

FINAL PHASE I OPERATIONS PLAN

- **SITE WORK PLAN**
- **CLEAN-UP PLAN**
- **SAMPLING AND ANALYSIS PLAN**
- **HEALTH AND SAFETY PLAN**

**Onondaga Drum Site
Nedrow, New York**

PRINTED ON

MAY 14 1993

SITE WORK PLAN

**Onondaga Drum Site
Nedrow, New York**

MAY 1993

REF. NO. 5067 (2/sub-1)

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CONESTOGA-ROVERS & ASSOCIATES

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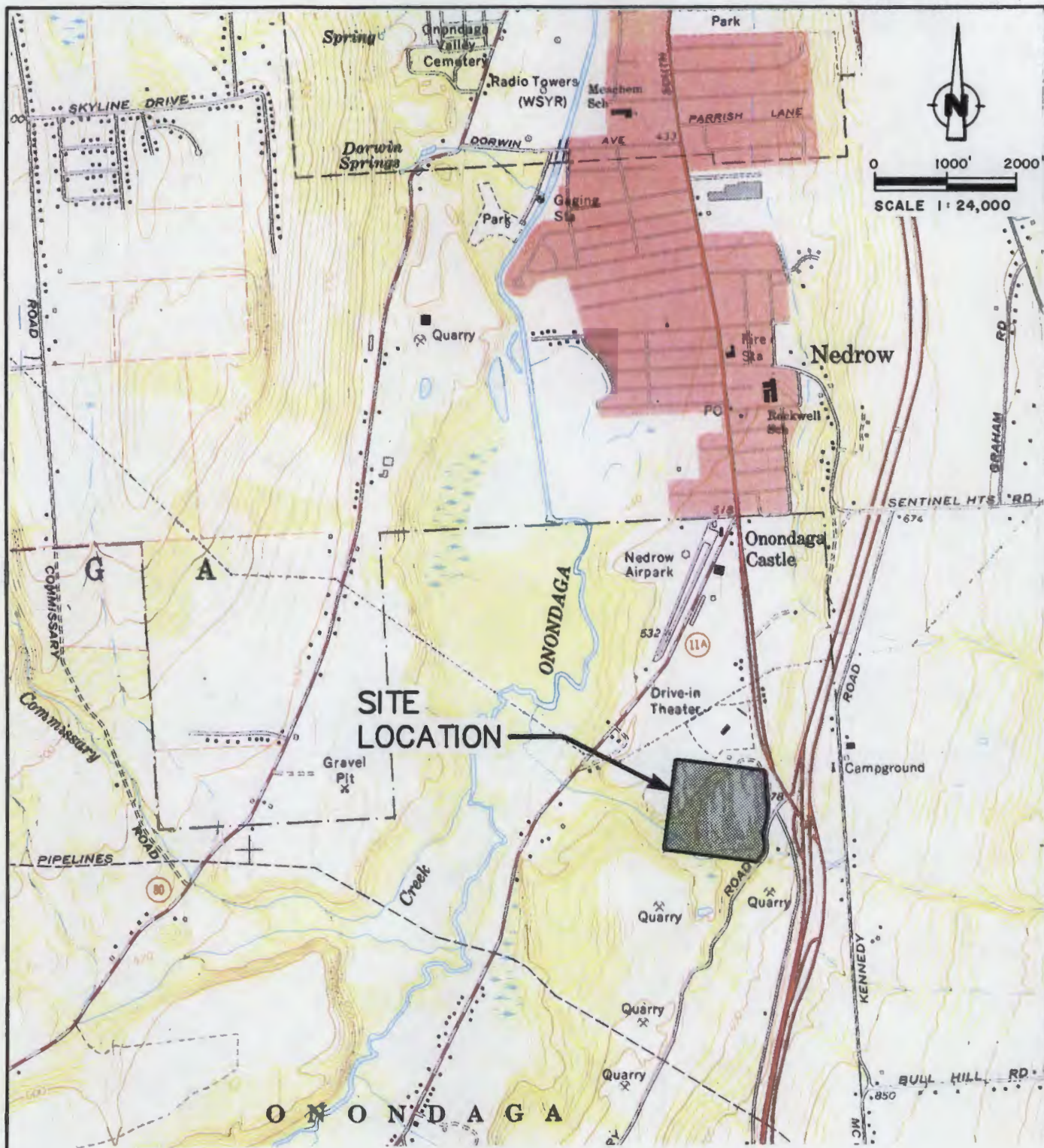
1.0 INTRODUCTION

The Onondaga Drum Site (Site) is situated west of the intersection of Route 11 and Quarry Road on the Onondaga Nation Territory in the Town of Nedrow, New York. The Site location is presented on Figure 1.1. The Site plan is presented on Figure 1.2.

The Site occupies approximately 25 acres in a sparsely populated rural area which is used for both residential and agricultural purposes. During the mid 1950s to the early 1980s, waste materials including industrial waste was disposed of at the Site.

To date, the U.S. Environmental Protection Agency (EPA) has collected approximately 1,300 surficial and partially buried drums at the Site, of which 1,046 were found to be empty and were subsequently sent to a disposal facility for recycling. Waste material contained in the remaining drums was bulked according to compatible waste streams into a total of 60 new drums. The 60 drums are currently staged at the Site pending disposal.

A work plan entitled "Drum Disposal Plan" was prepared by Conestoga-Rovers & Associates (CRA) for Stauffer Management Co. (Stauffer) and submitted to the EPA on October 27, 1992. The Drum Disposal Plan was prepared to address the characterization and disposal of the 60 staged drums at the Site as required by the Administrative Order on Consent (Consent Order) (Index Number II-CERCLA-2022) effective October 2, 1992. The work described in the Drum Disposal Plan will commence 14 days following the approval of the Plan by the EPA.

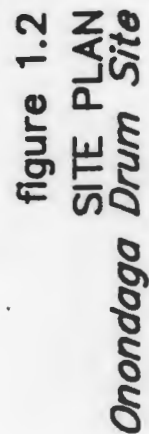


MAP SOURCE: SOUTH ONONDAGA, N.Y.
QUADRANGLE USGS 7.5 SERIES

figure 1.1
SITE LOCATION
Onondaga Drum Site

CRA

5067(2)-NOV.16/92-REV.0



MAP SOURCE: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

5067(2)-NOV.16/92-REV.0

This Final Phase I Operations Plan has been prepared in accordance with paragraphs 19 to 24 of the Consent Order to address locating the remaining buried drums at the Site, the excavation and removal of the drums and treatment and/or disposal of the drums and their contents. The Final Phase I Operations Plan consists of the following:

- Site Work Plan;
- Clean-Up Plan;
- Sampling and Analysis Plan; and
- Health and Safety Plan.

The general rationale for the work program is to initially conduct investigatory activities (magnetometer survey and test pitting) to define the areas of the Site with buried drums. Once these areas have been defined, an estimate of the magnitude of the drum excavation program can be made and the excavation can be conducted in a systematic fashion to optimize productivity and minimize potential releases to the environment.

The Site Work Plan describes the tasks required to delineate areas that contain drums and to identify those areas of the Site that do not require further investigation. Initial Site preparatory activities including decontamination, drum staging, personnel support and hygiene facilities are described in the Site Work Plan. The Site Work Plan includes a contingency plan which describes the necessary measures required to protect human health and the environment in the event of a release of any

hazardous materials at or from the Site. The Site Work Plan includes a schedule for the completion of the various work tasks.

The Clean-Up Plan addresses the removal, disposal and/or treatment of all drum materials, and grossly contaminated soil directly associated with the drum area. The Clean-Up Plan presents the tasks required for drum excavation, staging, sampling, off-Site transportation and treatment/disposal. The protocols for handling contaminated soil and groundwater within the drum excavation areas are also described.

The Sampling and Analysis Plan presents the detailed procedures and methods for the sampling and analysis of soil, groundwater, three off-Site potable water sources and drummed materials at the Site. Drummed material sampling and analyses will be conducted to determine compatibility and disposal characteristics of the wastes. A Quality Assurance Project Plan (QAPP) is included as an attachment to the Sampling and Analysis Plan to ensure that the sampling and analyses are conducted in conformance with EPA Quality Assurance/Quality Control (QA/QC) objectives.

The Health and Safety Plan provides the minimum safety requirements that will be implemented during the activities conducted under the Final Phase I Operations Plan. The Health and Safety Plan satisfies the requirements of 29 CFR 1910.120.

The project organization chart is presented on Figure 1.3.

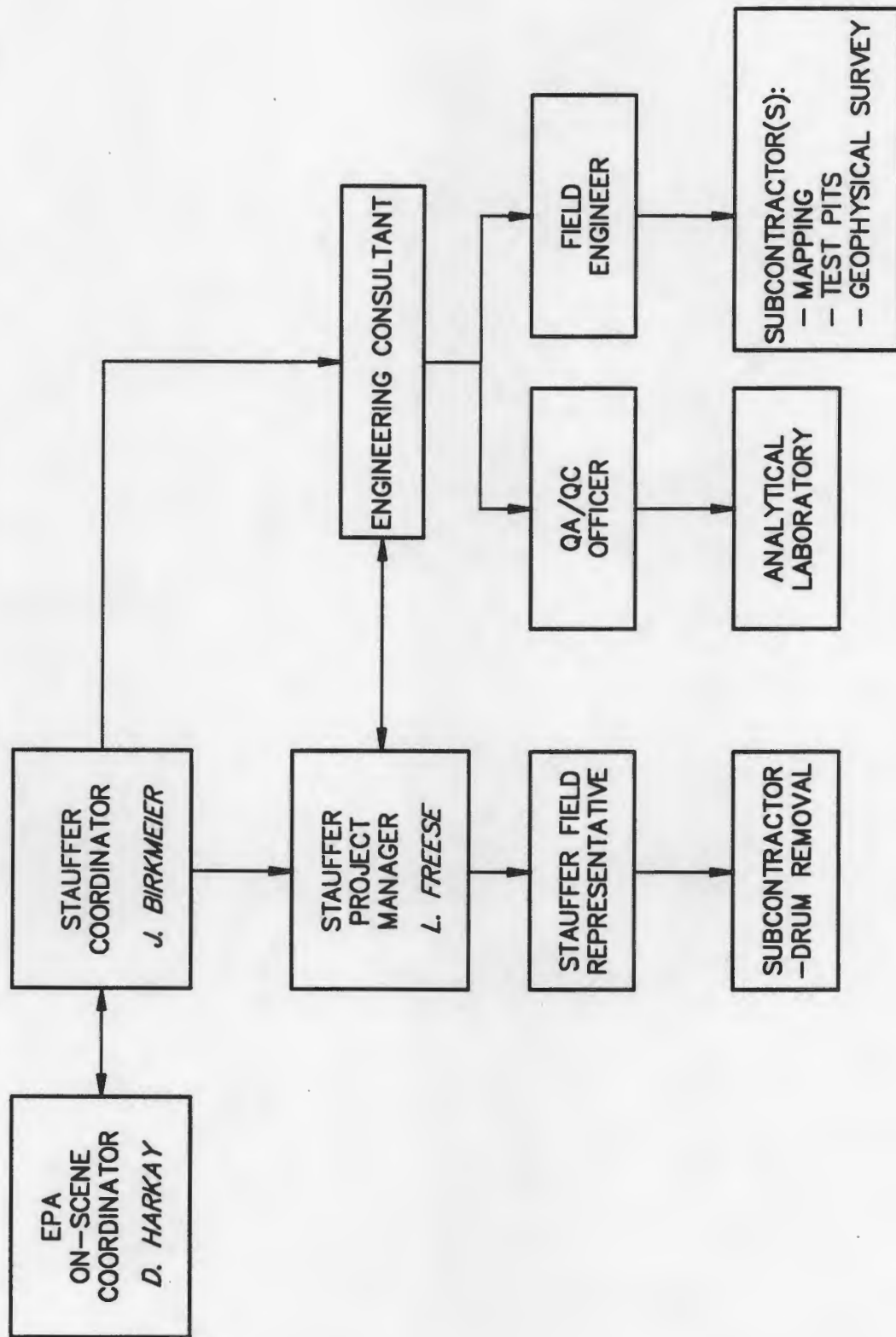


figure 1.3
PROJECT ORGANIZATION
Onondaga Drum Site

2.0 SITE PREPARATION

Initial Site preparation will include all activities necessary to prepare the Site prior to commencing any tasks under the Final Phase I Operations Plan.

2.1 SITE SECURITY

A snow fence will be installed and maintained around the perimeter of the Site throughout the duration of the project. Signs bearing the following legend will be maintained on the snow fence "Danger - Unauthorized Persons Keep Out".

A lockable gate will be installed across the Site access road. Access to the Site will be restricted to project personnel.

2.2 CLEARING AND GRUBBING

The Site is covered with dense brush and small trees throughout much of the area to be investigated. In order to facilitate Site activities such as the geophysical survey, test pits, drum excavation and handling and the placement of support facilities, the vegetation will be cleared prior to work startup. Heavy equipment including bulldozers will be used as required.

The cleared and grubbed vegetation will be chipped or, if unsuitable for chipping, stockpiled on-Site at a location to be determined in the field with the concurrence of the EPA. The debris may be used as fill material on Site and will remain on the property.

2.3 WETLANDS ASSESSMENT

The wetlands bordering the Onondaga Nation Indian Reservation have been designated by the New York State Department of Environmental Conservation (NYSDEC). However, the wetland area adjacent to the Site is located on the Onondaga Nation Indian Reservation and is thereby exempt from the jurisdiction of the NYSDEC and is not regulated by the New York Wetlands Laws (New York Environmental Conservation Law, Article 24). However, the wetland area may be subject to jurisdiction under Section 404 of the Clean Water Act.

In order to determine if the wetlands in the area of the → Site are "jurisdictional wetlands", the Army Corps of Engineers will be consulted. If deemed necessary, a wetlands delineation study will be conducted in accordance with the Routine Wetland Delineation procedures as presented in the Army Corps of Engineers Wetland Delineation Manual (January, 1987). If it is determined that Site activities will occur in the delineated wetland or that Site activities will alter the delineated wetland, the necessary precautions will be taken to ensure that these activities will not adversely impact the wetlands (see Section 6.3 of the Clean-up Plan).

Consequently, consultation with the appropriate state and federal wildlife agencies, in accordance with the Fish and Wildlife Coordination Act of 1958, may also be required.

Environmental control including measures to address sediment migration is presented in Section 6.0 of the Clean-up Plan.

2.4 MAPPING AND WETLAND DELINEATION

A topographic survey of the Site and surrounding area will be conducted utilizing aerial photography and a topographic map will be prepared. Elevation on the topographic map will be indicated by utilizing contour lines at every two foot change in elevation. The horizontal scale of the topographic map will be no less than 1 inch = 60 feet.

The topographic map will be used for reporting purposes to accurately locate key features or areas such as the geophysical survey, test pits and work and safety zones. Wetland areas adjacent to the Site will also be delineated.

2.5 PERSONNEL SUPPORT AND HYGIENE FACILITIES

At the commencement of the project all personnel support and hygiene facilities as specified in the Health and Safety Plan (HSP) will be established at the Site. Facilities to be established at the Site include:

- i) personnel hygiene facility;
- ii) emergency medical facility (including emergency shower and eyewash station);
- iii) portable lavatory;
- iv) separate tankage for potable and waste water; and
- v) Contractor's office trailer.

The personnel support and hygiene facilities will be located on Site in the approximate locations indicated on Figure 2.1.

2.6 EQUIPMENT DECONTAMINATION FACILITY

During the initial investigation phase (i.e. test pit investigation) minimal equipment decontamination will be required. The backhoe bucket will be cleaned between locations, only if it has contacted grossly contaminated waste material. If required, a temporary decontamination pad will be constructed adjacent to the test pit area to decontaminate the backhoe bucket and other equipment as required before moving to another test pit location.



figure 2.1
SITE PREPARATION LAYOUT
Onondaga Drum Site

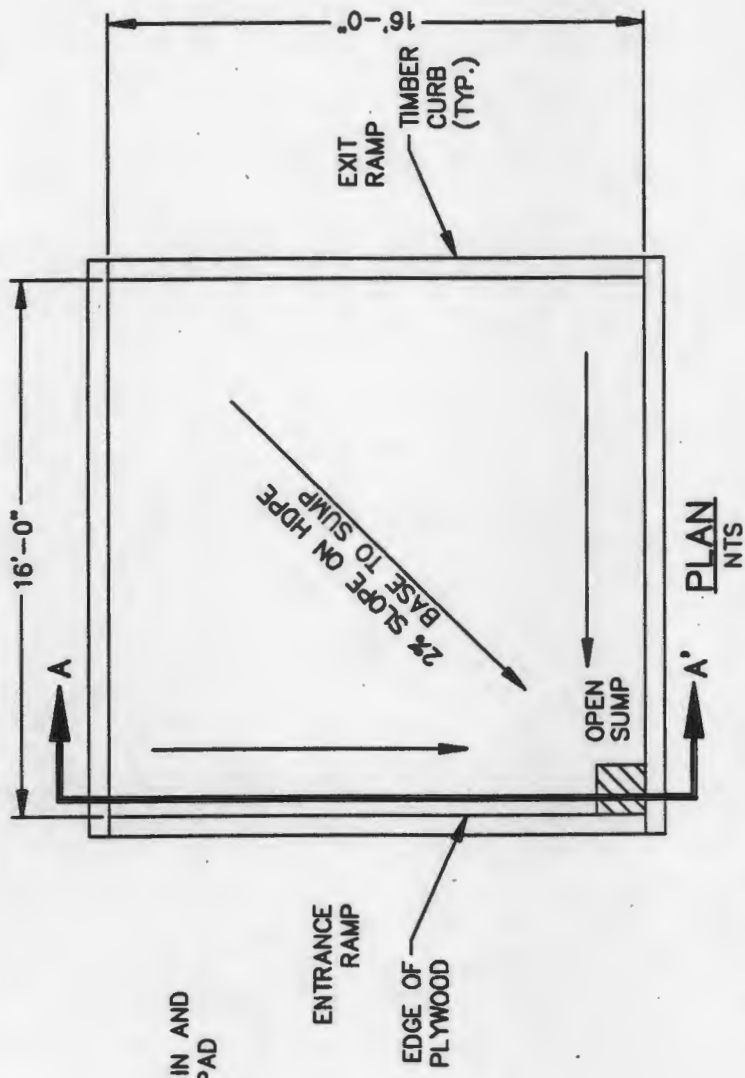
At the completion of the test pitting program, the backhoe and any other equipment that contacted waste material will be decontaminated at a temporary decontamination pad prior to leaving the Site. The temporary decontamination pad will be constructed adjacent to the test pit area in the contaminant reduction zone. Typical temporary decontamination pad construction details are presented on Figure 2.2.

Prior to commencing the drum excavation program, one or more decontamination facilities will be strategically located next to the excavation areas. These facilities will be located within the contaminant reduction corridor and all equipment that comes into contact with hazardous substances will be decontaminated prior to entering the support zone. The decontamination facility will be constructed to the specification shown on Figure 2.3.

"Caution" tape will be utilized to demarcate the limits of the exclusion zone(s) during the test pitting and drum excavation activities.

The surface of the decontamination pad will be sloped to a wastewater collection sump. A pump and hosing will be available to remove decontamination wastewaters to the wastewater holding tank on an as-required basis. A high-pressure steam cleaner will be used for decontamination of all equipment prior to leaving the Site.

Following the completion of the Final Phase I Operations Plan activities the decontamination facility and temporary snow fencing will



NOTE:
PROVIDE RAMPS IN AND
OUT OF DECON PAD

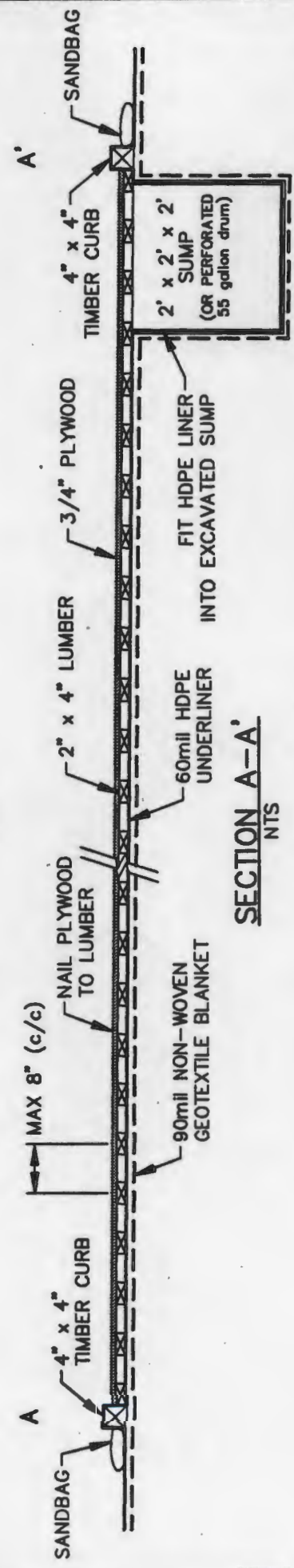
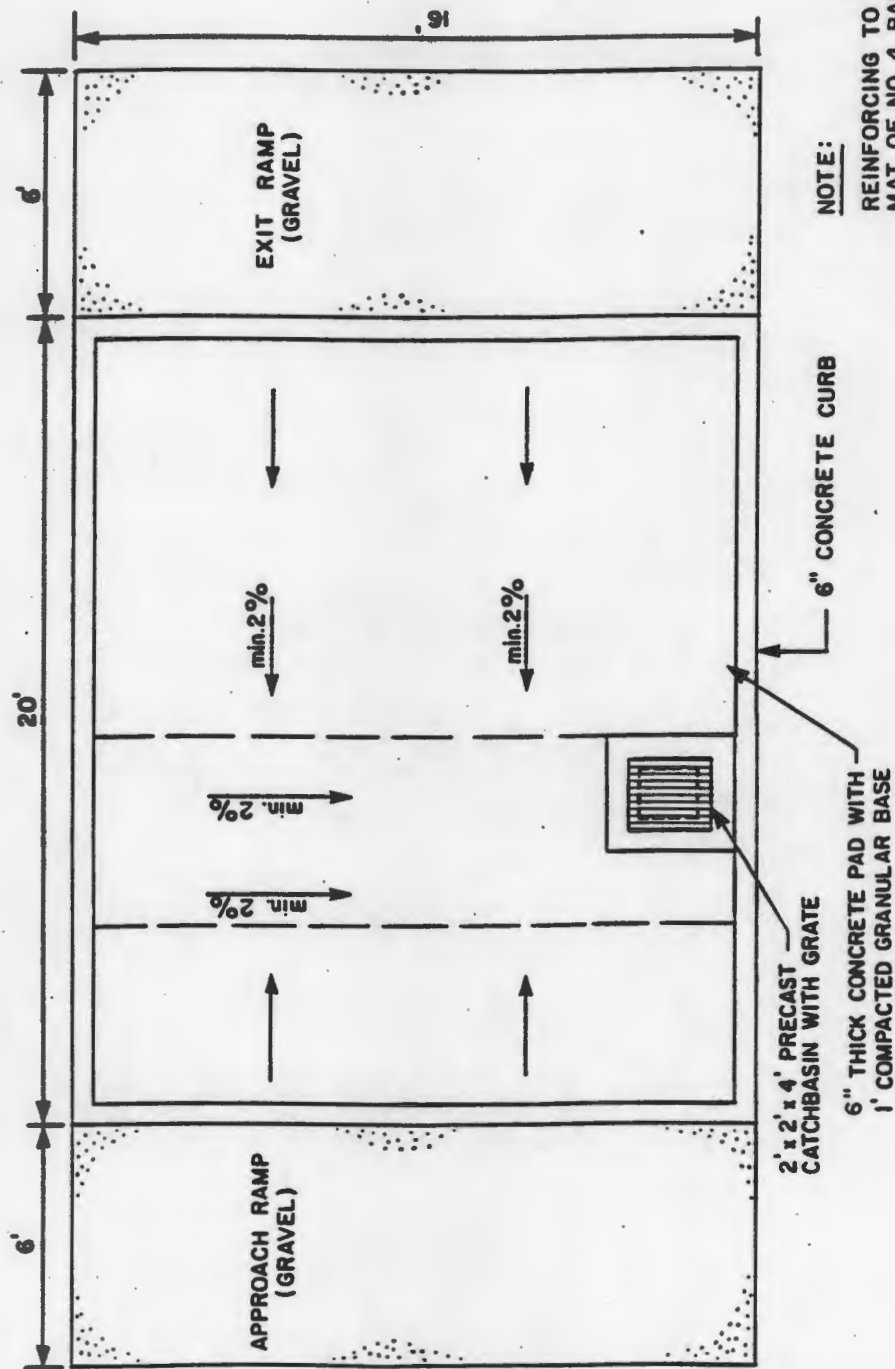


figure 2.2
TYPICAL TEMPORARY EQUIPMENT
DECONTAMINATION PAD DETAIL
Onondaga Drum Site



NOTE:

REINFORCING TO BE DOUBLE
MAT OF NO. 4 BARS @ 12" O.C.E.W.

figure 2.3
PLAN VIEW OF DECONTAMINATION FACILITY
Onondaga Drum Site

be removed should they be deemed unnecessary for further activities at the Site.

2.7 STAGING FACILITY

It is expected that the quantity of waste generated during the initial investigative tasks will be small. During the test pitting program, leaking drums and drums that are ruptured by the backhoe will be overpacked at the point of generation to prevent further spreading of contamination.

After overpacking, these drums will be transported to a temporary staging area located within the general drum area. The location of the temporary staging area will be determined in the field in conjunction with the EPA field representative. The temporary staging area will be demarcated in the field and classified as an exclusion zone when any sampling, material transfer, or bulking activities are taking place.

Following waste characterization, material transfer or bulking, the drums will be transported to the existing staging pad prior to loading for off-Site treatment/disposal.

Following completion of the investigative tasks, a determination of the estimated quantity of waste to be excavated will be made and appropriately sized staging areas will be constructed (see Clean-Up Plan).

The staging area will be demarcated in the field. Signs will be placed around the area bearing the legend "Danger Unauthorized Persons Keep Out". These signs will be legible from at least a distance of 50 feet and will be visible from any approach to the area.

Space will also be provided on the drum staging area for the provision of two 2,000-gallon containers for wastewater. Additional capacity will be provided as required.

2.8 WEIGH SCALE

A temporary weigh scale will be mobilized to the Site and installed for the weighing of waste materials transported off Site. The weigh scale will be a truck scale of sufficient capacity to weigh the axle loads of the trucks used to transport manifested waste materials. The weigh scale will be used to determine the manifested weight of each shipment and to determine compliance with axle load restrictions. The disposal Contractor will be responsible for testing the weigh scale for calibration prior to initial use.

2.9 ACCESS ROADS

Access roads will be constructed on Site as required during excavation activities to allow for vehicle access from the appropriate staging

areas to the excavation areas. The access roads are intended to provide a stable base for heavy machinery operation.

3.0 BURIED DRUM INVESTIGATION PROGRAM

3.1 GEOPHYSICAL INVESTIGATION

A geophysical survey will be conducted at the Site in order to delineate any areas that may potentially contain buried drums or other metallic containers. Any areas identified as potentially containing metallic debris will be further investigated by test pits and/or trenches as presented in Section 3.2. Survey areas that do not indicate the presence of buried metallic objects will be eliminated from further investigation.

3.1.1 Survey Area

The areal limits of the geophysical survey will be limited to the 25 acre Site.

Based upon the results of the mapping (see Section 2.3) a reference survey grid will be established over the study area. A base station will be established and designated 0 North, 0 East. Grid stations will be staked at 50-foot northing intervals and 50-foot easting intervals to facilitate accurate station locations. Magnetometer/gradiometer data will be collected on a 10-foot by 10-foot grid pattern within the established 50-foot by 50-foot control grid.

3.1.2 Magnetometer/Gradiometer Survey

The total field magnetic data (measured in units of gammas) and the vertical gradient of the total field magnetic data (measured in units of gammas per meter) will be measured at each 10 foot by 10 foot grid node.

Measurements of the total magnetic field are locally disturbed by the presence of buried ferrous objects (most commonly steel objects or iron-rich rocks). The size of the disturbance (magnetic anomaly) is a function of the magnetic properties, mass, shape and distance to the objects. Magnetic data alone cannot be used to distinguish drums from other types of ferrous metal objects of similar dimensions and mass.

Vertical magnetic gradient data is used to interpret the relative depth of buried metal objects. Steep vertical magnetic gradients indicate the presence of near-surface metallic objects. The vertical magnetic gradient for deeply buried metallic objects is relatively small.

A total field magnetometer/gradient instrument will be used at each pre-determined grid node to measure the total field and vertical gradient. In addition, diurnal field variations caused by atmospheric processes will be monitored by periodically measuring the magnetic field strength at a base station which overlies non-ferrous material. The variations in the magnetic field caused by the diurnal effects will be removed from the data.

