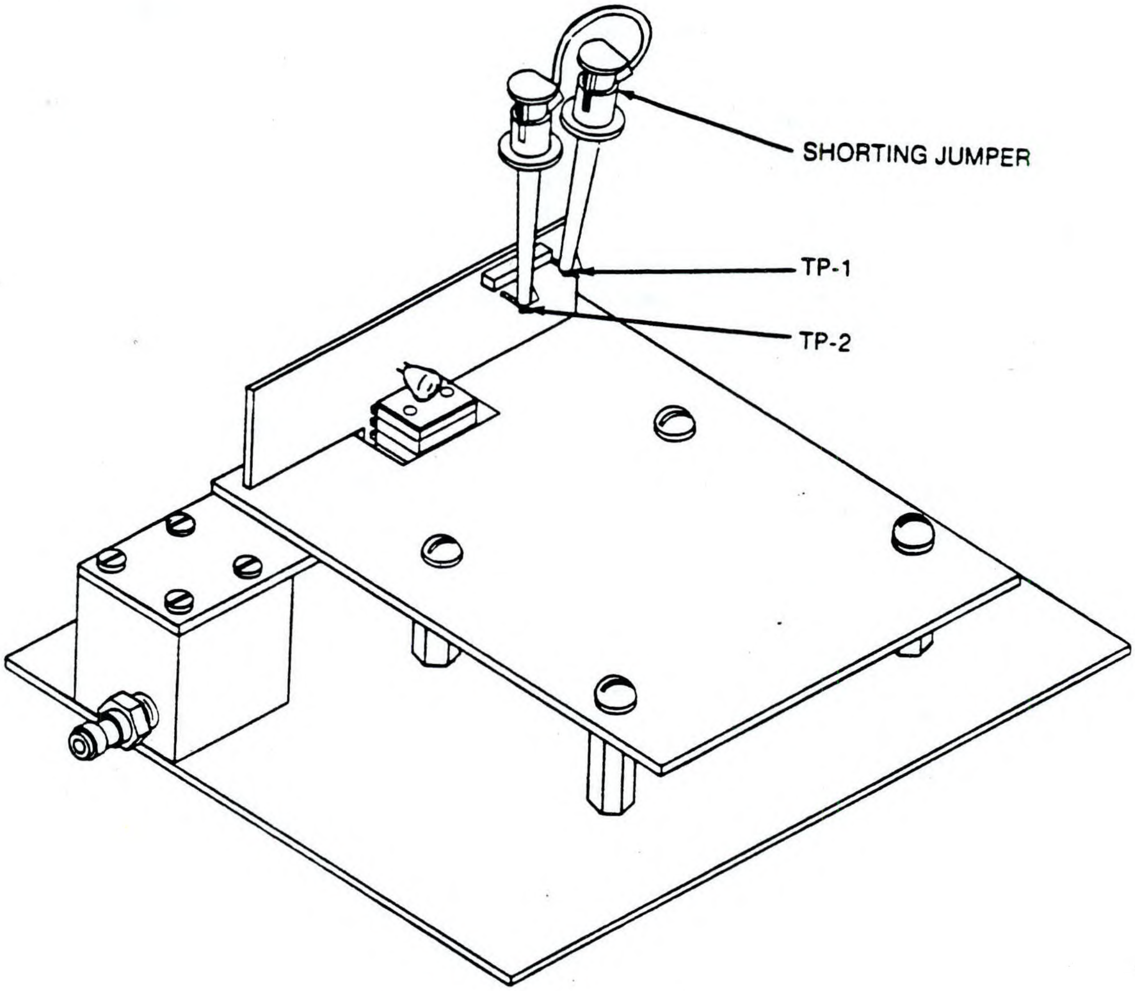


Figure 5-4. Calibration Adjustments



JUMPER TP-1 AND TP-2 TOGETHER TO DISABLE AUDIBLE ALARM.

Figure 5-5. Location of Alarm Disable Test Points

5.6 ADJUSTING THE ALARM TRIP POINTS

5.6.1 Adjusting the Oxygen Deficiency Alarm Point

1. Loosen the four thumbscrews retaining the front panel. Lift up the right-hand side of the panel to gain access to the O_2 Alarm pot, R33, shown in Fig. 5-6.
2. Turn pot R33 fully counterclockwise.
3. Unlock the OXYGEN CALIB knob and adjust it until the O_2 meter indicates the concentration of the desired trip point.
4. Turn pot R33 clockwise very slowly and stop as soon as the oxygen alarm activates.
5. Turn OXYGEN CALIB knob clockwise and press the RESET switch to clear the alarm.
6. While observing the O_2 meter, slowly turn OXYGEN CALIB knob counterclockwise and verify that the alarm activates at the desired trip point. Again turn OXYGEN CALIB knob clockwise and press the RESET switch to clear the alarm.
7. Readjust the OXYGEN CALIB control per Paragraph 5.4.2.
8. Re-position the front panel and tighten the thumbscrews.

5.6.2 Adjusting the Combustibles Alarm Point

1. Loosen the four thumbscrews retaining the front panel. Lift up the right-hand side of the panel to gain access to the Combustibles Alarm pot, R16, shown in Fig. 5-6.
2. Turn pot R16 fully clockwise.
3. Unlock the ZERO ADJ knob and adjust it until the Combustibles meter indicates the concentration of the desired trip point.
4. Turn pot R16 counterclockwise very slowly and stop as soon as the combustibles alarm activates.
5. Turn ZERO ADJ knob counterclockwise and press the RESET switch to clear the alarm.
6. While observing the Combustibles meter, slowly turn ZERO ADJ knob clockwise and verify that the alarm activates at the desired trip point. Again turn ZERO ADJ knob counterclockwise and press the RESET switch to clear the alarm.
7. Readjust the ZERO ADJ control for a Combustibles meter indication of zero. Then relock the ZERO ADJ control.
8. Re-position the front panel and tighten the thumbscrews.

5.7 TROUBLESHOOTING

Table 5-2 lists the most common symptoms and the most likely causes of malfunctions that may occur with the Sniffer 503A and the corrective action to be taken.

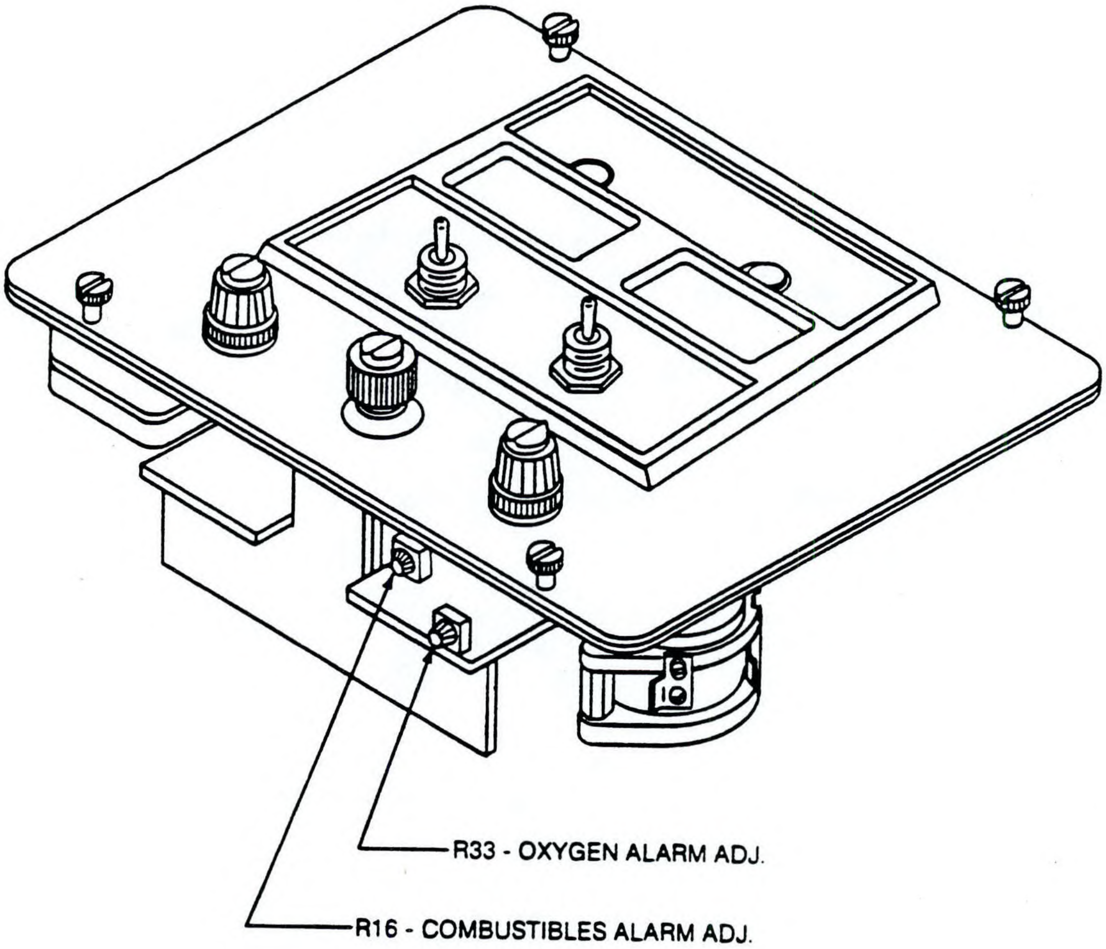


Figure 5-6. Alarm Adjustment Locations

TABLE 5-2. TROUBLESHOOTING

Trouble	Probable Cause	Remedy
Combustibles meter pegs up or down scale and will not zero in fresh air.	(a) Active sensor element open or shorted. (b) Reference sensor element open or shorted.	Replace sensor 51-1057.
Oxygen meter reads low and will not calibrate.	Oxygen cell output less than 19 mV.	Replace oxygen cell 51-7331.
Oxygen meter reads above 21 and will not calibrate.	Oxygen cell output greater than 60 mV.	Replace oxygen cell 51-7331.
Response slow, more than 5 seconds to start of response. Flow rate less than 700 cc/min (1.5 SCFH).	(a) Defective pump. (b) Dirty, clogged parts in probe hose, reaction chamber, or blocked exhaust port.	Replace pump. Clean and/or clear blockages.
Meter indications OK, audible or visual alarms do not activate, cannot be adjusted.	Defective printed circuit board.	Replace, or troubleshoot and repair circuit board 51-2180.
Both combustible and oxygen readings abnormal and instrument will not calibrate.	(a) 2.0 volt reference not between 1.95 and 2.05 volts (TP4 to TP9). (b) 3.7 volt reference not between 3.6 and 3.8 volts (see Fig. 7-3) (TP6 to TP9).	Replace, or troubleshoot and repair circuit board 51-2180.
Instrument fails to charge.	Defective charger.	Replace, refer to Table 5-1.
Combustibles readings out of tolerance.	Instrument not calibrated.	Follow calibration Section 5.5.
Cannot calibrate combustibles section.	Defective combustibles sensor.	Replace sensor 51-1057.
Instrument dead, no power.	(a) Dead battery. (b) Defective battery or charger.	Charge battery per Paragraph 5.2.2. Replace.

5.8 SENSOR REPLACEMENT

5.8.1 Oxygen Cell

The life of an oxygen cell is conservatively estimated at six months. Its life is not affected by the amount of time the instrument is used. Oxygen cells are shipped in a sealed envelope purged of all oxygen to inhibit the cell's chemical action. Once the seal is broken and the cell is exposed to air, the cell starts to operate and will deplete at a fixed rate, regardless of whether the instrument is used or not.

Whenever it becomes necessary to replace the oxygen cell, follow the procedure below. When placing the instrument in operation for the first time, omit Step 2.

Equipment Required

- Replacement Oxygen Cell, Part No. 51-7331
- Screwdriver, 3/16" Blade
- Scissors

Procedure

1. Loosen the four thumbscrews retaining the front panel. First lift up the right-hand side of the panel, then lift the entire panel clear of the case.

2. See Fig. 5-7. Using a small screwdriver, remove the two screws retaining the oxygen cell flange and then remove the flange. Remove and discard the old oxygen cell.

WARNING!

The oxygen cell contains a solution of potassium hydroxide. Do not puncture. If solution contacts the skin, flush with water and vinegar immediately. If solution contacts the eyes, flush with a boric acid solution and get immediate medical attention!

3. Position the O-ring in the oxygen cell base.

4. The new oxygen cell (Part No. 51-7331) is shipped in a sealed foil envelope. Use a pair of scissors to cut open the envelope and remove the cell.

5. Look at the contacts of the oxygen cell base (see Fig. 5-7). Three contacts have dimples and one has a hole. Line the oxygen cell up so that its plastic screw is in line with the contact that has the hole, mesh end toward the base. Snap the cell into the base so the three stainless steel screwheads line up in the dimples in the contacts. The plastic screw head should protrude through the hole in the contact. If properly positioned, the label on the rear of the cell should be readable.

6. Position the flange over the rear of the cell. Insert the two screws and tighten with a screwdriver. DO NOT overtighten these screws!

7. Calibrate the oxygen detector per Section 5.4.

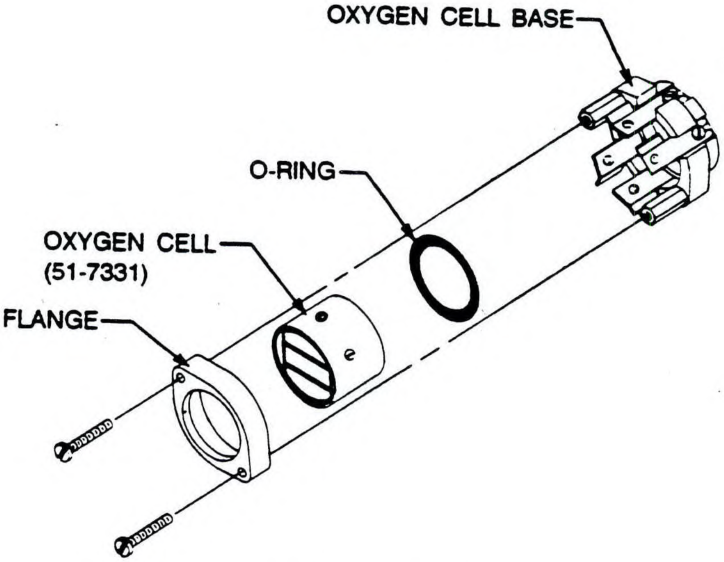


Figure 5-7. Oxygen Cell Installation

5.8.2 Combustibles Sensor

The combustibles sensor should last at least one year when operated eight hours a day and when only sampling small quantities of combustible gases and vapors. Operation for long periods of time in areas with combustible gas concentrations near or above the lower explosive limit may shorten sensor life. The sensor should be replaced when the % LEL SPAN pot, R10, will no longer calibrate the instrument as described in Paragraph 5.5.4.

Equipment Required

- Replacement Combustibles Sensor, Part No. 51-1057
- Screwdriver, 3/16" Blade

Procedure

1. Loosen the four thumbscrews retaining the front panel. First lift up the right-hand side of the panel, then lift the entire panel clear of the case.
2. See Fig. 5-8. Remove four retaining screws from the sensor socket and pull the socket free.
3. Unplug and discard the old sensor.
4. Plug the new combustibles sensor (Part No. 51-1057) into the socket. Make sure the spring is in place in the reaction chamber.
5. Position the socket into the reaction chamber so the four screw holes line up.
6. Insert and tighten the four retaining screws.
7. Calibrate the combustibles detector per Section 5.5.

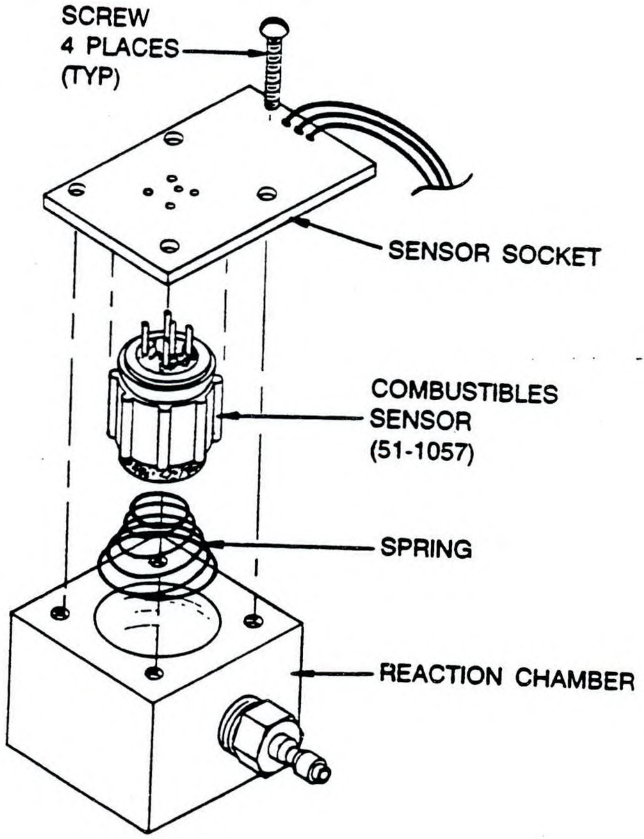


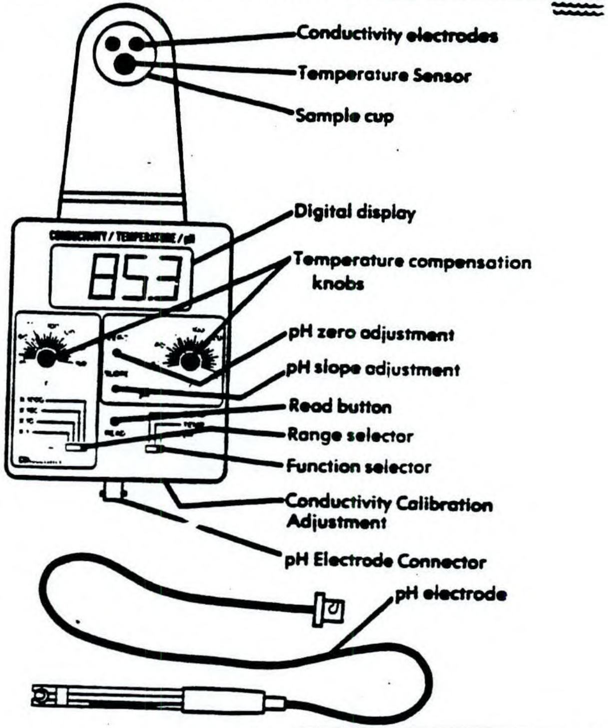
Figure 5-8. Combustibles Sensor Installation

3

HYDAC

DIGITAL CONDUCTIVITY, TEMPERATURE/pH TEST

HB835-1



FEATURES

- Digital display liquid-crystal type, 3-½ digit
- Visual warning when battery needs to be replaced
- 9 Volt Alkaline Battery
- Automatic battery strength compensation
- Rugged ABS (Acrylonitrile Butadine Styrene) instrument case plus handy carrying case

Conductance measurement

4 ranges, measured in micromhos

0 to 20
0 to 200
0 to 2,000
0 to 20,000

Integral sample cup

Accessible Calibration Adjustment

Temperature measurement

0 to 160° Fahrenheit range

Integral sample cup

pH measurement

0 to 14 range

Slope and zero adjustments on face of unit

External electrode

Buffer solutions available

ACCURACY

Conductivity ± 2% Full Scale

Temperature ± 2° Fahrenheit

pH ± .01 pH units of 77° Fahrenheit

COLE-PARMER
INSTRUMENT CO.
7425 N. OAK PARK AVE.
CHICAGO, ILLINOIS 60648
(800) 323-4340 (312) 647-7600

ELECTRODE INSTRUCTIONS

SEALED COMBINATION ELECTRODE WITH SILVER/SILVER CHLORIDE REFERENCE

PREPARATION FOR USE

1. Moisten the electrode body with tap water and carefully remove the lower (storage) plastic cap. CAUTION SHOULD BE USED IN REMOVING THIS CAP. PULL STRAIGHT DOWN. DO NOT BEND THE BODY OF THE ELECTRODE. THIS CAN RESULT IN DAMAGE TO THE INTERNAL ELEMENT. Rinse the exposed pH bulb and ceramic wick area with tap water. NOTE: Save this lower plastic cap for use in storage of the electrode.

2. For first time use, or after long term storage, immerse the lower end of the electrode in tap water for 30 minutes. This hydrates the pH bulb and prepares the ceramic wick for contact with test solutions.

3. If air bubbles are present in the pH bulb, shake the electrode downward to fill the bulb with solution.

4. NOTE: For electrodes with a removable guard, the guard is shipped in the box separate from the electrode. When the storage cap is removed, this guard is easily slipped on for bulb protection and off for bulb cleaning.

pH MEASUREMENTS

5. Rinse electrode tip with distilled water and immerse in a buffer solution whose pH is close to that of the solution to be tested. Stir solution with the electrode to assure contact with elements in the shrouded tip and to dislodge any air bubbles if present.

6. Adjust the standardize control on the pH meter to cause the meter to read the pH of the buffer. NOTE: Allow a few minutes for the electrode to reach full equilibrium.

7. Remove electrode from buffer, rinse vigorously with distilled water, shake off clinging water and immerse electrode in the solution to be tested. Read the pH value. NOTE: The electrode should always be rinsed with distilled water between solutions to prevent cross-contamination.

8. In high precision measurements it is good practice to repeat paragraphs 5 and 6 in this section as needed to assure full equilibration of the electrode.

STORAGE

9. SHORT TERM: Immerse the electrode tip in 2M KCl (dilute 4M KCl with an equal volume of distilled water).

10. LONG TERM: Fill lower plastic cap with 2M KCl and replace it on electrode tip. Replace electrode in shipping box.

RESTORING ELECTRODE WITH IMPAIRED RESPONSE

Used electrodes, which are mechanically intact, can often be restored to full response by one of the following procedures:

1. INORGANIC SCALE DEPOSITS: Dissolve the deposit by immersion of the electrode tip in dilute hydrochloric acid for a few minutes followed by a thorough rinse in tap water.

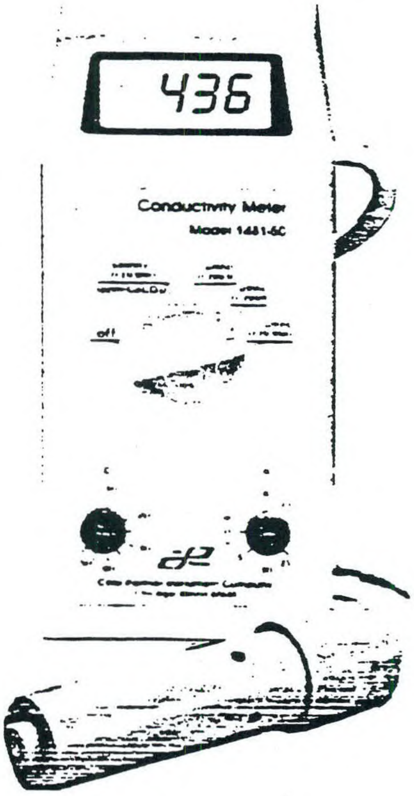
2. ORGANIC OIL OR GREASE FILMS: Wash electrode tip with detergent and water. If film is known to be soluble in a particular organic solvent, wash with this solvent. Rinse electrode tip with tap water.

3. PLUGGED OR DRY CERAMIC WICK: Remove the contaminate with one of the above procedures, then soak in 2M KCl solution.

Operating Instructions

Cole-Parmer's 148

Digital Conductivity Me



Cole
Parmer

Cole-Parmer Instrument Company

7425 North Oak Park Avenue, Chicago, Illinois 60648
Phone 1-312-647-7600 or Toll-free 1-800-323-4340

1. General information
2. Specifications
3. Calibration
4. Use of instrument
5. Use of temperature compensation
6. Use of salinity scale
7. Calibration of the salinity scale
8. Checking the electrode
9. Cleaning the electrode
10. Warranty
11. Return of items

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1. General Information

The instrument comes with a remote PVC probe, with two stainless steel electrodes located just below the PVC cap. A probe sleeve protects the electrodes and is perforated to direct the flow of liquid during measurements. It is not possible to take readings without this protective sleeve. The electrode is kept dry in the air and will not give a reading in a dry state.

A soft vinyl carrying case, 9-volt battery and an instruction manual are also included with the meter. Model 1481-52, a pint of standard calibration solution (12,980 µmho) is available as an optional accessory; call Cole-Parmer, toll-free at 1-800-323-4340, for additional information or technical assistance. (In Illinois, call collect at 1-312-647-7600.)

2. Specifications

Ranges:	µmho: 0 - 199.9, 0 - 1999, 0 - 19,990 ppm CaCO$_3$: 0 - 19,990
Accuracy:	±1% full scale
Drift:	1 digit/10°C
Temperature compensation:	Manual, 0° to 30°C at 2% per °C
Cell constant:	Adjustable by potentiometer K ±15%
Display:	1/2" LCD; with low battery indicator
Battery:	One 9-volt (included)
Battery life:	100 hours continuous operation
Probe:	Contains 2 stainless steel electrodes; PVC body, 59" cord
Dimensions:	7"L x 3¼"W x 1½"D
Weight:	1½ lbs (0.9kg) with case and probe

3. Calibration

Procedure below is based on use of the 1481-52 conducitivity calibration solution. Follow these instructions carefully:

1. If the instrument is in the "Off" position, turn the switch to the "0 - 19.990 µmho" position.
2. Pour the calibration solution into a beaker and measure the temperature of the solution.
3. Immerse the electrode in the solution so that the liquid flows through the perforations. Stir gently to permit any trapped air in the electrode to escape.
4. Position the Temperature Adjustment dial (°C) on "25".
5. Check the µmho value of the solution in terms of the ambient temperature. If the solution temperature is other than ambient, refer to the Temperature/µmho table, page 4.
6. Adjust the Cell Constant dial (K%) until the display reads "12.88" (on this scale a final zero must be added).

NOTE: When the calibration is complete, the meter will maintain the proper value for at least a month.

4. Using the instrument

If the unit has been calibrated, just immerse the end of the electrode in the liquid to be measured.

If the reading is higher than the range selected, the display will read "1" in the far left digit position. If this happens, go to a higher range. For example:

> The solution to be measured is 350 µmho. If the instrument is initially positioned at the "0 - 199.9" µmho range, only "1" will be displayed. Go to the "0 - 1999" µmho range to display the "350" µmho reading.

5. Using the temperature compensation

Variations in temperature have an effect on the conductive characteristics of the sensor. For example, the value of a piece of metal taken at 200°C is different from the value it would have had at 25°C. To correct this kind of error, the temperature is understood to be at 25°C (ambient) unless indicated otherwise.

When conductivity is measured at temperatures other than 25°C, the manual temperature adjustment should be used to correct this error. Refer to the chart below for the µmho value of the standard solution (Model 1481-52) at various temperatures.

NOTE: The influence of the temperature is an average of 2% per °C. For example, if the solution at 10°C measures 1000 µmho, at 25°C it would have measured 1200 µmho.

Temperature/salinity value chart

Temperature (°C)	Salinity (in µmhos)
0	7150
5	8220
10	9330
15	10480
16	10720
17	10950
18	11190
19	11430
20	11670
21	11910
22	12150
23	12390
24	12640
25	12880
26	13130
27	13370
28	13620
29	13870
30	14120
31	14370

6. Use of the salinity scale

The salinity scale displays the ratio between µmho and ppm $CaCO_3$ (about 0.5) automatically. Other salts have different specific µmho/ppm $CaCO_3$ ratios. NaCl, for example, has 0.64 µmho.

The salinity scale is used specifically for determining this ratio, as in the case of "primary" waters, heating, evaporating towers. In fact, in almost all these cases the presence of $CaCO_3$ is predominent with respect to the other salts.

7. Calibration of the salinity scale

It is possible to use the salinity scale reading directly in µmhos. A very interesting use consists of expanding the scale up to 199.900 µmho. To make this modification, proceed as follows:

1. Unscrew the 3 screws on the back cover. Inside you will see a "multi-turn" trimmer located near the right-hand edge of the printed circuit.
2. With the switch in the "0 - 19.990 µmho" position, immerse the electrode in the calibrating solution.
3. Turn the Cell Constant dial (K%) to calibrate the instrument to the standard solution value, thereby decreasing the value to one tenth of the original value. For example: for a reading of "1164", adjust to "11.640."
4. Position the switch on the salinity scale and turn the trimmer on the circuit board until the display reads "116." In this way one gets a measurement that is 1/10 of the preceeding one. The range, in such a case, will therefore be 0 - 199.99.

NOTE: Two zeros are added to the reading on the salinity scale (ppm $CaCO_3$). However, the 0 - 19.990 range has been decreased.

8. Checking the electrode

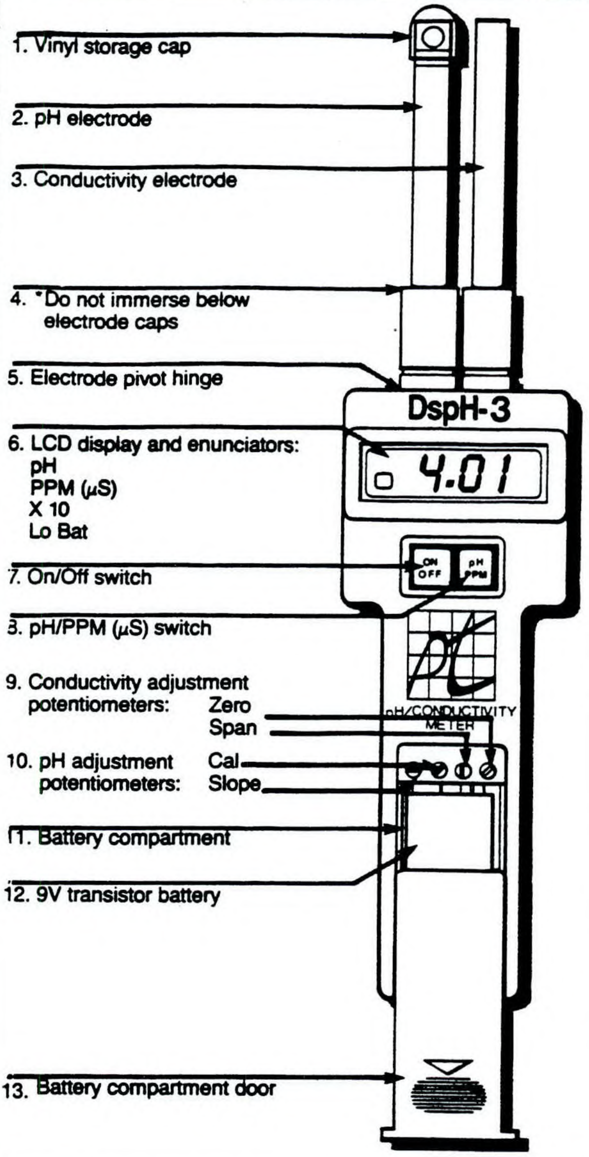
The electrode is made of PVC and therefore has limited resistance to temperature extremes. In particular it should be noted that the 4 steel rings (which combine to form the 2 electrodes) are embedded in the PVC. Prolonged exposure to high temperatures can open the joint, permitting fluid underneath the rings and breaking the electrical contact.

A damaged electrode is easily identifiable. To test for damage, unscrew the PVC sleeve and dry the rings. In air, with switch in the "0 - 199.9" position, the display should read "0.0". (Readings of "0.1" and "0.2" are still acceptable.) Higher readings, such as "10.0," are a clear symptom of a ruined electrode.

9. Cleaning the electrode

Periodically, and at least once a month, it is a good idea to unscrew the protective cover and carefully clean the rings and the PVC support. Use alcohol and a cotton wad. Then rinse the electrode throughly and dry with care.

DspH-3 pH/3 RGE. CONDUCTIVITY METER



OPERATING INSTRUCTIONS

1. Deploy electrodes in either the 90 or 180 degree measurement position.
2. Energize by depressing the On/Off switch once.
3. Immerse electrodes into solution to be measured. For proper operation, immerse electrodes ½ their length.
4. When energized, the LCD enunciator will indicate which parameter is being measured. E.G. pH, PPM (μS), or PPM (μS) X10. Only the 200K range utilizes the X10 enunciator. 20K and 2K are direct readings. Note selection sequence in #7. Overrange conductivity is indicated by a 1. Proceed to higher range for reading.
5. Agitate electrodes briefly and observe the reading.
6. For each range change desired, depress the pH/PPM (μS) switch once. This unit utilizes 3 ranges of conductivity. The range sequence is: pH-200K-20K-2K.
7. Rinse electrodes thoroughly and replace pH storage cap.

CALIBRATION INSTRUCTIONS

Your instrument has been pre-calibrated prior to shipment. Calibration should be performed periodically with fresh pH buffers and known conductivity solutions.

pH MODE

1. Rinse the pH probe in distilled water.
2. Insert in a fresh #7 buffer solution.
3. Slide back the battery compartment cover to the first stop exposing the adjustment pots.
4. Adjust the CAL pot until the display reads 7.00.
5. Remove probes, rinse and insert in a #4 or 10 buffer solution.
6. Adjust the SLOPE pot until the display reads the correct value.

CONDUCTIVITY MODE

1. Rinse probes thoroughly by agitating in pure water.
2. Wipe off conductivity probe and allow to dry.
3. Once dry, conductivity should read 0 in air.
4. Adjust ZERO pot if reading is incorrect.
5. Immerse sensor in known conductivity solution. Adjust SPAN pot to desired conductivity value.
6. Only a single point calibration in the 2K range is required to standardize. However, if unit is to be used primarily in higher ranges, it is recommended that the single point calibration be performed near point of use for best resolution.
7. Rinse probes.

HELPFUL HINTS

1. Electrodes should be rinsed thoroughly after each test.
2. Be sure to replace the protective pH cap after each use.
3. Fill the cap with a small amount of pH 4 buffer or tap water.
4. If the conductivity probe does not zero, it may indicate dried solids on the sensor. Clean with a mild detergent solution.
5. For best results, calibrate pH with a buffer that is within 3 pH units of the test sample.
6. Choose a conductivity calibration solution that is near the samples to be measured.
7. Remove the battery when the instrument will be stored for a long period.

Model
5941-00

pHep - pH electronic paper

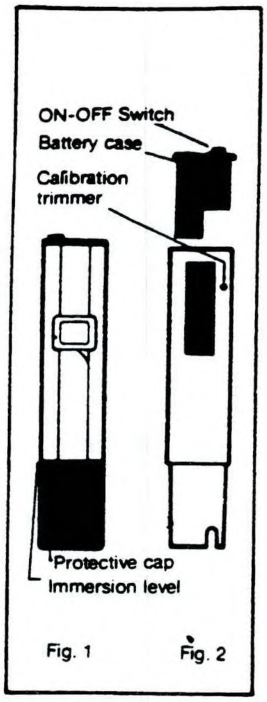


Fig. 1 Fig. 2

Specifications:

— **Range:**	0.0 to 14.0 pH
— **Resolution:**	0.1pH
— **Accuracy:**	± 0.2 pH
— **Battery:**	4 x 1.4 V (DURACELL MP 675H or equivalent)
— **Battery life:**	1,000 hours
— **Operating temperature:**	0 to 50°C (32°F to 122°F)
— **Size (L x W x H)**	6" x 1-1/4" x 3/4"
— **Calibration:**	By offset trimmer
— **Weight:**	2.3 oz

Operating Information:

- Remove protective cap (figure 1).
- Turn on pHep by ON-OFF switch located on top (figure 2).
- Dip pHep in solution up to immersion level (figure 1). Under no circumstances immerse above display level.
- Stir gently and wait a few seconds. If electrode is dry wait a bit longer.
- When not in use, switch off pHep and replace protective cap.
- Large differences in readings of pH (±0.5 pH) could be due to dry electrode or run-down batteries. To improve performance leave pHep up to immersion level in tap water for a few minutes at least once a week.
- To change batteries, pull out the battery case (figure 2) and replace batteries.
- To recalibrate the instrument, dip in pH 7 solution and adjust the reading if necessary by offset trimmer using a small screwdriver.

Made in Singapore

Before you begin — some tips on using the pHep

Do not be alarmed when white crystals form on the cap. This is normal with all pH electrodes.

Condition the pHep: Remove the cap and soak the sensor for at least one half hour in either a 4.0 pH or 7.0 pH buffer, or tap water. Immerse the sensor end up to the ridge (about 1 inch from the end).

Calibrate the pHep: After conditioning, you must calibrate the pHep, using a buffer solution with a value close to the solution to be measured. When measuring drinking water, for example, immerse the pHep in a 7.0 pH buffer, agitate in the buffer, and let the reading stabilize for a few seconds. Then turn the trimpot, located on the back of the meter, until the display reads 7.0 pH. Since electrode response normally changes with time, we recommend that you periodically recalibrate.

Simple maintenance: Take quick readings of aggressive solutions, heavy metals or proteins. Rinse immediately with de-ionized water to remove any residue from the electrode. In most other solutions, rinse with distilled water or even tap water if de-ionized water is not available. When storing the pHep, we recommend that you insert a small piece of white tissue or sponge in the base of the cap, wet it with the same liquid you used to condition (see above), and then replace the cap firmly. This retards leakage from the reference electrode and prolongs the useful life of the pHep. If you do not store it as recommended, repeat the conditioning soak procedure after storage of more than a week.

Applications: water conditioning, factory waste, effluent monitoring, plating rinse tanks, food processing, routine testing in schools and labs, swimming pools, aquariums and fish culture.

Cole-Parmer Instrument Company
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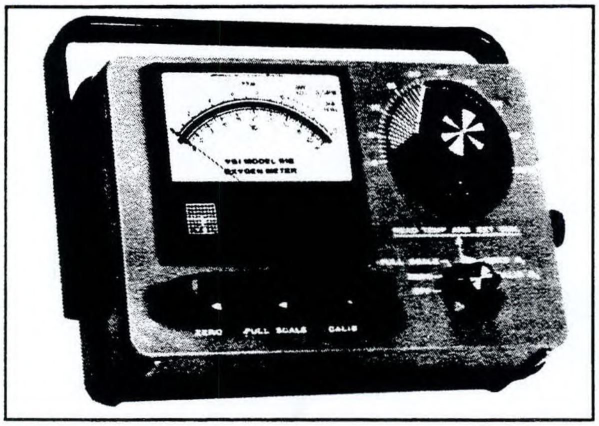

Oxygen Meter, Model 51B, YSI, A low cost, high accuracy, battery-operated instrument ideal for field work in either fresh or salt water. It indicates dissolved oxygen directly over a 0-15 mg/l range within a temperature range of -5° to +45° C with an accuracy of ±0.2 mg/l or better at calibration temperature. Temperature measurement accuracy is to ± 0.6° C. The oxygen scale is readable to 0.1 mg/l; the temperature scale to 0.25° C. Response time typically for temperature and dissolved oxygen readings is 90% in ten seconds at 30° C constant temperature. Operation is very simple; just dial in the local altitude and water salinity, adjust for ambient temperature, and you're ready to measure. Uses four disposable "C" size zinc batteries which provide approximately 1000 hours of operation. Order probes, calibration chamber and probe service kit separately.

III. Calibration

The operator has a choice of three calibration methods — Winkler Titration, Saturated Water, and Air. Experience has shown that air calibration is quite reliable, yet far simpler than the other two methods. The three methods are described in the following paragraphs.

Winkler Titration

1. Draw a volume of water from a common source and carefully divide into four samples. Determine the oxygen in three samples using the Winkler Titration technique and average the three values. If one of the values differs from the other 2 by more than 0.5 mg/l, discard that value and average the remaining two.
2. Place the probe in the fourth sample and stir.
3. Read temperature of calibration sample and set solubility dial to sample temperature. Observe correct salinity. Allow the probe to remain in the sample at least two minutes before setting temperature.
4. With switch in READ O_2 position, set CALIB O_2 Knob to the average value determined in Step 1. Leave in the sample for an additional two minutes to verify stability.

Saturated Water

1. Air saturate a volume of water (300-500cc) by aerating or stirring for at least 15 minutes at a relatively constant temperature.
2. Place the probe in the sample and stir.
3. With the switch in the CALIB O_2 position, adjust the CALIB Knob to the mark for the local altitude. Leave probe in sample for 2 minutes to verify stability.

Air Calibration

1. Switch to CALIB O_2 position.
2. Place the probe in moist air. B.O.D. probes can be placed in partially filled B.O.D. bottles. Other probes can be placed in YSI 5075A Calibration Chamber (Refer to the following section describing CALIBRATION CHAMBER) or the small calibration bottle (the one with the hole in the bottom along with a few drops of water. The probe can also be wrapped loosely in a damp cloth taking care the cloth does not touch the membrane. Wait approximately 10 minutes for temperature stabilization. This may be done simultaneously while the probe is stabilizing.
3. With the CALIB Knob set the meter pointer to the mark for the local altitude. Be sure reading is steady. For calibration at altitudes higher than 7000 feet above sea level, see Table II. Recalibration is recommended when altitude is changed. A 1000 ft. altitude change can result in a 3% reading error — 0.3 mg/l at 10.0 mg/l.

The probe is now calibrated and should hold this calibration value for many measurements. Calibration can be disturbed by physical shock, touching the membrane, or drying out of the electrolyte. Check calibration after each series of measurements and in time you will develop a realistic schedule for recalibration. For best results when not in use, follow the storage procedures recommended for the various probes described under OXYGEN PROBES AND EQUIPMENT. This will reduce drying out and the need to change membranes.

Calibration Chamber

The YSI 5075A Calibration Chamber is an accessory that helps obtain calibrating conditions when air calibrating in the field and is also a useful tool when measuring in shallow water (less than 4 ft). As shown in Figure 9, it consists of a 4-1/2 ft. stainless steel tube (1) attached to the calibration chamber (5) and the measuring ring (7). For calibration insert the solid rubber stopper (6) into the bottom of the calibration chamber (5). Push the probe (4) through the hollow rubber stopper (3) as shown in Detail A. For maximum accuracy wet the inside of the calibration chamber (5) with fresh water. This creates a 100% relative humidity environment for calibration. Insert the probe-stopper assembly in the top of the calibration chamber.

During calibration hold the calibration chamber under water and calibrate as described in the Air Calibration procedure. Keep the handle above the water at all times. After calibration the chamber can be used as a measuring aid by removing the probe-stopper assembly from the calibration chamber (5) and placing it in measuring ring (7). (See Detail C). Slowly stir the water with the wand when measuring.