The magnetometer/gradiometer survey is expected to be most useful in the northern area of the Site and other areas which contain minimal surficial metal debris. The survey will be conducted on a 10-foot by 10-foot grid in these areas until it is determined that the existing surficial and buried debris is affecting the measurements, resulting in unreliable data. Areas not included in the magnetometer survey will have to be investigated using test pits located in a grid pattern (see Section 3.2).

3.1.3 Presentation of Data

Upon completion of the geophysical survey, the magnetic and gradiometer data will be plotted and contoured at appropriate contour intervals such that the potential presence of any buried metallic objects can be delineated. The finalized contour map presenting the results of the geophysical survey will aid in the test pit excavation program presented in Section 3.2. In addition, the Clean-up Report will present the raw data, corrected data, vertical component, any modeling results from the magnetometer data and an interpreted base map indicating the location of significant targets. The report will also document the geophysical techniques and field procedures used for the survey.

3.2 TEST PIT INVESTIGATION

Test pits or trenching will be conducted at the Site to delineate both the horizontal and vertical limits of drummed waste prior to

drum excavation activities. Test pits will also be used to investigate any anomalies indicated by the geophysical survey as presented in Section 3.1. The results of the geophysical survey and any other visual surface evidence will be used to locate trenching areas and test pits that may be required to define the limits of buried drums.

The depths of excavation for each test pit will be determined by the field engineer based on the following criteria:

- depth will not exceed the depth to native soil;
- depth will not exceed 15 feet unless drums are encountered; and
- depth will not exceed the depth to the water table.

A detailed field log will be recorded for each excavation along with grid coordinates. The type and character of fill (or soil) encountered, the type and characteristics of any refuse, debris or waste material encountered and the depths of any water bearing zones will be noted on each test pit log.

3.2.1 Methodology/Procedure

Test pits will be excavated using a track mounted backhoe (or equivalent) with a non-toothed bucket capable of excavating to a depth of 20 feet below the ground surface (BGS). The backhoe operator compartment will be suitably equipped to protect the operator from waste materials or contaminated soil and water. The excavation portion of the backhoe or any

portions of it coming in contact with potentially contaminated soil will be steam cleaned (if necessary). Water generated and collected during steam cleaning will be containerized, labeled and stored in the Drum Staging Area.

The side slopes of the test pits, and hence their bottom width, will be consistent with OSHA standards presented in 29 CFR Part 1826. Loose soils will require more moderate side slopes in order to reduce sloughing and collapse. Any drums or containers encountered during the course of the test pitting activities will be left in place. Care will be taken to avoid rupturing of any buried drums during the test pitting activities. If necessary, hand shovelling will also be utilized to uncover buried drums. If a drum is ruptured during the test pitting activities, it will be removed from the excavation and handled in accordance with the drum handling procedures presented in the Clean-up Plan.

Information from neighboring test pits and the geophysical survey will be used to develop the appropriate investigative strategy at each test pit where drums are encountered. Additional test pits or trenches may be required in a particular area to adequately define the extent of the buried drums. Trenches or equally spaced test pits may be extended outward from the original test pit in a radial manner to define the extent of the buried drums.

During the test pit investigation, areas identified as anomalous by the geophysical survey will be investigated to determine the source of the magnetic disturbance. The test pit investigation will be extended as necessary to delineate these areas.

3.2.2 Data Reduction/Reporting

A log of each test pit will be prepared which will include grid location, a description of the soils encountered, visual signs of contamination, depth of any water bearing zones and any unusual conditions encountered. The test pit will be screened with a PID or OVA, radiation survey meter, explosimeter and HCN vapor analyzer, calibrated daily, as set forth in the HSP. Each test pit will be photographed and/or videotaped to provide a permanent record of the exploration.

The locations of each test pit will be identified by referencing the grid system used for the geophysical survey (and will be surveyed into Site coordinates). The edges of the drum areas will also be staked in the field, surveyed and plotted on the Site Plan.

4.0 DRUM EXCAVATION PROGRAM

The drum excavation activities are presented in the Clean-up Plan. Drum excavation activities include the excavation, handling, sampling, characterization and off-Site transportation of all buried drums or other containerized or non-containerized hazardous waste. Drum excavation activities will commence following the activities presented in Section 3.0, of this Work Plan.

All sampling required by the drum excavation program will be conducted in accordance with the Sampling and Analysis Plan and will follow the health and safety protocols presented in the HSP.

5.0 POTABLE WATER WELL SAMPLING

Three off-Site potable water wells will be sampled and analyzed for TCL and TAL compounds. The location of these wells will be verified by the EPA coordinator prior to sampling.

Sample collection and analytical protocols are presented in the Sampling and Analysis Plan and associated QAPP.

All well sampling will be conducted in accordance with the health and safety protocols presented in the HSP.

6.0 CONTINGENCY PLAN

The following contingency measures will be implemented to provide the necessary protection to human health and the environment in the event of a release of any hazardous materials at or from the Site.

Activities that could potentially result in the release of hazardous materials include the test pit program; drum excavation, handling, staging, sampling, transportation and disposal.

6.1 ON-SITE CONTINGENCY PLAN

If release of hazardous material occurs on Site, the protocols presented in Section 10.0 of the HSP will be followed and the individual that observes the release will immediately:

- i) notify the Field Engineer and Site Safety Officer;
- ii) take immediate action to control and contain the release;
- iii) keep unnecessary personnel away, isolate the area of release, and deny entry;
- iv) do not allow anyone to touch released material;
- v) stay upwind; keep out of low areas; and
- vi) keep combustibles away from the released material.

If human health or the environment are threatened, the Field Engineer will notify the National Response Center (NRC) (800) 438-2427 as soon as possible. NRC will be notified of any release of reportable

quantities including all releases which threaten human health or the environment. The EPA will be notified of all releases within 24 hours and will determine if releases other than those noted above require notification to the NRC.

An employee alarm system to signify a major release or an emergency will consist of three short blasts using an air horn. An air horn will always be maintained at the Site during active work hours and will be immediately available to all personnel involved in Site activities.

Upon implementing the above procedures, the immediate areas of the release, including downwind areas, will be scanned with the HNu meter to identify the level of protection required for personnel safety equipment to clean up the released material. As a minimum, personnel will wear all protective clothing specified in the HSP including supplied air respiratory protection as required. Air monitoring will determine if the level of respiratory protection can be downgraded. The air monitoring action levels as presented in the HSP will be followed during any clean-up of a release.

Should releases occur from drums containing solid wastes, the released material will be placed into containers and covered. Each container will be labeled as to contents.

Liquid and/or sludge spills will be first covered with an absorbent to absorb any free liquids to minimize the amount that may infiltrate into the ground. The absorbent material and soils contacted by the

spill will be excavated and placed in containers. These containers will be labeled to indicate contents.

An assessment will then be made to determine the need to conduct post-clean-up soil sampling and analysis. EPA will be provided with a copy of the assessment report. Collected samples will be analyzed for the waste constituents previously identified on Site. If analytical data are available for the released materials, these data will be used to determine the analytes of concern.

A release report will be prepared by Stauffer submitted to the EPA, summarizing the release and response action.

6.2 OFF-SITE CONTINGENCY PLAN

Only authorized transporters, as discussed in the Clean-up Plan, will be used for the transportation of hazardous waste. If a release of material from a transport vehicle occurs while in transit, the following actions will be taken by the transport operator to reduce potential migration of the waste material.

- i) Immediately notify the Contractor, who will in turn notify the Stauffer Project Manager (Mr. L.A. Freese (302) 886-4384), and the EPA On-Site Coordinator (OSC). In the event of a release of a reportable quantity, the National Response Center ((800) 438-2427) will also be notified;

- ii) Take immediate measures within the capabilities of the transport driver to control the release, if necessary;
- iii) Contain and eliminate the release, if possible;
- iv) The driver must remain within a safe distance of the vehicle, and will keep unnecessary people away, isolate the area of the release and deny entry to unauthorized personnel;
- v) Stay upwind, keeping out of low areas, and do not allow contact with the released material;
- vi) Contact the appropriate local authorities (police, fire department, traffic control, etc.) and local hazardous materials response unit; and,
- vii) Other actions, as advised by the local spill response authorities.

Upon implementing these procedures, the same action to clean up the release will be implemented as described in the Clean-up Plan.

7.0 REPORTING

Upon completion of the activities presented in Section 3.0 of the Site Work Plan, a plan will be prepared delineating the extent of buried drums at the Site and the Site layout for drum removal activities (e.g. staging areas, access roads, excavation sequence). A copy of this plan will be provided to EPA.

Following the completion of all activities presented in the Final Phase I Operations Plan and the Drum Disposal Plan a report entitled "Site Clean-up Report" will be prepared in accordance with paragraph 29 of the Consent Order will be submitted to the EPA. The Site Clean-up Report will present the results of the work tasks identified in the Final Phase I Operations Plan and Drum Disposal Plan and will include the following:

- i) synopsis of all work performed under the Consent Order;
- ii) identification and detailed description of all EPA-approved modifications to the Drum Disposal Plan and the Final Phase I Operations Plan which occurred during performance of the work required under the Consent Order;
- iii) results of all groundwater sampling and analysis required pursuant to paragraph 22.g of the Consent Order, and all soil sampling and analysis required by the Final Phase I Operations Plan. All groundwater and soil sampling and analysis results shall include QA/QC data and chain-of-custody records;

- iv) a list of all laboratories, transporters, and disposal or recycling facilities utilized during the clean-up;
- v) copies of all manifests and bills of lading generated in connection with the transport of materials off Site;
- vi) copies of all "certificates of destruction" of all materials which are disposed and/or treated off-Site; and
- vii) a sworn statement by Respondent setting forth the following:
"I certify that the information contained in and accompanying this submission to the United States Environmental Protection Agency is true, accurate, and complete."

In addition to the Site Clean-up Report, biweekly progress reports will be submitted to the EPA throughout the duration of the project. In accordance with the Consent Order the bi-weekly progress reports will include:

- i) the actions taken toward achieving compliance with the Consent Order during the previous two-week period;
- ii) all testing and sampling results and any other data relevant to the project;

- iii) a description of the activities scheduled for the following two-week period; and
- iv) information regarding any project delays or anticipated delays that may affect the schedule for completion of the Final Phase I Operations tasks and any efforts made to mitigate those incurred or anticipated delays.

The analytical results for the potable well sampling will be reported to the EPA within 30 days of sample collection as specified in paragraph 21e of the Consent Order.

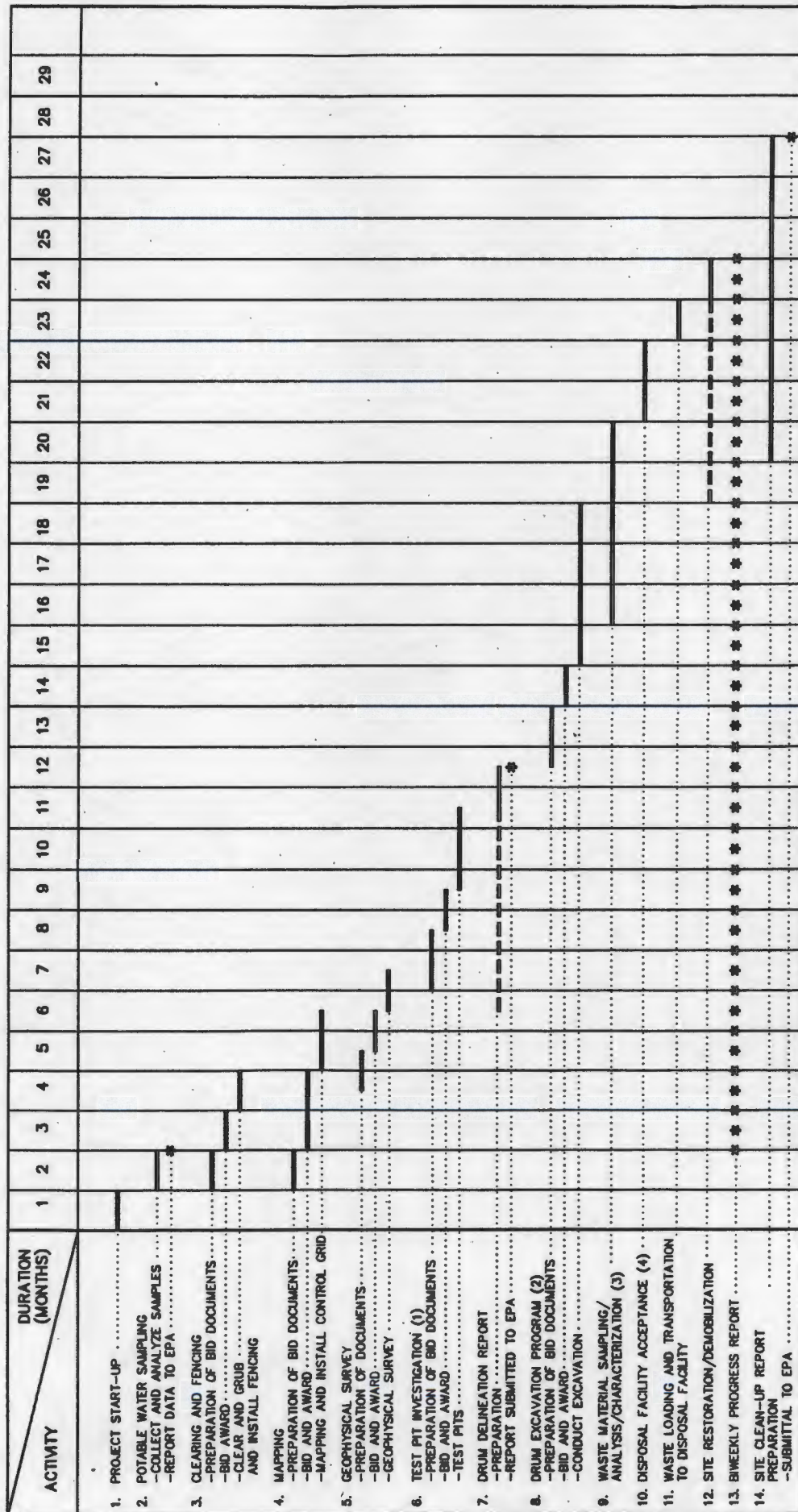
8.0 PROJECT SCHEDULE

The proposed schedule for the Final Phase I Operations Plan is presented on Figure 8.1.

The actual duration of certain activities is contingent upon the following factors:

- i) the extent of the test pit investigation as determined by the geophysical survey;
- ii) the number of drums found at the Site;
- iii) presence and quantity of potentially contaminated soils;
- iv) presence and quantity of potentially contaminated groundwater within the drum excavation areas;
- v) quantity and disposal method of hazardous materials (drum contents, soil and groundwater); and
- vi) availability and scheduling of disposal facility.

The project schedule will, therefore, be adjusted as information concerning these key factors is obtained. The EPA will be advised of any modifications or updates to the schedule in the bi-weekly progress reports.



LEGEND

★ MILESTONE EVENT

———— CONTINUOUS ACTIVITY

----- INTERMITTENT ACTIVITY

NOTES:

1. SCHEDULE COMMENCES UPON EPA APPROVAL OF PHASE I OPERATIONS PLAN AND SECURING SITE ACCESS.

2. TEST PIT INVESTIGATION DURATION IS DEPENDENT UPON THE RESULTS OF THE GEOPHYSICAL SURVEY AND THE NUMBER OF DRUMS.

3. DRUM EXCAVATION DURATION IS DEPENDENT UPON THE NUMBER OF DRUMS TO BE EXCAVATED.

4. WASTE MATERIAL SAMPLING/ANALYSIS/CHARACTERIZATION DURATION IS DEPENDENT UPON THE VOLUME OF WASTE MATERIALS TO BE SAMPLED.

5. DISPOSAL FACILITY ACCEPTANCE DURATION IS DEPENDENT UPON APPROVAL AND SCHEDULING INTO DISPOSAL FACILITY.

CRA

5067 (2) NOV 24/92 REV.0 (S-02)

figure 8.1

PROJECT SCHEDULE

Onondaga Drum Site

CLEAN-UP PLAN

**Onondaga Drum Site
Nedrow, New York**

MAY 1993

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CONESTOGA-ROVERS & ASSOCIATES

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APPENDIX A SEDIMENT/EROSION CONTROL MEASURES

1.0 INTRODUCTION

This Clean-up Plan describes the activities required for the buried drum removal program which includes the following tasks:

- i) excavation, removal, disposal and/or treatment of drummed materials;
- ii) excavation, disposal and/or treatment of contaminated soil (grossly contaminated or saturated with waste);
- iii) sampling of groundwater which flows into excavation areas;
- iv) collection and analysis of post-excavation soil samples from buried drum excavations;
- v) waste profiles and weighing of all hazardous waste that leaves the Site; and
- vi) procedures for the decontamination, crushing and disposal of empty drums and drum fragments.

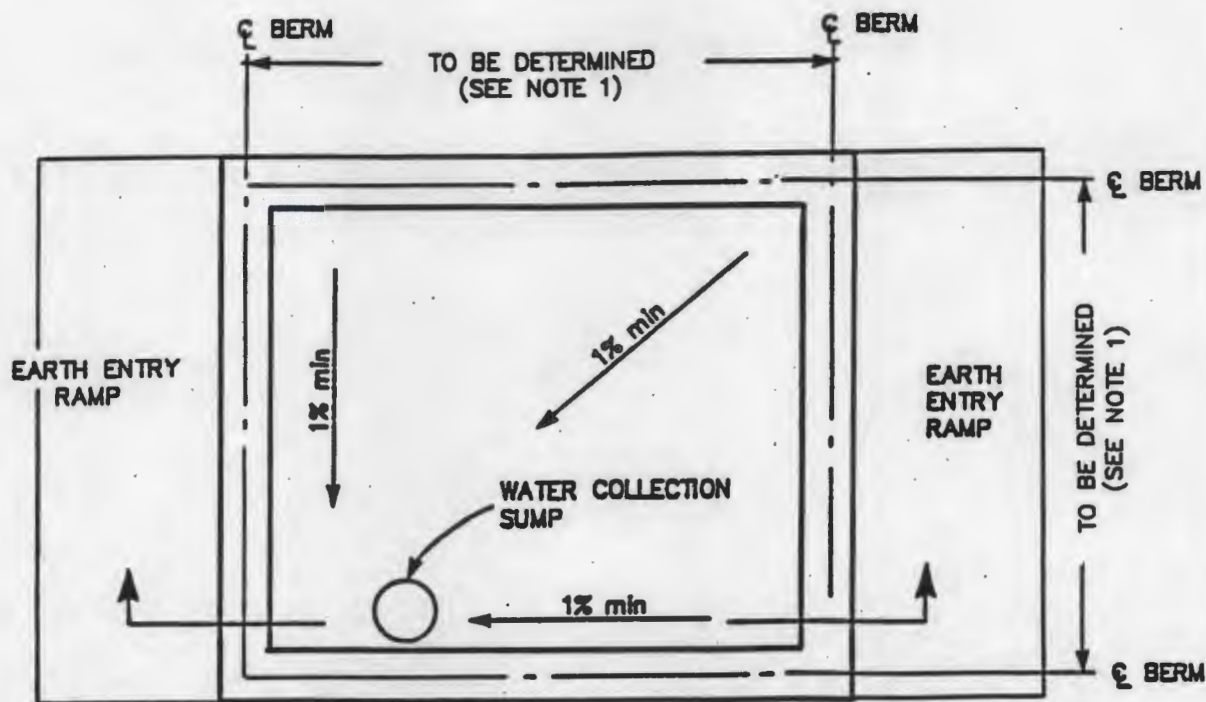
Sampling activities required by the Clean-up Plan are presented in the Sampling and Analysis Plan and associated QAPP. All activities performed for the Clean-up Plan will be conducted in accordance with the health and safety protocols presented in the Health and Safety Plan (HSP).

2.0 SITE PREPARATION

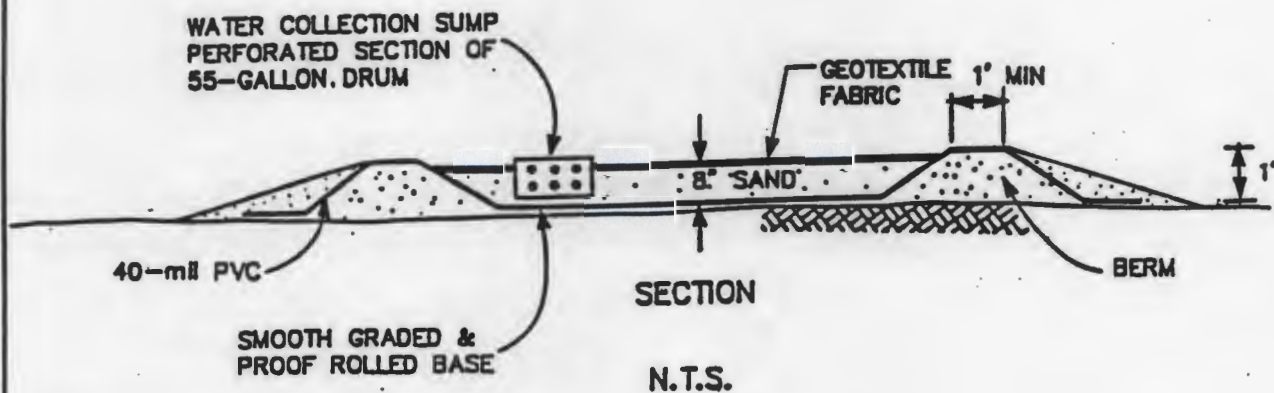
2.1 STAGING FACILITIES

Prior to commencing drum excavation activities, two staging facilities will be constructed. The exact locations and size of these staging facilities will be determined based upon the estimated amount of material requiring staging as determined by the geophysical survey and test pit program presented in Section 3.0 of the Site Work Plan. One staging facility will include two distinct areas: a drum staging area; and a large container (e.g. roll-off) staging area. The second staging facility will be for grossly contaminated soil encountered during the drum excavation program. Typical construction details for the staging areas are presented on Figure 2.1.

The drum staging area will be used for the interim storage of overpacked excavated drums while conducting sampling, compatibility testing and characterization prior to the consolidation of wastes (if any) and off-Site disposal of the drums. The procedure for grounding drums prior to sampling is discussed in Section 4.3.3 of the Sampling and Analysis Plan. The drum staging area may be used for the consolidating of compatible waste streams, or the repackaging of drummed waste. Bulking operations are discussed in Section 4.0. If incompatible waste streams are determined during waste classification, the drums containing incompatible wastes will be kept separated by a minimum of ten feet.



PLAN VIEW
N.T.S.



SECTION
N.T.S.

NOTE:

THE FINAL DIMENSIONS OF THE STAGING PAD ARE DEPENDENT ON THE NUMBER OF DRUMS TO BE STAGED.

figure 2.1

TYPICAL STAGING PAD
Onondaga Drum Site

The area designated for roll-off staging will be approximately 50 feet wide by 35 feet long and will allow for the staging of up to four 40-cubic yard roll-offs. This area will be expanded as required.

The second staging facility will be used for staging grossly contaminated soils or debris saturated with waste. These materials will be stockpiled on a series of staging pads each typically constructed as shown on Figure 2.1. A 40-mil PVC synthetic liner will be installed under each pad for leak and spill protection. A geotextile filter fabric will be placed over the sand drainage blanket to provide stability and to prevent clogging of the sand. In addition, each pad will be constructed with an integral sump as shown to allow for the removal of collected waters. The surface of the liner will be sloped as shown to direct gravity drainage towards the sump. Liquids collected in the sump will be pumped out as necessary and transferred to the wastewater tank. The transfer of liquids from the sumps will be the responsibility of the Contractor. Sump liquids will be removed on an as-required basis based on visual inspection of the sumps. Soils stockpiled on the staging area will be covered at all times except during sampling activities.

Each soil staging pad will be approximately 16 feet wide by 50 feet long and will allow for the staging of approximately 100 cubic yards of soil. Initially, one staging cell will be constructed and additional staging pads will be added as required. Soils will be placed on the pads using a front end loader. Since the pads will only be 16 feet wide, the loader will not be required to drive over the pad. The loader will approach and place the soils from the side of the pad.

Space will be provided on the drum staging area for the provision of two 2,000-gallon containers for wastewater. Additional capacity will be provided as required.

Both staging facilities (drum/roll-off and soil) will be classified as Exclusion Zones (EZ) with all EZ requirements as presented in the HSP.

The decontamination area and staging facilities will be demarcated in the field. Signs will be placed around the areas bearing the legend "Danger-Unauthorized Persons Keep Out". These signs will be legible from at least a distance of 50 feet and will be visible from any approach to the areas.

3.0 DRUM EXCAVATION PROGRAM

3.1 EXCAVATION PROTOCOLS

The drum excavation program will commence following the completion of the geophysical survey and test pit program as presented in Section 3.0 of the Site Work Plan. The information obtained from the geophysical survey and test pit program will be used to produce a plan delineating areas with buried drums at the Site. Based on this information, a drum excavation strategy, including sequencing of the excavations, will be developed for the Site.

Excavations will be completed using a tracked hydraulic excavator equipped with an earth excavation non-toothed bucket. Excavation equipment will be suitable to safely excavate to a minimum depth of 20 feet. All excavations will be completed in accordance with OSHA trenching requirements, 29 CFR Part 1826. Excavations will be conducted systematically in 1-foot lifts from existing ground surface to the bottom of the buried drums. As each area is excavated, any drums or drum parts which are encountered, and any grossly contaminated soil immediately associated with the drums or drum parts will be removed and staged at the staging areas presented in Section 2.1. Other soils, refuse or debris required to be excavated to expose the drums or drum parts will be temporarily staged immediately adjacent to the excavation and backfilled within the specific area of excavation.

Grossly contaminated soil as defined by the Consent Order means soil and/or debris that is grossly contaminated or saturated with waste. Identification of grossly contaminated soil will be by visual observation.

At the completion of the excavation and prior to backfilling any refuse or debris, soil samples will be collected from the excavation sidewalls and bottom (see Section 3.2.6). All excavation areas and soil sampling locations will be plotted to scale on the Site Plan.

A preliminary classification check list will be completed as drummed waste is encountered (see Section 3.2.3 b)) and a drum inventory log (see Section 4.0) will be completed at the staging pad. Soil profile descriptions will be recorded for each excavation area.

Excavated materials will be assigned the following classifications:

- intact drums including contents;
- drum fragments;
- grossly contaminated soils; or
- non-visibly contaminated soils and debris.

It is anticipated that all drum removal activities will be conducted in dry or semi-dry conditions and that buried drums will not have to be removed from below the groundwater table. If small quantities of water enter the excavation from precipitation and/or sidewall seepage, this water will be allowed to infiltrate into the ground.

Measures will be taken to isolate drum excavation areas from any significant ponded water in the excavation (e.g. absorbent booms placed between the immediate drum excavation area and any significant ponded water in another part of the excavation). If the excavation area is sufficiently large, the bottom of the excavation may be sloped to allow any water in the excavation to flow to a low point in the excavation that is not in the immediate drum removal area.

If there is evidence that buried drums are present below the groundwater table, dewatering will be required prior to removal of the drums. Drum removal activities in these areas would cease until a situation specific dewatering program is developed and approved by the EPA.

In the event that drum failure results in the release of waste into standing water in the excavation, the contaminated water will be pumped from the excavation, containerized, and disposed/treated in accordance with applicable regulations.

3.2 DRUM AND CONTAINERIZED WASTE HANDLING PROTOCOLS

3.2.1 General

All excavation, waste sampling and container handling activities will be conducted in accordance with the HSP. All activities will be

conducted in accordance with the protocols contained in the Federal Register, Vol. 54, No. 244, March 6, 1989, Occupational Safety and Health Administration, 29 CFR Part 1910, Hazardous Waste Operations and Emergency Response; Final Rule.

This section applies to all activities involved in the handling of drums or drum parts that may have contained, or do contain, potentially hazardous waste materials in the solid or liquid state. The procedures described within this section specify the minimum requirements that will be implemented to minimize the potential for migration of waste constituents to the surrounding environment, and exposure to the surrounding population.

3.2.2 Equipment

a) Safety Equipment

During the handling of drums or containers, safety apparel and equipment as specified in the HSP, will be worn or used at all times. In particular, Level B protection which includes supplied air will be worn at all times while handling drums or containers whose contents are unknown.

b) Handling Equipment

All handling, moving and transporting of drums will be performed with mechanical equipment whenever possible. Drums shall be moved by grappler, non-metallic slings, within a backhoe bucket or front-end loader or by other means that will minimize damage to drums and release of contents therefrom. Movement or handling by personnel may be required in the event that mechanical means cannot be properly or safely employed due to drum breakage or leakage.

Portions of equipment that contact drums or containers will preferably be constructed of non-ferrous metals. Should steel equipment be used, contact portions will be coated or lined to preclude spark generation in accordance with 40 CFR § 1910.120(j)(1)(xii). Portable pumps, if used, will be intrinsically safe.