5

Cole Parmer

Model 5942-00

ORP: Oxidation Reduction Potential Tester

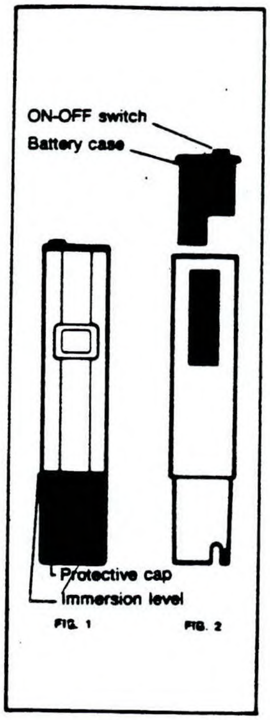

FIG. 1 FIG. 2

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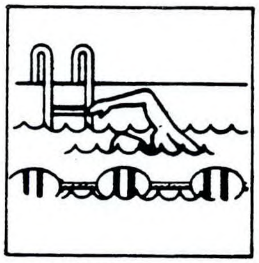
Specifications:

Range:	−999 to +999 mV
Resolution:	1 mV
Battery:	4 x 1.4 (Duracell MP 675H or equivalent)
Battery life:	1000 hours (approx)
Operating temp:	0 to +50°C (32° to 122°F)
Size (LxWxH):	5.6" x 1.1" x 0.6"
Weight:	2.3 ounces

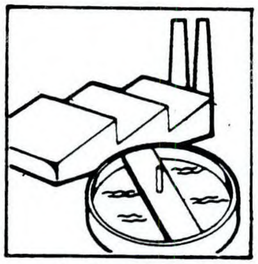
Operating Instructions:

1. Remove protective cap (figure 1). Note Salt crystal formation around cap is normal.
2. Turn on ORP by ON-OFF switch located on top (figure 2).
3. Dip ORP in solution up to but not beyond immersion level (figure 1).
4. Stir gently and wait several minutes until reading stabilizes, longer if the electrode bulb was dry.
5. When not in use, switch off ORP and replace protective cap.
6. Replace all batteries if the display becomes faint or disappears altogether, or if the accuracy deteriorates.
7. To change batteries, pull out battery case (figure 2) and replace batteries.
8. The ORP does not require calibration. If you suspect the readings, check batteries or call Cole-Parmer.

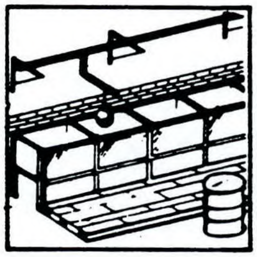
APPLICATIONS



SWIMMING POOLS

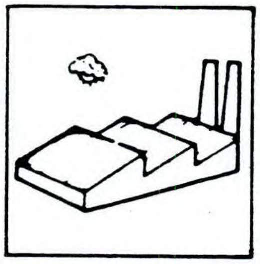


FACTORY WASTE



PLATING TANKS

SCHOOLS AND LABS



GENERAL INDUSTRY

Cole-Parmer Instrument Co.
7425 N. Oak Park Avenue
Chicago, Illinois 60648

6

WATER LEVEL MEASUREMENTS

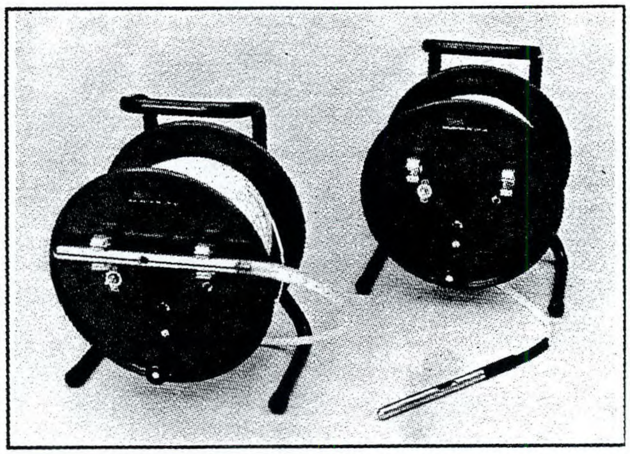
Solinst

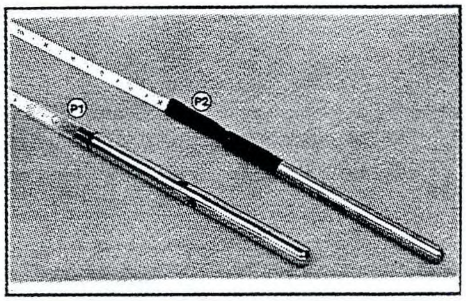
The preferred water level meter for durability, quality, and ease of operation for years has been SOLINST. The instrument most frequently used is the Model 101 with the M2 option to provide a scale in feet and 10ths of feet; with markings every 20th of a foot. The standard instrument is equipped with a nickel plated brass probe (P1 Probe), however a stainless steel probe (P2 Probe) is a popular option

Model 101—Flat Tape Water Level Meter

For measuring the depth of water in boreholes, standpipes and wells, the Flat Tape Water Level Meter (dipmeter) is the most reliable and accurate of the Solinst Water Level Meters and is easy to operate and read.

Also available is the Model #102 Coaxial Cable Water Level Meter for use in applications with small size tubes.





P1 Regular nickel plated brass have 0.59" diam. (15mm) and are 8-1/4" long (210.0mm).

P2 316 Stainless Steel fitted with a neoprene strain relief have a 0.5" diam. (12.7mm) and are 7-1/2" long (190.5mm). It is ideal for environmentally sensitive applications.

Other Options

Indicator Signals An audible buzzer is standard equipment. However, a signal light can also be added, where background noise may be a problem.

Sensitivity Control

The standard equipment includes a sensitivity control mounted on the circuit board which can be set to suit water conductivity conditions. This control can be incorporated into the on/off switch, as a variable scale, for cases in which a variety of water conductivity conditions are encountered.

ATTACHMENT B

LABORATORY QUALITY ASSURANCE/ QUALITY CONTROL PLAN

(To be subsequently provided by selected laboratory)

ATTACHMENT C

DATA VALIDATOR SCOPE OF WORK

DATA VALIDATION SCOPE OF WORK - NYSDEC RI/FS PROGRAM

Data validation is the systematic process by which the data quality is determined with respect to data quality criteria that are defined in project and laboratory quality control programs and in the referenced analytical methods. The data validation process consists of an assessment of the acceptability or validity of project data with respect to stated project goals and requirements for data usability. Ideally, data validation establishes the data quality in terms of project data quality objectives. Data validation consists of data editing, screening, checking, auditing, certification, review, and interpretation. The purpose of data validation is to define and document analytical data quality and determine if the data quality is sufficient for the intended use(s) of the data. In accordance with DEC requirements, all project data must be of known and acceptable quality. Data validation is performed to establish the data quality for all data which are to be considered when making project decisions. Laboratories will be required to submit results which are supported by sufficient back-up data and QA/QC results to enable the reviewer to conclusively determine the quality of data.

DATA AND QUALIFICATIONS OF A DATA VALIDATOR

In order to ensure an acceptable level of performance, the following qualifications and requirements are established for all consultants/contractors functioning as data validators. These qualifications and requirements shall apply whether the consultant/contractor is: a) retained directly through contracts executed by this agency; b) retained as a subcontractor to a consultant functioning under contracts executed by this agency or c) retained by a responsible party functioning under the guidance and direction of an order on consent. Consultant/Contractor functioning as a data validator shall be independent of the laboratory generating the data.

The consultant/contractor functioning as a data validator shall provide evidence that all staff members involved in the data validation process have: a) a bachelors degree in chemistry or natural sciences with a minimum of 20 hours in chemistry; b) one (1) year experience in the implementation and application of the protocol(s) used in generating the data for which they are responsible. The successful completion of the EPA Data Validation Training Course may be substituted for the analytical experience requirement. In addition, these same staff members must have a minimum of one (1) year experience evaluating CLP data packages for contract and protocol compliance.

The consultant must provide the résumé of the proposed third party data validator along with a recent data validation report prepared by that validator for review and approval by the Division of Hazardous Waste Remediation Quality Assurance Officer.

The independent data validator is also required to meet with a data validator of the Quality Assurance Section prior to reviewing the first data package.

Consistent with the Division's Quality Assurance Program Plan, all laboratory data generated in support of any investigation, remediation or monitoring activity carried out under the Division's program responsibility shall be developed under the administrative and operational control of a Quality Assurance Project Plan (QAPjP). To this end the QAPjP shall become an integral part of the Project Work Plan and those portions that pertain to the development and production of analytical data shall define the task of the laboratory charged with developing and producing this data. The QAPjP, as part of the Project Work Plan shall include the following information:

1. The number and types of samples that are to be analyzed.
2. The sample holding times that must be observed and the time from which these holding times shall be measured.
3. The list of analytes to be identified and quantified during the analytical process.
4. The site specific limits of concern for each of the analytes listed in each of the matrices to be sampled.
5. The matrix specific method detection limits that must be obtained for each of the analytes and matrices listed (this value should be in the neighborhood of 1/5 the site specific limit of concern.
6. The analytical protocols that shall be employed including any special handling or cleanup procedures that may be required.
7. The frequency and types of any required quality control samples (e.g., trip blanks, rinse blanks, replicates, matrix spikes and matrix spike duplicates.
8. The identification of any critical samples and any special analytical treatment that they may require.
9. The required deliverables and supporting documentation where these differ from or are not a part of the required analytical protocols.

In order to facilitate the data validation process, copies of the project Work Plan, Quality Assurance Project Plan (addressing the above referenced nine points of information), together with the project required deliverables and supporting documentation, and laboratory subcontract shall be submitted to the firm contracted to carry out the data validation portion of the standby contract.

Task I: Completeness

The Validator shall review the data package to determine completeness. A complete data package will consist of the following eight (8) components:

1. All sample chain of custody forms.
2. The case narrative(s) including all sample/analysis summary forms*.
3. Quality Assurance/Quality Control summaries including all supporting documentation.
4. All relevant calibration data including all supporting documentation.
5. Instrument and method performance data.
6. Documentation showing the laboratory's ability to attain the contract specified method detection limits for all target analytes in all required matrices.
7. All data report forms including examples of the calculations used in determining final concentrations.
8. All raw data used in the identification and quantitation of the contract specified target compounds.

*These forms appear as an addendum to the NYSDEC CLP forms package and will be required for all data submissions regardless of the protocol requested.

All deficiencies in the requirement for completeness shall be reported to the consultant immediately. The laboratory shall be contacted by the consultants QAO and shall be given ten (10) calendar days to produce the documentation necessary to remove the deficiencies.

Task II: Compliance

The Validator shall review the submitted data package to determine compliance with those portions of the Work Plan that pertain to the production of laboratory data. Compliance is defined by the following criteria.

1. The data package is complete as defined in Task 1 above.
2. The data has been produced and reported in a manner consistent with the requirements of the QAPjP and the laboratory subcontract.
3. All protocol required QA/QC criteria have been met.

4. All instrument tune and calibration requirements have been met for the time frame during which the analyses were completed.

5. All protocol required initial and continuing calibration data is present and documented.

6. All data reporting forms are complete for all samples submitted. This will include all requisite flags, all sample dilution/concentration factors and all premeasurement sample cleanup procedures.

7. All problems encountered during the analytical process have been reported in the case narrative along with any and all actions taken by the laboratory to correct these problems.

The data validation task requires that the Validator conduct a detailed comparison of the reported data with the raw data submitted as part of the supporting documentation package. It is the responsibility of the Validator to determine that the reported data can be completely substantiated by applying protocol defined procedures for the identification and quantitation of the individual analytes. To assist the Validator in this determination, the following documents are recommended; however, the EPA Functional Guidelines will be used for format only. The specific requirements noted in the Project Quality Assurance Project Plan are prerequisite, for example holding times or special analytical project needs, to those noted in the Functional Guidelines.

1. The particular protocol(s) under which the data was generated (e.g., NYSDEC Contract Laboratory Protocol; EPA SW-846; EPA Series 500 Protocols).

2. Data validation guidance documents such as:

    a. "Functional Guidelines for Evaluation Inorganic Data" (published by EPA Region 2).

    b. "Functional Guidelines for Evaluation Organics Analyses" Technical Directive Document No. HQ-8410-01 (published by EPA).

    c. "Functional Guidelines for Evaluating Pesticides/PCB's Analyses" Technical Directive Document No. HQ-8410-01 (published by EPA).

    NOTE: These documents undergo periodic revision. It is assumed that the selected firm will have access to the most current applicable documents and guidelines.

The Validator shall submit a final report covering the results of the data review process. This report shall be submitted to the Project Manager or his designee and shall include the following:

1. A general assessment of the data package as determined by the accomplishment of Tasks I-II above.

2. Detailed descriptions of any and all deviations from the required protocols. (These descriptions must include references to the portions of the protocols involved in the alleged deviations).

3. Any and all failures in the Validator's attempt to reconcile the reported data with the raw data from which it was derived. (Again, specific references must be included). Telephone logs should be included in the validation report.

4. A detailed assessment by the Validator of the degree to which the data has been compromised by any deviations from protocol, QA/QC breakdowns, lack of analytical control, etc., that occurred during the analytical process.

5. The report shall include, as an attachment, a copy of the laboratory's case narrative including the DEC required sample and analysis summary sheets.

6. The report shall include an overall appraisal of the data package.

7. The validation report shall include a chart presented in a spread sheet format, consisting of site name, sample numbers, data submitted to laboratory, year of CLP or analytical protocol used, matrix, fractions analyzed (e.g., volatiles, semi-volatiles, Pest/PCB, Metals, CN). Space should be provided for a reference to the NYSDEC CLP when non-compliancy is involved and a column for an explanation of such violation.

OLD CORTLAND COUNTY LANDFILL REMEDIAL INVESTIGATION/ FEASIBILITY STUDY

FINAL WORK PLAN - APPENDIX B HEALTH AND SAFETY PLAN

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ENVIRONMENTAL CONSERVATION
DIV. ENVIRONMENTAL ENFORCEMENT
BUFFALO FIELD UNIT

DECEMBER, 1996

PREPARED FOR

CORTLAND COUNTY DEPARTMENT
OF SOLID WASTE
TOWN LINE ROAD
McGRAW, NEW YORK 13101

PREPARED BY

BARTON & LOGUIDICE, P.C.
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SYRACUSE, NEW YORK 13220

PROJECT NO. 331.21

OLD CORTLAND COUNTY LANDFILL
REMEDIAL INVESTIGATION/FEASIBILITY STUDY

FINAL WORK PLAN - APPENDIX B
HEALTH AND SAFETY PLAN

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1.0 PURPOSE

The purpose of the Health and Safety Plan for the Old Cortland County Landfill, Cortland County, New York, is to provide specific guidelines and establish procedures for the protection of personnel conducting a Remedial Investigation/Feasibility Study of the Old County Landfill. This Site-Specific Health and Safety Plan is based on previous testing and information available to date. The Plan and procedures shall be updated based upon the on-going investigation of the site conditions, including the most current information available for each media.

All personnel conducting activities on-site, in which a potential exposure exists, must be in compliance with all applicable Federal and State rules and regulations. All personnel conducting site activities must also be familiar with the procedures, requirements and provisions of this Plan. In the event of conflicting Plans and requirements, personnel must implement those safety practices which afford the highest level of protection.

1.1 Personnel

Barton & Loguidice, P.C., Project Manager
Mark J. Chauvin

Client Contact
Ralph Pitman

Barton & Loguidice, P.C., Site Safety Officer
Field Investigation Personnel

Subcontractors

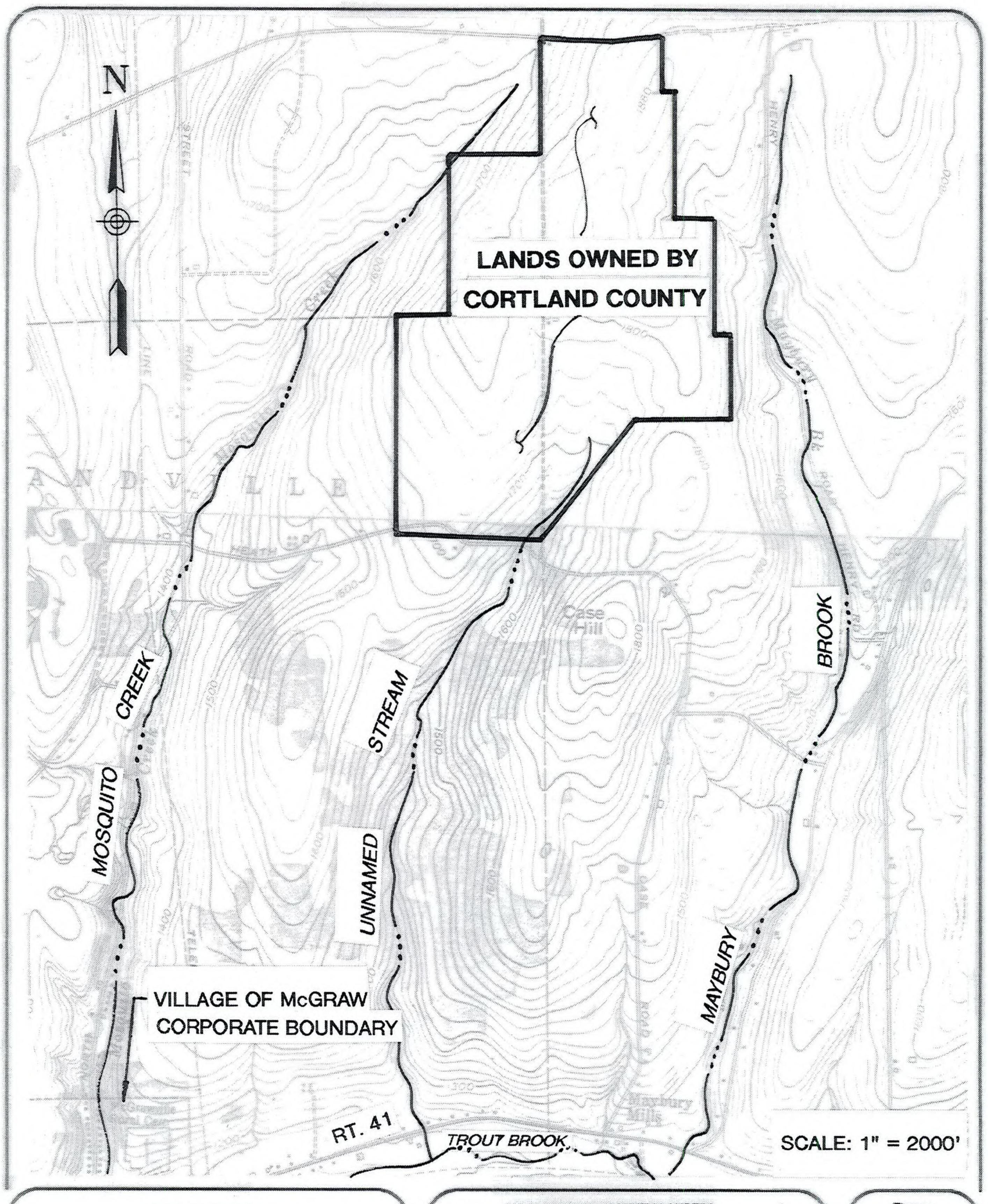
2.0 SITE BACKGROUND

The Old Cortland County Landfill site is part of an approximate 539.9 acre property located on Town Line Road, in the Town of Solon in northern Cortland County. Figure 2-1 is presented for orientation purposes.

The Old County Landfill is a closed municipally owned landfill facility. The landfill was operated by the County from 1972 to 1988. Prior to the County operation, the landfill was run by the City of Cortland since the mid 1960's, and before that, as a private landfill since the mid 1950's. The facility has accepted domestic, commercial and industrial wastes originating in the City of Cortland and surrounding townships.

Although wastes accepted at the site had been primarily domestic in nature, a number of drums containing liquid hazardous wastes from nearby industries and manufacturers have been disposed of at the landfill.

The Old County Landfill encompasses approximately 36 acres of the total 539.9-acre parcel of land owned by the County. The remainder of the site contains the abandoned City of Cortland Landfill, the closed Pine Tree Landfill, the existing County Landfill, borrow and infrastructure areas. The surrounding land use is under residential and agricultural ownership and is sparsely populated.



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OLD CORTLAND COUNTY LANDFILL
REMEDIAL INVESTIGATION/FEASIBILTY STUDY

SITE LOCATION AND
SURFACE DRAINAGE MAP

TOWN OF SOLON
CORTLAND COUNTY

Figure
2-1
Project No.
331.21

3.0 SITE CONTROL

The purpose of site control is to minimize potential contamination of workers, protect the public from the site's hazards, and prevent vandalism. The degree of site control necessary depends on site characteristics, site size and the surrounding community.

The Old Cortland County Landfill provides limited access, since it is somewhat secluded by densely forested property and forested meadowlands which provides no direct access to the site. West of the project site is the landfill access road which is accessible only during operational hours when the access control gate is open.

The Department of Solid Waste Office and access control gate are located at the landfill entrance on Town Line Road. The Solid Waste Office will serve as the Field Office during the RI/FS activities. Barton & Loguidice, P.C., and Cortland County are requesting personnel, subcontractors, and visitors to report to the Office prior to entering the site or construction activities.

The restricted access and rural location of the project site contribute significantly to minimizing the site's hazards to the surrounding community and reduce the potential for vandalism.

3.1 Work Zones

Site work zones will be established for each work area, prior to initiation of field investigation activities. Each of these zones will be periodically monitored, and personnel protection levels will be established in accordance with procedures established in Sections 6.4 and 6.6, respectively.

Site work zones are broken down into three basic categories:

1. The Exclusion Zone - contaminated work area.

2. The Contamination Reduction Zone - the decontamination area.

3. The Support Zone - uncontaminated, clean area.

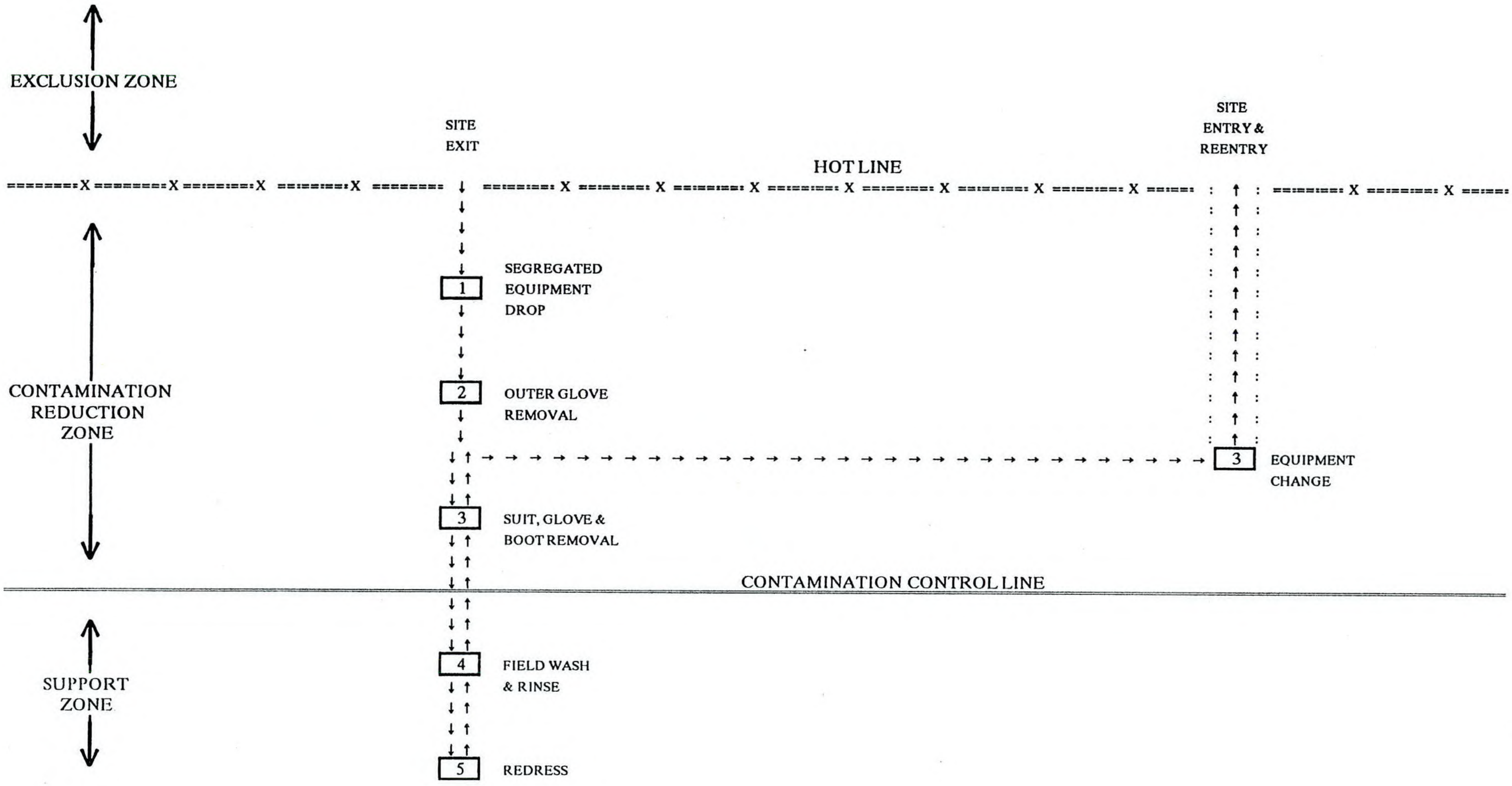
The Exclusion Zone (formally Contamination Zone) is the area where the primary field investigation activity occurs such as sampling, installation of wells, etc. This area must be clearly marked with hazard tape or other means. Only personnel involved in the work activities will be allowed in the Exclusion Zone. An Exclusion Zone surrounding each work area of field investigations will be established.

The Contaminated Reduction Zone (CRZ), formally the Buffer Zone, is the transition area between the contaminated area and the clean area. Decontamination is the main focus in the area. The decontamination of workers and equipment limits the physical transfer of hazardous substances into the clean area. A Contamination Reduction Zone will be established surrounding all of the work areas involving field investigation activities. A Contamination Reduction Corridor containing a decontamination pad will be located in this zone. A Contamination Reduction Corridor is a pathway in which decontamination occurs. One pathway will be established for heavy equipment and one for personnel decontamination. This area will also serve as an access control point for personnel entering the Exclusion Zone.

The Support Zone (formally the Clean Zone) is an uncontaminated zone which is the location of administrative and other support functions, such as first aid, telephones, equipment supply and emergency information. The Support Zone should have negligible potential for exposure to contaminants and is equivalent to that of background.

3.2 Decontamination

A personnel decontamination area will be established in the Contamination Reduction Zone. All personal protective equipment will be disposed of and/or decontaminated at the conclusion of each work day. Designated containers for Tyvek suits and other disposables will be located in the CRZ. Tyvek suits, respirator cartridges and other disposables (inner gloves) will be doffed before meal breaks and at the conclusion of the work day and replaced with new equipment prior to commencing work. Respiratory equipment, foul weather gear and other non-disposables will be fully decontaminated and then placed in a designated personal protective equipment storage area. The decontamination layout for the various levels of protection is shown in Figures 3-1, 3-2 and 3-3.



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OLD CORTLAND COUNTY LANDFILL

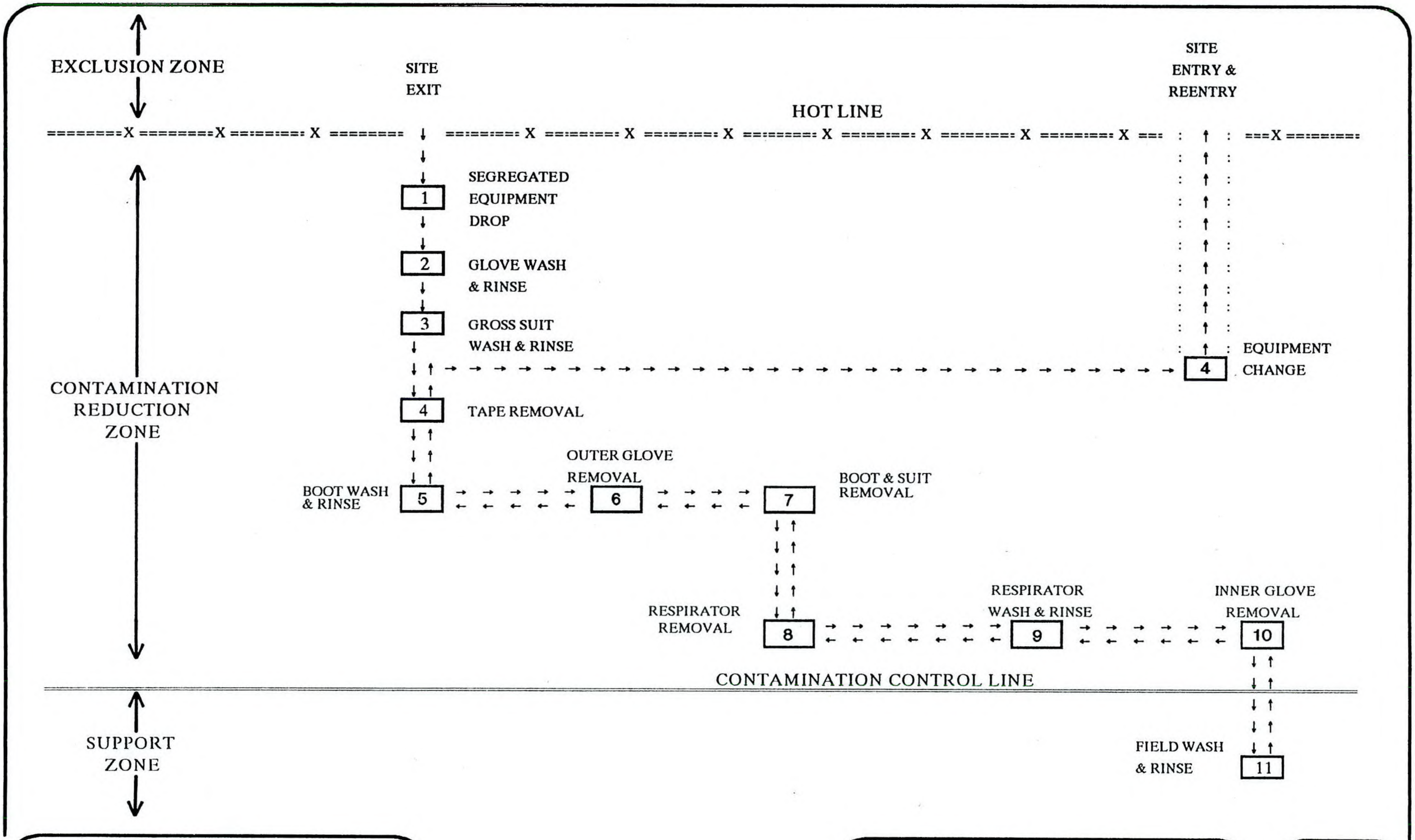
REMEDIAL INVESTIGATION/FEASIBILITY STUDY

LEVEL D
DECONTAMINATION PROCEDURES

TOWN OF SOLON
CORTLAND COUNTY

Figure
3-1

Project No.
331.21



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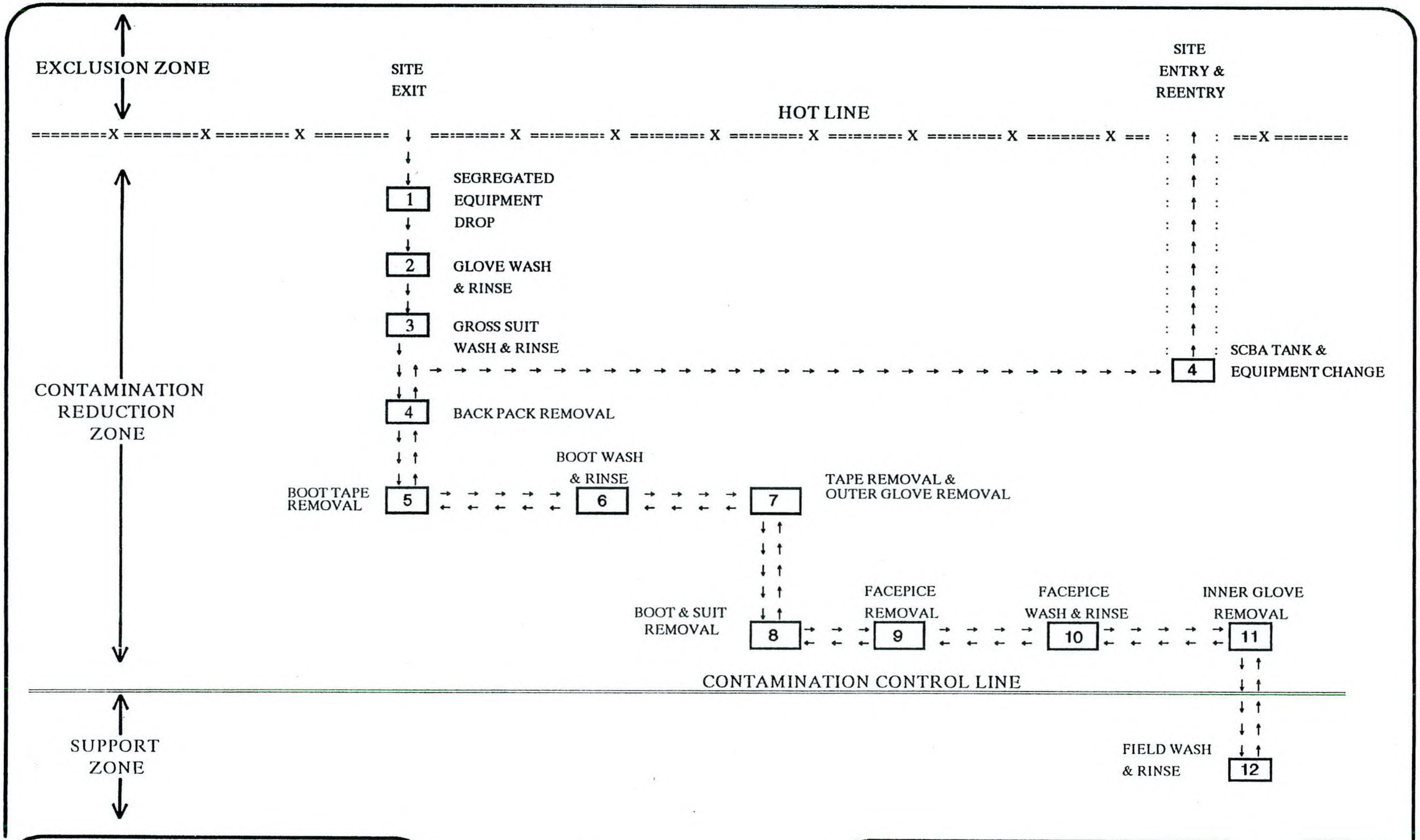
OLD CORTLAND COUNTY LANDFILL
REMEDIAL INVESTIGATION/FEASIBILITY STUDY

LEVEL C
DECONTAMINATION PROCEDURES

TOWN OF SOLON
CORTLAND COUNTY

Figure
3-2

Project No.
331.21



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OLD CORTLAND COUNTY LANDFILL
REMEDIAL INVESTIGATION/FEASIBILITY STUDY

LEVEL B
DECONTAMINATION PROCEDURES

TOWN OF SOLON
CORTLAND COUNTY

Figure
3-3

Project No.
331.21

4.0 RI/FS FIELD ACTIVITIES

The following site activities will be conducted during the RI/FS:

- Topographic Survey
- Limits of Waste Investigations
- Geophysical Survey
- Evaluation of Buried Drum Condition
- Surface Water Sampling
- Sediment Sampling
- Boring/Well Installations and Sampling
- Ecological Evaluation
- Groundwater Sampling
- Source Area Air Monitoring Survey

A brief description of these activities, and the company responsible for each, is presented below. Also, the need for Personal Protective Equipment (PPE) for each activity is indicated.

4.1 Topographic Survey

A topographic map of the site area will be prepared using aerial photography. A land surveyor will provide support in setting up ground control for the aerial mapping. This activity is not considered a hazardous waste operation; therefore, personnel will not be required to wear PPE.

4.2 Limits of Waste Investigation

Barton & Loguidice will subcontract with a backhoe operator to perform a series of shallow test pits around the perimeter of the Old Cortland County Landfill. Since it is certain that buried wastes will be encountered, it will be necessary to perform continuous monitoring for the presence of combustible gases and VOCs. Both the subcontractor and B&L on-site personnel will be attentative to the types of waste encountered, specifically waste asbestos which may pose an inhalation hazard if disturbed.

It is anticipated that the limits of waste investigation will be completed over an approximate 3-4 day period. Throughout this period, all B&L and subcontractor personnel present within the Exclusion Zone (immediate vicinity of test pit) will be fitted with personal air sampling equipment for asbestos and VOCs. Samples will be analyzed daily to track the potential exposure of workers and to make modifications in the level of PPE. It is anticipated at this time that this work can be completed in Level D PPE.

4.3 Geophysical Survey

Barton & Loguidice will subcontract with a geophysical surveyor to perform a geophysical survey using electromagnetic terrain conductivity and/or magnetometer methods. The survey will be performed in accordance with the Work Plan or as site conditions dictate. Because the geophysical survey methods will be nonintrusive, this activity is not considered a hazardous waste operation, and PPE is not required.

4.4 Evaluation of Buried Drum Condition

A supplemental excavation program will be conducted within the vicinity of the reported drum disposal area to determine the condition of the buried drums. This activity will include the removal of wastes (up to 20 feet thick) above the drums, staging of excavated wastes, removal of selected representative drums for evaluation and backfilling the excavated area to its previous condition. The intrusive nature of this work suggests the potential for worker exposure to a variety of physical and chemical hazards. It is anticipated at this time that workers within the Exclusion Zone will be required to perform site activities in Level B PPE. This level of protection is designated due to the unknown concentrations of possible contaminants present and the potential for oxygen deficient conditions. The extent of the Exclusion Zone will be initially set as an approximate 50-foot radius around the excavation, but may be enlarged if air monitoring results necessitate a modification.

A separate Health and Safety Plan will be required of the subcontractor selected to perform the excavation and drum search. The Plan will be developed in compliance with 29 CFR 1910.650 (Subpart P - Excavations). In addition to the standard HASP requirements, the Plan must address specific air monitoring and sampling procedures, site control measures and contingency procedures to be followed during the trenching program.

4.5 Surface Water Sampling

Surface water samples will be collected by Barton & Loguidice at locations specified in the Work Plan. Samples will be collected by submerging a beaker or sample bottle directly into the water at midstream. Level D PPE equipment is required to perform this activity.

4.6 Sediment Sampling

Sediment sampling will be collected by Barton & Loguidice at locations specified in the Work Plan. They will consist of the top 6 inches of solid material at the sampling location. Level D PPE equipment is required to perform this activity.

4.7 Boring/Well Installations and Sampling

Barton & Loguidice will supervise the drilling and sampling of soil borings and the installation of monitoring wells. Borings will be advanced using appropriate drilling methods to the top of and into bedrock. If conditions allow, a monitoring well couplet will be installed at each boring.

During drilling, soil samples will be collected using 2-inch and 3-inch split-spoon samplers. Samples will be collected continuously for the full depth of the boring. Locations of the proposed boring and monitoring wells are presented in the Work Plan Sheet 1. The name of the drilling Contractor will be provided at a later date.

Level D PPE will be required of both Barton & Loguidice and the drilling Contractor personnel.

4.8 Groundwater Sampling

Groundwater samples will be collected by Barton & Loguidice from the designated existing wells and from the newly installed monitoring wells. Groundwater will be collected from each well using disposable Teflon bailers. Level D PPE is required to perform this activity.

4.9 Source Area Air Monitoring Survey

A Source Area Air Monitoring Survey will be performed over the approximately 36-acre refuse disposal area. The survey will be conducted in accordance with the details outlined in the Work Plan. This survey will be non-intrusive, but will require Level D PPE.

5.0 HAZARD EVALUATION

5.1 Chemical

The potential hazards for each field investigation activity include:

- Inhalation of volatile organic vapors.
- Inhalation of contaminated dusts and asbestos.
- Direct contact with contaminated media (i.e., sediments, refuse, soils, groundwater).
- Oxygen deficient and/or explosive conditions.
- Physical injuries, such as heat stress, frostbite, abrasions.
- Exposure to biological hazards such as poisonous plants and insect bites.

Information collected to date has indicated the presence of a number of chemical contaminants. Despite their relatively low concentrations, a Chemical Hazard Data Sheet has been prepared for each chemical substance found to date. These data sheets contain information on the physical, chemical and toxicological properties of the chemical constituent. Attachment A contains the Chemical Hazard Data Sheets arranged in alphabetical order.

5.2 Mechanical, Physical, Electrical and Temperature

The mechanical, physical, electrical and temperature hazards associated with each field activity are summarized in Table 5-1, including the routes of entry for hazardous compounds.

TABLE 5-1
RI/FS SITE ACTIVITY HAZARD EVALUATION

SITE ACTIVITY	MECHANICAL	ELECTRICAL	CHEMICAL	PHYSICAL	TEMPERATURE
Limits of Waste Investigation	Accidental injury from excavation equipment	Buried power lines	Inhalation of toxic vapors and asbestos fibers, accidental ingestion, skin absorption, eye contact	Collapse of excavation, buried pipelines, puncture from buried objects	Heat/Cold stress
Evaluation of Buried Drum Condition	Accidental injury from excavation equipment	None anticipated	Inhalation of toxic vapors and asbestos fibers, accidental ingestion, skin absorption, eye contact	Collapse of excavation, water, puncture from buried objects	Heat/Cold stress
Geophysical Survey	Accidental injury from geophysical instrumentation	None anticipated	Inhalation of toxic vapors	None anticipated	Heat/Cold stress
Boring/Well Installation and Sampling	Accidental injury from drill rig or sampling equipment	Buried power lines	Inhalation of toxic vapors, accidental ingestion, skin absorption, eye contact	Buried pipelines	Heat/Cold stress
Subsurface Soil Sampling	Accidental injury from sampling equipment	None anticipated	Inhalation of toxic vapors, accidental ingestion, skin absorption, eye contact	None anticipated	Heat/Cold stress
Surface Water Sampling	Accidental injury from sampling equipment	None anticipated	Accidental ingestion, skin absorption, eye contact	Water	Heat/Cold stress
Sediment Sampling	Accidental injury from sampling equipment	None anticipated	Accidental ingestion, skin absorption, eye contact	Water	Heat/Cold stress
Groundwater Sampling	Accidental injury from bailers	None anticipated	Inhalation of toxic vapors, accidental ingestion, skin absorption, eye contact	None anticipated	Heat/Cold stress
Source Area Air Monitoring	None anticipated	None anticipated	Inhalation of toxic vapors, skin absorption, eye contact	Slope of terrain	Heat/Cold stress

6.0 PERSONNEL PROTECTION

6.1 General Guidelines

The following is a list of the general guidelines which are required for the Remedial Investigation/ Feasibility Study of Old Cortland County Landfill. These guidelines follow the established guidelines of the Barton & Loguidice, P.C., Corporate Health and Safety Program:

- All field investigation activities must be coordinated through the Site Safety Officer and the Project Manager.