Vehicular handling and transport equipment will be equipped with Class ABC fire extinguishers and shall comply with 40 CFR § 1910.157 and SCBA if deemed necessary by the Site Safety Officer.

The equipment used for the handling and transport of drums or containers will be regularly maintained. A maintenance sheet will be available on Site and completed as required. In particular, the ignition, manifold and exhaust components will be maintained to prevent backfiring or generation of sparks within the exhaust gases.

Prior to removal from the Site, all equipment will be decontaminated as described in Section 8.0 of the Sampling and Analysis Plan.

3.2.3 Drum Handling

a) Working Groups

During the excavation of the drums, a team of personnel specifically trained in the handling of containerized waste will be designated to perform this task. This team will contain no fewer than two people. During the handling of containerized waste, visual contact will be maintained between members of the working team at all times. All team members will be able to communicate with ease between themselves and will comply with HSP requirements. All communications will be transmitted via hand signals (during activities requiring SCBA) or verbal (during all other activities) in accordance with 40 CFR § 1910.120(j)(5)(iv) with the exception of heavy equipment operations. Heavy equipment operators will be in radio communication with the field crew supervisor.

b) Point-of-Excavation Handling

As containerized waste is encountered, and prior to physically handling a drum, a preliminary classification check list will be completed. This list will include:

- a) screening with a radiation survey meter;
- b) screening of the container with an explosimeter;
- c) screening with a photoionization monitor (HNU or equivalent) for organic vapors;
- d) visual description of the drum, container contents and labelling information (if available and legible); and
- e) condition of the drum or container as it appears in the excavation.

All screening instruments will be calibrated daily. Backup instruments will be provided.

If, during this inspection, an open or leaking drum or container is observed to contain liquids, the liquids will be immediately pumped or bailed into a repack drum prior to removing the drum or container from the excavation. Portable intrinsically safe pumps will be provided for this purpose. If an open drum or container is identified to contain solids, the drum or container will be carefully removed from the excavation. If the container is neither open nor leaking, the container will be carefully removed from the excavation and examined for structural and hydraulic integrity. Drums that cannot be moved without rupture, leakage or spillage will be emptied, into a DOT approved salvage drum using a portable hand pump (for liquid wastes) or a hand shovel (for sludges). All intact drums with contents will be overpacked into DOT approved 85-gallon salvage drums prior to removal to the appropriate staging facility. Drums shall be removed from the excavation by grappler, non-metallic slings, within the backhoe bucket or by other means that will minimize damage to drums and release of contents therefrom.

Prior to overpacking drums, all identifying markings, words and symbols will be recorded both by photo documentation and notation in a drum log. Free liquids from leaking drums will be collected using an absorbent material, as discussed in Item c) below.

After overpacking, the drums will be transported to the staging facility with a front-end loader or fork lift configured with a suitable carrying apparatus. All drums will be oriented on the staging facility on pallets to permit sampling of each individual drum for compatibility characterization and disposal parameters. Sufficient area to permit forklift truck access to the drums will be maintained. All overpacked containers will be opened and sampled at the staging area.

All empty drum carcasses, drum parts, lids, and associated debris will be consolidated adjacent to the excavation in a 40-cubic yard roll-off prior to removal to the appropriate staging facility. Drums containing less than one inch of residue will be considered empty. The site where the roll-offs are placed adjacent to the excavation area(s) will be prepared with a granular base, as required to support the roll-off and heavy equipment operation. Drum parts shall be removed from the excavation by grapples, non-metallic slings, within the backhoe bucket or by other means, and safety protocols under OSHA.

Prior to consolidating drum parts, all identifying markings, words and symbols will be recorded both by photo documentation and notation in a drum log.

After the roll-off is full, the roll-off will be transported to the appropriate staging facility. Additional roll-offs will be staged on Site for usage if necessary.

3.2.4 Grossly Contaminated Soils

Soil that is grossly contaminated or saturated with potentially hazardous waste will be identified by visual examination during the excavation of drums. Excavated soils, immediately associated with the drums or drum parts, identified to be grossly contaminated, will be loaded onto on-Site transport units (front end loader) and removed to the designated staging pad (see Section 2.1).

Stockpiled grossly contaminated soils will be covered with an impermeable liner during periods of work stoppage, during precipitation events and at the end of each day. The liner will minimize air release (vapor or particulates) as well preventing precipitation from contacting the soils. Air monitoring will be conducted for VOC emissions in the vicinity of the stockpile areas on a daily basis during operating days. This frequency may be reduced if air emissions are minimal as expected.

Stockpiled grossly contaminated soils will be subject to waste characterization (see Section 5.0) to determine appropriate treatment/disposal methods. The soils will also be subjected to the appropriate disposal analyses, as specified in the Sampling and Analysis Plan.

Containerized materials encountered during the excavation of the buried wastes will be handled as described, in Section 4.0.

3.2.5 Groundwater Entering Excavations

If possible, all excavations will be conducted in a dry state. Measures will be taken to minimize flow of surface water and groundwater into excavation areas where it may come in contact with potentially hazardous materials. Berms or diversion channels may be installed to divert flow away from contaminated areas.

Any groundwater which flows into and/or rises to fill the excavated area(s) will be sampled for TCL and TAL parameters in accordance with the Sampling and Analysis Plan.

3.2.6 Post-Excavation Soil Sampling

Post excavation soil samples will be collected from all excavations from which grossly contaminated soil is removed. The actual number of samples collected will be based upon the size of the excavation. One five-point composite sample will be collected for each 600 sq. ft. (24 ft x 24 ft) of excavation. The samples will be analyzed for the complete list of TCL/TAL parameters. Details of the post-excavation soil sampling are provided in the Sampling and Analysis Plan.

4.0 HANDLING AND PACKAGING OF EXCAVATED WASTES

The sampling, handling and packaging of excavated wastes will be performed at the staging facility. All drums will be oriented to permit sampling of each individual drum. Sufficient area to permit forklift truck access to the drums will be maintained. Material handling operations at the staging facility, if not already performed at the point-of-excavation, will consist of:

- i) assignment of a unique container number to each drum easily visible and labeled both on top and side;
- ii) notation of approximate volume of contents, condition of drum, pertinent labelling information, visual appearance of contents and physical state;
- iii) photographic logging of each intact drum/overpack unit;
- iv) segregating solid and liquid waste drums on the basis of visual observation or, in the event of uncertainty in accordance with the Paint Filter Test;
- v) collection of representative samples for compatibility testing and waste characterization; and
- vi) consolidation of similar waste streams on the basis of compatibility testing data and placement in compatible groupings at the staging

facility pending ultimate disposal. Drums containing compatible materials will be placed in the same row. Drums containing incompatible materials will be separated by a minimum of ten feet. (Note: All drums staged at the facility will be contained within overpacks which are elevated on wooden pallets, see Site Work Plan).

Excavated materials which are removed and placed in the appropriate staging facility will be kept separate according to whether the materials are drummed solid wastes, drummed liquid wastes, bulked drum parts or grossly contaminated soils immediately associated with drums or drum parts. Excavated grossly contaminated soils will be placed on a separate staging pad(s) for temporary storage while awaiting characterization.

Compatible liquid wastes, if consolidated into a bulk container, will be pumped from the drums using a portable hand pump. In the event that drums, subsequent to pumping liquid wastes, contain excessive sludge/residue, the drums shall be scraped out by hand shovelling.

Drummed wastes which are visually identifiable as solids and solidified sludges may be emptied from the containers and bulked with other compatible dry wastes designated for off-Site disposal.

Drums whose contents were consolidated for bulk transport will not be reused. The drums will be crushed and placed in 40-yard roll-offs for disposal as hazardous wastes at a RCRA compliant and/or TSCA compliant facility, as appropriate. Overpack drums may be reused on -Site.

The handling and packaging of all drums will be conducted in accordance with the requirements of the HSP.

Following waste characterization and consolidation, drum wastes and grossly contaminated soils will be disposed of off Site in accordance with Federal and State regulations.

5.0 WASTE SAMPLING

Waste characterization and testing will be conducted as required on excavated containerized liquid and solid waste to determine the appropriate disposal and/or treatment method to ensure compliance with 40 CFR 261 and 6 NYCRR Part 371. In addition, testing will be conducted to ensure that drummed materials are consolidated in a safe manner for transport and disposal. Waste characterization will also be conducted on excavated grossly contaminated soils.

All sampling and analytical procedures and protocols are presented in the Sampling and Analysis Plan and associated QAPP. The Sampling and Analysis Plan presents EPA-approved methods for sampling and analysis of the various matrices for compatibility, disposal characteristics, Target Compound List (TCL) parameters (Target Analyte List (TAL) parameters and Toxicity Characteristic Leaching Procedure (TCLP) parameters. Table 5.1 presents the analytical requirements for waste characterization.

TABLE 5.1

WASTE CHARACTERIZATION ANALYSIS

Physical Characteristics

Physical State	Sample inspection
Free Liquids	Sample inspection
Specific Gravity	Volume and weight measurement
pH	EPA SW-846(1), Method 9040
Flash Point	EPA SW-846, Method 1010
Solids	ASTM-D-3977-80
Ash Content	ASTM E-830-87
BTU	ASTM E-711-87

Chemical Composition

Metals	EPA SW-846, Method 6010/7000 series for TAL (2) metals
Organic	
TCL (3)	
Volatiles	EPA SW-846, Method 8240
Organochlorine	
Pesticides and PCBs	EPA SW-846, Method 8080
TCL Semi-volatiles	EPA SW-846, Method 8270
Total Organic Halides	EPA SW-846, Method 9020

Other Components

Cyanides	EPA SW-846, Method 9010/9012
Sulfides	EPA SW-846, Method 9030
Phenols	EPA SW-846, Method 8040
Sulfur	ASTM E-775-87
Chlorine	ASTM E-776-87
TOC	EPA SW-846, Method 9060

Hazardous Characteristics

Reactivity	EPA SW-846, Section 7.3, Chapter 7
Corrosivity	EPA SW-846, Method 1110
TCLP	40 CFR Part 268, Appendix II

Notes:

- (1) EPA SW-846, Test Methods for Evaluating Solid Waste, Third Edition, 1986.
- (2) TAL = Target Analyte List
- (3) TCL = Target Compound List

6.0 ENVIRONMENTAL CONTROL

6.1 SURFACE WATER CONTROL

All excavation, staging and consolidation operations will be carried out under dry conditions to the maximum extent possible. During excavation activities surface water runoff will be prevented from entering excavations using dikes and ditching around the perimeter of the excavation to divert runoff away from the excavation. Precipitation which may enter an excavation will be either allowed to infiltrate into the ground or will be purged from the excavation into a wastewater tanker for analysis to determine method of disposal.

During excavation activities all provisions necessary to maintain the excavations and the staging pads free from water will be available on Site. The work force will maintain sufficient pumping equipment, machinery and tankage in good working condition for all emergencies, such as power outage.

Grossly contaminated soil will be covered with an impermeable liner during periods of work stoppage including periods of precipitation and at the end of each working day. Any liquids accumulated in the staging pad sumps will be transferred to the wastewater storage tank.

Precipitation will be prevented from contacting consolidated empty drums/drum parts. The roll-off in which the empty

drums/drum parts are consolidated, will be equipped with a water-tight lid. The lid will be closed during periods of work stoppage including periods of precipitation and at the end of each working day.

Subsequent to the completion of excavation activities, each excavated area will be backfilled with soil and/or debris and graded to provide sufficient slope to allow surface drainage away from the excavated areas.

6.2 DUST CONTROL

Dust control measures will be implemented as required to prevent the generation of dust during excavation and handling operations. Dust control measures will consist of watering down access roads on Site and/or spraying a fine mist over areas being excavated.

6.3 EROSION AND SEDIMENT CONTROL

Temporary erosion and sediment control measures will be installed prior to the start of drum excavation activities and maintained as appropriate, until vegetation from Site rehabilitation has been established. The locations for the sediment and erosion controls will be determined in the field prior to excavation.

Sediment and erosion controls will include straw bale dikes and/or silt fences to intercept sediment-laden surface water runoff from the drum excavation areas. Typical construction details for these control measures are presented in Appendix A.

Visual examination, if any, on the controls will be used to assess if the sediments are to be managed with the grossly contaminated soils (see Section 3.2.4) or can be used on Site as backfill.

6.4 GENERAL HOUSEKEEPING

Daily accumulations of solid waste material such as discarded safety equipment, debris and rubbish will be collected in garbage bags and disposed of in accordance with Federal and State regulations.

Sanitary refuse will be contained in a designated area in the general office and support area. Trash removal services will be provided on a weekly basis, during active work, for uncontaminated solid waste.

The Site will not be allowed to become littered with general non-hazardous refuse and/or waste materials from the working areas, but will be maintained in a neat and orderly condition throughout the construction period.

7.0 SPILL CONTROL AND RESPONSE

7.1 SCOPE

During all active work at the Site involving the transport and handling of excavated drums or other wastes, the Contractor will be required to implement and maintain an on-Site and off-Site Spill Control and Response Plan. This plan, as presented herein, will provide contingency measures for potential releases of material from drummed or other wastes handled on Site.

7.2 MATERIAL HANDLING

a) Bulked Liquids and Solids

All vehicles provided for the handling of bulked liquids (e.g. wastewater) and solids will be required to be in a good state of repair and will be operated by trained operators in a safe manner to prevent spills during handling. Should any tankers be used for hauling bulked liquids, they must be licensed for that purpose and must be inspected to ensure that all valves, manways and other access ports are secured to prevent leaks. Prior to use, the hauler will be required to document that the tanker is clean. Haulage units used for bulked solids will be inspected to ensure that their tailgates are secured and the loads are tarped to avoid spillage or tracking of excavated material.

b) Drummed Waste

The handling and transport of drummed waste will be, at all times, conducted in a controlled and safe manner which will minimize damage to structurally sound drums, repacks or overpacks. Section 2.0 addresses drum handling procedures and equipment to be used which provides protection for the handling of explosive and/or shock sensitive waste.

Extreme care will be exercised in opening drums or other sealed containers in which the contents may be harmful to sampling personnel. When practical, a drum will not be moved or opened unless the drum appears to be structurally sound.

Drums will be opened in such a manner that excess interior pressure, as evidenced by bulging or swelling, has been safely relieved. If pressure cannot be relieved from a remote location, appropriate shielding will be placed between sampling personnel and the drums to reduce the risks of injury.

Prior to transferring drums to the appropriate staging facility all drums will be overpacked into DOT approved 85-gallon salvage drums. All drums that cannot be moved without rupture, leakage or spillage will be emptied into a DOT approved 85-gallon salvage drum using a portable hand pump (for liquid wastes) or a hand shovel (for solids and sludges). Drums shall be moved by grappler, non-metallic slings, within a backhoe

bucket or front-end loader or by other means that will minimize damage to containers and release of contents therefrom. A minimum inventory of 10 additional overpack units, in addition to those required to overpack the drums, will be provided on Site adjacent to the staging area and each active excavation area.

c) Equipment

The following equipment will be available on Site and used for any unexpected spills:

- i) sand, fill or other non-combustible absorbent;
- ii) 85-gallon DOT approved overpack drums (10 adjacent to staging area and each active excavation area);
- iii) front end loader and/or backhoe; and
- iv) shovels.

Hand tools which are used will generally be discarded with the waste material unless it is determined appropriate to decontaminate the tools. If tools are decontaminated, they will receive a detergent wash in addition to steam cleaning or hot water washing.

7.3 SPILL PREVENTION AND RESPONSE

The handling and transport of drummed waste will be, at all times, conducted in a controlled and safe manner which will minimize damage to the containers and prevent release of the contents. All intact drums with contents will be overpacked prior to removal to the appropriate staging facility, thereby mitigating the potential of leakage during movement to the staging facility. Additional overpack units will be provided at the excavation area for use in the event of leakage or spillage.

In the event that a drum or container of liquid is spilled outside of the excavation areas, the drum handling team will immediately respond to the spill. The spilled liquids will be confined to the immediate area of the spill and the liquids will be pumped, with the use of a portable hand pump, into a repack drum. The spilled liquids will be confined by diking around the spill with native material or with an inert absorbent. Any residual liquids which cannot be pumped will be absorbed with a sufficient quantity of inert absorbent to ensure that no free liquids remain. If the spill occurred on soil, the visibly affected soil will be treated as contaminated material based on a visual determination of spill contamination. This material will be considered grossly contaminated soil and will be staged accordingly. Spills that occur outside of an area of excavation will be marked and reported to the EPA.

Liquids spilled within excavations will be pumped, with the use of a portable hand pump, into a repack drum. Soil/fill adjacent to the spill area will be placed to absorb any residual liquid. Materials underlying

the spill zone will be treated as contaminated materials based on a visual determination of spill contamination. This material will be excavated and staged in the stockpile of grossly contaminated soils , as discussed in Section 3.2.4.

In the event that a spill comes into contact with standing water, the effected water will be pumped from the excavation, containerized, and disposed/treated in accordance with applicable regulations. Absorbent material will be available during excavation of buried drums and handling of waste for use in the event of a liquid spill.

8.0 OFF-SITE DISPOSAL

a) Approved Disposal Facilities

EPA will be provided advance notification of the off-Site facilities that have been selected for the treatment or disposal, as appropriate, of drummed or bulk wastes, and the disposal of wastewaters. All facilities identified for hazardous waste disposal will be RCRA compliant and/or TSCA compliant, as applicable, and will comply with the requirements specified hereafter. Completed waste profiles and the supporting analytical data will be provided to EPA for review a minimum of 15 business days prior to the shipment of waste from the Site.

Any wastes excavated, which are staged and deemed to be non-hazardous as determined by the waste characterization study, will be transported to a sanitary landfill and/or Publicly Owned Treatment Works system, as applicable, for disposal.

b) Letter of Agreement

Each designated disposal facility will provide a letter of agreement. This agreement will specify the total estimated quantities of wastes and the intended method of disposal for each waste stream. Each Letter of Agreement will provide the facility name and EPA Identification number, facility locations, name of responsible contact for facility, telephone number for the contact, signed letter of agreement to accept wastes as specified, the unit of measure utilized at the facility for costing purposes,

waste characterization requirements and expected schedule for shipment. A copy of all Letters of Agreement will be provided to the EPA and the environmental agency of the accepting state; if shipped to a facility outside the State of New York a minimum of five (5) business days prior to shipment of the waste.

9.0 OFF-SITE WASTE TRANSPORTATION

9.1 PREPARATION OF OFF-SITE TRANSPORT VEHICLES

All off-Site transport vehicles will be prepared as appropriate prior to receiving drummed or bulk waste. Drummed wastes will be loaded and secured in a manner which will prevent damage to the containerized materials and meets all applicable DOT transport requirements (49 CFR 177, 178 and 179).

A weatherproof tarp will be provided and secured over each shipment leaving Site. Exception will only be made for enclosed transport units.

Following tarping, each transport vehicle will enter the decontamination facility. Each vehicle will be decontaminated to ensure that no loose soil, sludge or other material is tracked off Site. Particular attention will be paid to removing materials from tires, undercarriages, and portions of vehicles which may have been in contact with waste materials during loading operations. Transport drivers will remain in their vehicle cabs while they are in the Contaminant Reduction Zone and the Exclusion Zone as specified in the HSP.

9.2 OFF-SITE WASTE TRANSPORTATION AND DISPOSAL

9.2.1 Manifesting and Labeling

All excavated drums, overpacks and bulk transport units designated for off-Site disposal will be labelled and manifested (if RCRA hazardous) prior to leaving the Site for off-Site disposal facilities. The analytical results obtained in accordance with Section 4.0 will be used for manifesting purposes and for determining the necessary placarding of vehicles. The manifest forms and records will be consistent with 40 CFR Part 262 "Standards Applicable to Generators of Hazardous Waste", 40 CFR Part 263 "Standards Applicable to Transporters of Hazardous Waste", and 6 NYCRR Part 372 "New York Hazardous Waste Manifest System Regulations".

An EPA hazardous waste generator number, obtained prior to shipping wastes off Site, will be used on all manifests. All waste leaving the Site will be weighed prior to removal and again upon arrival at the disposal/treatment facility.

Prior to off-Site disposal, an inventory of all waste generated by category will be compiled and presented to the EPA.

9.2.2 Authorized Transporters

Only transporters which are licensed by EPA, DOT and the State of New York will be used for the transport of hazardous materials if any wastes are found to be hazardous. Transporters will be in compliance with applicable state and federal hazardous waste transportation requirements (i.e., 40 CFR Part 263 and 6 NYCRR 364). If drums or bulk wastes are scheduled for facilities outside of the State of New York, transporters will be required to be licensed in the appropriate State(s) as well as comply with other applicable Federal laws including DOT requirements.

If wastes are deemed to be non-hazardous (based upon receipt and review of supporting analytical data) then transporters will be licensed for general transportation of sanitary wastes or as required by New York for the transport of Special Waste. These wastes will be disposed of in an appropriate sanitary landfill or into a Publicly Owned Treatment Works (POTW) system, as is appropriate. This determination will be made in accordance to the results from the Waste Characterization.

9.2.3 Transportation Routes

All transportation routes to off-Site facilities will be predetermined prior to commencing off-Site transport of waste materials. A primary and secondary route to each facility will be identified. The secondary route will be used only if the primary route becomes impossible due to weather and road conditions or blockage from traffic accidents. The

appropriate State and interstate officials will be consulted as to whether any proposed routes are scheduled for construction or seasonal closures which will occur during implementation of this project.

All applicable DOT requirements will be complied with during transportation (i.e. 24-hour notification hotline). The coordinator of the Emergency Management Division, Onondaga County [(315) 434-2525] will be notified of waste shipment prior to transport.

10.0 PROJECT CLOSEOUT

10.1 GENERAL

All closeout activities will be coordinated and performed in such a manner that no waste materials scheduled for off-Site disposal or mobilized facilities remain at the Site upon completion of this program. Constructed facilities (i.e., decontamination facility, staging facility, snow fence) will be removed if it is determined that they will not be utilized for further activities at the Site.

As discussed in Section 3.0, all excavations will be backfilled and regraded at the completion of the excavation activities.

10.2 EXCLUSION ZONE SURFICIAL CLEANUP

It is anticipated that the tracking of waste materials will be minimal due to the use of the vehicle decontamination station and access roads. If necessary, surficial cleanup of roadways will be performed after all excavated waste drums have been removed from the excavations. Visibly contaminated soils will be placed with the stockpiled soil for characterization/disposal.

10.3 FINAL EQUIPMENT DECONTAMINATION

A final decontamination of all equipment will be performed on the equipment decontamination pad. Decontamination of equipment will consist of wire brushing to remove loose dirt and debris and adhered residues, and a high-pressure hot water wash or steam rinse. Particular attention will be paid to joints, sprockets, and undercarriages. Each piece of equipment will be inspected after decontamination prior to removal from the Site. An inspection record will be maintained by the field engineer. Each decontaminated piece of equipment leaving the Site will be recorded on the inspection record along with the name of the inspector.

10.4 STORED WASTEWATER REMOVAL

The stored wastewaters will be characterized in accordance with Section 4.0 and the Sampling and Analysis Plan prior to removal from Site. The characterization analyses of the liquid contents will determine the appropriate method of disposal. The tank contents will be transferred to liquid waste transportable tankers as necessary and disposed of at an appropriate off-Site facility. Following emptying of the wastewater tank, the tank interior will be decontaminated with a high-pressure water wash supplemented by detergent (Alconox). Any decontamination wastewater generated will be collected and transported to appropriate off-Site facilities for final disposition in accordance with all applicable State and Federal regulations.

10.5 FINAL CLEANUP

Final cleanup will involve cleaning the Site of litter and trash resulting from the work and leaving the Site in a neat and orderly condition. Litter and trash resulting from the work will be disposed of at a local sanitary landfill.

APPENDIX A

SEDIMENT/EROSION CONTROL MEASURES

STANDARD AND SPECIFICATIONS FOR STRAW BALE DIKE

Definition

A temporary barrier of straw or similar material used to intercept sediment laden runoff from small drainage areas of disturbed soil.

Purpose

The purpose of a bale dike is to reduce runoff velocity and effect deposition of the transported sediment load. Straw bale dikes have an estimated design life of three (3) months.

Conditions Where Practice Applies

The straw bale dike is used where:

1. No other practice is feasible.
2. There is no concentration of water in a channel or other drainage way above the barrier.
3. Erosion would occur in the form of sheet erosion.

4. Length of slope above the straw bale dike does not exceed these limits.

Constructed Slope	Percent Slope	Slope Length (ft.)
2:1	50	25
2 - 1/2:1	40	50
3:1	33	75
3 - 1/2:1	30	100
4:1	25	125

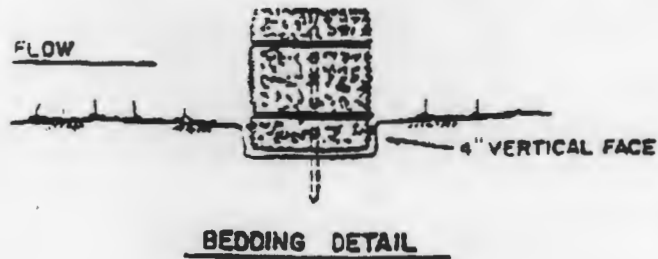
Where slope gradient changes through the drainage area, steepness refers to the steepest slope section contributing to the straw bale dike.

The practice may also be used for a single family lot if the slope is less than 15 percent. The contributing drainage area in this instance shall be less than one acre and the length of slope above the dike shall be less than 200 feet.

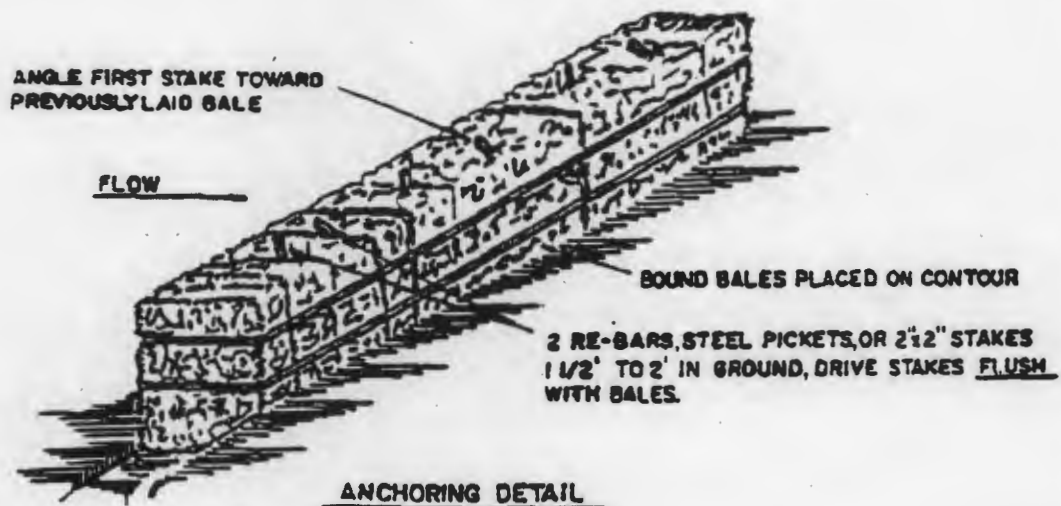
Design Criteria

A design is not required. All bales shall be placed on the contour with cut edge of bale adhering to the ground. See Figure 5A.8 on page 5A.18 for details.

Figure 5A.8
Straw Bale Dike Details



DRAINAGE AREA NO MORE THAN 1A AC. PER 100 FEET OF STRAW BALE DIKE
FOR SLOPES LESS THAN 25%.



CONSTRUCTION SPECIFICATIONS

1. BALES SHALL BE PLACED AT THE TOE OF A SLOPE OR ON THE CONTOUR AND IN A ROW WITH ENDS TIGHTLY ABUTTING THE ADJACENT BALES.
2. EACH BALE SHALL BE EMBEDDED IN THE SOIL A MINIMUM OF (4) INCHES, AND PLACED SO THE BINDINGS ARE HORIZONTAL.
3. BALES SHALL BE SECURELY ANCHORED IN PLACE BY EITHER TWO STAKES OR RE-BARS DRIVEN THROUGH THE BALE. THE FIRST STAKE IN EACH BALE SHALL BE DRIVEN TOWARD THE PREVIOUSLY LAID BALE AT AN ANGLE TO FORCE THE BALES TOGETHER. STAKES SHALL BE DRIVEN FLUSH WITH THE BALE.
4. INSPECTION SHALL BE FREQUENT AND REPAIR REPLACEMENT SHALL BE MADE PROMPTLY AS NEEDED.
5. BALES SHALL BE REMOVED WHEN THEY HAVE SERVED THEIR USEFULNESS SO AS NOT TO BLOCK OR IMPEDE STORM FLOW OR DRAINAGE.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
SYRACUSE, NEW YORK

STRAW BALE DIKE

STANDARD SYMBOL

SBD

STANDARD AND SPECIFICATIONS FOR SILT FENCE

Definition

A temporary barrier of geotextile fabric (filter cloth) used to intercept sediment laden runoff from small drainage areas of disturbed soil.

Purpose

The purpose of a silt fence is to reduce runoff velocity and effect deposition of transported sediment load. Limits imposed by ultraviolet stability of the fabric will dictate the maximum period the silt fence may be used.

Conditions Where Practice Applies

A silt fence may be used subject to the following conditions:

1. Maximum allowable slope lengths contributing runoff to a silt fence are:

Slope Steepness	Maximum Slope Length (ft)
2:1	50
3:1	75
4:1	125
5:1	175
Flatter than 5:1	200

2. Maximum drainage area for overland flow to a silt fence shall not exceed 1/2 acre per 100 feet of fence; and
3. Erosion would occur in the form of sheet erosion; and
4. There is no concentration of water flowing to the barrier.

Design Criteria

Design computations are not required. All silt fences shall be placed as close to the area as possible, and the area below the fence must be undisturbed or stabilized.

A detail of the silt fence shall be shown on the plan, and contain the following minimum requirements:

1. The type, size, and spacing of fence posts.
2. The size of woven wire support fences.
3. The type of filter cloth used.
4. The method of anchoring the filter cloth.
5. The method of fastening the filter cloth to the fencing support.

Where ends of filter cloth come together, they shall be overlapped, folded and stapled to prevent sediment bypass. See Figure 5A.9 on page 5A.20 for details.

Criteria for Silt Fence Materials

1. **Silt Fence Fabric:** The fabric shall meet the following specifications unless otherwise approved by the appropriate erosion and sediment control plan approval authority. Such approval shall not constitute statewide acceptance. Statewide acceptability shall depend on in field and/or laboratory observations and evaluations.

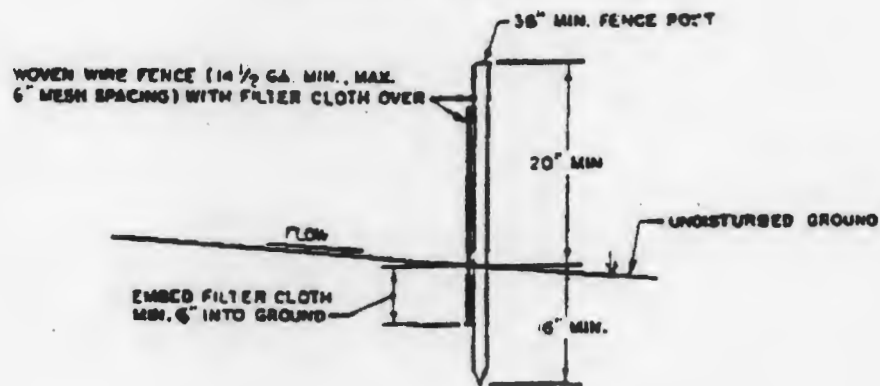
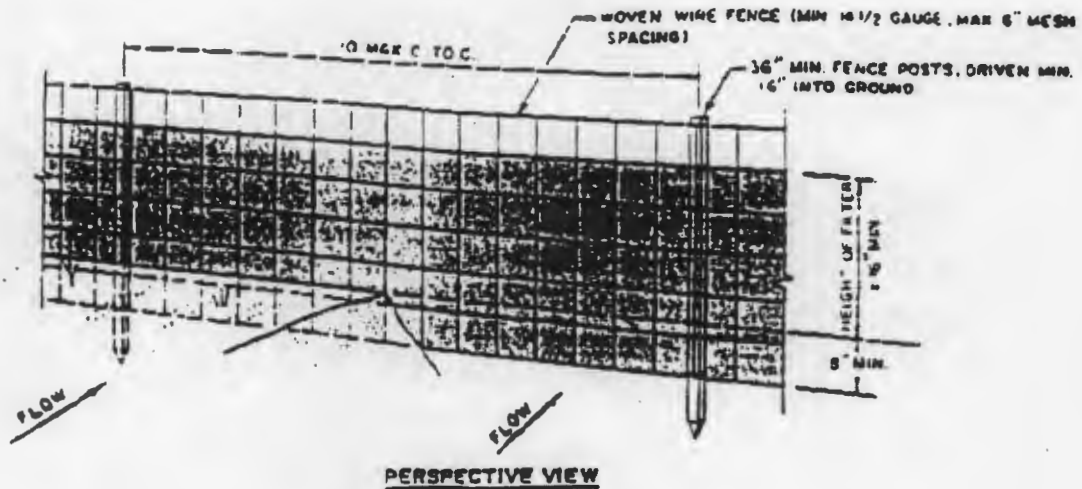
Fabric Properties	Minimum Acceptable Value	Test Method
Grab Tensile Strength (lbs)	90	ASTM D1682
Elongation at Failure (%)	50	ASTM D1682
Mullen Burst Strength (PSI)	190	ASTM D3786
Puncture Strength (lbs)	40	ASTM D751 (modified)
Slurry Flow Rate (gal/min/sf)	0.3	
Equivalent Opening Size	40-80	US Std Sieve CW-02215
Ultraviolet Radiation Stability (%)	90	ASTM G-26

2. **Fence Posts (for fabricated units):** The length shall be a minimum of 36 inches long. Wood posts will be of sound quality hardwood with a minimum cross sectional area of 3.0 square inches. Steel posts will be standard T and U section weighing not less than 1.00 pound per linear foot.

3. **Wire Fence (for fabricated units):** Wire fencing shall be a minimum 14-1/2 gage with a maximum 6 in. mesh opening, or as approved.

4. **Prefabricated Units:** Envirofence or approved equal may be used in lieu of the above method providing the unit is installed per details shown in Figure 5A.9.

**Figure 5A.9
Silt Fence Details**



CONSTRUCTION NOTES FOR FABRICATED SILT FENCE

1. WOVEN WIRE FENCE TO BE FASTENED SECURELY TO FENCE POSTS WITH WIRE TIES OR STAPLES.
2. FILTER CLOTH TO BE TO BE FASTENED SECURELY TO WOVEN WIRE FENCE WITH TIES SPACED EVERY 24" AT TOP AND MID SECTION.
3. WHEN TWO SECTIONS OF FILTER CLOTH ADJOIN EACH OTHER THEY SHALL BE OVERLAPPED BY SIX INCHES AND FOLDED.
4. MAINTENANCE SHALL BE PERFORMED AS NEEDED AND MATERIAL REMOVED WHEN "BULGES" DEVELOP IN THE SILT FENCE

POSTS: STEEL EITHER "1" OR "2" TYPE OR 2" HARDWOOD

FENCE: WOVEN WIRE, 14 1/2 GA. 6" MAX. MESH OPENING

FILTER CLOTH: FILTER X, MIRAFI 100X, STABILINKA 1140N OR APPROVED EQUAL.

PREFABRICATED UNIT: GEOFAB, ENVIROFENCE, OR APPROVED EQUAL.

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
SYRACUSE, NEW YORK

SILT FENCE

STANDARD SYMBOL



SAMPLING AND ANALYSIS PLAN

**Onondaga Drum Site
Nedrow, New York**

MAY 1993

REF. NO. 5067 (2/sub-3)

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CONESTOGA-ROVERS & ASSOCIATES

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APPENDIX A QUALITY ASSURANCE PROJECT PLAN

1.0 INTRODUCTION

This report presents the Sampling and Analysis Plan (SAP) for the Final Phase I Operations Plan for the Onondaga Drum site (Site), Nedrow, New York. The SAP contains the sampling and analytical protocols required for characterizing containerized liquid and solid waste and grossly contaminated soil or debris for disposal purposes. Soils from the sides of the excavation and groundwater entering excavation areas will also be sampled and analyzed. In addition, groundwater from three potable off-Site wells will be sampled and analyzed in accordance with this SAP.

Work and Safety zones are presented on Figure 2.1 of the Site Work Plan.

The locations of the three potable off-Site wells will be indicated in the field by the EPA field representative.

Site security during the activities of the SAP are presented in the Site Work Plan.

A project schedule including sampling and analytical activities is presented in the Site Work Plan.

The Quality Assurance Project Plan (QAPP) is presented in Appendix A. The QAPP outlines the Quality Assurance (QA) and Quality Control (QC) activities designed to meet the data quality goals associated with the Final Phase I Operations Plan.

2.0 GENERAL SAMPLING PROTOCOLS

The following protocols will be employed during all sampling throughout this program:

1. All sampling instruments and equipment will be cleaned in accordance with the protocols presented in Section 8.0 prior to sampling at each location.
2. A new pair of disposable latex gloves will be used at each location to be sampled for chemical analyses. Additional glove changes will be undertaken as conditions warrant.
3. All sampling generated wastes such as gloves, tyveks, etc. will be collected and contained for proper disposal.
4. Samples will be labeled noting the location and/or interval, date, time and sampler's initials. A hard cover bound field book will be maintained to record all samples and sampling events.
5. All collected samples will be iced in laboratory supplied coolers after collection and labeling. Any remaining space will be filled with packing to cushion the containers within the shipment coolers. Each cooler will be sealed with a transportation security seal containing the sampler's initials. The cooler will then be sealed with packing tape.

All samples will be delivered to the laboratory by commercial courier or Contractor personnel, within 48 hours following sample collection.

6. Samples will remain under the control of the Engineer until relinquished to the laboratory or commercial courier under a chain-of-custody (see Section A.6.3 of the QAPP, Appendix A).

Additional protocols specific to each sampling method are presented in the following sections.

3.0 POTABLE WELL SAMPLING

Three potable off-Site wells will be sampled and analyzed for Target Compound List (TCL) and Target Analyte List (TAL) parameters. The location of the wells will be confirmed with the EPA in the field. If the well is equipped with a pump and is inaccessible for conventional well sampling equipment, samples will be collected directly from a tap after allowing the water to run for 15 minutes. If the well is not currently in use and is accessible for conventional well sampling equipment, the well will be purged and sampled in accordance with the protocols presented in Sections 3.1 and 3.2.

3.1 WELL PURGING

Prior to sample collection, the well will be purged in accordance with the following protocol:

1. All personnel involved in well purging will wear rubber gloves.
2. Purging will be conducted until three well volumes are evacuated. After each well volume is evacuated, a sample will be collected and analyzed for pH and conductivity. Purging will be considered complete when three consecutive readings of pH and conductivity are obtained. Readings will be considered consistent if all three conductivity values are within 10 percent of the average value and all three pH readings are within ± 1 pH unit of the average value. In the event that consistent

readings are not obtained, purging will continue until a maximum of five well volumes are evacuated.

3. Acceptable methods of water extraction during purging include bailers, peristaltic pumps, bladder pumps, Waterra pumps, and centrifugal pumps.
4. All water extraction equipment will be cleaned in accordance with the protocols presented in Section 8.0.
5. All purge water will be collected and stored for later disposal/treatment.

3.2 WELL SAMPLING

Following well purging, well sampling will be carried out according to the following protocol.

1. Wells will be sampled, using a bottom filling bailer attached to a nylon or polypropylene rope or pumped using a bladder pump. A new length of rope will be used at each well. Bailers will be constructed of either teflon or stainless steel. Prior to use in the initial and all subsequent monitoring wells, the bailer or pump will be cleaned as specified by Section 8.0.

2. Sufficient groundwater will be collected for chemical analysis.

Groundwater samples will be collected in containers as specified in Table A.5.1 of the QAPP (see Appendix A). Samples will be analyzed for TCL VOCs, SVOCs, Pesticides/PCBs, TAL metals and cyanide.

Sample containers will be prepared using washing procedures that meet or exceed the requirements of the specified methods. Sample containers will be shipped to the Site in sealed containers.

3. Field measurements of pH (using a Fisher Model MDL-107 pH meter or equivalent) and conductivity will be taken during well development and purging. A field temperature reading (using a YSI Model 33 SCT meter or equivalent) will be taken immediately prior to sample collection. Calibration of field instruments will be in accordance with the manufacturer's instructions.
4. One blind duplicate sample will be collected.
5. A rinse water sample (rinsate blank) will be collected. The rinse water sample will consist of distilled or deionized water poured into, and then sampled out of, the sampling instrument cleaned under the protocol outlined in Section 8.0. This will provide a quality assurance check on the field decontamination procedures employed during sampling.
6. One trip blank will be collected for TCL VOCs.

4.0 WASTE SAMPLING

4.1 GENERAL

Waste characterization and testing will be conducted as required on excavated containerized liquid and solid wastes to determine the appropriate disposal mode and ensure compliance with 40 CFR 261 and/or the New York State Codes, Rules and Regulations, 6 NYCRR Part 371. In addition, testing will be conducted to ensure that drummed materials are consolidated in a safe manner for transport and disposal. Waste characterization will also be conducted on excavated grossly contaminated soils and wastewater.

The following subsections describe the procedures which will be implemented for sampling drummed liquid wastes, drummed solid wastes, bulk soils, and wastewater for compatibility and/or characterization purposes.

4.2 WET WASTES/DRY WASTES SEGREGATION

Waste materials will be segregated as wet wastes or dry wastes when the drums are opened on the staging pad. Materials for which classification as a wet or dry waste is not readily apparent will be classified using the Paint Filter Test (Method 9095). The results of the test will govern disposal classification. In accordance with 40 CFR Part 264 - Subpart N -

Landfills, materials passing the Paint Filter Test may be disposed of in a RCRA or TSCA compliant landfill if found to be hazardous (based upon waste characterization testing). Materials failing the Paint Filter Test will be considered liquid wastes and will be disposed at an appropriate off-Site RCRA or TSCA compliant facility if found to be hazardous (based upon waste characterization testing).

4.3 SAMPLE COLLECTION PROTOCOLS

4.3.1 Sampling of Soil

Sampling of the bulk grossly contaminated soil will be conducted at the staging area for the waste materials. Composite samples will be collected which are representative of the staged materials. All soil samples will be analyzed for TCL and TAL parameters in accordance with the QAPP.

Sampling of stockpiled soil is required to characterize the soil for treatment/disposal purposes. The soil has already been disturbed during excavation and mixed to a degree, therefore, the procedures used to obtain representative samples from in situ soils are not applicable in this situation. A four-point composite sample will be collected from each stockpile (approximately 100 C.Y.) as follows:

1. A new pair of disposable latex gloves shall be used at each sample location for the preparation of samples.

2. A new five-foot length of two-inch diameter aluminum tubing or a split-spoon sampler shall be decontaminated in accordance with Section 8.0 prior to use at each sample location.
3. The aluminum tube or split-spoon sampler shall be forced horizontally into the face of the stockpile as deep as possible and then extracted.
4. The collected soil shall be emptied into a clean stainless steel bowl and homogenized prior to collecting the analytical sample, with the exception of samples for VOC analyses. Samples for VOC analyses will be transferred directly from the sampler to the sample container prior to homogenizing the sample.
5. The sample shall be collected with clean utensils and placed into appropriate sample containers (see Table A.5.1, Appendix A).
6. Where a duplicate sample is required, the duplicate shall be taken concurrently with the analytical sample from the material in the bowl.

4.3.2 Post-Excavation Soil Sampling

Following completion of an excavation which involved removal of grossly contaminated soils, soil sampling in the excavation area will be conducted prior to backfilling of debris and/or grading.

One five (5)-point composite sample will be collected for every 600 sq.ft. (24 ft x 24 ft) of the excavation area. Each post-excavation sample will be analyzed for TCL and TAL parameters in accordance with the QAPP.

The post-excavation soil samples will be collected as follows:

1. A new pair of disposable latex gloves shall be used at each sample location for the collection and preparation of the samples.
2. Samples will be collected using stainless steel trowels or spoons that have been decontaminated in accordance with Section 8.0 prior to use at each sampling location.
3. The collected soil from each sampling location (i.e. 24 ft x 24 ft area) will be homogenized prior to collecting the analytical sample, with the exception of samples for VOC analyses. Samples for VOC analyses will be transferred directly from the sampler to the sample container prior to homogenizing the sample.
4. Samples shall be collected with clean utensils and placed into appropriate sample containers (see Table A.5.1, Appendix A).

4.3.3 Collected Wastewaters Sampling

Wastewaters collected and contained in the wastewater tank(s) will be sampled and analyzed in accordance with requirements of the receiving off-Site disposal facility(ies). Collected wastewaters will include equipment decontamination washwaters, shower wastewaters, and surface waters collected from the staging pad. The frequency of sample collection will be determined in consultation with the disposal facility. Samples of the contained wastewaters will be collected as follows:

1. New disposable latex gloves will be used when collecting each liquid sample. Additional new glove changes will be made as conditions warrant.
2. Samples will be collected using glass sampling thieves, a stainless steel bailer or a sampler capable of taking samples from discrete depths (i.e. bacon bomb sampler, kemmerer, etc.). Samples will be collected from the top, middle and bottom of the liquid volume, if multiple phases are present or from the entire depth of liquid volume, depending on depth of liquid. Samples will be collected in the appropriate precleaned bottles to be supplied by the laboratory. All sample bottles will be cleaned and quality controlled as specified in the QAPP.
3. All disposable gloves will be collected and contained for proper disposal with other materials during the response program.

4. The chain-of-custody procedures will follow those specified in the QAPP.

4.3.4 Drummed Material Sampling

This section describes the general procedures that will be followed when opening and sampling drummed waste containers removed from the excavation areas and transported to the staging area. Drum handling protocols will follow those outlined in the Clean-up Plan.

a) Safety Equipment

During the sampling of drummed materials, personal protective equipment as specified within the HSP, will be worn or used at all times.

SCBA, as required by the HSP will be worn at all times while sampling any drummed waste or while cleaning and sampling spilled materials for which physical and hazardous characteristics have not been determined.

b) Sampling Equipment

Materials and equipment required for sampling are as follows:

1. Sample bottles as specified in the QAPP.
2. A uniquely numbered sample identification label affixed to sample container.
3. Chain-of-Custody data sheets.
4. 4-foot by 3/4-inch I.D. glass sampling thief.
5. Stainless steel trowel, spoon or trier for collection of solid or sludge samples, if applicable.
6. Remotely operated pneumatic ram or check key device.
7. Brass mallet and chisel.
8. Bung wrench.

All drums will be sampled on the staging pads to mitigate spillage onto ground surface.

c) Presampling Safety Considerations

Extreme care will be exercised in opening drums or other sealed containers in which the contents may be harmful to sampling personnel. When practical, a drum will not be moved or opened unless the drum appears to be structurally sound.

Drums will be opened in such a manner that excess interior pressure, as evidenced by bulging or swelling, has been safely relieved. If pressure cannot be relieved from a remote location, appropriate shielding will be placed between sampling personnel and the drums to reduce the risks of injury.

After the initial opening and visual inspection of the drum contents, drums will be segregated visually into two classes, solid or liquid, and moved to the portion of the staging pad reserved for preliminary staging and sampling. Drums will be staged in an upright position. Drummed liquids will be further segregated into liquids of unknown content and visually identifiable liquids such as waste paints. All drums and mechanical equipment will be grounded prior to the commencement of sampling.

During the initial inspection, any customized containers, suspicious looking drums, or drums labeled as containing hazardous materials (explosives, etc.) will be clearly marked for special handling.

d) Drum Entry

All drums will be grounded prior to sampling. A metal grounding rod will be driven into the ground adjacent to the staging area. A wire, leading from the rod, will then be clipped to the drum.

If the bung can be removed, the sampling of contained liquids will be safely accomplished by glass thief. Following sampling, the glass thief will be broken and discarded within the drum. A drum that has a badly rusted bung, or that cannot be sampled as above, will be entered with a hydraulically operated non-sparking penetrating device operated remotely (i.e. brass rod attached to backhoe arm). All drums within the staging area will be contained within overpack drums. The overpack drums will always be closed except during sampling operations.

e) Sampling Procedures

The following procedures will be adhered to during sampling of drummed liquid waste.

1. Remove cover from sample container.
2. Insert sampling thief almost to the bottom of the drum or until a solid layer is encountered. About one foot of tubing should extend above the drum. A representative sample of the liquid in the entire drum will be collected for compatibility testing and waste characterization.
3. Allow the liquid waste in the drum to reach its natural level in the tube.
4. Cap the top of the sampling tube with a double-gloved thumb or stopper, ensuring liquids do not come into contact with the sampler's thumb or stopper.
5. Carefully remove the capped tube from the drum and insert the uncapped end in the sample container. Do not spill liquid on outside of bottle.
6. Release the thumb or stopper and allow the glass thief to drain completely and fill the sample container. Repeat the above steps until sufficient volume has been collected for analysis.

7. Remove tube from the sample container, break in two pieces and place the tube in the drum.
8. Cap the sample container tightly and place prelabeled sample container in a carrier.
9. Replace the bung or place plastic over the drum.
10. Transport the sample to the laboratory for analysis.

Sampling of drummed solids or sludges, if encountered, will in general conform to the preceding procedures with the following exceptions:

1. Sample collection will be accomplished using a stainless steel trowel, spoon or trier. All sampling equipment will be cleaned prior to use. Reusable sampling equipment will be cleaned between subsequent drums using the protocol presented in Section 8.0.
2. A representative sample of drummed solids or sludges will be collected, if practical.
3. The sample collected will be a composite of a minimum of four samples collected from representative locations throughout the drummed solids or sludges.

Absorbent material will be readily available at all times at the staging areas.

4.3.5 Groundwater Sampling

If at the completion of the excavation, groundwater flows into and/or rises to fill the excavated area(s), a grab sample will be collected and analyzed for TCL and TAL parameters in accordance with the requirements of the QAPP.

4.3.6 Sample Shipment

All samples will be packed according to the protocols presented in the QAPP. The samples will then be placed on ice or cooler packs in laboratory supplied coolers after labeling. Samples will be shipped together on a weekly basis to the project laboratory by overnight courier or delivered by sampling personnel. All sample shipment will conform to 49 CFR § 172.101 DOT regulations for shipping high hazard samples. Samples will be maintained at 4°C at the laboratory until completion of all analytical work.

Each cooler will be sealed with two transportation security seals containing the sampler's initials. The cooler will then be sealed with packing tape.

4.3.7 Chain-Of-Custody

Samples will remain under the control of sampling personnel in the field until relinquished to the laboratory in accordance with the QAPP.

5.0 DRUMMED WASTE COMPATIBILITY TESTING

5.1 SEGREGATION OF DRUMMED WASTES INTO WASTE CLASSES

Drummed wastes will be segregated according to waste classes prior to consolidation, if any, and waste characterization for disposal. The waste classes determined by the testing referenced in this section will permit an assessment of material incompatibilities and chemical characteristics which need to be further addressed for disposal purposes. Segregated materials which are determined to have the same compatibility characteristics as determined by the waste class determined in this section, will be subjected to compatibility testing described in the following section (Section 5.2) prior to consolidation, if any, for disposal. All wastes will be properly characterized (analyzed) in accordance with the receiving disposal facility requirements (see Section 6.0).

The determination of waste classes will be conducted at an off-Site laboratory using samples collected in the field following the protocols outlined in Section 4.3.3. No more than five milliliters (ml) of waste is needed to conduct the waste classification tests. This volume will be collected as a split sample in the laboratory from the total sample volume collected. The remaining sample volume will be kept for compatibility and waste characterization testing and analysis required by the disposal facility for disposal acceptance.

5.1.1 General Testing (Field Assessment)

- a. Visual Classification - All wastes will be visually classified as to state (liquid or solid), color, viscosity and other identifying features.
- b. Phase Determination - Phase determination will be implemented to assess whether the waste is a liquid, solid, or heterogeneous mixture. This determination may sometimes be difficult for very viscous liquids or resins, but it is not crucial because the same characterization tests are performed on both solids and liquids. The determination of liquid wastes if not readily apparent will be in accordance with Section 4.2.

Visual classification and phase determination will be performed by sampling personnel during sample collection.

5.1.2 General Liquid Testing

- a. Flame Ignitability Test - The first test to be conducted will be an open flame ignitability test. A bunsen burner will be lit and adjusted to a small blue flame for this test. A fire extinguisher will be on hand when conducting this characterization test. The flame ignitability test may be conducted on several samples simultaneously. Two to five milliliter samples will be placed in disposable heat resistant containers. The containers are then placed in a large sand box or water bath and the lit bunsen burner is slowly passed over the unidentified waste. If a flame is observed, then the waste is classified as flammable. A non-

flammable classification will be assigned to the waste if the bunsen burner has been passed over the sample three to four times without a flame being observed. The test is qualitative and is not meant to be precise. The lighting, depth of the container, ventilation in the container and degree of contact between the flame and liquid will all affect the test result. (This procedure was taken from the paper, "Compatibility Field Testing Procedures for Unidentified Hazardous Waste" by Rodney D. Turpin, USEPA, Edison, New Jersey, presented at the National Conference on Management of Uncontrolled Hazardous Waste Sites, Washington DC, October 1981.)

- b. Water solubility and reactivity - Determination of whether the waste is soluble, insoluble, or reactive with water will be performed by placing several drops of the waste in a 40 mL vial containing three to five mL of distilled water. Should reactions of the waste with the water be observed such as gas generation, heat generation, combustion, etc., the waste will be categorized as water reactive and isolated from other waste materials. There is often some heat of solution or color change when a waste is mixed with water, but a waste which exhibits these mild reactions will not be considered a water-reactive waste.

A waste which is not readily miscible with water is organic in nature and its characteristics will be determined further by Organic Liquid Testing. Some organic solvents such as acetone and alcohols are miscible with water, but the mixing reaction is usually easily detectable. If the waste forms an immiscible layer at the bottom of the vial, the

waste may be either a halogenated organic liquid, or a dense petroleum hydrocarbon.

An aqueous waste will form a single phase in the vial. Water-soluble wastes may be either inorganic liquids or non-polar soluble organics and will be further characterized by Inorganic Liquid Testing as presented below.

5.1.3 Inorganic Liquid Testing

- a. The presence of soluble volatile organics in the waste will be checked by testing the headspace of the waste with an organic vapor monitor (PID instrument i.e. HNu). Alternatively, a FID instrument (i.e. Foxboro OVA) will be used with a combustible gas meter to determine net organic vapors. Samples which are determined to contain volatile organics in excess of 0.2 meter units will be reclassified as organic liquid and subjected to the testing in Section 5.1.4.
- b. The presence of soluble organics which are not volatile will be checked by testing the waste for total organic carbon (TOC). TOC will be determined using EPA Method 9060 (see Appendix C) contained in SW-846 "Test Methods for Evaluating Solid Waste" Third Edition. Samples found to contain a TOC content greater than 1 percent will be reclassified as organic liquid and subjected to the testing in Section 5.1.4.

- c. Inorganic Oxidizers - Testing for inorganic oxidizers will be done by placing a drop of the waste on a strip of potassium iodide (KI)/starch paper. A purple stain indicates the presence of an oxidizer. The color change occurs at 12.5 parts per million (ppm) of total inorganic oxidizers and peroxides. The stain must appear within two minutes for the waste to be categorized as an inorganic oxidizer. If two minutes have elapsed and no stain has appeared, the result of the test will be considered negative. If the waste is dark and stains the KI/starch paper dark because of its color, the edges of the spot will be checked closely for the purple color. Very strong acids or bases may also stain the paper brown. Should this happen, a strip of the KI/starch paper will be moistened with buffer solution and the test will be repeated. (The composition of the buffer solution and all other solutions are listed in Section 5.1.6.) A portion of the sample will also be diluted with the buffer solution, if necessary.
- d. Peroxides - Peroxides in the aqueous solution will be detected with peroxide test paper (such as EM Quant Peroxide-Test strips). The pH of one mL of the sample will be adjusted to between pH 2-12 with NaOH or H₂SO₄ solutions, if necessary. The reagent portion of a strip will be immersed into the sample for five seconds. A blue stain must appear within two minutes for the waste to be categorized as containing peroxides. If two minutes have elapsed and no stain has appeared, the result of the test will be considered negative. The test is sensitive to a few parts per million, and the relative darkness of the blue stain indicates the relative concentration of the peroxides.

- e. pH and Subsequent Reactivity Screening - The pH of the waste will be determined with pH paper. Samples with a pH less than or equal to three will be classified as acidic, and samples with a pH greater than three will be classified as neutral or base. The detection limit for pH is one pH unit. The samples will be further tested as follows:
- i) Nitric or Perchloric Acid Testing - The acidic wastes ($\text{pH} < 3$) will be tested for nitric (HNO_3) or perchloric acid (HClO_4) with a sulfuric acid/diphenylamine test. Two milliliters of the sample will be pipetted into a vial and 0.5 mL of the diphenylamine solution will be added, followed by an equal amount of H_2SO_4 solution. A deep purple color will indicate the presence of nitrate or chlorate ions.
 - ii) Sulfide and Cyanide Testing - The basic liquids ($\text{pH} > 7$) will be tested for the presence of sulfide or cyanide ions. To test for sulfide, a drop of the sample will be placed on a strip of lead acetate paper which has been previously moistened with the buffer solution. A black stain indicates the presence of sulfide. If the sulfide test is positive, the sulfide will be removed before the following cyanide test is conducted. This will be accomplished by adding cadmium nitrate to a small amount of the sample and swirling until all of the sulfide has precipitated. Since cadmium nitrate will lower the pH of the sample, a buffer of NaOH will be added as required to avoid the loss of hydrogen cyanide gas.