- During any activity conducted on-site in which a potential exists for exposure to hazardous materials, or accident or injury, at least two persons must be present who are in constant communication with each other.

- Following the procedures, requirements and provisions of this Plan, all personnel who may be potentially exposed to hazardous materials or wastes must be in compliance with Federal and State Regulations, including OSHA 29 CFR 1910.120.

- Any drum or tank discovered on-site (with the exception of drums to be evaluated in the reported drum disposal area) will not be sampled or opened until an appropriate plan for unknown drum/tank sampling has been implemented.

- Samples from areas known or suspected to be contaminated with hazardous substances must be handled with the appropriate personal protective equipment.

- All equipment used in the site operations must be properly cleaned and maintained in good working order. Equipment must be inspected for signs of defects and/or contamination before and after each use.

- Eating, drinking, chewing gum or tobacco, and smoking are prohibited while performing site activities, and in work zones. Personnel must wash thoroughly before initiating any of the aforementioned activities.

- The discovery of any condition that would suggest the existence of a situation more hazardous than anticipated, shall result in the evacuation of site personnel and re-evaluation of the hazard and the level of protection.

6.2 Medical Surveillance

A Medical Surveillance Program is required for all personnel conducting field investigation activities for the Remedial Investigation/Feasibility Study of Old Cortland County Landfill. The Medical Surveillance Program must be in compliance with the provisions set forth in 29 CFR 1910.120.

A copy of the physician's written opinion report containing the following information shall be submitted to the Site Safety Officer:

- The physician's opinion as to whether the employee has developed any medical condition which would place the employee at increased risk of material impairment of the employee's health from work in hazardous waste operations or from respirator use.

- The physician's recommended limitations upon the employee's assigned work.

- A statement indicating the test performed and the testing date.

6.3 Training Requirements

All personnel conducting a field investigation for the Remedial Investigation/ Feasibility Study at the Old Cortland County Landfill shall provide evidence of training to the satisfaction of the Site Health and Safety Officer. The training requirements shall be in compliance with OSHA 29 CFR 1910.120. All on-site personnel, except for unqualified visitors, shall be thoroughly familiar with the following:

- Names of personnel and alternates responsible for site safety, health and emergency response procedures.

- Safety, health and other hazards presented on-site.

- Use of Personal Protective Equipment and designated levels of protection.

- Work practices that minimize risk from hazards.

- Safe use of equipment on-site.

- Medical surveillance requirements, including recognition of symptoms and signs of overexposure.

- Implementation of this Site Specific Health and Safety Plan.

6.4 Air Monitoring

Monitoring shall be performed within all work areas to detect the presence and the relative level of toxic substances. Monitoring shall be conducted to identify other hazardous situations such as the presence of flammable or explosive atmospheres, and/or oxygen deficient environments. The data collected throughout monitoring shall be used to determine the appropriate levels of protection.

Monitoring shall be conducted prior to entry in the work area and periodically while conducting work on-site to evaluate any changes in conditions of the specific work area. Periodic monitoring on the site will consist of monitoring initially, during change of the site conditions (i.e., opening of a well, soil excavation, sampling, etc.), and at 30-minute intervals. Any activity which is to be conducted in a confined space or enclosed area must be monitored for explosion potential and oxygen deficient environment, as well as chemical hazards.

An HNu Photoionizer will be present on-site to detect total organic vapor concentrations in the atmosphere. The working range of the HNu is from 1 ppm to 2,000 ppm. A combustible gas indicator, capable of recording explosive atmospheres as percent LEL and gas, and oxygen deficient atmospheres, will also be present on-site. Personal sampling equipment will be utilized during excavation activities to monitor daily for exposure to asbestos dust and VOCs.

6.5 Personal Protective Clothing and Equipment

The purpose of Personal Protective Equipment is to shield or isolate individuals from the chemical and physical hazards that may be encountered during work activities. The level of protection must correspond to the level of hazard known, or suspected, in the specific work area. There are four basic levels of personal protection (A, B, C and D) as established by the USEPA. Level A provides the highest level of protection, and Level D the lowest. Table 6-1 lists the various levels of protection and the corresponding Personal Protective Equipment.

6.6 Health and Safety Action Levels

An action level is a point at which increased protection is required due to the concentration of contaminants in the work area or observed conditions which indicate a greater hazard than anticipated. Each action level is determined by the concentrations above background levels, and the ability of the Personal Protective Equipment to protect against that specific contaminant or potential hazard. A clean zone background level will be established away from the specific work area. All field investigation activities, with the exception of the evaluation of buried drum conditions, shall be initially conducted in Level D Personal Protective Equipment as designated in Section 6.4. Level B protection will be required during the evaluation of the condition of drums in the reported drum disposal area.

An upgrade from Level D to Level C is required if:

- Concentrations of total organic vapors recorded in the work area by air monitoring equipment are above 5 ppm.

- Requested by an individual performing the task.

An upgrade to Level B is required if:

- Concentrations of organic vapors recorded by air monitoring equipment in the work area reach or exceed 50 ppm above background.

TABLE 6-1

SITE-SPECIFIC HEALTH AND SAFETY PLAN

Level D will be modified to contain the following:

> Blue, White or Gray Tyvek coveralls, outer chemical resistant boot covers, safety glasses, work boots and hard hat, where applicable.

Level C will consist of:

> White Tyvek or Saranex coveralls, full-faced air purifying respirator equipped with organic vapor-acid gas combination cartridge with attached HEPA filter; inner and outer chemical resistant gloves; chemical resistant boots; work boots; and a hard hat, if applicable.

Level B will consist of:

> White Tyvek or Saranex hooded coveralls; positive pressure, full-faced, self-contained breathing apparatus or supplied air respirator; inner and outer chemical resistant gloves; chemical resistant boots; work boots; and a hard hat, where applicable.

Personal Protective Equipment will be selected with specific considerations to the hazards associated with the Remedial Investigation/Feasibility Study for Old Cortland County Landfill.

- Personal sampling equipment indicates the presence of asbestos fibers in excess of 0.1 fiber/cm^3 (8-hr. TWA) or 1 fiber/cm^3 as averaged over a sampling period of 30 minutes.

- Activities are conducted in areas of confined or enclosed spaces.

Should the volatile organic concentration exceed 10 ppm above background within the work area, air screening will be conducted at the perimeter of the exclusion zone to determine whether Personal Protective Equipment use should be extended beyond the boundary. If fugitive emissions are leaving the exclusion zone, the controlled access work area will be expanded to re-establish the limits of the "clean zone". Perimeter monitoring at the limit of the new exclusion zone will continue until activities performed within the work area are completed. Continued detection of emissions beyond the exclusion zone boundary will result in a temporary work stoppage until conditions stabilize. Work will be abandoned in the event that a temporary work stoppage has had no effect at reducing potential down wind exposure to volatile organic vapors and to eliminate the potential for community exposure.

A work stoppage and evacuation (cease and desist) at the specific work area is required if:

- Concentrations of organic vapors recorded in the work area are greater than 500 ppm.

If ambient levels are measured which exceed the above criteria in areas which are accessible to the public or unprotected personnel, necessary site control measures must be implemented prior to commencing activities at the specific work site.

Temporary work stoppages may be required where specific activities involve excavations within the waste mass. In the event that asbestos materials are identified in open excavations, the following response will be followed:

- Move upwind of excavation (all personnel).
- Spray area with amended water to keep dust to a minimum (Site Health and Safety Officer).
- Backfill excavation.
- Do not proceed with activity until personal sampling data is reviewed and a determination can be made regarding the actual exposure.
- Evaluate the necessity to upgrade PPE for completion of activity.

Personnel should be able to upgrade or downgrade their level of protection with the concurrence of the Site Safety Officer and Project Manager.

7.0 EMERGENCY RESPONSE PLAN

If any situation or unplanned occurrence requires outside or support service, the appropriate contact from the following list will be made:

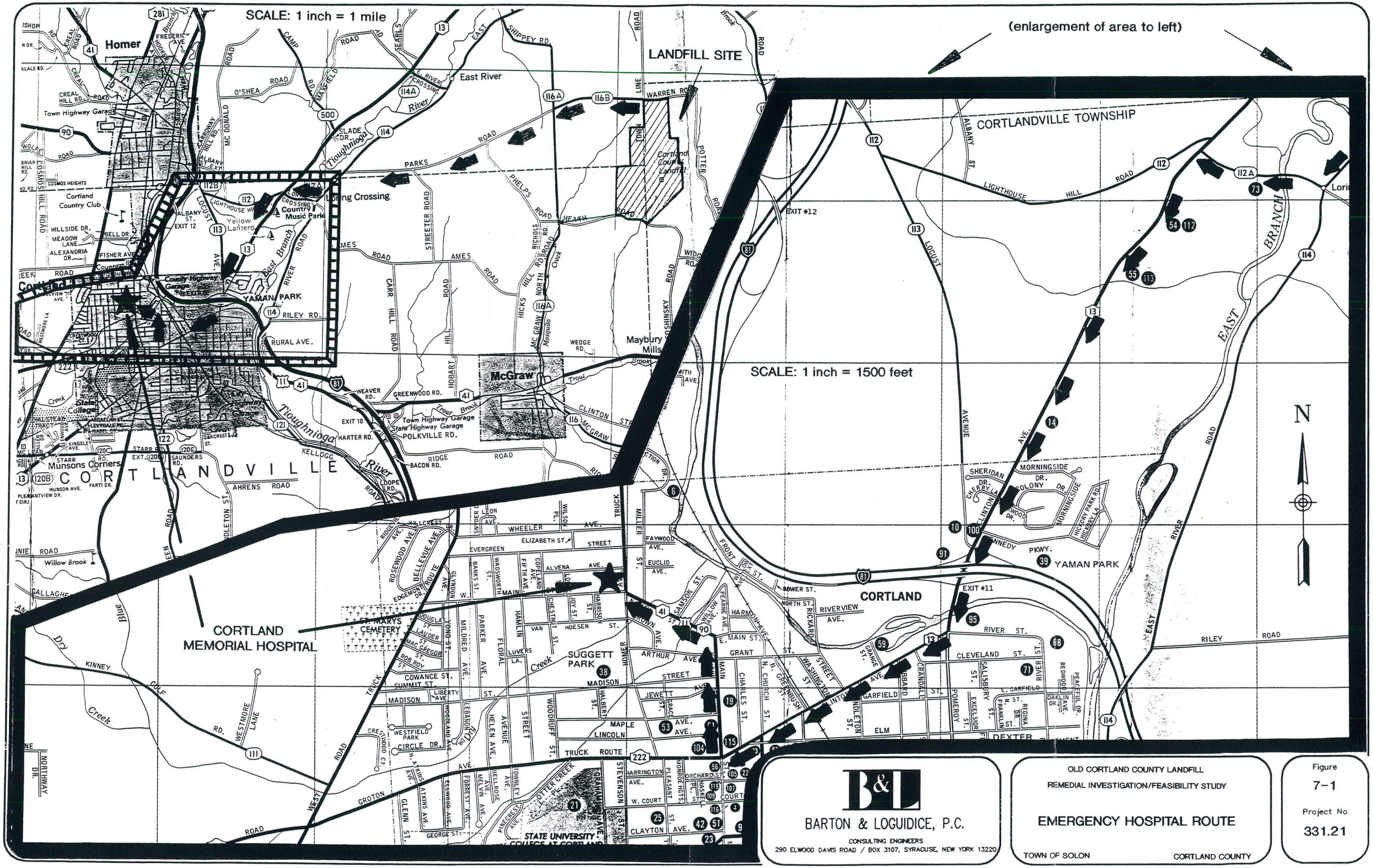
CONTACT	PERSON OR AGENCY	PHONE NUMBER
Cortland County Representative	Ralph Pitman	(607) 756-8077
NYSDEC Region 7 Regional Remediation Engineer	Charles Branagh	(315) 426-7551
Cortland County Health Department Director of Environmental Health	James Feuss	(607) 753-5035
Law Enforcement	New York State Police	(607) 756-5604
Fire Department	Cortland Fire Department	Dial 911 (607) 756-5613
Ambulance	Cortland Ambulance Service	Dial 911
Hospital	Cortland Memorial Hospital	(607) 756-3500
B&L Project Manager	Mark Chauvin	(315) 457-5200
B&L Principal-In-Charge	Paul Dudden	(315) 457-5200

7.1 Site Resources

A telephone for emergency use, restroom facilities and a water supply will be available at the Department of Solid Waste Office. A cellular phone will also be located in the SHSO's vehicle.

7.2 Emergency Routes

The closest hospital in to the site is the Cortland Memorial Hospital. The route to be used in transport to the hospital is shown in Figure 7-1.



OLD CORTLAND COUNTY LANDFILL
REMEDIAL INVESTIGATION/FEASIBILITY STUDY

EMERGENCY HOSPITAL ROUTE

TOWN OF SOLON
CORTLAND COUNTY

B&L
BARTON & LOGUIDICE, P.C.
CONSULTING ENGINEERS
290 ELWOOD DAVIS ROAD / BOX 3107, SYRACUSE, NEW YORK 13220

Figure
7-1

Project No.
331.21

Medical emergency procedures for exposure to individual compounds suspected at the site are listed in Attachment A.

7.3 Emergency Procedures

In the event that an emergency develops on-site, the procedures delineated herein are to be immediately followed. Emergency conditions are considered to exist if:

- Any member of the field team is involved in an accident or experiences any adverse effects or symptoms of exposure while on the scene.
- A condition is discovered that suggests the existence of a situation more hazardous than anticipated.

The following emergency procedures should be followed:

- Site work area entrance and exit routes should be planned, and emergency escape routes delineated by the Site Safety Officer.
- In the event that any member of the field team experiences any adverse effects or symptoms of exposure while on the scene, the entire field crew should immediately halt work, and act according to the instructions provided by the Site Safety Officer.
- For applicable site activities, wind indicators visible to all on-site personnel will be provided by the Site Safety Officer to indicate possible routes for upwind escape.

- The discovery of any condition that would suggest the existence of a situation more hazardous than anticipated will result in the suspension of work until the Office Safety Coordinator has been notified and appropriate instructions have been provided to the field team.

- In the event that an accident occurs, the Project Manager is to complete an Accident Report Form for submittal to the Managing Principal-in-Charge of the office. A copy will be forwarded to the firm-wide Health and Safety Program Office.

8.0 FORMS

The following forms will be used in implementing this Health and Safety Plan:

Plan Acceptance Form
Plan Feedback Form
Accident Report Form
Instrument Calibration Form
Air Monitoring Form
Exposure History Form

The Plan Acceptance Form will be filled out by all employees working at the site prior to commencement of site activities. The Plan Feedback Form will be filled out by the Site Safety Officer and any other on-site employee who wishes to fill one out. The Accident Report Form will be filled out by the Project Manager in the event that an accident occurs. Instrument Calibration and Air Monitoring forms will be completed by those field technicians assigned for operation of the equipment. The Exposure History Form will be completed by both the Project Manager and the individual for which the form is intended.

A copy of each form is given in Attachment B of this Health and Safety Plan.

All completed forms must be returned to the Office Safety Coordinator.

HEALTH AND SAFETY PLAN
ATTACHMENT A
CHEMICAL HAZARD DATA SHEETS

CHEMICAL HAZARD DATA SHEET

Chemical Name: Chloroethane　　**Date:** 2/89
Synonym: Ethyl Chloride
CAS Number: 75-00-3

EXPOSURE LIMITS

ACGIH Threshold Limit Value (TLV)	1000 ppm
OSHA Permissible Exposure Limit (PEL)	1000 ppm
Short Term Exposure Limit (STEL)	none ppm
Immediately Dangerous to Life and Health (IDLH)	20,000 ppm

INSTRUMENT RESPONSE

PID Ionization Potential	10.97 eV
FID Relative Response	NA

RESPIRATORY PROTECTION

Recommended Air Purifying Cartridge	Organic Vapor
Cartridge Efficiency Index	NA
Odor Detection	NA

ROUTES OF EXPOSURE

Inhalation　　Skin Absorption　　Ingestion

SYMPTOMS OF EXPOSURE

INHALATION: Vapor causes drunkenness, anesthesia, possible lung injury. EYE AND SKIN CONTACT: May cause frostbite.

TREATMENT OF EXPOSURE

INHALATION: Remove person to fresh air. Keep warm and quiet. Get medical attention. Administer artificial respiration if necessary. SKIN AND EYES: Treat for frostbite. Flush with water for fifteen minutes.

FIRE HAZARD

Flash Point: -58° F. Flammable. Extinguish with dry chemical or carbon dioxide. Poisonous gases produced in fire.

Chemical Fact Sheet* Version 3

CHLOROFORM

The information in this sheet applies to workplace exposure resulting from processing, manufacturing, storing or handling and is not designed for the population at large. Any generalization beyond occupational exposures should not be made. The best industrial hygiene practice is to maintain concentrations of all chemicals at levels as low as is practical.

Chemical Names: Trichloromethane, methyl trichloride, trichloroform methane, trichloroform, ; CAS 67-66-3.

Trade Names: Freon 20, R20 and others.

Uses: Refrigerant, extracting agent for penicillin and pharmaceuticals, in the manufacture of plastics and synthetic fibers, solvent, anesthetic.

PHYSICAL INFORMATION

Appearance: Clear, colorless liquid.

Odor: Ether-like. Minimum Detectable by Odor: 200 ppm.

Evaporation: Rapid, fumes generally heavier than air.

Behavior in Water: Only very slightly soluble; sinks.

HEALTH HAZARD INFORMATION

OSHA Standard: 50 ppm.

NIOSH Recommended Limit: 2 ppm.

ACGIH Recommended Limit: Average 8 hour exposure -- 10 ppm.

Short Term Exposure:

Inhalation: Symptoms are generally not observed at exposures below 90 ppm for 7 minutes. Effects may include headaches, pounding heart, dizziness, slowed reactions, unconsciousness, coma and death. Delayed effects of exposure which may not occur for up to 24 hours can include cramps, muscle tremors, jaundice, profuse sweating, liver damage, coma and death.

Skin: Can cause reddening of the skin, followed by blistering and chemical burns on prolonged contact.

Eyes: Vapors may cause stinging sensation. Splashes may cause pain, burning, redness and damage to tissues.

Ingestion: May cause nausea, vomiting and other symptoms as listed under inhalation. For an adult, death may result from 30 ml (1 liquid ounce).

Long Term Exposure:

The following symptoms have been observed in people exposed to levels up to 200 ppm over periods of weeks, months or years: depression, hallucination, sluggishness, loss of appetite, fatigue and liver and kidney damage. Chloroform is a cancer suspect agent because high levels cause kidney and liver cancer in rats and mice.

*Prepared by the Bureau of Toxic Substance Assessment, New York State Department of Health. For an explanation of the terms and abbreviations used, see "Toxic Substances: How Toxic is Toxic" available from the New York State Department of Health.

EMERGENCY AND FIRST AID INSTRUCTIONS

Inhalation: Move person to fresh air. Give artificial respiration or oxygen as required. Seek medical attention.

Skin: Remove soaked clothing. Wash affected areas with soap and water for at least 5 minutes. Seek medical attention if necessary.

Eyes: Wash eyes with large amounts of water for at least 15 minutes. Seek medical attention.

Ingestion: Seek medical attention immediately.

Note to Physician: Expired air and blood levels may be useful in estimating levels of acute exposure.

FIRE AND EXPLOSION INFORMATION

General: Chloroform is non-flammable and non-explosive.

REACTIVITY

Materials to Avoid: Strong alkalies like lye and potassium hydroxide decompose chloroform to chloride salts and formates.

Conditions to Avoid: Sunlight will decompose chloroform to highly toxic fumes.

PROTECTIVE MEASURES

Storage and Handling: Store in dark bottles or cans in a cool place.

Engineering Controls: Provide adequate ventilation, eyewash stations and showers.

Protective Clothing (Should not be substituted for proper handling and engineering controls): Impervious gloves, splash-proof goggles and apron should be worn if contact is likely.

Protective Equipment: For any detectable levels use a self-contained breathing apparatus with a full facepiece operated in a positive pressure mode or a combination Type C supplied-air respirator with an auxiliary self-contained breathing apparatus, both with a full facepeice and operated in a positive pressure mode. For escape from a contaminated area use a gas mask with an organic vapor canister or an escape self-contained breathing apparatus.

PROCEDURES FOR SPILLS AND LEAKS

Get all workers out of spill area. Use respirator and protective clothing when spreading absorbent material on spill. Shovel into buckets and take to safe place in open air. Allow to evaporate. Wash spill area with soap and water. For final disposal contact your regional office of the New York State Department of Environmental Conservation.

For more information:

Contact the Industrial Hygienist or Safety Officer at your worksite or the New York State Department of Health, Bureau of Toxic Substance Assessment, University Place, Albany, New York 12203.

Chemical Fact Sheet* Version 2 - June 1984

DICHLORODIFLUOROMETHANE

The information in this sheet applies to workplace exposure resulting from processing, manufacturing, storing or handling and is not designed for the population at large. Any generalization beyond occupational exposures should not be made. The best industrial hygiene practice is to maintain concentrations of all chemicals at levels as low as is practical.

Chemical Names: CAS 75-71-8.

Trade Names: Genetron 12, Isceon 122, Isotron 12, Freon 12 and others.

Uses: Refrigerant and aerosol propellant.

PHYSICAL INFORMATION

Appearance: Colorless gas; may be a liquid under pressure or refrigeration.

Odor: Ether-like.

Evaporation: Liquid evaporates rapidly.

Behavior in Water: Insoluble.

HEALTH HAZARD INFORMATION

OSHA Standard: Average 8 hour exposure -- 1000 ppm.

NIOSH Recommended Limit: None established.

ACGIH Recommended Limit: Average 8 hour exposure -- 1000 ppm.

Short Term Exposure:

Inhalation: Below 1000 ppm no effects are felt. Slight lung irritation has been reported following exposure to the propellant. At 50,000 ppm dizziness can occur. Levels of 150,000 ppm can cause loss of consciousness. Higher concentrations may cause irregular heartbeat. Death has occurred by inhalation when used as an aerosol propellant (due to freezing of the throat and lungs; the gas is extremely cold when released from pressure).

Skin: Can cause irritation and frostbite.

Eyes: The liquid can cause burns and frostbite. The gas has little toxicity.

Ingestion: Not applicable.

Long Term Exposure:

Human volunteers were exposed to 1000 ppm for four hours a day, five days a week for 2 to 4 weeks with no effects.

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*Prepared by the Bureau of Toxic Substance Assessment, New York State Department of Health. For an explanation of the terms and abbreviations used, see "Toxic Substances: How Toxic is Toxic" available from the New York State Department of Health.

EMERGENCY AND FIRST AID INSTRUCTIONS

Inhalation: Move victim to fresh air. Give artificial respiration or oxygen if necessary. Seek medical attention.

Skin: Wash with warm water for at least 5 minutes. Seek medical attention if necessary.

Eyes: Wash with water for at least 15 minutes. Seek medical attention.

Ingestion: Not applicable.

Note to Physician: Epinephrine or isoproterenol is contraindicated. Monitor arterial blood.

FIRE AND EXPLOSION INFORMATION

General: Non-flammable.

REACTIVITY

Materials to Avoid: Reactive metals, sodium, potassium, calcium, powdered aluminum, zinc and magnesium.

Conditions to Avoid: High temperatures will cause breakdown to highly toxic fumes.

PROTECTIVE MEASURES

Storage and Handling: Protect containers from physical damage.

Engineering Controls: Provide adequate ventilation. Sinks, showers and eyewash stations should be made available.

Protective Clothing (Should not be substituted for proper handling and engineering controls): If contact with liquid is possible, wear rubber gloves and safety glasses.

Protective Equipment: For levels up to 10,000 ppm use a supplied-air respirator or a self-contained breathing apparatus. For up to 50,000 ppm use a supplied-air respirator with a full facepiece either in pressure demand, positive pressure or continuous flow modes, or a self-contained breathing apparatus with a full facepiece. For escape from a contaminated area use a gas mask with an organic vapor canister or a self-contained breathing apparatus.

PROCEDURES FOR SPILLS AND LEAKS

Get all workers out of the area. Provide adequate ventilation. Move leaking containers to a safe place outdoors. For final disposal contact your regional office of the New York State Department of Environmental Conservation.

For more information: Contact the Industrial Hygienist or Safety Officer at your worksite or the New York State Department of Health, Bureau of Toxic Substance Assessment, Empire State Plaza, Corning Tower, Albany, New York 12237.

Chemical Fact Sheet* Version 1 - May 1986

1,1-DICHLOROETHANE

The information in this sheet applies to workplace exposure resulting from processing, manufacturing, storing or handling and is not designed for the population at large. Any generalization beyond occupational exposures should not be made. The best industrial hygiene practice is to maintain concentrations of all chemicals at levels as low as is practical.

Chemical Names: Chlorinated hydrochloric ether, ethylidene chloride, ethylidene dichloride; CAS 75-34-3.

Uses: A cleansing agent; a degreaser; as a solvent for plastics, rubber, oils and fats; as a grain fumigant; as a chemical intermediate in organic synthesis.

PHYSICAL INFORMATION

Appearance: Colorless, oily liquid.

Odor: Sweetish. Minimum Detectable By Odor: 50 ppm.

Evaporation: Rapid.

Behavior In Water: Slightly soluble, sinks.

HEALTH HAZARD INFORMATION

OSHA Standard: Average 8 hour exposure -- 100 ppm.

NIOSH Recommended Limit: None.

ACGIH Recommended Limit: Average 8 hour exposure -- 200 ppm.

Short Term Exposure:

Inhalation: May cause nasal irritation, salivation, sneezing, coughing, drowsiness, numbness in arms and legs, and unconsciousness.

Skin: Prolonged, confined or repeated skin contact may produce irritation.

Eyes: Liquid may cause irritation and chemical burns.

Ingestion: May cause nausea and vomiting. Probable lethal dose for humans is 1 oz to 1 pt. for a 150 lb person.

Long Term Exposure:

Has produced liver, kidney and lung damage and birth defects in laboratory animals. Whether it does so in humans is not known.

*Prepared by the Bureau of Toxic Substance Assessment, New York State Department of Health. For an explanation of the terms and abbreviations used, see "Toxic Substances: How Toxic Is Toxic", available from the New York State Department of Health.

EMERGENCY AND FIRST AID INSTRUCTIONS

Inhalation: Move the person to fresh air. Give artificial respiration or oxygen as necessary Get medical attention immediately.

Skin: Remove contaminated clothing immediately. Wash affected area with soap or mild detergent and water. If irritation persists, seek medical attention.

Eyes: Wash eyes immediately with large amounts of water, lifting the upper and lower lids occasionally. Get medical attention immediately.

Ingestion: Get immediate medical attention.

FIRE AND EXPLOSION INFORMATION

General: Combustible.

Explosive Limits: Upper -- 16%, lower -- 5.6%.

Extinguisher: Foam, carbon dioxide, dry chemical. Water may be ineffective except as a blanket.

REACTIVITY

Materials to Avoid: Strong oxidizers such as nitrates and permanganates and strong caustics such as sodium hydroxide or potassium hydroxide.

Conditions to Avoid: Highly toxic phosgene or vinyl chloride fumes may be formed when heated.

PROTECTIVE MEASURES

Storage and Handling: Store in cool, well-ventilated place, out of direct sun and away from sources of heat.

Engineering Controls: Ventilation, sinks, showers and eyewash stations should be readily available.

Protective Clothing (Should not be substituted for proper handling and engineering controls): Use aprons and gloves made from Viton or some other suitable material, face shields and other appropriate protective clothing necessary to prevent repeated or prolonged skin contact.

Protective Equipment: For levels up to 1000 ppm, use a chemical cartridge respirator with organic vapor cartridges, or a supplied-air respirator, or a self-contained breathing apparatus. For up to 4000 ppm, use a gas mask with an organic vapor canister, a supplied-air respirator with full facepiece, a self-contained breathing apparatus with a full facepiece or a Type C supplied-air respirator with full facepiece operated in pressure-demand or other positive pressure or continuous-flow mode. For levels greater than 4000 ppm or for escape from areas of unknown concentrations: use a self-contained breathing apparatus with a full facepiece operated in pressure-demand or other positive pressure mode or a combination respirator which includes a Type C supplied air respirator with a full facepiece operated in pressure demand or other positive pressure or continuous flow mode and an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.

PROCEDURES FOR SPILLS AND LEAKS

Warn other workers of spill. Put on proper protective clothing and equipment. Ventilate and remove sources of ignition. Absorb small spills with paper towels and allow to evaporate in a safe place. Absorb large spills on sand or vermiculite. For final disposal, contact your regional office of the New York State Department of Environmental Conservation.

For more information:

Contact the Industrial Hygienist or Safety Officer at your worksite or the New York State Department of Health, Bureau of Toxic Substance Assessment, Empire State Plaza, Corning Tower, Albany, New York 12237.

Chemical Fact Sheet*

Version 1 - May 1986

1,2-DICHLOROETHYLENE

The information in this sheet applies to workplace exposure resulting from processing, manufacturing, storing or handling and is not designed for the population at large. Any generalization beyond occupational exposures should not be made. The best industrial hygiene practice is to maintain concentrations of all chemicals at levels as low as is practical.

Chemical Names: Acetylene dichloride; sym-dichloroethylene; 1,2-dichloroethene; dichloro-1,2-ethylene; CAS 540-59-0.

Trade Names: Dioform.

Uses: As an anesthetic, a solvent for fats and organic materials, a fermentation retardant, a refrigerant, an additive to dye and lacquer solutions, a solvent for heat sensitive substances, a constituent of perfumes and thermoplastics, and others.

PHYSICAL INFORMATION

Appearance: Colorless liquid.

Odor: Pleasant, ether-like. Minimum Detectable By Odor: 0.085 ppm.

Evaporation: Rapid.

Behavior In Water: Insoluble, sinks.

HEALTH HAZARD INFORMATION

OSHA Standard: Average 8 hour exposure -- 200 ppm.

NIOSH Recommended Limit: None established.

ACGIH Recommended Limit: Average 8 hour exposure -- 200 ppm.

Short Term Exposure:

Inhalation: May cause dizziness, drowsiness, nausea, vomiting, weakness, tremors, cramps, and at high levels unconsciousness.

Skin: May cause irritation.

Eyes: May cause irritation.

Ingestion: No reports of human ingestion, but may contribute to symptoms listed under inhalation.

Long Term Exposure:

May cause dizziness, drowsiness, nausea, vomiting, weakness and inflammation of the lungs. This substance has produced kidney and liver injury at high levels in laboratory animals. Whether it does so in humans is not known.

*Prepared by the Bureau of Toxic Substance Assessment, New York State Department of Health. For an explanation of the terms and abbreviations used, see "Toxic Substances: How Toxic Is Toxic", available from the New York State Department of Health.

EMERGENCY AND FIRST AID INSTRUCTIONS

Inhalation: Move person to fresh air. If breathing has stopped perform artificial respiration. Seek medical attention.

Skin: Remove contaminated clothing. Wash skin with soap and water. Seek medical attention if irritation persists.

Eyes: Wash with plenty of water lifting both eyelids. Seek medical attention if irritation persists.

Ingestion: Seek medical attention immediately.

FIRE AND EXPLOSION INFORMATION

General: Highly flammable liquid. Avoid heat, flames or sparks. Heat may cause formation of highly toxic phosgene gas.

Explosive Limits: Upper -- 12.8%, lower -- 9.7%.

Extinguisher: Water, water spray, foam, carbon dioxide, dry chemical.

REACTIVITY

Materials to Avoid: Decomposes on contact with acids, acid fumes, hot metals and ultraviolet light. Reacts violently with sodium, sodium hydroxide, potassium hydroxide, and nitrogen peroxide. Contact with strong oxidizers may cause fire and explosion. Will attack some forms of plastics, rubber and coatings.

Conditions to Avoid: Heat and fire cause the formation of highly toxic fumes of hydrogen chloride, phosgene and carbon monoxide.

PROTECTIVE MEASURES

Storage and Handling: Avoid containers made of copper or copper alloy. Outside storage is preferred, in glass bottles, metal cans, drums, tank trucks and tank cars. Indoor storage should be in a room or cabinet separate from oxidizing materials. Protect against physical damage.

Engineering Controls: Adequate ventilation, sinks, showers and eyewash stations should be provided.

Protective Clothing (Should not be substituted for proper handling and engineering controls): Splash-proof safety goggles, faceshields, Viton gloves and impervious clothing should be worn when working with this chemical.

Protective Equipment: For levels up to 1000 ppm, use a chemical cartridge respirator with full facepiece and organic vapor cartridges. For levels up to 4000 ppm, use a gas mask with organic vapor canister, supplied-air respirator with full facepiece, helmet, or hood or self-contained breathing apparatus with a full facepiece. For levels greater than 4000 ppm or for use in areas of unknown concentrations, use self-contained breathing apparatus with full facepiece operated in positive pressure mode or combination Type C supplied-air respirator with full facepiece operated in pressure-demand or other positive pressure or continuous flow mode and an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode. For firefighting, use a self-contained breathing apparatus with a full facepiece operated in pressure-demand or other positive pressure mode. For escape use any gas mask providing protection against organic vapors or any self-contained breathing apparatus.

PROCEDURES FOR SPILLS AND LEAKS

Warn other workers of spill. Put on proper protective clothing and equipment. Ventilate area. Remove all sources of ignition. Absorb small amounts on towels. Absorb large amounts on vermiculite or other suitable material and place in a suitable container. For final disposal, contact your regional office of the New York State Department of Environmental Conservation.

For more information:

Contact the Industrial Hygienist or Safety Officer at your worksite or the New York State Department of Health, Bureau of Toxic Substance Assessment, Empire State Plaza, Corning Tower, Albany, New York 12237.

Chemical Fact Sheet* Version 2

METHYL CHLORIDE

The information in this sheet applies to workplace exposure resulting from processing, manufacturing, storing or handling and is not designed for the population at large. Any generalization beyond occupational exposures should not be made. The best industrial hygiene practice is to maintain concentrations of all chemicals at levels as low as is practical.

Chemical Names: Chloromethane, monochloromethane; CAS 74-87-3.

Trade Names: Artic, R40 and others.

Uses: Refrigerant, local anesthetic, aerosol propellant, foaming agent, industrial solvent, fumigant, chemical reagent.

PHYSICAL INFORMATION

Appearance: Colorless gas; may be compressed to form a colorless liquid.

Odor: Ether-like. Minimum Detectable by Odor: 100 ppm.

Evaporation: Rapid; vapor generally sinks.

HEALTH HAZARD INFORMATION

OSHA Standard: Average 8 hour exposure -- 100 ppm.

NIOSH Recommended Limit: Reduce exposure to the lowest feasible limit.

ACGIH Recommended Limit: Average 8 hour exposure -- 50 ppm.

Short Term Exposure:

Inhalation: Illness has been reported at concentrations of 500 ppm. 10,000 ppm for 30 minutes has caused death. Can cause nausea, vomiting, painful neck, loss of appetite; more severe exposure may result in the above plus headache, diarrhea, dizziness, loss of coordination, tremors of hands and lips, drooping eyelids and eye twitch; very severe exposure may include the above plus burning sensation in mouth and throat, mustard-like taste, difficulty in swallowing, hallucinations, loss of memory, cold and clammy skin, rapid breathing, unconsciousness, coma and death. Onset of symptoms may be delayed several hours after exposure. Effects may last weeks or months.

Skin: Contact with liquified gas may cause freezing of skin; other symptoms are muscular pain, anemia, muscle weakness and fever.

Eyes: May cause irritation, dimness of sight and abnormally dilated pupils.

Ingestion: Ingestion of liquified gas will cause freezing of mouth and throat.

Long Term Exposure:

Symptoms of long term exposure are derived primarily from industrial accidents and exposure levels are unknown. However, inhalation can cause fatigue, loss of appetite, pale skin, weakness, drowsiness, nausea, vomiting and damage to heart, nerves and liver. Some effects may last months or longer. Contact with the skin may cause reddening and blistering of surface, visual disturbances, weakness, fever, drowsiness, anemia and muscle pain.

*Prepared by the Bureau of Toxic Substance Assessment, New York State Department of Health. For an explanation of the terms and abbreviations used, see "Toxic Substances: How Toxic is Toxic" available from the New York State Department of Health.

EMERGENCY AND FIRST AID INSTRUCTIONS

Inhalation: Move person to fresh air. Administer artificial respiration or oxygen as required. Seek medical attention if necessary.

Skin: Remove wet or frozen clothing after allowing to thaw. Wash affected area with soap and water for 5 minutes. Seek medical attention.

Eyes: Wash with large amounts of water for at least 15 minutes. Seek medical attention.

Ingestion: Seek medical attention immediately.

FIRE AND EXPLOSION INFORMATION

General: Flammable gas; vapor may travel long distance to source of ignition and flash back.

Explosive Limits: Upper -- 17%, lower -- 8.1%

Extinguisher: Carbon dioxide, water spray, or dry chemical.

REACTIVITY

Conditions to Avoid: Keep away from heat, flame and direct sunlight; yields poisonous fumes when heated to decomposition.

Materials to Avoid: Reacts vigorously with strong oxidizers (permanganates, dichromates); reacts violently with aluminum, magnesium, sodium and potassium metals.

PROTECTIVE MEASURES

Storage and Handling: Protect against physical damage; store in a cool, well-ventilated area away from sources of ignition.

Engineering Controls: Provide adequate ventilation, sinks, showers and eyewash stations.

Protective Clothing (Should not be substituted for proper handling and engineering control): If direct contact is possible, safety goggles, rubber gloves and aprons should be worn.

Protective Equipment: For any detectable levels use a self-contained breathing apparatus with a full facepiece operated in a positive pressure mode, or a combination Type C supplied-air respirator with an auxiliary self-contained breathing apparatus, both with a full facepiece and operated in a positive pressure mode. For escape from a contaminated area use an escape self-contained breathing apparatus. For firefighting use an escape self-contained breathing apparatus.

PROCEDURES FOR SPILLS OR LEAKS

Get all workers out of spill area. Wearing appropriate respirator, eliminate sources of ignition. Ventilate area. Methyl chloride evaporates rapidly and will not need other clean-up action. Protect against combustion. For final disposal contact your regional office of the New York State Department of Environmental Conservation.

For more information:

Contact the Industrial Hygienist or Safety Officer at yourworksite or the New York State Department of Health, Bureau of Toxic Substance Assessment, 2 University Place, Albany, New York 12203.

Chemical Fact Sheet* Version 2

TOLUENE

The information in this sheet applies to workplace exposure resulting from processing, manufacturing, storing or handling and is not designed for the population at large. Any generalization beyond occupational exposures should not be made. The best industrial hygiene practice is to maintain concentrations of all chemicals at levels as low as is practical.

Chemical Names: Methylbenzene, methylbenzol, phenylmethane, toluol; CAS 108-88-3.

Trade Names: Methacide, Antisal I and others.

Uses: Used in the manufacture of benzoic acid, benzaldehyde, explosives, dyes and adhesives.

PHYSICAL INFORMATION

Appearance: Clear, colorless liquid.

Odor: Strong, pleasant. Minimum Detectable by Odor: 40 ppm.

Behavior in Water: Only a very small amount will mix, the rest will float.

Evaporation: Liquid evaporates very slowly.

HEALTH HAZARD INFORMATION

OSHA Standard: Average 8 hour exposure limit -- 200 ppm.

NIOSH Recommended Limit: Average 8 hour exposure -- 100 ppm.

ACGIH Recommended Limit: Average 8 hour exposure -- 100 ppm.

Short Term Exposure:

Inhalation: 100 ppm exposure can cause dizziness, drowsiness and hallucinations. 100-200 ppm can cause depression. 200-500 ppm can cause headaches, nausea, loss of appetite, loss of energy, loss of coordination and coma. In addition to the above, death has resulted from exposure to 10,000 ppm for an unknown time.

Skin: Can cause dryness and irritation. Absorption may cause or increase the severity of symptoms listed above.

Eyes: Can cause irritation at 300 ppm.

Ingestion: Can cause a burning sensation in the mouth and stomach, upper abdominal pain, cough, hoarseness, headache, nausea, loss of appetite, loss of energy, loss of coordination and coma.

Long Term Exposure:

Levels below 200 ppm may produce headache, tiredness and nausea. From 200 to 750 ppm symptoms may include insomnia, irritability, dizziness, some loss of memory, loss of appetite, a feeling of drunkeness and disturbed menstruation. Levels up to 1,500 ppm may cause heart palpitations and loss of coordination. Blood effects and anemia have been reported but are probably due to contamination by benzene. Most of these effects are believed to go away when exposure stops.

Prepared by the Bureau of Toxic Substance Assessment, New York State Department of Health. For an explanation of the terms and abbreviations used, see "Toxic Substances: How Toxic is Toxic" available from the New York State Department of Health.

EMERGENCY AND FIRST AID INSTRUCTIONS

Inhalation: Get person to fresh air Keep warm and quiet. Give artificial respiration, if necessary. Seek medical attention, if necessary.

Skin: Take off clothing soaked with liquid. Wash contaminated area with soap and water for at least 5 minutes. Seek medical attention, if necessary.

Eyes: Wash with large amounts of water for at least 15 minutes. Seek immediate medical attention.

Ingestion: Do not induce vomiting. Give one or two ounces of mineral oil. Seek immediate medical attention. Note: Never force an unconscious person to drink.

Note to Physician: Exposure to toluene at levels greater then 200 ppm may result in hippuric acid levels above 5 gm/liter urine. After elevated exposure, toluene may also be detected in blood.

EXPLOSION INFORMATION

General: Flammable liquid. Fumes may spread a considerable distance and flash back. Will ignite at 4.4°C, 40°F.

Explosive Limits: Upper Limit -- 7.0%, Lower Limit -- 1.27%.