High chloride ion concentrations may interfere with the cyanide ion detector tube test. Therefore, the waste will be diluted by adding 8 mL of distilled water to a 0.5 mL sample to minimize effects from interfering ions while retaining sensitivity to less than 100 ppm cyanide. After diluting the sample, the top of a cyanide ion detector tube (e.g. Matheson-Kitigawa) will be scored and broken and set in the sample with the red dot up. The liquid will be allowed to rise into the column by capillary action and any color change in the tube will be noted. A deep blue color will indicate the presence of the cyanide ion.

An alternate method for detecting sulfide- or cyanide-containing wastes consists of pumping a known volume of gas through hydrogen sulfide and hydrogen cyanide detector tubes. One or two drops of sulphuric acid solution are added to an equal amount of sample in a vial and the vapor space above the mixture is immediately tested for H_2S and HCN . If both tests are negative, several more drops of sample and acid solution are added and the test is repeated. The detector tubes may be reused several times if the tests continue negative. Due to the high toxicity of H_2S and HCN , precautions will be taken to avoid breathing any gases which may evolve from the sample. The detection limit for cyanide using a Draeger tube is 2 to 15 milligrams per cubic meter (mg/m^3) or equivalent to 6 to 45 mg of material in a sample, and for sulfide is one to 200 ppm or equivalent to 1.3 to 250 mg of material in a sample.

5.1.4 Organic Liquid Testing

- a. The headspace above the sample will be tested for volatile organics with an organic vapor monitor (PID instrument, i.e. HNu).
Alternatively, a FID instrument (i.e., Foxboro OVA) will be used with a combustible gas meter to determine organic vapors. Headspace readings will be noted for informational purposes.
- b. Beilstein's Test - The second flame test is Beilstein's copper wire halogen test. A small coil will be bent in the end of a length of copper wire and held over the peak of the flame until any green flame disappears. Do not allow the wire to melt in the flame. Allow the wire to cool, then dip it in a small amount of the waste and hold it in the edge of the flame again. A green flame indicates the presence of a halogen (chloride, bromine, fluorine, iodine). If the test is to be repeated, the wire must be thoroughly cooled before dipping the coil back into the liquid. The detection limit for the Beilstein's test is 0.1 percent. Very volatile liquids may have a tendency to evaporate in the flame before decomposition can occur, thus causing a negative result. Several compounds have also been found to cause a green flame (e.g. organic acids, copper cyanide, urea, and quinaline and pyridine derivatives).
- c. The possible presence of organic oxidizers will be checked for by placing a drop of the waste on a strip of KI/starch paper. A purple stain will indicate the presence of an oxidizer.

- d. Organic peroxides will be tested for with the peroxide test paper. After immersing the reagent portion of the strip in the sample for five seconds, the strip will be moistened by breathing several times on the reagent pad. Peroxides will be indicated by a blue stain, as in the inorganic liquid test.
- e. A pH determination will be made after mixing 2 mL of the sample with 2 mL of distilled water. Determination of the pH of the water phase will be made with pH test paper.

5.1.5 Solids Testing

- a. Color, texture, and approximate density of the waste and any other sample-specific preliminary information will be recorded.
- b. An open flame ignitability test will be performed on a BB-sized portion of the waste and all observations recorded.
- c. Reactivity: Another BB-sized portion of the sample will be added to a vial containing 10 mL of distilled water.

Reactions will be observed. If no violent reaction is observed, an additional amount of sample equivalent to about one cubic centimeter (cc) will be added to the water. The vial will be swirled to thoroughly mix the waste with the water.

- d. The pH of the mixture will be determined. The oxidizer, peroxide, sulfide, and cyanide tests may be conducted on the waste/water mixture as in Inorganic Liquids Testing, above.

5.1.6 Preparation of Solutions for Tests

- a. Buffer Solution: Dissolve 24.3 g $\text{NaC}_2\text{H}_3\text{O}_2 \cdot 3\text{H}_2\text{O}$ (sodium acetate trihydrate) or 14.6 g anhydrous $\text{NaC}_2\text{H}_3\text{O}_2$ in 40 mL distilled water. Add 48 mL concentrated acetic acid and bring solution to 100 mL with distilled water.
- b. Diphenylamine Solution: 1.0 g of diphenylamine in 50 mL methanol.
- c. Sulfuric Acid: Four parts concentrated H_2SO_4 to one part water.
- d. Sodium Hydroxide Solution: 0.1N sodium hydroxide solution (4.0 grams anhydrous NaOH in one liter of distilled water).

5.1.7 PCB Screening

All drummed waste determined to fall under the same waste classification will be screened for PCB contamination prior to compatibility testing. A five sample composite will be prepared by collecting a split sample in the laboratory from the total volume collected. The composite

sample will be screened for PCBs using SW-846 Method 8080 (see Appendix C). Should the composite sampling yield PCBs at a concentration greater than 10 ppm, individual samples from which the five composite sample was prepared, will be screened for PCBs.

5.2 COMPATIBILITY TESTING AND CONSOLIDATION

Drummed waste materials which are to be consolidated prior to off-Site transport and disposal will be subjected to compatibility testing. The mixing of incompatible materials will be minimized by consolidating primarily materials which were determined to belong to the same waste class following the procedures in Section 5.1. The mixing of materials from the same waste class will prevent incompatible reactions from occurring. Where waste materials from different waste classes are considered for consolidation, the information obtained from the tests will be used in conjunction with the compatibility information contained in the USEPA document "A Method For Determining the Compatibility of Hazardous Wastes", EPA-600/2-80-076, dated April 1980 for assessing the potential for incompatible reactions.

Compatibility testing for the purpose of consolidation will be performed using small quantities of the materials proposed for consolidation. Compatibility testing will typically be conducted for binary combinations by adding one component to the other and monitoring for

resultant physical reactions that occur. The materials will be classified as incompatible when reaction consequences include any of the following⁽¹⁾:

- i) heat generated by chemical reaction;
- ii) fire produced by extremely exothermic reactions;
- iii) generation of innocuous gases (i.e. N_2 , CO_2 , etc.) which can cause pressurization of closed containers potentially resulting in container rupture;
- iv) generation of toxic gases (i.e. HCN , H_2S , etc.);
- v) generation of flammable gases (i.e. H_2 , C_2H_2 , etc.);
- vi) explosion due to extremely vigorous reactions or reactions producing sufficient heat to detonate unstable reactions or reaction products;
- vii) violent polymerization resulting in the generation of extreme heat and sometimes toxic/flammable gases; and
- viii) solubilization of toxic substances.

(1) USEPA, "A Method for Determining the Compatibility of Hazardous Wastes", EPA-600/2-80-076, April 1980.

Compatibility testing of ternary combinations will not be attempted unless two of the materials have already been binary tested and the resulting compatible product is used for testing.

6.0 WASTE CHARACTERIZATION

Following compatibility testing and consolidation, composite samples will be collected from each waste and analyzed for TCL volatiles, semi-volatiles, pesticides/PCBs, TAL inorganics, reactivity, corrosivity and ignitability. Solid wastes which are determined to have chemical constituents in excess of twenty (20) times the Regulatory Levels for Toxicity Characteristic per 40 CFR 261 will also be tested using the Toxicity Characteristic Leaching Procedure (TCLP). The TCLP samples may be collected and extracted at the same time as the TCL/TAL samples and the decision to analyze the extract will be made based on the TCL/TAL results.

Depending upon the proposed treatment/disposal method(s), additional testing may include other analyses listed in Table 6.1. These additional sampling and analysis requirements, if any, will be identified by the selected disposal facilities. The waste characterization requirements will be confirmed following selection of the Contractor and identification of disposal facilities.

Any additional sampling and analysis of drummed materials, as required by the disposal facilities, will be performed following consolidation, if conducted, and will consist of the analysis of representative composite samples of each group of materials (same waste characteristics). Where disposal facilities identify waste constituent limitations imposed by their acceptance criteria or operating licenses, a "lab scale" composite of compatible materials proposed for consolidation will be prepared. The analysis of the "lab scale" composite will be performed prior to performing

TABLE 6.1

WASTE CHARACTERIZATION ANALYSIS

Physical Characteristics

Physical State	Sample inspection
Free Liquids	Sample inspection
Specific Gravity	Volume and weight measurement
pH	EPA SW-846(1), Method 9040
Flash Point	EPA SW-846, Method 1010
Solids	ASTM-D-3977-80
Ash Content	ASTM E-830-87
BTU	ASTM E-711-87

Chemical Composition

Metals	EPA SW-846, Method 6010/7000 series for TAL (2) metals
Organic	
TCL (3)	
Volatiles	EPA SW-846, Method 8240
Organochlorine	
Pesticides and PCBs	EPA SW-846, Method 8080
TCL Semi-volatiles	EPA SW-846, Method 8270
Total Organic Halides	EPA SW-846, Method 9020

Other Components

Cyanides	EPA SW-846, Method 9010/9012
Sulfides	EPA SW-846, Method 9030
Phenols	EPA SW-846, Method 8040
Sulfur	ASTM E-775-87
Chlorine	ASTM E-776-87
TOC	EPA SW-846, Method 9060

Hazardous Characteristics

Reactivity	EPA SW-846, Section 7.3, Chapter 7
Corrosivity	EPA SW-846, Method 1110
TCLP	40 CFR Part 268, Appendix II

Notes:

- (1) EPA SW-846, Test Methods for Evaluating Solid Waste, Third Edition, 1986.
- (2) TAL = Target Analyte List
- (3) TCL = Target Compound List

the actual field consolidation to ensure that consolidated materials are acceptable to the disposal facilities.

The on-Site EPA Field Representative will be provided with split samples upon request and will be informed of the names of the laboratories being used prior to shipping the samples for analysis.

The field consolidation of liquids, if conducted, will at all times follow the addition sequence determined from the laboratory compatibility testing. Consolidation of compatible liquids will be performed in the appropriate transportation units (i.e. liquid waste transportable tanker). No on-Site treatment of liquids will be performed. Based on the existing drum characterization and disposal program, liquid wastes are not anticipated to be encountered at the Site.

7.0 SOIL CHARACTERIZATION

During the excavation of the drums, grossly contaminated soils will be excavated and stockpiled within the appropriate staging facility (see Clean-up Plan). The soils will be stockpiled on a series of staging pads. Precipitation will be prevented from infiltrating or from directly running off stockpiled soils placed on the staging pads. The stockpiled soils will be covered with an impermeable liner during periods of work stoppage, during precipitation events, and at the end of each working day. Any collected liquids in the staging pad sumps will be collected and transferred to the wastewater storage tank.

During and at the completion of excavation activities, the stockpiled soils will be sampled and characterized for the full Target Compound List/Target Analyte List (TCL/TAL) and disposal characteristic parameters as presented in Section 4.3.1. Samples will be collected and analyses completed in accordance with the protocols specified in the QAPP.

8.0 SAMPLING EQUIPMENT CLEANING PROTOCOL

Prior to the collection of any samples designated for chemical analysis, all sampling equipment and tools will be decontaminated with the following procedure:

- i) clean water wash with non-phosphate detergent to remove all visible foreign matter,
- ii) tap water rinse,
- iii) rinse with pesticide-grade isopropanol/hexane/isopropanol,
- iv) rinse with deionized water. The volume of water used must be at least five times the volume of solvent used in step (iii), and
- v) air dry for 15 minutes.

Fluids used for cleaning will not be recycled. All wash water, rinse water and decontamination fluids will be transferred to clearly labeled drums pending final disposal.

Following final rinse, sampling equipment will be visually inspected to verify that they are free of particulates and other solid material which may contribute to possible sample cross-contamination.

All cleaned equipment will be placed on polyethylene sheeting or covered with aluminum foil to avoid contact with a contaminated surface prior to use.

APPENDIX A

QUALITY ASSURANCE PROJECT PLAN

ONONDAGA DRUM SITE

NEDROW, NEW YORK

QUALITY ASSURANCE PROJECT PLAN (QAPP)

PROJECT TITLE: Onondaga Drum Site QAPP

PREPARED BY: CONESTOGA-ROVERS & ASSOCIATES (CRA)

Approved By: _____ Date: _____
Project Manager - Consultant

Approved By: _____ Date: _____
QA/QC Officer
Analytical Activities - Consultant

Approved By: _____ Date: _____
QA/QC Officer
Field Activities - Consultant

Approved By: _____ Date: _____
Project Manger - Project Laboratory

Approved By: _____ Date: _____
QA/QC Officer -
Laboratory Activities - Project Laboratory

Approved By: _____ Date: _____
USEPA Remedial Project Manager

Approved By: _____ Date: _____
USEPA
Region II QA Manager

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A.1.0 INTRODUCTION

This Quality Assurance Project Plan (QAPP) presents the policies, organization, objectives, functional activities and specific Quality Assurance (QA) and Quality Control (QC) activities designed to achieve the data quality goals associated with the Final Phase I Operations Plan to be implemented at the Onondaga Drum Site (Site) in Nedrow, New York. The purpose and objective of the QAPP is to ensure that the analytical results are accurate and representative of field conditions. The analytical methods and QA/QC procedures presented in this QAPP are referenced from and shall be consistent with the guidelines established in the documents entitled, "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", EPA SW-846, 3rd edition, November 1986; "Annual Book of ASTM Standards", American Society for Testing and Materials, 1991; "Methods for the Determination of Organic Compounds in Drinking Water", EPA-600/4-88/039, December 1988 and "Methods for the Chemical Analysis of Water and Wastes", EPA-600/4-79-020, revised March 1983. This QAPP is an integral part of the Sampling and Analysis Plan (SAP) component of the Final Phase I Operations Plan.

A.2.0 PROJECT DESCRIPTION

The Final Phase I Operations Plan is designed to facilitate the identification, excavation and staging, sampling and analysis and off-Site transportation and disposal of potentially buried drums at the Site. In addition, samples will be collected of visually contaminated soils associated with the drums and groundwater which may flow into or rise up in the excavations following removal of the drums. Three potable water samples will also be collected and analyzed to determine if past waste disposal activities impacted these water sources.

A.2.1 BACKGROUND

Background information concerning the Site and Scope of Work are presented in the Site Work Plan.

A.2.2 SCHEDULE

The start of project field activities will be determined by the date upon which approval of this and supporting documentation is granted by the EPA.

A detailed project schedule is presented in the Site Work Plan.

A.2.3 SAMPLING PROGRAM

The sampling program associated with the Site activities is outlined in the SAP. The sampling program consists of the collection and analysis of containerized solid and liquid wastes to facilitate the treatment/disposal of these materials. Groundwater and visibly contaminated soil encountered during the drum excavation program will also be sampled and analyzed. In addition, samples will be collected and analyzed from three potable water wells.

Details regarding sampling procedures and protocols are provided in the SAP.

The matrices to be sampled are expected to include liquid and solid waste materials, soil, groundwater and potable water.

A.3.0 PROJECT ORGANIZATION AND RESPONSIBILITY

The Engineering Consultant (Consultant), under the direction of Stauffer, has overall responsibility for all phases of the Site activities. The Consultant will perform or supervise all field investigations and, using the information compiled from this program, will facilitate the removal of materials from the Site. All reports based on Site activities will be produced by the Consultant.

The project laboratory will perform all chemical analyses of samples collected during the Site activities.

Both the Consultant and the project laboratory will provide project management as appropriate to their responsibilities. The Consultant will provide administrative oversight and QA/QC for all deliverables. All final project deliverables will be issued by the Consultant .

Figure A.3.1 presents the organizational chart for the sampling and analysis segments of the project. The functional responsibilities of each of the key technical personnel will be as follows:

Project Manager

- overview of field activities
- overview of laboratory activities
- decide laboratory data corrective action
- data assessment
- preparation and review of reports

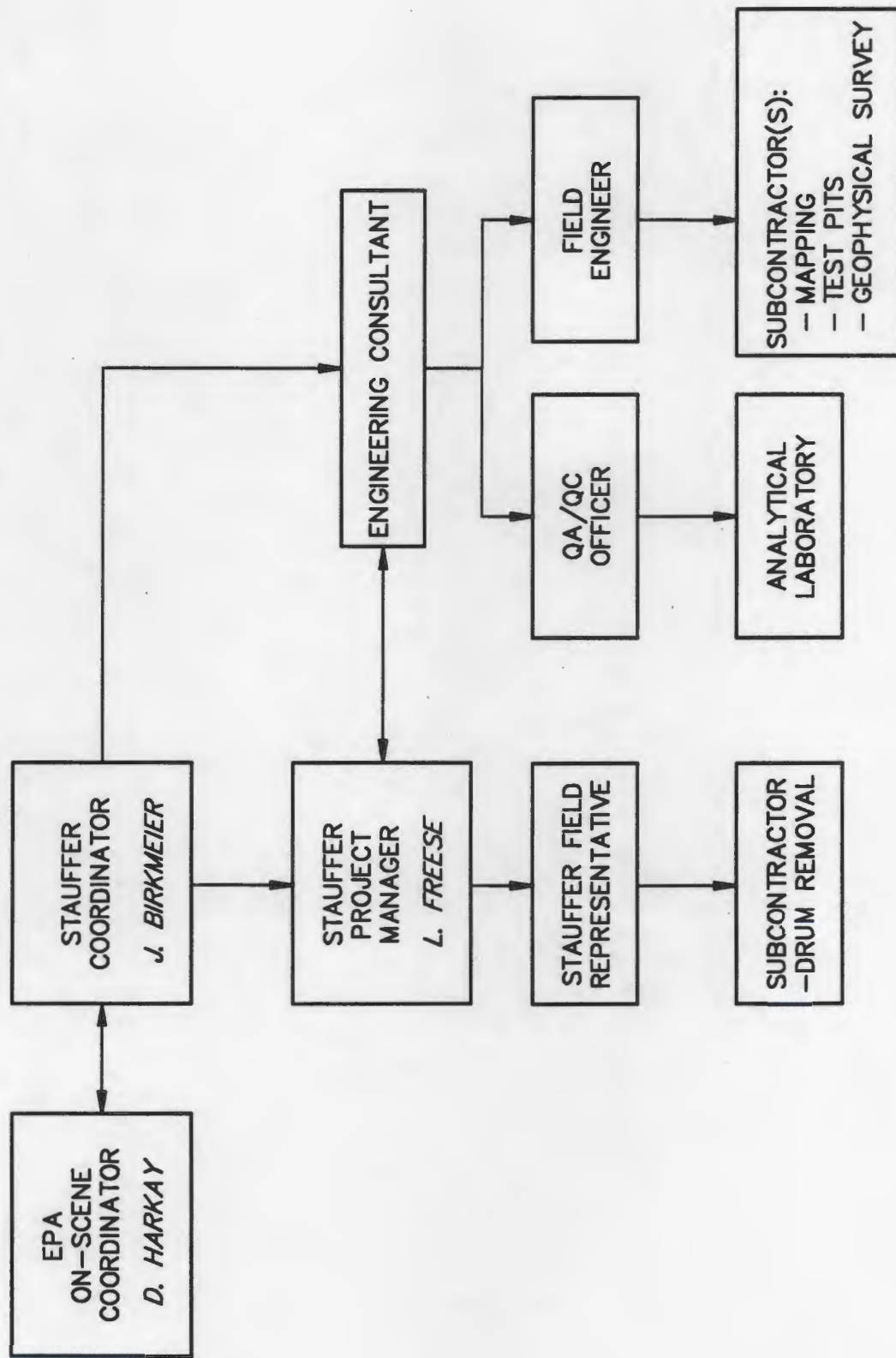


figure A.3.1
PROJECT ORGANIZATION
Onondaga Drum Site

- technical representation of project activities
- managerial guidance to technical group
- approval of the QAPP
- evidence file custodian

QA/QC Officer - Analytical Activities

- systems audits - laboratory activities
- overview and review field QA/QC
- coordinate supply of performance evaluation samples
- review laboratory QA/QC
- data validation and assessment
- advise on data corrective action procedures
- preparation and review of reports
- QA/QC representation of project activities

Quality Assurance Officer - Field Activities

- management of field activities and field QA/QC
- data assessment
- technical representation of field activities

Project Manager - Project Laboratory

- ensures all resources of the laboratory are available on an as-required basis
- overview of final analytical reports
- approval of the QAPP

Operations Manager - Project Laboratory

- coordinate laboratory analyses
- supervise in-house chain-of-custody

- schedule sample analyses
- oversee data review
- oversee preparation of analytical reports
- approve final analytical reports prior to submission to the Consultant

QA/QC Officer - Laboratory Activities - Project Laboratory

- overview laboratory quality assurance
- overview QA/QC documentation
- conduct detailed data review
- decide laboratory actions, if required
- technical representation of laboratory QA procedures
- preparation of laboratory SOPs as necessary
- approval of the QAPP

Sample Custodian - Project Laboratory

- receive and inspect the incoming sample containers
- record the condition of the incoming sample containers
- sign appropriate documents
- verify chain of custody and its correctness
- notify laboratory manager and laboratory supervisor of sample receipt and inspection
- assign a unique identification number and customer number, and enter each into the sample receiving log
- with the help of the operations manager, initiate transfer of the samples to appropriate lab sections
- control and monitor access/storage of samples and extracts

Primary responsibility for project quality control rests with the Consultant's QA/QC Officer. Ultimate responsibility for project quality rests with the Consultant's Project Manager. Independent quality assurance will be provided by the analytical laboratory project manager and QA/QC Officer prior to release of all data to the Consultant.

A.4.0 QUALITY ASSURANCE OBJECTIVES FOR MEASUREMENT DATA

The overall QA objective is to develop and implement procedures for field sampling, chain of custody, laboratory analyses and reporting that will provide representative and accurate data. Specific procedures to be used for chain of custody, calibration, laboratory analyses, reporting, quality control, audits, preventive maintenance, and corrective actions are presented in other sections of this QAPP. Specific procedures relative to sampling are presented in the Final Phase I Operations Plan and the SAP0s2

Data quality objectives (DQOs) have been established in accordance with the USEPA guidance document entitled, "Data Quality Objectives for Remedial Response Activities", dated March 1987, to ensure that the database developed during the investigation meets the objectives and quality necessary for its intended use, namely, to facilitate the treatment/disposal of waste materials at the Site, and to provide a legally defensible database.

The purpose of this section is to define the goals for the level of QA effort. Objectives for accuracy, precision, sensitivity, completeness, representativeness, and comparability of measurement data from the analytical laboratory will be discussed. In addition, QA objectives for field measurements will also be discussed.

A.4.1 LEVEL OF QA/OC EFFORTS

A.4.1.1 Field QA/OC Sampling

To assess the quality of data resulting from the field sampling program, field (rinse) blank samples, and samples for matrix spike samples will be collected (where appropriate) and submitted to the analytical laboratory.

Field QA/QC samples that shall be provided to the analytical laboratory will be as identified below:

- a) Field (rinse) blank samples will be collected at a frequency of one per 10 decontamination events. Field blanks will be prepared by rinsing decontaminated sampling equipment with analyte free water and preserving the field blanks the same as aqueous samples. Field blanks will be analyzed for the same parameters as the corresponding investigative samples. Field (rinse) blank samples will not be required for samples collected using dedicated or disposable sampling equipment.
- b) Sufficient sample volume will be supplied to the laboratory in order to perform matrix spike/matrix spike duplicate (MS/MSD) analyses at a frequency of one per 20 investigative samples.

The sampling and analysis program is summarized in Table A.4.1, which lists the parameters to be measured, the number, type and

TABLE A.4.1

SUMMARY OF SAMPLING AND ANALYSIS PROGRAM
ONONDAGA DRUM SITE
NEDROW, NEW YORK

<i>Sample Matrix</i>	<i>Laboratory Parameters</i>	<i>Investigative Samples</i>	<i>Field Blanks (1)</i>	<i>Field Duplicate</i>	<i>MS/MSD MS/DUP (2)</i>	<i>Total</i>
Containerized Waste	Compatibility Testing	tbd (4)	10%	0	0	tbd
Containerized Waste	Waste Characterization (3) TCL/TAL, TCLP	tbd	0	0	5%	tbd
Soil	Waste Characterization (3) TCL/TAL	tbd	10%	10%	5%	tbd
Groundwater	TCL/TAL	tbd	10%	10%	5%	tbd
Potable Water	TCL/TAL	3	1	1	1	6

(1) Field blanks will be collected only when equipment decontamination occurs and will not be collected when using disposable equipment.

(2) Matrix spike/matrix spike duplicate samples are required for organic samples. Matrix spike/laboratory duplicate samples are required for inorganic samples.

(3) Parameters to be analyzed are dependent on the methods of disposal and the requirements of the disposal facility selected. A tentative list of parameters is presented in Table A.8.1.

(4) The number of investigative samples will be dependent upon the number of waste streams determined during the compatibility testing for containerized waste and by visual determination for soil and groundwater.

frequency of sampling, and the level of QA effort required for each matrix. It should be noted that the parameters for waste characterization to be analyzed are dependent on the methods of disposal and the requirements of the disposal facility. Consequently, additional or fewer analyses may be required.

Field (rinse, trip) blanks will be analyzed to check for procedural contamination resulting from sampling device cleaning procedures, ambient conditions at the Site, contamination from sample shipment and/or transport. MS/MSD samples will be analyzed to evaluate analytical accuracy and precision.

A.4.1.2 Laboratory QA/QC Effort

A.4.1.2.1 Accuracy, Precision and Sensitivity of Analyses

The fundamental QA objective with respect to the accuracy, precision and sensitivity of analytical data is to achieve the QC acceptance criteria of each analytical protocol. The sensitivities required for these analyses will be at least the targeted detection limits listed in Tables A.4.2 through A.4.4 for the matrices of concern, barring any chemical interferences or dilutions required due to elevated concentrations of the subject analyte(s). In these cases, the laboratory detection limits will be substituted for the targeted detection limits in accordance with the method(s) protocols.

**TARGETED DETECTION LIMITS FOR ORGANIC ANALYSES
ONONDAGA DRUM SITE
NEDROW, NEW YORK**

Volatile Compounds		Targeted Detection Limits				
Compound	Cas No.	Liquid Waste (mg/L)	Solid Waste (mg/kg)	Groundwater (µg/L)	Soil (µg/kg)	Potable Water (µg/L)
Chloromethane	74-87-3	10	5.0	10	10	1.5
Bromomethane	74-83-9	10	5.0	10	10	1.5
Vinyl chloride	75-01-4	10	5.0	10	10	1.5
Chloroethane	75-00-3	10	5.0	10	10	1.5
Methylene chloride	75-09-2	10	2.5	5	5	1.0
Acetone	67-64-1	10	5.0	10	10	5.0
Carbon disulfide	75-15-0	10	2.5	5.0	5.0	3.0
1,1-Dichloroethene	75-35-4	10	2.5	5.0	5.0	1.5
1,1-Dichloroethane	75-34-3	10	2.5	5.0	5.0	1.5
1,2-Dichloroethene (Total)	40-59-0	10	2.5	5.0	5.0	1.5
Chloroform	67-66-3	10	2.5	5.0	5.0	1.5
1,2-Dichloroethane	107-06-2	10	2.5	5.0	5.0	1.5
2-Butanone	78-93-3	10	5.0	10	10	5.0
1,1,1-Trichloroethane	71-55-6	10	2.5	5.0	5.0	1.5
Carbon tetrachloride	56-23-5	10	2.5	5.0	5.0	1.5
Vinyl acetate	108-05-4	10	5.0	10	10	5.0
Bromodichloromethane	75-27-4	10	2.5	5.0	5.0	1.5
1,2-Dichloropropane	78-87-5	10	2.5	5.0	5.0	1.5
cis-1,3-Dichloropropene	10061-01-5	10	2.5	5.0	5.0	2.0
Trichloroethene	79-01-6	10	2.5	5.0	5.0	1.5
Dibromochloromethane	124-48-1	10	2.5	5.0	5.0	1.5
1,1,2-Trichloroethane	79-00-5	10	2.5	5.0	5.0	1.5
Benzene	71-43-2	10	2.5	5.0	5.0	1.5
trans-1,3-Dichloropropene	10061-02-6	10	2.5	5.0	5.0	1.0
Bromoform	75-25-2	10	2.5	5.0	5.0	1.5
4-Methyl-2-pentanone	108-10-1	10	5.0	10	10	5.0
2-Hexanone	591-78-6	10	5.0	10	10	5.0
Tetrachloroethene	127-18-4	10	2.5	5.0	5.0	1.5
Toluene	108-88-3	10	2.5	5.0	5.0	1.5
1,1,2,2-Tetrachloroethane	79-34-5	10	2.5	5.0	5.0	1.5
Chlorobenzene	108-90-7	10	2.5	5.0	5.0	1.5
Ethyl Benzene	100-41-4	10	2.5	5.0	5.0	1.5
Styrene	100-42-5	10	2.5	5.0	5.0	1.0
Xylenes (Total)	1330-20-7	10	2.5	5.0	5.0	1.5

**TARGETED DETECTION LIMITS FOR ORGANIC ANALYSES
ONONDAGA DRUM SITE
NEDROW, NEW YORK**

BASE/NEUTRAL/ACID COMPOUNDS		<i>Targeted Detection Limits</i>				
<i>Compound</i>	<i>Cas No.</i>	<i>Liquid Waste (mg/L)</i>	<i>Solid Waste (mg/kg)</i>	<i>Groundwater (µg/L)</i>	<i>Soil (µg/kg)</i>	<i>Potable Water (µg/L)</i>
Phenol	108-95-2	10	20	10	330	2.5
bis(2-Chloroethyl) ether	111-44-4	10	20	10	330	2.5
2-Chlorophenol	95-57-8	10	20	10	330	2.5
1,3-Dichlorobenzene	541-73-1	10	20	10	330	2.5
1,4-Dichlorobenzene	106-46-7	10	20	10	330	2.5
Benzyl alcohol	100-51-6	10	20	10	330	2.5
1,2-Dichlorobenzene	95-50-1	10	20	10	330	2.5
2-Methylphenol	95-48-7	10	20	10	330	2.5
bis(2-Chloroisopropyl) ether	108-60-1	10	20	10	330	2.5
4-Methylphenol	106-44-5	10	20	10	330	2.5
N-Nitroso-di-n-dipropylamine	621-64-7	10	20	10	330	2.5
Hexachloroethane	67-72-1	10	20	10	330	2.5
Nitrobenzene	98-95-3	10	20	10	330	2.5
Isophorone	78-59-1	10	20	10	330	2.5
2-Nitrophenol	88-75-5	10	20	10	330	2.5
2,4-Dimethylphenol	105-67-9	10	20	10	330	2.5
Benzoic Acid	65-85-0	50	100	50	1,600	20
bis(2-Chloroethoxy) methane	111-91-1	10	20	10	330	2.5
2,4-Dichlorophenol	120-83-2	10	20	10	330	2.5
1,2,4-Trichlorobenzene	120-82-1	10	20	10	330	2.5
Naphthalene	91-20-3	10	20	10	330	2.5
4-Chloroaniline	106-47-8	10	20	10	330	2.5
Hexachlorobutadiene	87-68-3	10	20	10	330	2.5
4-Chloro-3-methylphenol (para-chloro-meta-cresol)	59-50-7	10	20	10	330	2.5
2-Methylnaphthalene	91-57-6	10	20	10	330	2.5
Hexachlorocyclopentadiene	77-47-4	10	20	10	330	2.5
2,4,6-Trichlorophenol	88-06-2	10	20	10	330	2.5
2,4,5-Trichlorophenol	95-95-4	50	100	50	1,600	2.5
2-Chloronaphthalene	91-58-7	10	20	10	300	2.5
2-Nitroaniline	88-74-4	50	100	50	1,600	20

**TARGETED DETECTION LIMITS FOR ORGANIC ANALYSES
ONONDAGA DRUM SITE
NEDROW, NEW YORK**

BASE/NEUTRAL ACID EXTRACTABLES		<i>Targeted Detection Limits</i>				
<i>Compound</i>	<i>Cas No.</i>	<i>Liquid Waste (mg/L)</i>	<i>Solid Waste (mg/kg)</i>	<i>Groundwater (µg/L)</i>	<i>Soil (µg/kg)</i>	<i>Potable Water (µg/L)</i>
Dimethylphthalate	131-11-3	10	20	10	330	2.5
Acenaphthylene	208-96-8	10	20	10	330	2.5
2,6-Dinitrotoluene	606-20-2	10	20	10	300	2.5
3-Nitroaniline	99-09-2	50	100	50	1,600	20
Acenaphthene	83-32-9	10	20	10	300	2.5
2,4-Dinitrophenol	51-28-5	50	100	50	1,600	20
4-Nitrophenol	100-02-7	50	100	50	1,600	20
Dibenzofuran	132-64-9	10	20	10	330	2.5
2,4-Dinitrotoluene	121-14-2	10	20	10	330	2.5
Diethylphthalate	84-66-2	10	20	10	300	2.5
4-Chlorophenyl-phenyl-ether	7005-72-3	10	20	10	330	2.5
Fluorene	86-73-7	10	20	10	330	2.5
4-Nitroaniline	100-01-6	50	100	50	1,600	20
4,6-Dinitro-2-methylphenol	534-52-1	50	100	50	1,600	20
N-Nitrosodiphenylamine	86-30-6	10	20	10	330	2.5
4-Bromophenyl-phenylether	101-55-3	10	20	10	330	2.5
Hexachlorobenzene	118-74-1	10	20	10	330	2.5
Pentachlorophenol	87-86-5	50	100	50	1,600	20
Phenanthrene	85-01-8	50	20	10	330	20
Anthracene	120-12-7	10	20	10	330	20
Di-n-butylphthalate	84-74-2	10	20	10	330	2.5
Fluoranthene	206-44-0	10	20	10	330	2.5
Pyrene	129-00-0	10	20	10	330	2.5
Butylbenzylphthalate	85-68-7	10	20	10	330	2.5
3,3'-Dichlorobenzidine	91-94-1	20	40	20	660	5.0
Benzo(a)anthracene	56-55-3	10	20	10	330	2.5
Chrysene	218-01-9	10	20	10	330	2.5
bis(2-Ethylhexyl)phthalate	117-81-7	10	20	10	330	2.5
Di-n-Octylphthalate	117-84-0	10	20	10	330	2.5
Benzo(b)fluoranthene	205-99-2	10	20	10	330	2.5
Benzo(k)fluoranthene	207-08-9	10	20	10	330	2.5
Benzo(a)pyrene	50-32-8	10	20	10	330	2.5
Indeno(1,2,3-cd)pyrene	193-39-5	10	20	10	330	2.5
Dibenz(a,h)anthracene	53-70-3	10	20	10	330	2.5
Benzo(g,h,i)perylene	191-24-2	10	20	10	330	2.5

**TARGETED DETECTION LIMITS FOR ORGANIC ANALYSES
ONONDAGA DRUM SITE
NEDROW, NEW YORK**

PESTICIDES/PCBS		Targeted Detection Limits				
Compound	Cas No.	Liquid Waste (mg/L)	Solid Waste (mg/kg)	Groundwater (µg/L)	Soil (µg/kg)	Potable Water (µg/L)
alpha-BHC	319-84-6	10	20	0.05	8.0	0.01
beta-BHC	319-85-7	10	20	0.05	8.0	0.01
delta-BHC	319-86-8	10	20	0.05	8.0	0.01
gamma-BHC (Lindane)	58-89-9	10	20	0.05	8.0	0.01
Heptachlor	76-44-8	10	20	0.05	8.0	0.01
Aldrin	309-00-2	10	20	0.05	8.0	0.01
Heptachlor epoxide	1024-57-3	10	20	0.05	8.0	0.01
Endosulfan I	959-98-8	10	20	0.05	8.0	0.01
Dieldrin	60-57-1	20	20	0.10	16.0	0.02
4,4'-DDE	72-55-9	20	20	0.10	16.0	0.02
Endrin	72-20-8	20	20	0.10	16.0	0.02
Endosulfan II	33213-65-9	20	20	0.10	16.0	0.02
4,4'-DDD	72-54-8	20	20	0.10	16.0	0.02
Endosulfan sulfate	1031-07-8	20	20	0.10	16.0	0.02
4,4'-DDT	50-29-3	20	20	0.10	16.0	0.02
Methoxychlor	72-43-5	100	20	0.5	80.0	0.1
Endrin ketone	53494-70-5	20	20	0.10	16.0	0.2
alpha-Chlordane	5103-71-9	10	20	0.5	80.0	0.1
gamma-Chlordane	5103-74-2	10	20	0.5	80.0	0.1
Toxaphene	8001-35-2	100	50	1.0	16.0	0.2
Aroclor-1016	12674-11-2	50	10	0.5	80.0	0.1
Aroclor-1221	11104-28-2	50	10	0.5	80.0	0.1
Aroclor-1232	11141-16-5	50	10	0.5	80.0	0.1
Aroclor-1242	53469-21-9	50	10	0.5	80.0	0.1
Aroclor-1248	12672-29-6	50	10	0.5	80.0	0.1
Aroclor-1254	11097-69-1	50	10	1.0	160	0.2
Aroclor-1260	11096-82-5	50	10	1.0	160	0.2

Notes:

- (1) Solid waste targeted detection limits provided are based on wet weight results. Actual detection limits shall be reported on a dry weight basis and as such, detection limits will be higher.
- Detection limits are provided for guidance purposes only as they may not always be technically achievable due to such factors as matrix interference and elevated analyte concentrations which would require sample dilution. In these cases, the laboratory detection limits will be substituted for the targeted detection limits in accordance with the method(s) protocols.

**TARGETED DETECTION LIMITS FOR METALS
AND GENERAL CHEMISTRY ANALYSES
ONONDAGA DRUM SITE
NEDROW, NEW YORK**

<i>Metal</i>	<i>Targeted Detection Limits Liquid Waste (µg/L)</i>	<i>Targeted Detection Limits Solid Waste (mg/kg)</i>	<i>Targeted Detection Limits Groundwater (µg/L)</i>	<i>Targeted Detection Limits Soil (mg/kg)</i>	<i>Potable Water (µg/L)</i>
Aluminum	2,000	80	200	40	100
Antimony	120	20	60	12	5
Arsenic	20	5	10	2	5
Barium	200	80	200	40	50
Beryllium	10	5	5	1	5
Cadmium	10	10	5	1	0.5
Calcium	2,000	80	5,000	1,000	1,000
Chromium	20	10	10	2	10
Cobalt	100	20	50	10	10
Copper	50	40	25	5	10
Iron	200	20	100	20	100
Lead	10	10	3	0.6	2
Magnesium	10,000	80	5,000	1,000	1,000
Manganese	30	10	15	3	10
Mercury	2	0.3	0.2	0.04	0.2
Nickel	80	20	40	8	20
Potassium	10,000	80	5,000	1,000	2,000
Selenium	10	5	5	1	2
Silver	20	10	10	2	5
Sodium	10,000	80	5,000	1,000	1,000
Thallium	20	20	10	2	2
Vanadium	100	20	50	10	10
Zinc	40	10	20	4	20

**TARGETED DETECTION LIMITS FOR METALS AND GENERAL CHEMISTRY ANALYSES
ONONDAGA DRUM SITE
NEDROW, NEW YORK**

<i>General Chemistry Parameters</i>	<i>Targeted Detection Limits Liquid Waste (mg/L)</i>	<i>Targeted Detection Limits Solid Waste (mg/kg)</i>	<i>Targeted Detection Limits Groundwater (µg/L)</i>	<i>Targeted Detection Limits Soil (mg/kg)</i>	<i>Potable Water (µg/L)</i>
Cyanide, total	0.05	1.0	0.01	2.0	0.01
Phenols	0.10	1.0	NA	NA	NA
Sulfide	0.05	1.0	NA	NA	NA
Total Solids	5.0	NA	NA	NA	NA
Total Organic Carbon	2.0	100	NA	NA	NA
% Ash	NA	NA	NA	NA	NA
Heat Content (BTU)	NA	NA	NA	NA	NA
Specific Gravity	NA	NA	NA	NA	NA
Flash Point	NA	NA	NA	NA	NA
Total Organic Halides	0.100	1.0	NA	NA	NA
pH	NA	NA	NA	NA	NA
Cyanide, Reactive	100	NA	NA	NA	NA
Free Liquids	NA	NA	NA	NA	NA
Sulfide, Reactive	100	1%	NA	NA	NA
Sulfur	1%	1%	NA	NA	NA
Chlorine	1%	1%	NA	NA	NA
Corrosivity	NA	NA	NA	NA	NA

Notes:

- Detection limits are provided for guidance purposes only as they may not always be technically achievable due to such factors as matrix interferences and elevated analyte concentrations which would require sample dilution. In these cases, the laboratory detection limits will be substituted for the targeted detection limits in accordance with the method(s) protocols.
- NA - Not Applicable

TABLE A.4.4
TARGETED DETECTION LIMITS FOR TCLP ANALYSES
ONONDAGA DRUM SITE
NEDROW, NEW YORK

<i>Parameter</i>	<i>Regulatory Limit (mg/L)</i>	<i>Targeted Detection Limit (mg/L)</i>
Analyses: Metals		
Arsenic	5.0	1.0
Barium	100.0	10
Cadmium	1.0	0.1
Chromium	5.0	1.0
Lead	5.0	1.0
Mercury	0.2	0.01
Selenium	1.0	0.1
Silver	5.0	1.0
Pesticides		
Chlordane	0.03	0.01
Endrin	0.02	0.01
Heptachlor	0.008	0.005
(Heptachlor-epoxide)	0.008	0.005
Lindane	0.4	0.2
Methoxychlor	10.0	5.0
Toxaphene	0.5	0.3
Herbicides		
2,4-D	10.0	5.0
2,4,5-TP (Silvex)	1.0	0.5
Volatiles		
Benzene	0.5	0.1
Carbon tetrachloride	0.5	0.1
Chlorobenzene	100.0	0.1
Chloroform	6.0	0.1
1,2-Dichloroethane	0.5	0.1
1,1-Dichloroethene	0.7	0.1
Methyl ethyl ketone	200.0	0.1
Tetrachloroethene	0.7	0.1
Trichloroethene	0.5	0.1
Vinyl chloride	0.2	0.1

TABLE A.4.4
TARGETED DETECTION LIMITS FOR TCLP ANALYSES
ONONDAGA DRUM SITE
NEDROW, NEW YORK

<i>Parameter</i>	<i>Regulatory Limit (mg/L)</i>	<i>Targeted Detection Limit (mg/L)</i>
Analyses: Semi-Volatiles		
o-Cresol (2-Methylphenol)	200.0	0.1
m & p-Cresol (3 & 4-Methylphenol)	200.0	0.1
Cresol (total)	200.0	0.1
1,4-Dichlorobenzene	7.5	0.1
2,4-Dinitrotoluene	0.13	0.10
Hexachlorobenzene	0.13	0.10
Hexachloro-1,3-butadiene	0.5	0.10
Hexachloroethane	3.0	1.0
Nitrobenzene	2.0	1.0
Pentachlorophenol	100.0	1.0
Pyridine	5.0	1.0
2,4,5-Trichlorophenol	400.0	1.0
2,4,6-Trichlorophenol	2.0	1.0

Notes:

- Detection limits are provided for guidance purposes only as they may not always be technically achievable due to such factors as matrix interferences and elevated analyte concentrations which would require sample dilution. In these cases, the laboratory detection limits will be substituted for the targeted detection limits in accordance with the method(s) protocols.
- NA - Not Applicable

The method(s) precision (relative percent difference) will be determined from duplicate sample analyses or MS/MSD sample analyses. A minimum of one sample per 20 investigative samples will be analyzed in duplicate or spiked and analyzed in duplicate. Results of these analyses will be compared to the acceptance criteria presented in the appropriate methods, as identified in Section A.8.0.

The method accuracy (percent recovery) will be determined by spiking selected samples (matrix spikes) with test compounds or analytes. Accuracy will be reported as the percent recovery of the test compound or analyte and will be compared to acceptance criteria given in the appropriate methods, as identified in Section A.8.0.

A.4.1.2.2 Completeness, Representativeness and Comparability

The QA objective for completeness is to collect and analyze all environmental samples in a manner such that valid data is obtained. Achievement of this objective will rely on the use of strict sample identification and custody procedures, use of standard reference materials, proper instrument calibration and maintenance, analysis of quality control samples, performance audits, and corrective action anytime QC acceptance criteria are exceeded.

An objective of this program is the collection of samples that are representative of the matrix from which they were collected. Achievement of this objective will rely on the use of sampling procedures, as

described in the SAP, that have been designed with the goal of obtaining representative samples.

The QA objective for comparability is the generation of Site characterization data that can be used to make valid comparisons with analytical data that may be generated in the future at this Site.

This objective also involves the analysis of environmental samples collected during the sampling program in a manner that produces results comparable to the results that would be obtained by another laboratory using the same analytical procedure. This is achieved by the use of standard materials traceable to the National Institute of Standards and Technology (NIST), the use of standardized accepted procedures for sample collection and sample analysis, and analysis of quality control samples to validate the analytical results.

A.4.2 FIELD MEASUREMENTS

Measurement data will be generated in many field activities. These activities may include, but are not limited to, the following:

- i) documenting time and weather conditions;
- ii) determining drum content volumes and layering; and
- iii) determining waste stream volumes and weights.

The general QA objective for such measurement data is to obtain reproducible and comparable measurements to a degree of accuracy consistent with the use of standardized procedures.

A.5.0 SAMPLING PROCEDURES

The procedures for sample collection and for performing all related field activities are described in detail in the SAP.

A.5.1 SAMPLE CONTAINERS, PRESERVATION, SAMPLE HOLDING TIMES AND SHIPPING MEANS

Required sample containers, sample preservation methods, shipping means and required sample holding times are presented in Table A.5.1.

A.5.2 FIELD DECONTAMINATION OF SAMPLING EQUIPMENT

Procedures to be used for sampling equipment cleaning are presented in the SAP.

TABLE A.5.1
CONTAINER, PRESERVATION, SHIPPING AND PACKAGING REQUIREMENTS
ONONDAGA DRUM SITE
NEDROW, NEW YORK

Analysis	Sample Containers	Preservation	Maximum Holding Times(1)	Volume of Sample	Shipping Means	Packaging
LIQUIDS						
Liquid						
TCL-Volatiles	2 x 40 ml glass teflon septum	None	14 days from collection to analysis	Fill completely	Federal Express Priority 1	Vermiculite or Foam Chips
TCL-Base/Neutral and Acid Extractables (BNAs)	2 x 1L amber glass bottles	None	7 days from collection to extraction, 40 days to analysis	Fill to neck of bottles	Federal Express Priority 1	Vermiculite or Foam Chips
TCL-Pesticides/PCBs	2 x 1L amber glass bottles	None	7 days from collection to extraction, 40 days to analysis	Fill to neck of bottles	Federal Express Priority 1	Vermiculite or Foam Chips
TAL-Metals	1 x 1L plastic or glass bottles	None	6 months (mercury 28 days) from collection to analysis	Fill to shoulder of bottle	Federal Express Priority 1	Vermiculite or Foam Chips
TCLP VOC	1-250 mL Septum Top	None	14 days for TCLP extraction, 14 days for analysis	Fill completely	Federal Express Priority 1	Vermiculite or Foam Chips
TCLP-BNA Pesticide/Herbicide	2-1L glass	None	14 days for TCLP extraction, 7 days for preparative extraction, 40 days for analysis	Fill to shoulder of bottle	Federal Express Priority 1	Vermiculite or Foam Chips
TCLP-Metals (except mercury)	One 500-mL glass	None	6 months for TCLP extraction, 6 months for analysis	Fill to shoulder of bottle	Federal Express Priority 1	Vermiculite or Foam Chips
TCLP-Mercury	One 500-mL glass	None	28 days for TCLP extraction, 28 days for analysis	Fill to shoulder of bottle	Federal Express Priority 1	Vermiculite or Foam Chips
General Chemistry Parameters	2 x 1L amber glass bottles	None	Varies	Fill to neck of bottles	Federal Express Priority 1	Vermiculite or Foam Chips

TABLE A.5.1
CONTAINER, PRESERVATION, SHIPPING AND PACKAGING REQUIREMENTS
ONONDAGA DRUM SITE
NEDROW, NEW YORK

Analysis	Sample Containers	Preservation	Maximum Holding Times(1)	Volume of Sample	Shipping Means	Packaging
MATRICES						
Solid						
TCL-Volatiles	1 x 4 oz wide mouth glass jar	None	14 days from collection to analysis	Fill completely	Federal Express Priority 1	Vermiculite or Foam Chips
TCL BNAs/Pest/PCBs	1 x 8 oz. wide mouth glass jar	None	7 days from collection to extraction, 40 days to analysis	Fill to shoulder of bottle	Federal Express Priority 1	Vermiculite or Foam Chips
TAL-Metals	1 x 8 oz. wide mouth glass jar	None	6 months (mercury 28 days) from collection to analysis	Fill to shoulder of bottle	Federal Express Priority 1	Vermiculite or Foam Chips
TCLP VOC	One 4-ounce glass	4°C	14 days for TCLP extraction, 14 days for analysis	Fill completely	Federal Express Priority 1	Vermiculite or Foam Chips
TCLP-BNA, Pesticide/Herbicide	2-100 mL glass	4°C	14 days for TCLP extraction, 7 days for preparative extraction, 40 days for analysis	Fill to shoulder of bottle	Federal Express Priority 1	Vermiculite or Foam Chips
TCLP-Metals (except mercury)	One 500-mL glass	None	28 days for TCLP extraction, 28 days for analysis	Fill to shoulder of bottle	Federal Express Priority 1	Vermiculite or Foam Chips
TCLP-Mercury	One 500-mL glass	None	28 days for TCLP extraction, 28 days for analysis	Fill to shoulder of bottle	Federal Express Priority 1	Vermiculite or Foam Chips
General Chemistry Parameters	2-8 oz wide mouth glass jars	None	Varies	Fill to shoulder of bottle	Federal Express Priority 1	Vermiculite or Foam Chips

TABLE A.5.1
CONTAINER, PRESERVATION, SHIPPING AND PACKAGING REQUIREMENTS
ONONDAGA DRUM SITE
NEDROW, NEW YORK

Analysis	Sample Containers	Preservation	Maximum Holding Times(1)	Volume of Sample	Shipping Means	Packaging
MATRICES						
Groundwater/Potable Water						
TCL-Volatiles	2 x 40 ml glass teflon septum	4°C HCL to pH<2	14 days from collection to analysis	Fill completely	Federal Express Priority 1	Vermiculite or Foam Chips
TCL-Base/Neutral and Acid	2 x 1L amber glass bottles	4°C	7 days from collection to extraction, 40 days to analysis	Fill to neck of bottles	Federal Express Priority 1	Vermiculite or Foam Chips
Extractables (BNAs)						
TCL-Pesticides/PCBs	2 x 1L amber glass bottles	4°C	7 days from collection to extraction, 40 days to analysis	Fill to neck of bottles	Federal Express Priority 1	Vermiculite or Foam Chips
TAL-Metals	1 x 1L plastic or glass bottles	None	6 months (mercury 28 days) from collection to analysis	Fill to neck of bottle	Federal Express Priority 1	Vermiculite or Foam Chips
Cyanide	1 x 1L plastic	NaOH to pH<12	14 days for analysis	fill to neck of bottle	Federal Express Priority 1	Vermiculite or Foam Chips
Soil						
TCL-Volatiles	2 x 4 oz wide mouth glass jar	4°C	14 days from collection to analysis	Fill completely	Federal Express Priority 1	Vermiculite or Foam Chips
TCL BNAs/Pest/PCBs	1 x 8 oz. wide mouth glass jar	4°C	14 days from collection to extraction, 40 days to analysis	Fill to shoulder of bottle	Federal Express Priority 1	Vermiculite or Foam Chips
TAL-Metals	1 x 8 oz. wide mouth glass jar	None	6 months (mercury 28 days) from collection to analysis	Fill to shoulder of bottle	Federal Express Priority 1	Vermiculite or Foam Chips
Cyanide	1 x 8 oz wide mouth glass jar	4°C	14 days for analysis	Fill to shoulder of bottle	Federal Express Priority 1	Vermiculite or Foam Chips
General Chemistry Parameters	2-8 oz wide mouth glass jars	None	Varies	Fill to shoulder of bottle	Federal Express Priority 1	Vermiculite or Foam Chips

(1) Maximum holding times are based from time of sample collection.

A.6.0 SAMPLE CUSTODY AND DOCUMENT CONTROL

The following documentation procedures will be used during sampling and analysis to provide chain of custody control during transfer of samples from collection through storage. Recordkeeping documentation will include the use of the following:

- i) a field logbook (bound, with numbered pages) to document sampling activities in the field;
- ii) labels to identify individual samples;
- iii) chain of custody forms to document the analyses to be performed; and
- iv) laboratory sample custody logbook.

A.6.1 FIELD LOGBOOK

In the field, the sampler will record in the field logbook the following information for each sample collected:

- i) unique sample identification number;
- ii) sample matrix;
- iii) name of sampler;
- iv) sample source;
- v) time and date;
- vi) pertinent data (i.e. drum volume and layering);
- vii) analysis to be conducted;
- viii) sampling method (i.e. grab, composite);

- ix) appearance of each sample (i.e. color, turbidity, sediment);
- x) preservative added, if any;
- xi) number of sample bottles collected; and
- xii) pertinent weather data.

Each field logbook page will be signed by the sampler.

All field logbooks, sample labels and chain of custody records will be recorded in waterproof, non-erasable black ink. Entry errors, if made, shall be voided by crossing out with a single line and the corrected information will be inserted. All such corrections shall be initialed and dated by the person making the entry.

A.6.2 SAMPLE IDENTIFICATION

A sample numbering system will be used to identify each collected sample by unique sample number. This system will provide a tracking number to allow retrieval and cross-referencing of sample information. A listing of the sample identification numbers with written descriptions of sample location, type and date will be maintained by the Contractor. The sample numbering system which may be used is described as follows:

Example: L-060192-AA-YYY

Where: L-Designated sample type

(L=Liquid, S=Solid, SL=Soil, GW=Groundwater,
PW=Potable Water)

060192: date of collection (mm/dd/yy)
AA: sampler initials
YYY: sequential number starting with 001 at the start of the
project

The sample number shall be noted on the sample label in
waterproof ink. Sample labels shall be firmly affixed to the samples they
identify.

QA/QC samples will also be numbered with a unique
sample number.

A.6.3 CHAIN OF CUSTODY RECORD

A chain of custody form will be completed to document
the transfer of sample containers. Figure A.6.1 illustrates a typical chain of
custody form. Custody seals will be placed around each cooler as presented in
the Work Plan. The cooler will then be sealed with packing tape. Sample
container labels will include sample number, place of collection and date and
time of collection. Samples may be held up to 24 hours prior to shipment via
overnight courier to the laboratory.

The chain of custody form, completed at the time of
sampling, will include, but not be limited to, the sample number, date and

time of sampling, and the name of the sampler. The chain of custody form will be signed, timed and dated by the sampler when transferring the samples. Custody transfers will be recorded for each individual sample. For example, if samples are split and sent to more than one laboratory, a record sheet will accompany each sample. The number of custodians in the chain of possession will be kept to a minimum. The chain of custody forms will be returned to the Consultant.

A chain of custody form will be prepared for each cooler being shipped to the laboratory. Each chain of custody form will consist of four copies which will be distributed as follows:

- The shipper will retain one copy.
- Three copies will be enclosed in a waterproof envelop within the cooler with the samples.
- The cooler will then be sealed properly for shipment. The coolers will be sealed with nylon strapping tape. Custody seals will be placed over the cooler opening in such a manner as to indicate tampering during shipment.
- The laboratory, upon receiving the samples, will complete the three remaining copies.
- The laboratory will maintain one copy for their records.

- One copy will be returned to the Consultant by the laboratory upon receipt of the samples.
- One copy will be returned to the Consultant with the data deliverables package.

Upon receipt of the cooler at the laboratory, the cooler and the seal and each sample container custody seal will be inspected by the designated sample custodian. The condition of the cooler and the sample container custody seals will be noted on the chain of custody form by the sample custodian. If either the cooler seal or the individual sample container custody seals are intact, the sample containers will be accepted for analyses. The sample custodian will document the date and time of receipt of the cooler, and sign the chain of custody form.

If damage or discrepancies are noticed, they will be recorded in the remarks column of the chain of custody form, dated and signed. Any damage or discrepancies will be reported to the laboratory supervisor who will inform the laboratory manager and QA/QC Officer, who will in turn notify the Consultant.

Completed chain of custody forms describing the transport to and receipt at the laboratory are required to be returned to the Consultant with the hard copy of the analytical report in order to facilitate data validation.

A.6.4 SAMPLE DOCUMENTATION IN THE LABORATORY

Each sample or group of samples shipped to the laboratory for analysis will be given a unique identification number. The laboratory sample custodian will record the client name, number of samples and date of receipt of samples in the Sample Control Logbook.

The laboratory will be responsible for maintaining analytical logbooks and laboratory data. Raw laboratory data produced from the analysis of samples submitted for this program will be inventoried and maintained by the laboratory for a period of five years. The laboratory will advise the Consultant 60 days prior to expiration of the five years. The Consultant will advise the laboratory regarding the need for additional storage prior to expiration of the 60 days.

A.6.5 STORAGE OF SAMPLES

After the sample custodian has completed the chain of custody forms and the incoming sample log, the chain of custody forms will be checked to ensure that all samples are stored in the appropriate locations. All samples will be stored within an access controlled custody room and will be maintained under appropriate preservation requirements until all analytical work is complete.