Extinguisher: Water spray, carbon dioxide, dry chemical or foam.

REACTIVITY

Materials to Avoid: Reacts violently with chlorine, permanganate and dichromate.

Conditions to Avoid: Sources of ignition.

PROTECTIVE MEASURES

Storage and Handling: Store outdoors or in a detached building, if possible. If indoors, store in a standard flammable liquid storage room or cabinet. Protect containers from physical damage.

Engineering Controls: Use in well-ventilated area. Eyewash stations, sinks and showers should be readily available.

Protective Clothing (Should not be substituted for proper handling and engineering controls): If direct contact is likely, wear viton, PVA, NBR or polyethylene clothing.

Protective Equipment: For levels up to 1000 ppm use a chemical cartridge respirator with organic vapor cartridges, a supplied-air respirator, a self-contained breathing apparatus or a powered air-purifying respirator with organic vapor cartridges. For levels up to 2,000 ppm use a gas mask with an organic vapor canister, a supplied-air respirator with a full facepiece, a self-contained breathing apparatus with a full facepiece or a supplied-air respirator operated in continuous flow mode. For levels above 2000 ppm or at unknown concentrations use a self-contained breathing apparatus with a full facepiece operated in a positive pressure mode or a Type C supplied-air respirator with an auxiliary self-contained breathing apparatus, both with a full facepiece and operated in a positive pressure mode. For escape from a contaminated area use a gas mask with an organic vapor canister or an escape self-contained breathing apparatus.

PROCEDURES FOR SPILLS OR LEAKS

Get all workers out of the spill area. Put on a respirator and other protective clothing. Spread sand or other absorbent material over liquid to absorb it. Shovel into buckets, take to a safe place in the open air. Wash area of spill with soap and water. For final disposal contact your regional office of the N.Y.S. Department of Environmental Conservation.

For more information:

Contact the Industrial Hygienist or Safety Officer at your worksite or the New York State Department of Health, Bureau of Toxic Substance Assessment, 2 University Place, Albany, New York 12203.

Chemical Fact Sheet* 1,1,1-TRICHLOROETHANE December 1982

The information in this sheet applies to workplace exposure resulting from processing, manufacturing, storing or handling and is not designed for the population at large. Any generalization beyond occupational exposures should not be made. The best industrial hygiene practice is to maintain concentrations of all chemicals at levels as low as is practical.

Chemical Names: Chloroethane, methyl chloroform, alpha-trichloroethane, methyl trichloroethane; CAS 71-55-6.

Trade Names: Inhibisol, Chlorten, Chlorothene NU, Chlorothene VG, Chlorothene, Alpha-T, Aerothene TT and others.

Uses: Cleaning of plastics molds and cold type metal, dry cleaning and degreasing.

PHYSICAL INFORMATION

Appearance: Colorless liquid.

Odor: Sweetish, like chloroform. Minimum Detectabley by Odor: 400 ppm.

Behavior in Water: Not soluble, sinks.

Evaporation: Rapid.

HEALTH HAZARD INFORMATION

OSHA Standard: Average 8 hour exposure -- 350 ppm.

NIOSH Recommended Limit: 350 ppm.

ACGIH Recommended Limit: Average 8 hour exposure -- 350 ppm.

Short Term Exposure:

Inhalation: Levels above 900 ppm can cause dizziness, mental confusion, drowsiness, loss of coordination and unconsciousness. Death may result.

Skin: Can cause irritation and rash. Absorption is moderate; may contribute significantly to health hazard.

Eyes: Has caused irritation at levels of 450 ppm.

Ingestion: May cause symptoms similar to inhalation. In addition, may cause mouth, throat and stomach irritation.

Long Term Exposure:

Repeated or prolonged contact at levels of 450 ppm or above may result in irritation and dry, scaley,fractured skin. Dizziness, mental confusion, slowed response time and generally reversible liver and kidney damage may result from prolonged inhalation.

*Prepared by the Bureau of Toxic Substance Assessment, New York State Department of Health. For an explanation of the terms and abbreviations used, see "Toxic Substances: How Toxic is Toxic" available from the New York State Department of Health.

EMERGENCY AND FIRST AID INSTRUCTIONS

Inhalation: Move victim to fresh air. Give artificial respiration or oxygen as required. Seek medical attention if necessary.

Skin: Remove soaked clothing. Wash affected areas with soap and water. Seek medical attention as required.

Eyes: Flush with water for at least 15 minutes. Seek medical attention immediately.

Ingestion: Seek medical attention immediately.

Note to Physician: Expired air analysis may be useful in monitoring exposure.

FIRE AND EXPLOSION INFORMATION

General: Non-flammable.

REACTIVITY

Materials to Avoid: Reacts violently with acetone, nitrites, oxygen, sodium and sodium hydroxide. Corrosive to aluminum.

Conditions to Avoid: Hot metals or ultraviolet radiation will decompose 1,1,1-trichloroethane to form irritating and poisonous gases.

PROTECTIVE MEASURES

Handling and Storage: Store in a cool, dark, dry place. Do not store in aluminum containers.

Engineering Controls: Provide adequate ventilation. Sinks, showers and eyewash stations should be readily available.

Protective Clothing (Should not be substituted for proper handling and engineering controls): Gloves and apron of polyvinyl alcohol, neoprene (Do not use natural rubber) or leather, and splash proof goggles should be worn if contact with trichloroethane is likely.

Protective Equipment: For exposure up to 500 ppm use a supplied-air, or self-contained breathing apparatus with face shield. For escape from a contaminated area use a gas mask with organic vapor canister, or self-contained breathing apparatus.

PROCEDURES FOR SPILLS AND LEAKS

Keep workers out of spill area. Use sand or other absorbent to absorb material. Shovel into suitable container. Wash spill area with soap and water. For final disposal contact your regional office of the New York State Department of Environmental Conservation.

For more information:

Contact the Industrial Hygienist or Safety Officer at your worksite or the New York State Department of Health, Bureau of Toxic Substance Assessment, Empire State Plaza, Tower Building, Albany, New York 12237.

Chemical Fact Sheet* Version 3

TRICHLOROETHYLENE

The information in this sheet applies to workplace exposure resulting from processing, manufacturing, storing or handling and is not designed for the population at large. Any generalization beyond occupational exposures should not be made. The best industrial hygiene practice is to maintain concentrations of all chemicals at levels as low as is practical.

Chemical Names: Trichloroethylene, trichloroethene, ethylene trichloride; CAS 79-01-6.

Trade Names: Algylen, Benzinol, Chlorilen, Fleck-flip, Triclene, Tric, TCE and others.

Uses: The liquid is used as a degreaser and as a solvent in dry cleaning operations.

PHYSICAL INFORMATION

Appearance: Clear, colorless liquid.

Odor: Strong, sweet. Minimum Detectable by Odor: 25 ppm.

Evaporation: Liquid evaporates slowly.

Behavior in Water: Does not mix, sinks.

HEALTH HAZARD INFORMATION

OSHA Standard: Average 8 hour exposure limit -- 100 ppm.

NIOSH Recommended Limit: Average 10 hour day/40 hour week -- 25 ppm.

ACGIH Recommended Limit: Average 8 hour exposure limit -- 50 ppm.

Short Term Exposure:

Inhalation: Headache, sleepiness, nausea, vomiting, dizziness and coughing have been felt around 100 ppm. Unconsciousness can result at 3,000 ppm. Exposure to 8,000 ppm can cause death.

Skin: Can be absorbed through skin. May cause irritation, burning or redness.

Eyes: May cause irritation, burning or watering.

Ingestion: Can cause drunkenness, vomiting, diarrhea or abdominal pain. Unconsciousness, liver or kidney damage, vision distortion and death have been reported at large doses.

Long Term Exposure:

Contact with vapor levels near 100 ppm can cause giddiness, nervous exhaustion, increased sensitivity to alcohol including redness in the face (trichlorethylene blush), the ability to become addicted to the vapor, as well as effects of acute exposure listed above. Higher levels can alter one's heart rate. Repeated contact with hands can cause excessive dryness, cracking, burning, loss of sense of touch or temporary paralysis of fingers. Most of these effects seem to go away after exposure has stopped.

Trichloroethylene is considered a cancer suspect agent because high levels cause liver cancer in mice. Whether it causes cancer in humans is unknown.

*Prepared by the Bureau of Toxic Substance Assessment, New York State Department of Health. For an explanation of the terms and abbreviations used, see "Toxic Substances: How Toxic is Toxic" available from the New York State Department of Health.

EMERGENCY AND FIRST AID INSTRUCTIONS

Inhalation: Get person to fresh air. Give artificial respiration or oxygen, if necessary. Keep person warm and at rest. Seek medical attention, if necessary.

Skin: Take off clothing soaked with liquid. Flush skin with plenty of water.

Eyes: Flush eyes with water for 15 minutes. Seek medical attention, if necessary.

Ingestion: Seek medical attention. Do not induce vomiting.

Note to Physician: Expired air analysis and urinary metabolites have been used to monitor exposure.

FIRE AND EXPLOSION INFORMATION

General: Not flammable or explosive at room temperatures. Ignites at 770°F (410°C), moderately flammable at high temperatures.

Explosive Limits: Upper -- 41%, lower -- 11%.

Extinguisher: Carbon Dioxide, dry chemical or foam.

REACTIVITY

Materials to Avoid: Contact with strong alkalies can form highly poisonous and explosive products.

Conditions to Avoid: Contact with certain hot metals (e.g., aluminum and magnesium), open flames or ultraviolet radiation can form poisonous or explosive products.

PROTECTIVE MEASURES

Storage and Handling: Store in sealed steel or plastic cans or dark glass bottles.

Engineering Controls: Use in well-ventilated areas with no cross drafts. Sinks and showers should be available.

Protective Clothing (Should not be substituted for proper handling and engineering controls): If direct contact is likely, wear coveralls, polyvinyl boots and gloves, and goggles or a faceshield.

Protective Equipment: For any detectable levels use a self-contained breathing apparatus with a full facepiece operated in a positive pressure mode or a supplied-air respirator with an auxiliary self-contained breathing apparatus both with a full facepiece and operated in a postive pressure mode. For escape from a contaminated area use a gas mask with an organic vapor canister or an escape self-contained breathing apparatus.

Miscellaneous: Wash any liquid-soaked clothing before reuse. No food or smoking near liquid or vapor.

PROCEDURES FOR SPILLS AND LEAKS

Get all workers out of the spill area. Put on a respirator and other protective clothing. Spread sand or other absorbent material over liquid to absorb it. Shovel into buckets, take to a safe place in the open air. Wash area of spill with soap and water. For final disposal contact your regional office of the New York State Department of Environmental Conservation.

For more information:

Contact the Industrial Hygienist or Safety Officer at your worksite or the New York State Department of Health, Bureau of Toxic Substance Assessment, 2 University Place, Albany, New York 12203.

Chemical Fact Sheet* Version 2

VINYL CHLORIDE

The information in this sheet applies to workplace exposure resulting from processing, manufacturing, storing or handling and is not designed for the population at large. Any generalization beyond occupational exposures should not be made. The best industrial hygiene practice is to maintain concentrations of all chemicals at levels as low as is practical.

Chemical Names: Chloroethylene, chloroethene, ethylene monochloride, monochloroethene, monochloroethylene; CAS 75-01-4.

Trade Names: VC, VCM, Troviduer, and others.

Uses: In the manufacture of plastics, as a refrigerant, and in organic synthesis.

PHYSICAL INFORMATION

Appearance: Colorless gas; may be liquified by refrigeration or pressurization.

Odor: Faint, sweet, ether-like. Minimum Detectable by Odor: 4000 ppm.

Behavior in Water: Slightly soluble. Evaporation: Rapid.

HEALTH HAZARD INFORMATION

OSHA Standard: Average 8 hour exposure -- 1 ppm.

NIOSH Recommended Limit: Lowest reliably detectable level.

ACGIH Recommended Limit: Average 8 hour exposure -- 5 ppm.

Short Term Exposure:

Inhalation: Exposure at 8,000 ppm for 5 minutes can cause a feeling of intoxication, tiredness, drowsiness, abdominal pain, numbness and tingling in fingers and toes, pains in joints, coughing, sneezing, irritability and loss of appetite and weight.

Skin: Contact with liquid may cause frostbite; contact with vapor may cause irritation and rash. Absorption is possible through the skin.

Eyes: Can cause severe and immediate irritation.

Ingestion: None found.

Long Term Exposure:

May cause club-like swelling and shortening of finger tips. Skin may become thickened and stiff with coarse, whitish patches. Bones and joints of arms and legs may suffer damage. Liver and spleen damage may occur. Not all symptoms disappear after exposure stops.

Vinyl chloride has caused liver cancer in occupationally exposed individuals.

*Prepared by the Bureau of Toxic Substance Assessment, New York State Department of Health. For an explanation of the terms and abbreviations used, see "Toxic Substances: How Toxic is Toxic" available from the New York State Department of Health.

EMERGENCY AND FIRST AID INSTRUCTIONS

Inhalation: Move person to fresh air. Give artificial respiration or oxygen as required. Seek medical attention.

Skin: Remove soaked clothing. Wash affected area with soap and water for at least 5 minutes. Seek medical attention if necessary.

Eyes: Wash with running water for at least 15 minutes. Seek medical attention.

Ingestion: Seek immediate medical attention.

FIRE AND EXPLOSION INFORMATION

General: Flammable. Fumes may travel long distances and flash back. Ignites at -108°F (-78°C).

Explosive Limits: Upper -- 33%, Lower -- 3%.

Extinguisher: Stop flow of gas. Use water to keep fire exposed containers cool.

REACTIVITY

Conditions to Avoid: High temperatures may cause breakdown to phosgene and hydrochloric acid. Avoid sources of ignition.

Materials to Avoid: Long contact with air may result in formation of unstable peroxides which are explosive. Corrosive to iron at high temperatures in the presence of water.

PROTECTIVE MEASURES

Storage and Handling: Protect against physical damage. Outside or detached storage preferred. Indoors, store in a cool, dry, well-ventilated area away from sources of ignition.

Engineering Controls: Provide ventilation or process enclosures. Sinks, showers and eyewash stations should be readily available.

Protective Clothing (Should not be substituted for proper handling and engineering controls): Goggles, gloves and impervious clothing should be worn if contact with vinyl chloride is possible.

Protective Equipment: For any detectable levels use a self-contained breathing apparatus with a full facepiece operated in a positive pressure mode or a supplied-air resirator with an auxiliary self-contained breathing apparatus, both with a full facepiece and operated in a positive pressure mode. For escape from a contaminated area use a gas mask providing protection against vinyl chloride or an escape self-contained breathing apparatus.

PROCEDURES FOR SPILLS AND LEAKS

Get all workers out of the spill area. Put on respirator and other protective clothing. Establish ventilation to keep levels below explosive limit. Remove possible sources of ignition. Move leaking cylinders to safe place in open air. For final disposal contact your regional office of the New York State Department of Environmental Conservation.

For more information:
Contact the Industrial Hygienist or Safety Officer at your worksite or the New York State Department of Health, Bureau of Toxic Substance Assessment, 2 University Place, Albany, New York 12203.

HEALTH AND SAFETY PLAN
ATTACHMENT B
HEALTH AND SAFETY FORMS

SITE SPECIFIC HEALTH & SAFETY PLAN

PLAN ACCEPTANCE FORM

INSTRUCTIONS: *This form is to be completed by each person working on the project work site and returned to the Office Safety Coordinator.*

Project Name:____
Project No.:___________

I represent that I have read and understand the contents of the above plan and agree to perform my work in accordance with it.

____
Signed

____
Print Name

____
Company

____
Date

PLAN FEEDBACK FORM

Problems with plan requirements:

____

____

____

____

Unexpected situations encountered:

____

____

____

____

Recommendations for future revisions:

____

____

____

____

DAILY INSTRUMENT CALIBRATION CHECK SHEET

Project: ____________________ Project No.: __________
Client: ____________________ Instrument: ____________________
Operator: ____________________ Calibration Gas: ____________________
Date: __________ Weather Conditions: ____________________

Date	Pure Air (Y/N)	Calibration Gas (ppm)	Battery (GOOD/BAD)	Calibrated By	Remarks/Comments

ACCIDENT REPORT FORM

Supervisor's Report of Accident		Do Not Use For Motor Vehicle or Aircraft Accidents
TO:		FROM: Telephone: ( )
Name of Injured or Ill Worker		
Company		
Social Security Number		
Date of Accident	Time of Accident	Exact Location of Accident
Narrative Description of Accident		
Nature of Illness or Injury and Part of Body Involved		Lost Time Yes ☐ No ☐

Probable Disability (Check One)

Fatal ☐
Lost Work Day with ______ Days Away From Work
Lost Work Day with ______ Days of Restricted Activity
No Lost Work Day ☐
First Aid Only ☐

Corrective Action Recommended (by whom and when)

Name of Supervisor	Title
Signature	Date

DAILY AIR MONITORING DATA SHEET

GENERAL DATA

Project: ____________________ Project No.: ________

Client: ____________________

Operator: ____________________

Weather Conditions: ____________________

Estimated Wind Speed/Direction: ____________________

Location of Background Level Readings:

EQUIPMENT SETTINGS

HNu

Range:

Span Pot:

Calibration Gas:

Explosimeter

Alarm Triger – %LEL:

Alarm Trigger–%Oxygen:

Calibration Gas:

MONITORING DATA

Time of Reading	Reading Location	Reading

EMPLOYEE EXPOSURE HISTORY FORM

EMPLOYEE NAME: ______________________________

PROJECT: ______________________________

PROJECT NUMBER: ______________________________

DATE(S) FROM/TO: ______________________________

HOURS ON SITE: ______________________________

CONTAMINANTS (SUSPECTED/REPORTED):

(SEE ATTACHED LABORATORY ANALYSIS)

OLD CORTLAND COUNTY LANDFILL
REMEDIAL INVESTIGATION/ FEASIBILITY STUDY

FINALWORK PLAN - APPENDIX C
CITIZEN PARTICIPATION PROGRAM

DECEMBER, 1996

RECEIVED

DEC 09 1996

N.Y.S. DEPT. OF
ENVIRONMENTAL CONSERVATION
DIV ENVIRONMENTAL ENFORCEMENT
BUFFALO FIELD UNIT

PREPARED FOR

CORTLAND COUNTY DEPARTMENT
OF SOLID WASTE
TOWN LINE ROAD
McGRAW, NEW YORK 13101

PREPARED BY

BARTON & LOGUIDICE, P.C.
CONSULTING ENGINEERS
290 ELWOOD DAVIS ROAD
BOX 3107
SYRACUSE, NEW YORK 13220

PROJECT NO. 331.21

OLD CORTLAND COUNTY LANDFILL
REMEDIAL INVESTIGATION/FEASIBILITY/STUDY

FINAL WORK PLAN - APPENDIX C
CITIZEN PARTICIPATION PROGRAM

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1.0 INTRODUCTION

The objective of the Citizen Participation Program established for the Old Cortland County Landfill Remedial Investigation/Feasibility Study (RI/FS) is to sustain an open dialogue between the County and its residents regarding activities associated with the RI/FS and possible impacts such activities may have on the Community. This program will consist of a continuing exchange of information, ideas, concerns or preferences so that adequate public involvement is maintained throughout the duration of the Remedial Investigation/ Feasibility Study.

Public participatory activities incorporated in this program include both those activities best suited for the needs and concerns of Cortland County and its residents, as well as those required by the New York State Department of Environmental Conservation.

2.0 BASIC SITE INFORMATION

The Old Cortland County Landfill site has been deemed an "inactive hazardous waste site" by the New York State Department of Environmental Conservation (NYSDEC) and was subsequently included in the Department's Registry of Inactive Hazardous Waste Disposal Sites in New York (No. 712001). Consequently, it has been established that a Remedial Investigation/ Feasibility Study Work Plan drafted on behalf of Cortland County by its Consulting Engineers, Barton & Loguidice, P.C., is needed in order to account for the present situation at the site. The Remedial Investigation focuses on characterizing the site and its actual or potential threat to public health and the surrounding community as well as the identification of contaminant sources and areas affected by such contamination. In addition, the Remedial Investigation is designed to provide accurate technical data to support the development and evaluation of remedial alternatives during the Feasibility Study. Objectives of this program include: characterizing groundwater flow conditions, determining the extent of possible groundwater contamination, collecting data to evaluate probability of contamination in the deep groundwater system, determine surface water and sediment contamination, establish a public health risk/ environmental impact assessment, and adequately evaluate potential remedial action technologies and alternatives.

The Old Cortland County Landfill is part of a 539.9 acre site of which approximately 36 acres are encompassed by the Old County Landfill. Refuse deposited at the site principally consists of domestic, commercial, and industrial waste collected from the City of Cortland and surrounding Townships. However, reports have indicated that between 1972 and 1974, a number of drums containing liquid hazardous waste had been deposited at the site; consequently, the site has been labeled hazardous. In addition, an approximate 3-5 acre area separate from the Old County Landfill was used for the disposal of ferrous oxide sludge from Buckbee-Mears. It is believed that, due to the isolated nature of the Old Cortland County Landfill, the potential for contamination of the surrounding community is quite minimal. For example, the site is surrounded by dense forest, and forested and open meadowlands which allows for no direct access. Access to the landfill property is strictly controlled since the existing waste disposal facility is located on the same property. The surrounding residential community is sparsely populated.