A.6.6 SAMPLE DOCUMENTATION

Evidentiary files for the entire project shall be inventoried and maintained by the Consultant and shall consist of the following:

- A Work Plan
- B Project Logbooks
- C Field Data Records
- D Sample Identification Documents
- E Chain of Custody Records
- F Laboratory Data, etc.
- G Correspondence
- H Report Notes, Calculations, etc.
- I References, Copies of Pertinent Literature
- J Miscellaneous - Photos, Maps, Drawings, etc.
- K Final Report

The evidentiary file materials shall be the responsibility of the Project Manager with respect to maintenance and document removal.

A.7.0 CALIBRATION PROCEDURES AND FREQUENCY

The calibration procedures that will be used for the analyses of the samples collected during the Site activities shall be in accordance with the analytical methods presented in Section A.8.0, Table A.8.1.

A.8.0 ANALYTICAL PROCEDURES

The analytical methodologies that will be used for the analysis of the samples collected during the Site activities are referenced in Table A.8.1. The parameters to be analyzed will depend on the requirements of the disposal facility and, consequently, additional or fewer analyses may be required than those presented in Table A.8.1.

A.8.1 DETECTION LIMIT REQUIREMENTS

The data generated during the Site activities will have targeted detection limits that are consistent with those presented in Tables A.4.2 through A.4.4. If any chemical interferences are present or dilutions are required due to elevated concentrations of the subject analyte(s), the laboratory detection limits will be substituted for the targeted detection limits in accordance with the method(s) protocols.

In addition, for samples initially analyzed by gas chromatography/mass spectrometry (GC/MS), a library search will be executed for Non-Target Compound List (TCL) sample components for the purpose of tentative identification. Up to ten substances of greatest apparent concentration for the volatile organic fraction and 20 substances of greatest apparent concentration for the base neutral/acid (BNA) extractable fraction will be tentatively identified via a forward search of the NIST Mass Spectral Library.

TABLE A.8.1

SUMMARY OF ANALYTICAL METHODS
ONONDAGA DRUM SITE
NEDROW, NEW YORK

Compatibility Testing

<i>Analysis</i>	<i>Method Reference¹</i>
Phase Separation	Visual
Matrix Type	Visual
Physical Description	Visual
pH	SW-846 9040
Oxidizes	Spot Test
Peroxides	Test Strip
Water Solubility	Visual
Cyanide	Spot Test
Sulfide	Test Strip
Phenols	SW-846 9066 (modified)
Flammability	SW-846 1020
Halogen Screen	Beilstein Test

Waste Characterization

<i>Analysis</i>	<i>Method Reference</i>
Physical State	Sample inspection
Free Liquids	Sample inspection
Specific Gravity	Volume and weight measurement
pH	ASTM-D-3977-80
Solid	ASTM E-830-87
Ash Content	ASTM E-711-87
BTU	ASTM E-711-87
TAL Metals	SW-846 6010/7000 series
TCL Volatiles	SW-846 8240
TCL Pesticides and PCBs	SW-846 8080
TCL Semi-volatiles	SW-846 8270
Total Organic Halides	SW-846 9020
Cyanides	SW-846 9010/9012
Sulfides	SW-846 9030
Phenols	SW-846 8040
Sulfur	ASTM E-775-87
Chlorine	ASTM E-776-87
TOC	SW-846 9060
Reactivity	SW-846 Section 7.3

TABLE A.8.1

SUMMARY OF ANALYTICAL METHODS
ONONDAGA DRUM SITE
NEDROW, NEW YORK

<i>Analysis</i>	<i>Method Reference</i>
Corrosivity	SW-846 1110
Ignitability	SW-846 1010/1020
Toxicity	40 CFR Part 261, Appendix II
 <u>Groundwater/Soil</u>	
<i>Analysis</i>	<i>Method Reference</i>
TCL VOC	SW-846 8240
TCL BNA	SW-846 8270
TCL Pesticides/PCB	SW-846 8080
TAL Inorganics	SW-846 6010/7000 series
 <u>Potable Water</u>	
<i>Analysis</i>	<i>Method Reference</i>
TCL VOC	EPA-DW 524.2
TCL BNA	EPA-DW 525
TCL Pesticides/PCB	EPA-DW 508
TAL Inorganics	EPA-WW 200 series

¹ SW-846 - "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", EPA SW-846, 3rd edition, November 1986.

ASTM - "Annual Book of ASTM Standards", American Society for Testing and Materials, 1991.

TAL - Target Analyte List

TCL - Target Compound List

EPA-DW - "Methods for the Determination of Organic Compounds in Drinking Water", EPA-600/4-88/039, December 1988

EPA-WW - "Methods for the Chemical Analysis of Water and Wastes", EPA-600/4-79-020, revised March 1983

Computer library search routines will not use normalization routines that would misrepresent the library or unknown spectra when compared to each other. Only after visual comparison of sample spectra with the nearest library searches will the mass spectral interpretation specialist assign a tentative identification.

A.8.2 IDENTIFICATION

Identification of all targeted TCL analytes will be accomplished with an authentic standard of the analyte. When authentic standards are not available (i.e. for non-TCL compounds) identification will be considered tentative.

For gas chromatographic determinations of specific analytes, the relative retention time of the unknown will be compared with that of the authentic standard. Since a true identification by GC is not possible, an analytical run for compound confirmation will be followed according to the specifications in the methods. Peaks must elute within daily retention-time windows established for each indicator parameter to be declared a tentative or confirmed identification. Retention time windows are determined by a standard 72-hour study defined in each method. Results of the study are to be filed in the laboratory and available for inspection during a QC audit.

For gas chromatographic/mass spectrometric determinations of specific analytes, the spectrum of the analyte will conform

to a literature representation of the spectrum or to a spectrum of the authentic standard obtained after satisfactory tuning of the mass spectrometer. The appropriate analytical methods will be consulted for specific criteria for matching the mass spectra, relative response factors, and relative retention times to those of authentic standards.

A.8.3 QUANTIFICATION

The procedures for quantification of analytes are discussed in the appropriate specific analytical methods.

Estimation of the concentration of an organic compound not contained within the calibration standard may be accomplished by comparing the mass spectral response of the compound with that of an internal standard. This procedure is specified in the referenced methods.

A.9.0 DATA REDUCTION, VALIDATION, ASSESSMENT AND REPORTING

A.9.1 GENERAL

The laboratory will perform analytical data reduction and validation in-house under the direction of the laboratory QA/QC Officer. The laboratory QA/QC Officer will be responsible for assessing data quality and advising the Consultant of any qualifications, based on the QC criteria outlined in appropriate methods, which would caution the data user of possible unreliability. Laboratory data reduction, validation, and reporting will be conducted as detailed in the following:

- Raw data produced and checked by the responsible analyst will be turned over for independent review by another analyst.
- The area supervisor will review the data for attainment of the quality control criteria presented in the referenced analytical methods.
- Upon completion of all reviews and acceptance of the raw data by the laboratory operations manager, a computerized report will be generated and sent to the laboratory QA/QC Officer.
- The laboratory QA/QC Officer will complete a thorough inspection of all data.
- The laboratory QA/QC Officer and area supervisor will decide whether any sample reanalysis is required.
- Upon acceptance of the preliminary reports by the laboratory QA/QC Officer, final reports will be generated and signed by the laboratory manager.

The Consultant's QA/QC Officer will conduct an evaluation of laboratory data reduction and reporting. These evaluations will consider the finished data sheets, rinsate blank data, field duplicate data and recovery data for surrogate and matrix spikes. The material will be checked for legibility, completeness, correctness, and the presence of requisite dates, initials and signatures. The results of these checks will be assessed and reported to the Consultant's Project Manager noting any discrepancies and their effect upon the acceptability of the data. All information garnered from QA/QC checks will be discussed in the final report.

Validation of the analytical data will be performed by the Consultant's QA/QC Officer for analytical activities. The process of data validation includes the following:

- i) determination of sample holding times;
- ii) evaluation of laboratory/reagent blank contamination;
- iii) evaluation of analytical accuracy via comparison of surrogate and matrix spike results against control criteria;
- iv) assessment of analytical precision based on duplicate analyses and/or MS/MSD analyses; and
- v) evaluation of field QA/QC results (field blanks, trip blanks, field duplicates); and
- vi) evaluation of the analytical data forms presented in Section A.9.2 of the QAPP.

Assessment of analytical and in-house data will include checks on data consistency by looking for comparability of duplicate analyses,

comparability to previous data from the same sampling location (if available), adherence to the accuracy and precision control criteria detailed in this document and anomalously high or low parameter values. The results of the data validations will be reported to the Project Manager, noting any discrepancies and their effect upon the acceptability of the data. Data validation will be performed utilizing the following documents for guidance:

- i) EPA Region II Contract Lab Program Organics Data Review and Preliminary Review (SOP #HW-6, Revision 7), March 1990;
- ii) Evaluation of Metals Data for the Contract Laboratory Program (SOP #HW-2, Revision 10), February 1990; or
- iii) EPA - approved equivalent procedures.

A.9.2 REPORTING AND DELIVERABLES REQUIREMENTS

The laboratory shall be required to submit two copies of a final complete analytical report within 30 calendar days of receipt of the final sample from the sampling event.

The analytical report submitted by the laboratory shall conform to all reporting and deliverable requirements specified below. The analytical report shall include, for each sample:

- date collected;
- date of sample receipt;
- date extracted or digested;

- date analyzed;
- method for sample preparation;
- analytical methodology;
- method of sample cleanup;
- method detection limits;
- sample dilution factor; and
- a case narrative including a discussion of all QC problems and corrective actions taken.

The following forms will accompany the analytical data packages:

Organics

Analytical Results (Form 1)
 Surrogate Recoveries (Form 2)
 Matrix Spike/Matrix Spike Duplicates (Form 3)
 Blank Summary (Form 4)
 GC/MS Tuning (Form 5)
 Initial and Continuing Calibration (Forms 6 and 7)
 Internal Standard and Evaluation Standards Summary (Form 8)
 Pesticide/PCB Standard Summary (Form 9)
 Pesticide/PCB Identification (Form 10)

Inorganics

Analytical Results (Form 1)
 Calibration Data (Form 2A)
 CRDL Standard Data (Form 2B)
 Blank Data (Form 3)
 ICP Interference Check Sample Data (Form 4)
 Matrix Spike Data (Forms 5A and 5B)
 Duplicate Data (Form 6)
 Laboratory Control Sample (Form 7)
 MSA Results (Form 8)
 ICP Serial Dilutions (Form 9)

Holding Times (Form 10)
Instrument Detection Limits (Form 11)
ICP Interelement Correction Factors (Forms 12A and 12B)
ICP Linear Ranges (Form 13)

The case narrative to each analytical report shall describe, in lay terms, any and all QA/QC problems encountered during analysis of the samples. For each sample for which QA/QC problems are encountered, the following specific information shall be reported in the case narrative:

- the Consultant's sample number;
- laboratory sample number;
- date of sample collection;
- date of sample receipt at the laboratory;
- date of sample analysis;
- sample matrix;
- parameters analyzed;
- data with outlying quality control;
- specific analytical problems that occurred; and
- the corrective action that was taken or attempted to resolve the problems.

A.9.3 QUANTITATION TECHNIQUES -ORGANICS AND INORGANICS

Equations for calculation of measured TCL organic, TAL inorganic and general chemistry parameters are presented in the methods referenced in Section A.8.0, Table A.8.1.

A.9.4

DOCUMENT CONTROL SYSTEM

A document control system ensures that all documents are accounted for when the project is complete.

The Consultant shall assign a project number to this project. This number will appear on sample identification tags, logbooks, data sheets, control charts, project memos and analytical reports, document control logs, corrective action forms and logs, QA plans and other project analytical records.

A.10.0 INTERNAL QUALITY CONTROL CHECKS AND FREQUENCY

A.10.1 FIELD QC

Quality control of field sampling will involve collection of field (rinsate) blank samples in accordance with the applicable procedures described in the Work Plan, and in accordance with the frequencies provided in Section A.4.1.1.

A.10.2 LABORATORY QC

Specific procedures related to internal laboratory QC samples (namely matrix spikes, surrogate spikes, blanks, QC check samples and matrix spike duplicates) are detailed in the following subsections.

A.10.2.1 Blanks

A reagent blank will be analyzed by the laboratory at a frequency of one blank per 20 analyses or, in the event that an analytical round consists of less than 20 samples, one reagent blank will be analyzed. The reagent blank, an aliquot of analyte-free water or solid will be carried through the entire analytical procedure.

A.10.2.2 Matrix Spike/Matrix Spike Duplicates

A MS/MSD sample will be analyzed at a frequency of one per 20 investigative samples. Acceptable criteria and compounds and/or analytes that will be used for matrix spikes relative to samples analyzed for TCL and TAL constituents, are identified in the appropriate methods (see Section A.8.0). Tables A.10.1 and A.10.2 present a summary of the compounds and/or analytes and acceptable criteria. Percent spike recoveries will be used to evaluate analytical accuracy while relative percent difference (RPD) between the spike and matrix spike duplicate will be used to assess analytical precision.

A.10.2.3 Surrogates

Surrogates are used in all GC/MS and GC analyses. Every blank, standard and environmental sample including MS/MSD samples, will be spiked with surrogate compounds prior to purging volatiles or extracting semi-volatiles.

Surrogates will be spiked into samples according to the appropriate analytical methods. Surrogate spike recoveries will fall within the control limits set by procedures specified in the method for analytes falling within the quantitation limits without dilution. Dilution of samples to bring the analyte concentration into the linear range of calibration may dilute the surrogates out of the quantification limit; assessment of analytical

TABLE A.10.1
MATRIX SPIKE/MATRIX SPIKE DUPLICATE
RECOVERY CONTROL LIMITS - ORGANICS (1)
ONONDAGA DRUM SITE
NEDROW, NEW YORK

<i>Matrix Spike Compounds</i>	<i>Liquid Recovery(2) Control Limits (Percent)</i>	<i>Solid Recovery(3) Control Limits (Percent)</i>
<i>Volatiles:</i>		
1,1-Dichloroethene	61 - 145 (14)	59 - 172 (22)
Trichloroethene	71 - 120 (14)	62 - 137 (24)
Chlorobenzene	75 - 130 (13)	60 - 133 (21)
Toluene	76 - 125 (13)	59 - 139 (21)
Benzene	76 - 127 (11)	66 - 142 (21)
<i>Base/Neutral and Acid Compounds:</i>		
1,2,4-Trichlorobenzene	39 - 98 (28)	38 - 107 (23)
Acenaphthene	46 - 118 (31)	31 - 137 (19)
2,4-Dinitrotoluene	24 - 96 (38)	28 - 89 (47)
Pyrene	26 - 127 (31)	35 - 142 (36)
N-Nitroso-Di-n-Propylamine	41 - 116 (38)	41 - 126 (38)
1,4-Dichlorobenzene	36 - 97 (28)	28 - 104 (27)
Pentachlorophenol	9 - 103 (50)	17 - 109 (47)
Phenol	12 - 89 (42)	26 - 90 (35)
2-Chlorophenol	27 - 123 (40)	25 - 102 (50)
4-Chloro-3-Methylphenol	23 - 97 (42)	26 - 103 (33)
4-Nitrophenol	10 - 80 (50)	11 - 114 (50)
<i>Pesticides/PCBs:</i>		
Lindane	56 - 123 (15)	46 - 127 (50)
Heptachlor	40 - 131 (20)	35 - 130 (31)
Aldrin	40 - 120 (22)	34 - 132 (43)
Dieldrin	52 - 126 (18)	31 - 134 (38)
Endrin	56 - 121 (21)	42 - 139 (45)
4,4-DDT	38 - 127 (27)	23 - 134 (50)

Notes:

- (1) Values in parentheses indicate maximum acceptable relative percent differences (RPD) between matrix spike/matrix spike duplicate (MS/MSD) analyses.
- (2) Control limits applicable to all liquid matrices.
- (3) Control limits applicable to all solid matrices.

TABLE A.10.2
MATRIX SPIKE/LABORATORY DUPLICATE
RECOVERY CONTROL LIMITS - INORGANICS (1)
ONONDAGA DRUM SITE
NEDROW, NEW YORK

<i>Analyte</i>	<i>Liquid Recovery(2) Control Limits (Percent)</i>	<i>Solid Recovery(3) Control Limits (Percent)</i>
Aluminum	75 - 125 (20)	75 - 125 (35)
Antimony	75 - 125 (20)	75 - 125 (35)
Arsenic	75 - 125 (20)	75 - 125 (35)
Barium	75 - 125 (20)	75 - 125 (35)
Beryllium	75 - 125 (20)	75 - 125 (35)
Cadmium	75 - 125 (20)	75 - 125 (35)
Calcium	75 - 125 (20)	75 - 125 (35)
Chromium	75 - 125 (20)	75 - 125 (35)
Cobalt	75 - 125 (20)	75 - 125 (35)
Copper	75 - 125 (20)	75 - 125 (35)
Iron	75 - 125 (20)	75 - 125 (35)
Lead	75 - 125 (20)	75 - 125 (35)
Magnesium	75 - 125 (20)	75 - 125 (35)
Manganese	75 - 125 (20)	75 - 125 (35)
Mercury	75 - 125 (20)	75 - 125 (35)
Nickel	75 - 125 (20)	75 - 125 (35)
Potassium	75 - 125 (20)	75 - 125 (35)
Selenium	75 - 125 (20)	75 - 125 (35)
Silver	75 - 125 (20)	75 - 125 (35)
Sodium	75 - 125 (20)	75 - 125 (35)
Thallium	75 - 125 (20)	75 - 125 (35)
Vanadium	75 - 125 (20)	75 - 125 (35)
Zinc	75 - 125 (20)	75 - 125 (35)
Cyanide	75 - 125 (20)	75 - 125 (35)

Notes:

- (1) Values in parentheses indicate maximum acceptable relative percent differences (RPD) between laboratory duplicate analyses..
- (2) Control limits applicable to all liquid matrices.
- (3) Control limits applicable to all solid matrices.

quality in these cases will be based on the quality control embodied in the check and the MS/MSD samples.

Table A.10.3 presents a summary of the surrogate recovery control limits for TCL parameters.

A.10.2.4 Blind Check Samples

Check samples may be included with other samples submitted for analyses. In general, the check sample will be obtained from USEPA and supplied to the Consultant. The analytes contained in the check sample will be a representative subset of the analytes of interest.

Results of any check sample analyses will be compared to method accuracy and precision criteria. Accuracy and precision are defined in Section A.13.0.

TABLE A.10.3
SURROGATE RECOVERY LIMITS (%)
ONONDAGA DRUM SITE
NEDROW, NEW YORK

	<i>Liquid (1)</i>	<i>Solid (2)</i>
<i>Volatiles</i>		
Toluene-d8	88 - 110	81 - 117
Bromofluorobenzene	86 - 115	74 - 121
1,2-Dichloroethane-d4	76 - 114	70 - 121
<i>Base/Neutral and Acids:</i>		
Nitrobenzene-d5	35 - 114	23 - 120
2-Fluorobiphenyl	43 - 116	30 - 115
Terphenyl-d14	33 - 141	18 - 137
Phenol-d6	10 - 94	24 - 113
2-Fluorophenol	21 - 100	25 - 121
2,4,6-Tribromophenol	10 - 123	19 - 122
<i>Pesticides/PCBs:</i>		
Dibutylchloroendate (DBC)	24-154 (3)	24-150*

Note:

- (1) Control limits applicable to all liquid matrices.
- (2) Control limits applicable to all solid matrices.
- (3) DBC recovery limits are advisory only. They should not be used to determine if sample should be reanalyzed.

A.11.0 PERFORMANCE AND SYSTEM AUDITS AND FREQUENCY

For the purpose of external evaluation, performance evaluation check samples from the USEPA and various State agencies are analyzed periodically by the analytical contractor.

Internally, the evaluation of data from these samples is done on a continuing basis over the duration of a given project.

The Consultant's QA/QC Officer may carry out performance and/or systems audits to ensure that data of known and defensible quality are consistently produced during the program.

System audits are qualitative evaluations of all components of field and laboratory quality control measurement systems and they determine if the measurement systems are being used appropriately. The audits may be carried out before all systems are operational, during the program, or after the completion of the program. Such audits typically involve a comparison of the activities given in the QAPP described herein with activities actually scheduled or performed. A special type of systems audit is the data management audit. This audit addresses only data collection and management activities.

The performance audit is a quantitative evaluation of the measurement systems used for a monitoring program. It requires testing the measurement systems with samples of known composition or behavior to

evaluate precision and accuracy. During an early sampling event for this program, a performance audit may be conducted by or under the auspices of the Consultant's QA/QC Officer without the knowledge of the analyst.

In addition, one external QA audit may be conducted by the Consultant prior to the analysis of any investigatory samples. Additional external QA audits will only be performed if deemed necessary by either the Stauffer Project Manager or the Consultant's QA/QC Officer. The project laboratory may also undergo QA audit(s) by the USEPA, if so requested.

A.12.0 PREVENTIVE MAINTENANCE

Specific preventive maintenance protocols for laboratory equipment will be consistent with the laboratory's standard operation procedures.

Routine maintenance of the GC/MS instruments will be performed as per manufacturer's recommendations. The GC/MS operations manager is responsible for the preventive maintenance of the GC/MS instruments.

The preventive maintenance of the GC instruments will be done on an "as-needed" basis. Several maintenance procedures will be conducted on a routine basis. Manufacturer's recommendations provide the primary basis for the established maintenance schedule.

Manufacturer's service contracts provide primary maintenance for most major instruments (i.e. GC instruments, atomic absorption spectrometers, analytical balances, etc.). All aspects of routine and non-routine instrument maintenance are recorded in logbooks, and the logbook is dedicated to each instrument.

**A.13.0 SPECIFIC ROUTINE PROCEDURES USED TO ASSESS
DATA PRECISION, ACCURACY AND COMPLETENESS**

A.13.1 QA MEASUREMENT QUALITY INDICATORS

A.13.1.1 Precision

Precision will be assessed by comparison of the analytical results between duplicate samples or duplicate matrix spike samples (MS/MSDs) (see Equation i, Section A.13.2).

A.13.1.2 Accuracy

Accuracy will be assessed by comparing a set of analytical results to the accepted or "true" values that would be expected (see Equation ii, Section A.13.2). In general, MS/MSD and check sample recoveries will be used to assess accuracy.

A.13.1.3 Outliers

Procedures discussed previously will be followed by documenting deviations. In the event that a result deviates significantly from established control limits, this deviation will be noted and its effect on the quality of the remaining data assessed and documented.

A.13.2 STATISTICAL EVALUATIONS

Standard statistical formulae shall be used in examination of the data and determination of their precision and accuracy. Statistical formulae which will be applied include:

i) Relative Percent Difference (RPD)

$$RPD = \frac{\frac{X_1 - X_2}{X_1 + X_2}}{2} \times 100$$

X₁ = result of original analysis

X₂ = result of duplicate analysis

RPD will be used to assess analytical precision.

ii) Percent Recovery

Percent recovery of spikes and check samples will be used to establish analytical accuracy and will be evaluated as follows:

$$\text{Matrix Spike Recovery} = \left(\frac{A - B}{C} \right) \times 100$$

Where:

A = the analyte concentration determined experimentally from the spike sample;

B = the background level determined by a separate analysis of the unspiked sample; and

C = the amount of the spike added.

Accuracy will be assessed from spike percent recoveries, audit sample performance, and QC check sample recoveries.

A.14.0 CORRECTIVE ACTION

The need for corrective action may be identified by system or performance audits or by standard QC procedures. The essential steps in the corrective action system will be:

- i) identifying and defining the problem and checking the predetermined limits for data acceptability beyond which corrective action is required;
- ii) assigning responsibility for investigating the problem;
- iii) investigating and determining the cause of the problem;
- iv) determination of a corrective action to eliminate the problem (this may include reanalysis or resampling and reanalysis);
- v) assigning and accepting responsibility for implementing the corrective action;
- vi) implementing the corrective action;
- vii) verifying that the corrective action has eliminated the problem; and
- viii) documenting the corrective action taken.

For each measurement system, the Consultant's QA/QC Officer will be responsible for initiating the corrective action and the laboratory supervisor will be responsible for implementing the corrective action.

A.15.0 QUALITY ASSURANCE REPORT TO MANAGEMENT

Management will receive reports on the performance of the measurement system and the data quality following the conclusion of the project.

Minimally, these reports will include:

- i) assessment of measurement quality indicators (i.e. data accuracy, precision and completeness);
- ii) results of system audits; and
- iii) QA problems and recommended solutions.

The Consultant's QA/QC Officer will be responsible for preparing these reports. The final report for the project will include a separate QA section which will summarize data quality information and detail an overall data assessment and validation in accordance with the data quality objectives outlined in this QAPP.

HEALTH AND SAFETY PLAN

**Onondaga Drum Site
Nedrow, New York**

MAY 1993

REF. NO. 5067 (2) (Subreport 4)
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CONESTOGA-ROVERS & ASSOCIATES

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1.0 INTRODUCTION

1.1 GENERAL

The Health and Safety Plan (HSP) presented herein provides the minimum safety requirements that will be implemented during the Phase I Operations Program at the Onondaga Drum Site (Site) to provide for a safe and minimal risk Plan environment for all on-Site personnel. It also provides for emergency response procedures and corrective procedures based on the results of Site perimeter air monitoring. It is noted that the Contractor will be required to develop a Health and Safety Plan for the Site work that will include, at a minimum, the requirements outlined in this document and 29 CFR 1910.120.

All personnel will receive training specific to this HSP before entering the Site and while on the Site will be required to comply with the provisions of the HSP as applicable to their specific Site duties. Written verification of training will be maintained on Site.

1.2 MANAGEMENT AND IMPLEMENTATION

The Client's Consultant will provide overall project coordination services and field oversight services during the implementation of the Phase I Operations Plan. The Consultant's Project Coordinator will provide managerial oversight regarding the Health and Safety Program and will be represented on Site by a designated Field Engineer (Engineer).

The implementation and enforcement of the HSP on a daily basis will be the responsibility of the Contractor who will be selected through a competitive bidding process. The Contractor will be required to assign a Safety Officer to develop and oversee the Health and Safety Plan during all on-Site activities. The Contractor will also be required to assign a Site Safety Officer who will report to the Safety Officer and will be responsible for the management of the HSP on a daily basis.

The Site Safety Officer will report all required air monitoring data and other health and safety related information to the Engineer. Stauffer will be responsible for providing the necessary information for submittal to the Agencies as required.

1.3 SITE CHARACTERIZATION AND POTENTIALLY HAZARDOUS COMPOUNDS

Section 1.0 of the Site Work Plan provides a description of the Site and previous activities which have been conducted at the Site. The following compounds have been identified to be present at elevated levels in the samples collected from previously staged drums at the Site: cresol, benzene, toluene, xylene, phenanthrene, pyrene, 2,4-dimethylphenol, fluoranthene, fluorene, naphthalene, chrysene, acenaphthene, acenaphthylene and 2-chlorophenol. Material Safety Data Sheets for these chemicals are provided in Appendix E. For those chemicals that Material Safety Data Sheets are not available, information is included from the

Groundwater Chemicals Desk Reference¹ . The Site Respiratory Protection Action Levels as presented in Section 6.0 follow the United States Environmental Protection Agency (USEPA) guidelines for levels of unknown organic vapours.

Sections 2.0, 3.0, 4.0 and 5.0 of the Site Work Plan describe in detail all work activities which will take place on Site. Table 1.1 presents the hazards/risks associated with these activities.

¹ Montgomery, J.H., Welkom, L.M., Groundwater Chemicals Desk Reference, Lewis Publishers, Michigan, 1990.