The landfill may, however, represent an impact to the environment including contamination of surface water stream sediments, flora and fauna, air quality, and groundwater. Immediately visible environmental impacts are apparent in the drainage ditch to the south of the landfill where leachate is present. The ditch discharges to the first of a series of settlement ponds. There is no visible leachate impact to the ponds.

3.0 SPECIFIC CITIZEN PARTICIPATION ACTIVITIES

The activities listed below represent the activities which are required by the NYSDEC. All the participation activities listed will be implemented through the course of the RI/FS Program development to completion.

1. A copy of the Final Work Plan for the RI/FS will be placed in local document repositories.

2. A public notice and fact sheet will be sent to contact list about the Final RI/FS Work Plan with the following information:

   - brief description of site
   - objectives and overview of the RI/FS
   - location of local document repository
   - contact person to send information and comments which may be useful in conducting the RI/FS

3. A copy of the Final RI/FS Reports will be placed in the project's local document repository.

4. A public notice and fact sheet about the Final RI/FS Reports will be sent to the contact list with the following information:

   - description of the site
   - objectives of RI/FS
   - summary of proposed remedial program
   - location of document repository
   - DEC contact person (also DOL and DOH, if appropriate)

5. A legal notice about the Final RI/FS will be published in the Cortland Standard with the following information:

   - brief summary of proposed remedial program
   - construction and operational requirements of the proposed program

6. The NYSDEC will prepare a Proposed Remedial Action Plan (PRAP) based on the findings of the Final RI/FS.

7. The NYSDEC will prepare a public notice and fact sheet to be sent to the contact list about availability of the PRAP with the following information:

   - description of the site
   - overview of work completed in the RI/FS
   - summary of findings of the RI/FS
   - brief analysis of the proposed remedial program
   - summary of DEC's reasons for selecting proposed program over proposed alternatives
   - contact person to send information and comments
   - location of local document repository
   - location, date, and time of public meeting
   - final date for submittal of comments - allow 30 days

8. Hold public meeting on Final RI/FS and the NYSDEC PRAP. Purpose of meeting is to :

   - present the Final RI/FS Report
   - discuss briefly remedial alternatives considered

- describe in detail the most promising alternative and how this alternative mitigates problems at the site
- receive public comment
- present schedule for future work

9. Prepare transcript of the public meeting and place in the local document repository.

10. The NYSDEC will prepare a Record of Decision (ROD) which will include:

    - a brief analysis of the remedial program selected for implementation
    - any significant changes from the proposed remedial program
    - responses to significant comments, criticisms and new data

11. If the remedial program selected by the ROD differs significantly from that proposed in the Final RI/FS, a legal notice will be published in the Cortland Standard with an explanation of the significant differences and the reasons such changes were made.

4.0 DOCUMENT REPOSITORIES

For the duration of the Old Cortland County Landfill Remedial Investigation/Feasibility Study, summary reports and documents pertaining to activities undertaken at the project site will be placed in various County identified document repositories for public inspection.

Cortland County Document Repositories will include the following:

Cortland County Legislature
County Office Building
60 Central Avenue
P. O Box 5590
Cortland, New York 13045-5590
(607) 753-5052

Cortland County Planning Department
County Office Building
60 Central Avenue
P. O. Box 5590
Cortland, New York 13045-5590
(607) 753-5043

Cortland Free Library
32 Church Street
Cortland, New York 13045
(607) 753-1042

Cortland County Clerk's Office
County Office Building
60 Central Avenue
P. O. Box 5590
Cortland, New York 13045-5590
(607) 753-5021

Memorial Library
State University of New York
at Cortland
P. O. Box 2000
Cortland, New York 13045
(607) 753-2525

New York State Department of
Environmental Conservation
Regional Remediation Engineer
Hazardous Waste Remediation
615 Erie Boulevard West
Syracuse, New York 13204
(315) 426-7551

New York State Department of
Environmental Conservation
Division of Hazardous Waste Remediation
50 Wolf Road, Room 222
Albany, New York 12233
(518) 457-1641

Public notices and drafted correspondence will be utilized in informing Cortland County residents and those listed on the contact list (Table 4-1) when reports will be made available at local document repositories.

TABLE 4-1

CONTACT LIST

PROPERTY OWNERS
(Within the vicinity of or adjacent to the Old Cortland County Landfill)

Robert L. Doran RD 1 McGraw, New York 13101	Elizabeth Doran P. O. Box 175 McGraw, New York 13101	Robert & Judy Wade 4530 McGraw N. Road McGraw, New York 13101
James & Marjorie McGuiness 4500 McGraw N. Road McGraw, New York 13101	Charles Doran 4372 Hicks Hill Road McGraw, New York 13101	Robert & Florence Doran 4353 McGraw N. Road McGraw, New York 13101
Nael Cam Farms 4260 N. Road, P. O. Box 826 McGraw, New York 13101	Robert & Alberta Owen 2977 Route 41 McGraw, New York 13101	Joan S. Lawrence Box 351 McGraw, New York 13101
Robert & Caroline Leach 3117 Route 41 McGraw, New York 13101	Robert & Jean Carman 3095 Route 41, Box 262 McGraw, New York 13101	Lloyd & Elaine Zirbel 3087 Route 41, Box 125 McGraw, New York 13101
James M. Craig, Sr. 3075 Route 41, Box 278 McGraw, New York 13101	Gordon H. & Rose Watrous 3061 Route 41 McGraw, New York 13101	Fred & Catherine Horner 3049 Route 41 McGraw, New York 13101
Gerald A. Decker 126 Carter Creek Road Newfield, New York 14867	William & Helen MacLean 2446 East River Road Cortland, New York 13045	John & Mardis Schuhle Box 7, 8 East Academy Street McGraw, New York 13101
David Camp Box 5004 Cortland, New York 13045	Phillip & Terry Hammond Potter Road, RD 1 McGraw, New York 13101	Bryan Wood RD Potter Road McGraw, New York 13101
Thomas Newkirk RD 1, Maybury Road McGraw, New York 13101	Harold & Linda Leonard 4582 Potter Road McGraw, New York 13101	Hubert & Alice Merchant 4576 Potter Road McGraw, New York 13101
Robert Harman 26 Crandall Street Cortland, New York 13045	Betty Hill Box 34 McGraw, New York 13101	Donald Henry Box 564 McGraw, New York 13101

TABLE 4-1 (Continued)

CONTACT LIST

Howard Henry Box 444, 4411 Soshinsky Rd. McGraw, New York 13101	Kevin Seaman & Charlene Belmont RD 1, Soshinsky Road McGraw, New York 13101	Richard Moore 4315 Maybury Road McGraw, New York 13101
Donald & Ruth Cranson RD 1, Maybury Road McGraw, New York 13101	Louis Cranson RD 1 McGraw, New York 13101	Leon Cranson RD 1, Maybury Road McGraw, New York 13101
Joan Furlin Box 123, RD 1 Bloomingburg, New York 12721	Colin & Joyce Wells 160 West Genesee Street Chittenango, New York 13037	Gutchess Lumber Co. 150 McLean Road, Box 5478 Cortland, New York 13045
Michael & Marla Coleman Box 122 McGraw, New York 13101	Richard Osborne West Road Cortland, New York 13045	William H. White 2697 Parks Road McGraw, New York 13101
Harold Burmingham RD 1, 2696 Parks Road McGraw, New York 13101	Cathy Jo Falso 4923 Shippey Road McGraw, New York 13101	Steven Sholar 4976 Shippey Road McGraw, New York 13101
Lloyd & Olga Smith P. O. Box 333 Goodland, Florida 33933	Sherry Rainbow 4858 North Road McGraw, New York 13101	Joseph Mertens 1628 Hawley Avenue Syracuse, New York 13206-3539
Duane & Janice Stafford Box 46 East Homer, New York 13056	John & William Diescher 3946 Route 41 Cortland, New York 13045	Royal W. Phillips 28 Grove Street Homer, New York 13077

STATE AND LOCAL DEPARTMENTS

Brian Davidson Project Manager NYSDEC 50 Wolf Road, Room 208 Albany, New York 12233-7010	Sue Miller Citizen Participation Specialist NYSDEC - Region 7 615 Erie Boulevard West Syracuse, New York 13204	Ralph Pitman Director of Solid Waste Cortland County Department of Solid Waste Town Line Road McGraw, New York 13045

TABLE 4-1 (Continued)

CONTACT LIST

Cortland County Health Dept. Attn: James V. Feuss Dir. of Environmental Health County Office Building 60 Central Avenue P. O. Box 5590 Cortland, New York 13045-5590	Charles Branagh Regional Remediation Engineer NYSDEC - Region 7 Hazardous Waste Remediation 615 Erie Boulevard West Syracuse, New York 13204	Henriette Hamel NYSDOH 217 South Salina Street Syracuse, New York 13202
Susan VanPatten Health Liaison Program NYSDOH 2 University Place Albany, New York 12203-3313		

PROJECT CONSULTANTS

Barton & Loguidice, P.C. Attn: Mark Chauvin Project Manager 290 Elwood Davis Road Box 3107 Syracuse, New York 13220		

LOCAL AND COUNTY ORGANIZATIONS
(Civic, Economic, Social and Environmental)

Soil and Water Conservation District 100 Grange Place Cortland, New York 13045	Cortland County Business Development Corp. 34 Tompkins Street Cortland, New York 13045	Industrial Development Agency 34 Tompkins Street Cortland, New York 13045
Cortland County Chamber of Commerce 34 Tompkins Street Cortland, New York 13045		

CORTLAND COUNTY TOWN SUPERVISORS

Supervisor James Longaker Town of Cincinnatus P. O. Box 313 Cincinnatus, New York 13040	Supervisor Raymond Thorpe Town of Cortlandville 15 Terrace Road Cortland, New York 13045	Supervisor Steven P. Breed Town of Cuyler 7377 East Keeney Road Cuyler, New York 13050

TABLE 4-1 (Continued)

CONTACT LIST

Supervisor Lisa Grinnell Town of Freetown 2853 Marathon-McGraw Road McGraw, New York 13101	Supervisor Charles L. Rowland Town of Harford 1125 Daisy Hollow Road Dryden, New York 13053	Supervisor William H. Wright Town of Homer 31 North Main Street, Town Hall Homer, New York 13077
Supervisor Gary W. James Town of Lapeer Hunts Corners Lisle Road Marathon, New York 13803	Supervisor Charles S. Adams Town of Marathon 3471 West Hill Road Marathon, New York 13803	Supervisor Peter D. Knapp Town of Preble 7125 Song Lake Road Tully, New York 13159
Supervisor Michael L. Franklin Town of Scott 7489 Ripley Hill Road Homer, New York 13077	Supervisor Kenneth Diaz Town of Solon Solon Town Hall N. Tower Road East Freetown, New York 13040	Sueprvisor Kimberly Abbey Town of Taylor 3380 Whitney Road Cincinnatus, New York 13040
Supervisor Harold Ferguson Town of Truxton Foster Road Truxton, New York 13158	Supervisor Ronald J. Anderson Town of Virgil 1267 NYS Route 392 - Virgil Cortland, New York 13045	Supervisor Alvin W. Doty, Jr. Town of Willet 218 Doty Road Marathon, New York 13803

NEW YORK STATE OFFICIALS

Honorable James T. Walsh U.S. House of Representatives 1269 Federal Building 100 South Clinton Street Syracuse, New York 13261	Honorable James Seward New York State Senate 45 Church Street Cortland, New York 13045	Honorable Martin A. Luster New York State Assembly 106 East Court Street Ithaca, New York 14850

MEDIA

Cortland Standard 110 Main Street Cortland, New York 13045	WKRT 292 Tompkins Street Cortland, New York 13045	WXHC 12 South Main Street Homer, New York 13077
WYYS 292 Tompkins Street Cortland, New York 13045	WCNY-TV 506 Old Liverpool Road Liverpool, New York 13088	

CORTLAND COUNTY LEGISLATURE

Raymond E. Homer, Chairman		

SOLID WASTE MANAGEMENT COMMITTEE MEMBERS

Richard C. Tupper	W. Stephen Harrington	Theodore Law

TABLE 4-1 (Continued)

CONTACT LIST

Sandra Price	Ronald Van Dee	George Armstrong
David Plew		

5.0 GLOSSARY OF TERMS

Project Manager - A Department staff member within the Division of Hazardous Waste Remediation (usually an engineer, geologist or hydrogeologist) responsible for the day-to-day administration of activities, and ultimate disposition of, one or more hazardous waste sites. The Project Manager works with the Office of Public Affairs as well as fiscal and legal staff to accomplish site-related goals and objectives.

Public - The universe of individuals, groups and organizations: a) affected (or potentially affected) by an inactive hazardous waste site and/or its remedial program; b) interested in the site and/or its remediation; c) having information about the site and its history.

Public Meeting - A scheduled gathering of the Department staff and the public to give and receive information, ask questions and discuss concerns. May take one of the following forms: large-group meeting called by the Department; participation by the Department at a meeting sponsored by another organization such as a Town Board or Department of Health; working group or workshop, tour of the hazardous waste site.

Public Notice - A written or verbal informational technique for telling people about an important part of a site's remedial program coming up soon (examples: announcement that the report for the RI/FS is publicly available; a public meeting has been scheduled).

The public notice may be formal and meet legal requirements (for example: what it must say, such as announcing beginning of a public comment period; where, when and how it is published).

- **Publish** - For purposes of 6 NYCRR Part 375.7, at a minimum requires publication of a legal notice in a local newspaper of general circulation.

Another kind of public notice may be more informal and may not be legally required (examples: paid newspaper advertisement; telephone calls to key citizen leaders; targeted mailings).

Responsiveness Summary - A formal or informal written or verbal summary and response by the Department to public questions and comments. Prepared during or after important elements in a site's remedial program. The responsiveness summary may list and respond to each question, or summarize and respond to questions in categories.

Toll-Free "800" Telephone Information Number - Provides cost-free access to the Department by members of the public who have questions, concerns or information about a particular hazardous waste site. Calls are taken and recorded 24 hours a day, and a Department staff member contacts the caller as soon as possible (usually the same day).

Definitions of Commonly Used Citizen Participation Terms

Availability Session - Scheduled gathering of the Department staff and the public in a setting less formal than a public meeting. Encourages "one-to-one" discussions in which the public meets with Department staff on an individual or small group basis to discuss particular questions or concerns.

Citizen Participation - A process to inform and involve the interested/affected public in the decision-making process during identification, assessment and remediation of inactive hazardous waste sites. This process helps to assure that the best decisions are made from environmental, human health, economic, social and political perspectives.

Citizen Participation Plan - A document that describes the site-specific citizen participation activities that will take place to complement the "technical" (remedial) activities. It also provides site background and rationale for the selected citizen participation program for the site. A plan may be updated or altered as public interest or the technical aspects of the program change.

Citizen Participation Specialist - A Department staff member within the Office of Public Affairs who provides guidance, evaluation and assistance to help the Project Manager carry out his/her site-specific Citizen Participation program.

Contact List - Names, addresses and/or telephone numbers or individuals, groups, organizations and media interested and/or affected by a particular hazardous waste site. Compiled and updated by the Department. Interest in the site, stage of remediation and other factors guide how comprehensive the list becomes. Used to assist the Department to inform and involve the interested/affected public.

Document Repository - Typically a regional DEC office and/or public building, such as a library, near a particular site, at which documents related to remedial and citizen participation activities at the site are available for public review. Provides access to documents at times and a location convenient to the public. Environmental Management Councils (EMCs). Conservation Advisory Committees (CACs) as well as active local groups often can serve as supplemental document repositories.

Information Sheet - A written discussion of a site's remedial process, or some part of it, prepared by the Department for the public in easily understandable language. May be prepared for the "general" public or a particular segment. Uses may include, for example: discussion of an element of the remedial program, opportunities for public involvement, availability of a report or other information, or announcement of a public meeting. May be mailed to all or part of the interested public, distributed at meetings and availability sessions or sent on an "as requested" basis.

Remedial Design - Once a remedial action has been selected, technical drawings and specifications for remedial construction at a site are developed, as specified in the final RI/FS report. Design documents are used to bid and construct the chosen remedial actions. Remedial design is prepared by consulting engineers with experience in inactive hazardous waste disposal site remedial actions.

Construction - DEC selects contractors and supervises construction work to carry out the designed remedial alternative. Construction may be as straightforward as excavation of contaminated soil with disposal at a permitted hazardous waste facility. On the other hand, it may involve drum sampling and identification, complete encapsulation, leachate collection, storage and treatment, groundwater management, or other technologies. Construction costs may vary from several thousand dollars to many millions of dollars, depending on the size of the site, the soil, groundwater and other conditions, and the nature of the wastes.

Monitoring/Maintenance - Denotes post-closure activities to insure continued effectiveness of the remedial actions. Typical monitoring/maintenance activities include quarterly inspection by an engineering technician; measurement of level of water in monitoring wells; or collection of groundwater and surface water samples and analysis for factors showing the condition of water, presence of toxic substances, or other indicators of possible pollution from the site. Monitoring/ maintenance may be required indefinitely at many sites.

Consent Order - A legal and enforceable negotiated agreement between the Department and responsible parties where responsible parties agree to undertake investigation and cleanup or pay for the costs of investigation and cleanup work at a site. The order includes a description of the remedial actions to be undertaken at the site and a schedule for implementation.

Contract - A legal document signed by a contractor and the Department to carry out specific site remediation activities.

Contractor - A person or firm hired to furnish materials or perform services, especially in construction projects.

Delisting - Removal of a site from the State Registry based on study which shows the site does not contain hazardous wastes.

Potentially Responsible Party Lead Site - An inactive hazardous waste site at which those legally liable for the site have accepted responsibility for investigating problems at the site, and for developing and implementing the site's remedial program. PRP's include: those who owned the site during the time wastes were placed, current owners, past and present operators of the site, and those who generated the wastes placed at the site. Remedial programs developed and implemented by PRP's generally result from an enforcement action taken by the State, and the costs of the remedial program are generally borne by the PRP.

Definitions of Significant Elements and Terms of the Remedial Program

NOTE: The first eight definitions represent major elements of the remedial process. They are presented in the order in which they occur, rather than in alphabetical order, to provide a context to aid in their definition.

Site Placed on Registry of Inactive Hazardous Waste Sites - Each inactive site known or suspected of containing hazardous waste must be included in the Registry. Therefore, all sites which State or County environmental or public health agencies identify as known or suspected to have received hazardous waste should be listed in the Registry as they are identified. Whenever possible, the Department carries out an initial evaluation at the site before listing.

Phase I Site Investigation - Preliminary characterizations of hazardous substances present at a site; estimates pathways by which pollutants might be migrating away from the original site of disposal; identifies population or resources which might be affected by pollutants from a site; observes how the disposal area was used or operated; and gathers information regarding who might be responsible for wastes at a site. Involves a search of records from all agencies known to be involved with a site, interviews with site owners, employees and local residents to gather pertinent information about a site. Information gathered is summarized in a Phase I report.

After a Phase I investigation, DEC may choose to initiate an emergency response; to nominate the site for the National Priorities List; or, where additional information is needed to determine site significance, to conduct further (Phase II) investigation.

Phase II Site Investigation - Ordered by DEC when additional information is still needed after completion of Phase I to properly classify the site. A Phase II investigation is not sufficiently detailed to determine the full extent of the contamination, to evaluate remedial alternatives, or to prepare a conceptual design for construction. Information gathered is summarized in a Phase II report and is used to arrive at a final hazard ranking score and to classify the site.

Remedial Investigation (RI) - A process to determine the nature and extent of contamination by collecting data and analyzing the site. It includes sampling and monitoring, as necessary, and includes the gathering of sufficient information to determine the necessity for, and proposed extent of, a remedial program for the site.

Feasibility Study (FS) - A process for developing, evaluating and selecting remedial actions, using data gathered during the remedial investigation to: define the objectives of the remedial program for the site and broadly develop remedial action alternatives; perform an initial screening of these alternatives; and perform a detailed analysis of a limited number of alternatives which remain after the initial screening stage.

Ranking System - The United States Environmental Protection Agency uses a hazard ranking system (HRS) to assign numerical scores to each inactive hazardous waste site. The scores express the relative risk or danger from the site.

Responsible Parties - Individuals, companies (e.g., site owners, operators, transporters or generators of hazardous waste) responsible for or contributing to the contamination problems at a hazardous waste site. PRP is a potentially responsible party.

Site Classification - The Department assigns sites to classifications established by State law, as follows:

- **Classification 1** - A site causing or presenting an imminent danger of causing irreversible or irreparable damage to the public health or environment -- immediate action required.

- **Classification 2** - A site posing a significant threat to the public health or environment -- action required.

- **Classification 2a** - A temporary classification for a site known or suspected to contain hazardous waste. Most likely the site will require a Phase I and Phase II investigation to obtain more information. Based on the results, the site then would be reclassified or removed from the State Registry if found not to contain hazardous wastes.

- **Classification 3** - A site which has hazardous waste confirmed, but not a significant threat to the public health or environment -- action may be deferred.

- **Classification 4** - A site which has been properly closed -- requires continued management.

- **Classification 5** - A site which has been properly closed, with no evidence of present or potential adverse impact -- no further action required.

State-Lead Site - An inactive hazardous waste site at which the Department has responsibility for investigating problems at the site and for developing and implementing the site's remedial program. The Department uses money available from the State Superfund and the Environmental Quality Bond Act of 1986 to pay for these activities. The Department has direct control and responsibility for the remedial program.