TABLE 1.1

**HAZARD/RISK ANALYSIS FOR THE
PHASE I OPERATIONS PLAN
ONONDAGA DRUM SITE
NEDROW, NEW YORK**

<i>Work Activity</i>	<i>Anticipated Hazard/Risk</i>	<i>Hazard Control</i>
Site Preparation Activities (Mobilization) and Sampling off-Site Potable Wells and Demobilization Activities	• slip/trip/fall hazards • potential back injuries from lifting and moving supplies and equipment • potential bites from insects, bees and wasps	• Level D PPE • participate in all required training programs
Site Clearing Activities Fence Installation and Geophysical Survey	• slip/trip/fall hazards • potential back injuries from lifting and moving supplies, equipment and debris • potential bites from insects, bees and wasps • hazards presented by the use of specialized equipment (chainsaws) • direct contact with waste materials or potentially contaminated soils • potential heat or cold stress • pinch points on hands while installing fence	• Level D and/or Level C PPE as determined by the Site Safety Officer • participate in all required training programs • only essential personnel in the work area • adhere to all Site procedures including personnel decontamination • review the standard operating procedure for chainsaws • use the "buddy system" • keep first aid equipment readily available
Test Pit Investigations, Soil and Drum Excavation Waste Sampling Activities (soil and drums)	• slip/trip/fall hazards • potential back injuries from lifting and moving supplies, equipment and drums • potential bites from insects, bees and wasps • hazards presented by the use of heavy equipment (i.e. being struck by equipment, excessive noise and fumes) and drum removal equipment	• Level B PPE or Level C PPE as determined by the Site Safety Officer (i.e. confirmatory soil sampling) • participate in all required training programs • only essential personnel in the work area • adhere to all Site procedures including equipment and personnel decontamination

TABLE 1.1

**HAZARD/RISK ANALYSIS FOR THE
PHASE I OPERATIONS PLAN
ONONDAGA DRUM SITE
NEDROW, NEW YORK**

<i>Work Activity</i>	<i>Anticipated Hazard/Risk</i>	<i>Hazard Control</i>
Test Pit Investigations, Soil and Drum Excavation Waste Sampling Activities (soil and drums)	• direct contact with drums containing unknown wastes and potentially contaminated soils and groundwater • potential heat or cold stress • pinch points on hands while moving drums • hazards presented by confined space entry • potential fire or explosion hazards	• review the standard operation procedure for any heavy equipment operation, drum excavation and confined space entry procedures • use non-sparking, non-metallic slings when moving drums • use the "buddy system" • keep first aid equipment readily available • use proper confined space entry permit
Site Restoration Activities and Moving and Loading Overpacked Drums	• slip/trip/fall hazards • potential back injuries from moving drums • potential leg injuries from falling drums • potential bites from insects, bees and wasps • hazards presented by heavy equipment and backing vehicles • potential heat or cold stress • pinch points on hands from moving drums • potential dust generation creating fugitive emissions • potential heat or cold stress	• Level D PPE • participate in all required training programs • only essential personnel in the work area • adhere to all Site procedures • review standard operating procedures for any heavy equipment operation or drum loading equipment • make sure backup alarms are functioning • keep first aid equipment readily available

TABLE 1.1

**HAZARD/RISK ANALYSIS FOR THE
PHASE I OPERATIONS PLAN
ONONDAGA DRUM SITE
NEDROW, NEW YORK**

<i>Work Activity</i>	<i>Anticipated Hazard/Risk</i>	<i>Hazard Control</i>
Decontamination Activities	• slip/trip/fall hazards • potential back injuries from moving supplies or equipment • potential heat or cold stress • direct contact with decontamination solvents and Site contaminants • potential hazards from operating specialized decontamination equipment (i.e. steam cleaner may cause burns)	• Level C PPE • participate in all required training programs • only essential personnel in the work area • adhere to all Site procedures including personnel decontamination • review standard operating procedures for use of decontamination equipment • keep first aid equipment readily available

2.0 BASIS

The Occupational Safety and Health Administration (OSHA) Standards and Regulations contained in Title 29, Code of Federal Regulations, Parts 1910 and 1926 (29 CFR 1910 and 1926) including the amended sections in 29 CFR 1910.120, "Final Rule on Hazardous Waste Operations and Emergency Response" and current TLVs as provided by the American Conference of Governmental Industrial Hygienists (ACGIH) provide the basis for the safety and health program. Some of the specifications within this Health and Safety Plan are in addition to OSHA regulations and reflect the positions of the United States Environmental Protection Agency (USEPA), the National Institute for Occupational Safety and Health (NIOSH), and the United States Coast Guard (USCG) regarding procedures required to ensure safe operations at hazardous waste disposal sites. Additional safety provisions, as required, have also been included in this document.

The safety and health of the public and on-Site personnel and the protection of the environment will take precedence over schedule considerations for all project work. If emergency shut down of operations is necessary, impacts will be considered only after the cause of the problem is resolved and work is resumed. The Engineer and the Contractor's Site Safety Officer will be responsible for decisions regarding when work will be stopped for health or safety reasons and when it will be restarted.

3.0 SAFETY OFFICER AND SITE SAFETY OFFICER

The Contractor will provide a designated Site Safety Officer who has knowledge of industrial hygiene. The Site Safety Officer will be on Site on a full-time basis and will report directly to the Safety Officer. The qualifications of the Site Safety Officer will be provided to the USEPA, upon request, prior to commencing Site mobilization.

The Safety Officer will:

- i) Be responsible for developing the Contractor Safety Plan which will include at a minimum the provisions outlined in this document;
- ii) Be responsible for the initial training sessions for all on-Site personnel with regard to this safety plan and other safety requirements to be observed during Site activities, including;
 - a) potential hazards,
 - b) personal hygiene principles,
 - c) personnel protective equipment,
 - d) respiratory protection equipment usage and fit testing, and
 - e) emergency procedures dealing with fire and medical situations;
- iii) Be responsible for implementation of the HSP at the initial period of all Site activities;
- iv) Review and modify the HSP, in consultation with the Project Coordinator, as more information becomes available concerning the

hazardous materials involved, review all monitoring reports and respirator inspection logs, provide the initial qualitative respirator fit test, and prepare sample hazardous substance information forms for known hazardous materials at the Site; and

- v) Oversee the Site Safety Officer's activities. The Safety Officer will maintain an appropriate level of contact with the Site Safety Officer to ensure that the HSP is properly implemented.

The Site Safety Officer will:

- i) Be responsible for daily enforcement and monitoring of the HSP;
- ii) Be responsible for assisting the Safety Officer in the initial training of all on-Site personnel with regard to this safety plan and other safety requirements to be observed during Site activities, including;
 - a) potential hazards,
 - b) personal hygiene principles,
 - c) personnel protective equipment,
 - d) respiratory protection equipment usage and fit testing, and
 - e) emergency procedures dealing with fire and medical situations;
- iii) Be responsible for alerting the Engineer prior to the Contractor starting any particularly hazardous work;
- iv) Be responsible for the maintenance of separation of any Exclusion Zone and Support Zone areas as described hereafter;

- v) Maintenance of the emergency contingency plan; and
- vi) Coordinate all on-Site air monitoring.

The Site Safety Officer will be currently certified in first aid and cardiopulmonary resuscitation.

4.0 MEDICAL SURVEILLANCE

In accordance with requirements detailed in 29 CFR 1910.134, and 29 CFR 1910.120, all Site personnel who will be required to work in the Exclusion Zones will receive medical surveillance by a licensed occupational physician or physician's group.

Personnel medical records will be maintained by either the consulting physician or by the Contractor's medical or personnel officer. If the records are kept by the Contractor, they will be filed in locked file cabinets with access limited to the Contractor's designated officer. A record of which tests were performed as part of the medical surveillance program and a copy of the consulting physician's statement regarding the tests and the employee's suitability for work will be kept at the Site. Personnel medical records and the results of the tests performed on each person will not be maintained at the Site. The physician's statement will be provided to the Engineer prior to commencing Site activities. The medical records will be available to the employee or his designated representative upon written request, as outlined in OSHA Regulation 1910.120 (f).

Personnel involved in work with waste materials during the duration of the project must be in the Contractor's medical surveillance program prior to working on Site. All on-Site Contractor personnel who will be required to work in any Exclusion Zones will have been provided a medical exam within one year prior to commencing work on Site.

The Contractor will be responsible to ensure that the necessary medical examinations are conducted on all on-Site Contractor personnel who will be expected to work in the Exclusion Zones prior to commencing work which requires respiratory protection. The Contractor will provide the medical certificates of approval to the Engineer and will ensure that personnel not obtaining such certificates will not enter or work in the Exclusion Zones. Non-Contractor personnel required to enter or work in the Exclusion Zones will provide proof of medical surveillance prior to their entry into the Contaminant Reduction Zones or Exclusion Zones.

Interim medical surveillance will be completed as required, such as when an individual exhibits poor health or high stress responses due to on-Site activity or when accidental exposure to elevated concentrations of contaminants occur.

Medical surveillance for personnel who will only occasionally enter the Contaminant Reduction Zones or Exclusion Zones will be established in accordance with 29 CFR 1910.120. As stated, medical surveillance will be required for those personnel "who are or may be exposed to hazardous substances or health hazards at or above the established permissible exposure limits for those substances, without regard to the use of respirators, for 30 days or more a year", or "who wear a respirator for 30 days or more a year". Medical surveillance for these personnel will be established on an individual basis.

5.0 TRAINING

The Contractor will provide and require that all personnel assigned to or entering the Site complete training or refresher sessions. Training and refresher sessions will ensure that all personnel are capable of and familiar with the use of safety, health, respiratory and protective equipment and with the safety and security procedures required for this Site. Training will meet the requirements of 29 CFR 1910.120 and documentation of successful completion of the training must be provided to the Engineer for each worker prior to commencing work on Site. At least one of the contractor personnel on Site will have successfully completed supervisor training in accordance with 29 CFR 1910.120 for Hazardous Waste Operations and Emergency Response.

The Contractor's representative will provide and conduct a training program for all Site personnel prior to commencing work within the Exclusion Zones. This training program will address as a minimum the following topics:

- i) Potential hazards;
- ii) Biology, chemistry and physics of Site-specific hazardous materials;
- iii) Rights and responsibilities of workers under OSHA and related additional legislation of the State of New York;
- iv) Task standard safety operating procedures;
- v) Types of monitoring equipment to be used;
- vi) Site Safety and Health Plan;
- vii) Internal and External Communications;

- viii) Medical surveillance program;
- ix) Personal protective clothing and equipment;
- x) Respiratory equipment including training and qualitative fit-testing for half-facepiece and full-facepiece respirators and use of self-contained breathing apparatus;
- xi) Air monitoring program;
- xii) Decontamination procedures;
- xiii) Evacuation, first aid and emergency procedures dealing with fire and medical situations;
- xiv) Work zones established at the Site;
- xv) Safe work practices associated with employee's work assignment, including dust control measures, hazardous materials recognition, and use of the buddy system;
- xvi) Basic operational safety, emphasizing hazards expected on Site;
- xvii) Prohibitions (general)
 - (a) facial hair such as beards and long sideburns which interfere with respirator fit; and
- xviii) Prohibitions (inside Exclusion and Contaminant Reduction Zones), including:
 - (a) Contact lenses,
 - (b) Eating, drinking, smoking, chewing in the Exclusion or Contaminant Reduction Zones,
 - (c) Personal articles, e.g. watches, if not protected by appropriate personal protective equipment, and
 - (d) Working when ill.

All personnel assigned to the Site will receive safety and health training, and upon completion of training will be recorded on Training Acknowledgment Form which will be submitted to the Engineer. The Training Acknowledgment Form will include provisions for the following information:

- i) Employee or visitor's name;
- ii) Verification of topics covered, including;
 - (a) Materials used,
 - (b) Equipment demonstration,
 - (c) Hands-on equipment practice for each employee,
 - (d) Prohibitions covered,
 - (e) Buddy-System Explanation, and
 - (f) Standard Operating Procedures; and
- iii) Date and Signature.

A sample of a Training Acknowledgment Form is included in Appendix A. All personnel assigned to the project will receive and be required to read the Site Health and Safety Plan. Following review of the Site Health and Safety Plan, all personnel are required to sign the acknowledgment form, a sample of which is presented in Appendix B.

There will be weekly safety training sessions conducted by the Site Safety Officer. The purpose of this training is to reinforce the proper procedures, to correct any deficiencies noted in the health and safety program, and to prepare the workers for any change in the health and safety program due to changes in the operations or unanticipated problems. Documentation

of this training will be submitted to the Engineer. Documentation will include the topic(s) covered and a signed list of attendees.

The Site Safety Officer will be responsible for ensuring that personnel that do not successfully complete the required training are not permitted to enter the Exclusion and Contaminant Reduction Zones.

5.1 VISITOR SAFETY TRAINING PROGRAM

All visitors who enter the Contaminant Reduction Zone or Exclusion Zone will be required to undergo a one-hour training program conducted by the Site Safety Officer in addition to the training required to meet the requirements of 29 CFR 1910.120. This training will be provided if the training does not prevent the Safety Officer from performing his/her designated duties, consequently causing a delay in Site work. If the Site Safety Officer is not available to perform the training, visitors will not be allowed to enter the Exclusion Zone until the necessary training can be performed. The training will consist of at least the following:

- i) Hazards potentially present at the Site;
- ii) Potential health or safety effects of these hazards;
- iii) Progress of work and the relationship of the present work in regard to the type of hazards that may be encountered;
- iv) Emergency signals and procedures;
- v) Type, limitations and use of personal protective equipment;
- vi) General safety rules and policies in effect at the Site; and

vii) Completion of a Training Acknowledgment Form.

If a visitor does not, for any reason, obtain the required training, he/she will not be permitted into these work zones.

6.0 RESPIRATOR PROGRAM

All on-Site personnel will receive training in the use of, and be fit tested for a full- facepiece respirator. All on-Site personnel requested to work within the Exclusion Zones will also receive training in supplied air breathing apparatus, and will be required to comply with their employer's specific written respiratory protection program.

Levels of respiratory protection have been chosen to be consistent with the regulations written in OSHA 1910.120 (c)(5)(iii). Level B respiratory protection (supplied air respirators either positive pressure-demand or self contained breathing apparatus) will be worn when handling waste streams which have not been fully characterized. Level C respiratory protection (air purifying respirators) will only be worn after waste streams have been fully characterized and a determination has been made by the Safety Officer that Level C respiratory protection is appropriate. This determination will be based on the potential airborne presence of compounds with the lowest recommended threshold limit value, their concentration levels in on-Site media, and upon the type of work activity being conducted. Table 11.1 presents the required respiratory protection levels for the specific work activities to be conducted on Site.

Prior to commencing Site activities and regularly during the active operations, both the Contaminant Reduction Zones and the Exclusion Zones will be monitored with appropriate monitoring equipment to determine the presence of any immediate dangers to life and health levels.

Respirator cartridges to be used in the full facepiece air purifying respirators if it is determined that they may be worn will be made by the same manufacturer as the facepieces in accordance with OSHA regulations. All air purifying respirators will be provided with appropriate cartridges as determined by the Safety Officer.

The Site Safety Officer will be responsible for implementing, maintaining and enforcing the respirator program. All respiratory protection devices will be cleaned daily and properly stored.

On-Site personnel unable to pass a respirator fit test will not enter or work in any Exclusion Zones or Contaminant Reduction Zones.

7.0 WORK AREAS

The Contractor will ensure that all personnel entering or exiting the Site will write the following information in an entry/exit log sheet:

- i) Date;
- ii) Name;
- iii) Name of Firm;
- iv) Time In;
- v) Time Out;
- vi) Safety Plan Read (Note Yes);
- vii) Site Visited or Location;
- viii) Protective Equipment Level (A, B, C, D);
- ix) Respirator/Medical Paper Work; and
- x) Remarks.

The Contractor will clearly lay out and identify work areas in the field and will limit equipment, operations and personnel in the areas as defined below prior to initiation of Site activities.

Exclusion Zone

This will include all areas in which soils or drums are being excavated, staged, sampled or handled, and surface areas adjacent to these areas which may be affected during these operations.

The Exclusion Zone will be clearly demarcated in the field with a Site control fence (temporary snow fence) or flagging tape at the Support Zone.

Access to the Exclusion Zone will be restricted to personnel who are wearing the proper personal protective equipment, have received the required medical examination, and have undergone the safety and health training. Eating, drinking, or smoking is prohibited in this area. A log of entry to and exit from any Exclusion Zone will be maintained for the purposes of stress monitoring and determining exposure times.

Contaminant Reduction Zone

This zone will occur at the interface of any Exclusion Zone and the Support Zone and will provide for the transfer of any construction materials and equipment, the decontamination of off-Site transport vehicles prior to entering the Support Zone, the decontamination of personnel and clothing prior to entering the Support Zone and for the physical segregation of the Support Zone from the Exclusion Zone.

Access to the Contaminant Reduction Zone will be restricted to personnel who are wearing the proper personal protective equipment, have undergone the medical examination, and have participated in the training program. Eating, drinking, or smoking is prohibited in this area.

Support Zone

This area includes the mobile office area and support facilities located within the Site perimeter fencing. The Support Zone will be clearly delineated and procedures will be implemented to prevent active or passive contamination from other work zones. The function of the Support Zone includes:

- i) An entry area for personnel, material and equipment to the Exclusion Zone;
- ii) An exit area for decontaminated personnel, materials and equipment from the Exclusion Zone;
- iii) The housing of Site special services; and
- iv) A storage area for clean safety and work equipment.

8.0 COMMUNICATIONS

The Contractor will provide telephone communication for the Site. Emergency numbers including police, fire, ambulance, hospital, poison control center and appropriate regulatory agencies will be prominently posted near each phone. A list of emergency telephone numbers is presented in Appendix C. In an emergency situation, the Site Safety Officer will be notified immediately. The Site Safety Officer will then be responsible for making the necessary contacts with off-Site emergency facilities.

In addition, key personnel will be equipped with radio communication.

Additional personnel will be provided with radio communication as deemed appropriate by the Contractor's Site Safety Officer.

9.0 EMERGENCY AND FIRST AID EQUIPMENT

The safety equipment listed below will be located and maintained within any Contaminant Reduction Zone or within any Exclusion Zone at appropriate locations as directed by the Site Safety Officer. The placement of the equipment will be at the discretion of the Site Safety Officer and will be located close to areas where drums are being handled at the point-of-excavation.

- i) portable emergency eye wash and shower;
- ii) two twenty-pound ABC type dry chemical fire extinguishers;
- iii) two Self-Contained Breathing Apparatus (SCBA) units, with a minimum of two spare tanks;
- iv) approved industrial First-Aid Kit for a minimum of 25 personnel, complete with buffer solutions for treating acid and caustic burns;
- v) Stretcher;
- vi) fire blankets; and
- vii) air horn.

10.0 EMERGENCY RESPONSE PLAN

10.1 PRE-EMERGENCY NOTIFICATION

Prior to site activities, notification will be made to the Onondaga Nation, restaurant proprietors and residents in the immediate area of the Site.

10.2 SITE SECURITY

A snow fence will be maintained around the perimeter of the Site throughout the duration of the project. A lockable gate will be installed across the Site access road to restrict unauthorized vehicular access to the Site. The gate will be locked when the Site is unattended.

During active waste handling, security shall be provided by the Contractor. The Contractor's duties shall include:

- i) limit vehicular access to the Site to authorized vehicles and personnel only;
- ii) provide initial screening of all Site personnel and visitors. A list of authorized personnel and the name of their employer will be available at the Site;

- iii) maintain a security log in which documentation is provided of all Site personnel, visitors and deliveries and any security incidents. This log will include the date, name, address, company, time in and time out for each employee and visitor. If unauthorized personnel are observed on Site and refuse to vacate the premises, appropriate law enforcement officials will be contacted for appropriate legal actions; and
- iv) maintain a visitor log at the Site. Visitors will not be allowed to enter without the knowledge of the contractor and approval of the Field Engineer. All visitors will be required to complete training in accordance with the HSP prior to gaining access to the secured areas of the Site (e.g. excavation areas).

10.3 ON-SITE CONTINGENCY PLAN

If release of hazardous material occurs on Site, the protocols presented in Section 10.5 will be followed and the following actions will immediately be taken:

- i) the individual that observes the release will immediately notify the Field Engineer and Site Safety Officer;
- ii) take immediate action to control and contain the release within the Site boundaries;
- iii) keep unnecessary personnel away, isolate the area of release, and deny entry;
- iv) do not allow anyone to touch released material;

- v) stay upwind; keep out of low areas; and
- vi) keep combustibles away from the released material.

If human health or the environment are threatened, the Field Engineer will notify the National Response Center (NRC) (800) 438-2427, the State Emergency Response Center (SERC) (518-457-4107), Chief Irving Powless of the Onondaga Nation (315-492-4210) and any potentially effected area residents or establishments as soon as possible . The SERC and the NRC will be notified of any release of reportable quantities including all releases which threaten human health or the environment. The EPA will be notified of all releases within 24 hours and will determine if releases other than those noted above require notification to the NRC.

An employee alarm system to signify a major release or an emergency will consist of three short blasts using an air horn. An air horn will always be maintained at the Site during active work hours and will be immediately available to all personnel involved in Site activities.

Upon implementing the above procedures, the immediate areas of the release, including downwind areas, will be scanned with the HNu to identify the level of protection required for personnel safety equipment to clean up the released material. As a minimum, personnel will wear all protective clothing specified in the HSP including supplied air respiratory protection as required. Air monitoring will determine if the level of respiratory protection can be downgraded. The air monitoring action levels as presented in the HSP will be followed during any clean-up of a release.

Should releases occur from drums containing solid wastes, the released material will be placed into containers and covered. Each container will be labelled as to contents.

Liquid and/or sludge spills will be first covered with an absorbent to absorb any free liquids to minimize the amount that may infiltrate into the ground. The absorbent material and soils contacted by the spill will be excavated and placed in containers. These containers will be labelled to indicate contents.

An assessment will then be made to determine the need to conduct post-cleanup soil sampling and analysis. EPA will be provided with a copy of the assessment report. Collected samples will be analyzed for the waste constituents previously identified on Site. If analytical data are available for the released materials, these data will be used to determine the analytes of concern.

A release report will be prepared by Stauffer and submitted to the EPA, and the Onondaga Nation summarizing the release and response action.

10.4 OFF-SITE CONTINGENCY PLAN

Only authorized transporters, as discussed in Section 9.2.2 of the Clean-up Plan, will be used for the transportation of hazardous waste.

If a release of material from a transport vehicle occurs while in transit, the following actions will be taken by the transport operator to reduce potential migration of the waste material.

- i) Immediately notify the Contractor, who will in turn notify the Stauffer Project Manager (Mr. L.A. Freese (302)886-4384), and the EPA OSC. In the event of a release of a reportable quantity, the National Response Center will also be notified;
- ii) Take immediate measures within the capabilities of the transport driver to control the release, if necessary;
- iii) Contain and eliminate the release, if possible;
- iv) The driver must remain within a safe distance of the vehicle, and will keep unnecessary people away, isolate the area of the release and deny entry to unauthorized personnel;
- v) Stay upwind, keeping out of low areas, and do not allow contact with the released material;
- vi) Contact the appropriate local authorities (police, fire department, traffic control, etc.) and local hazardous materials response unit; and,
- vii) Other actions, as advised by the local spill response authorities.

Upon implementing these procedures, the same action to clean up the release will be implemented as described in Section 10.3.

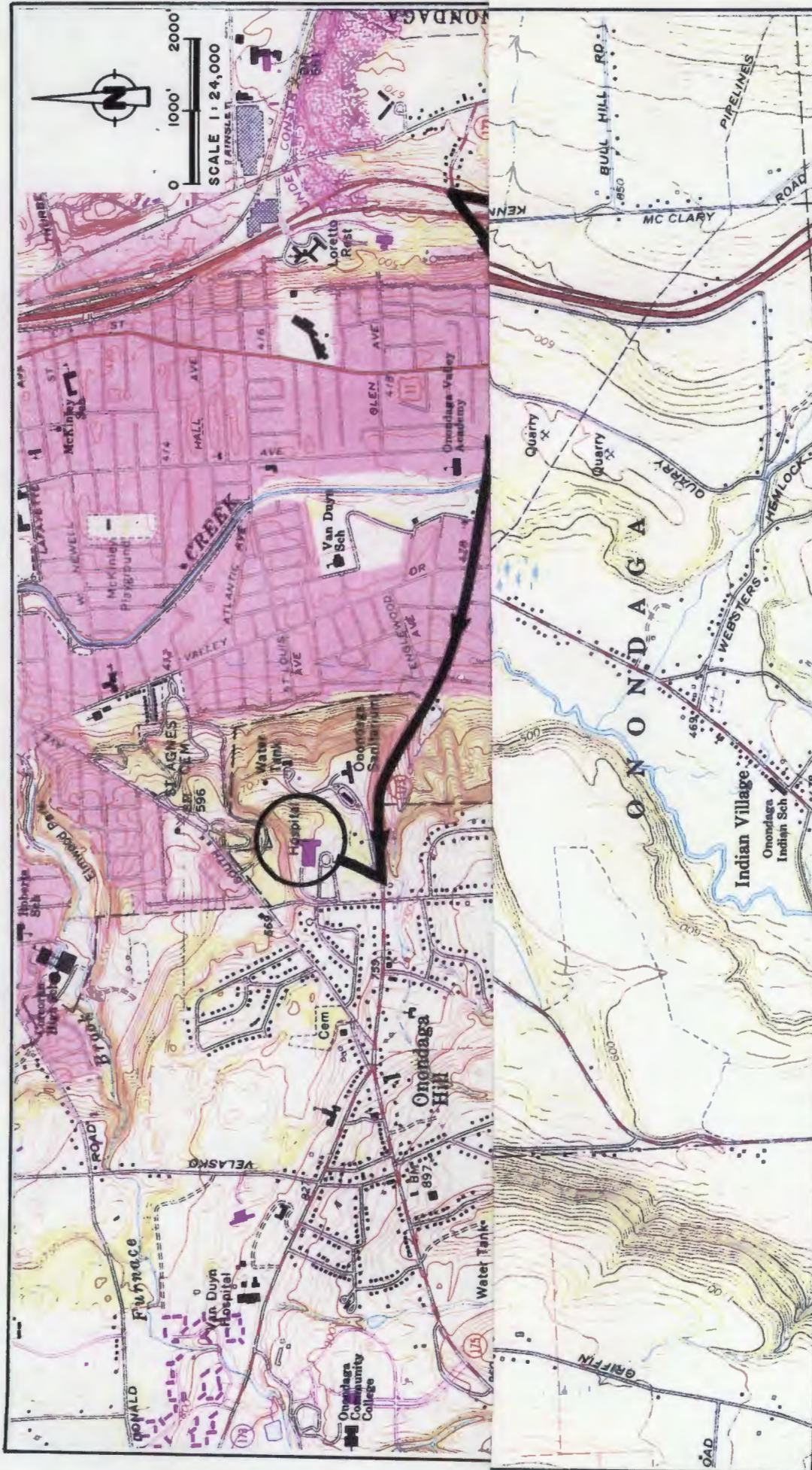
10.5 PERSONNEL EMERGENCY CONTINGENCY PLAN

In the event of serious injury to on-Site personnel or contact with hazardous materials requiring medical attention, the Contractor will ensure that the following protocol will be followed:

- i) in the event of an injury or chemical exposure, notify the Site Safety Officer who shall notify the Field Engineer and the Contractor's Project Manager;
- ii) the Site Safety Officer will be responsible for contacting the necessary off-Site emergency facilities, with the Field Engineer as backup if the Site Safety Officer is unavailable;
- iii) decontaminate personnel and administer appropriate first aid as required;
- iv) transport personnel to the designated medical facility. The closest medical facility to the Site is the Community General Hospital. The most direct route to the hospital is presented on Figure 10.1.

The following directions describe the best route to the Community General Hospital:

- 1) Take Route 11 south to the junction of Route 81.
- 2) Take Route 81 north to the next exit (Rockcut Road Brighton Ave.)
- 3) Get off at this exit and proceed west on Route 173.



MAP SOURCE: SOUTH ONONDAGA, N.Y.
QUADRANGLE USGS 7.5 SERIES

figure B.10.1
HOSPITAL ROUTE
Onondaga Drum Site

CRA

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- 4) Go approximately 2 miles and Community General is located up on a hill.

Fire fighting equipment (extinguishers) will be maintained in strategic locations within the Site to combat localized fires. The locations will be marked by an appropriate and highly visible sign. The Contractor shall ensure that designated personnel will be available whom are trained in fire fighting procedures and whom will be equipped with self-contained breathing apparatus when involved in fighting fires involving chemical substances which require the use of such respiratory equipment.

In the event of significant release of toxic or hazardous vapors from any source the source of such vapors will be immediately contained by overpacking or covering with fill. Equipment operators will utilize self contained breathing apparatus during such operations. Alternate plans of contaminant removal will be developed by the Contractor and submitted to the Field Engineer prior to recommencing work in the area.

In the event that an accident or some other incident such as an explosion or an exposure to toxic chemical levels occurs during the course of the project, the Site Safety Officer shall notify the Field Engineer immediately and undertake corrective actions. The Site Safety Officer shall sound the fire alarm should conditions warrant evacuation of the area of the incident. The Site Safety Officer shall provide a written report, within 24 hours, to the Field Engineer. The report will include the following items:

- a) Name, organization, telephone number, and location of the Contractor,
- b) Name and title of the person(s) reporting the incident,
- c) Date and time of accident/incident,
- d) Location of accident/incident giving pertinent details,
- e) Brief summary of accident/incident giving pertinent details including type of operation ongoing at time of accident,
- f) Cause of accident/incident, if known,
- g) Casualties (fatalities, disabling injuries),
- h) Details of any existing chemical hazard of contamination,
- i) Estimated property damage, if applicable,
- j) Nature of damage and effect on contract schedule,
- k) Action taken by the Contractor to ensure safety and security, and
- l) Other damage or injuries sustained (public or private).

Following Site mobilization and prior to commencing Site activities, the Site Safety Officer will establish designated meeting places for personnel in the event that on-Site work zone evacuation is required. The Site Safety Officer will select these locations such that they are upwind of work zones based on wind directional monitoring.

10.6 HEALTH AND SAFETY PLAN REVIEW

Periodically or as required, the Site management team will review the emergency response plan and modify any section to account for changing Site conditions.

In the event of any Site emergency, a meeting will be held to discuss and critique the emergency response actions which were undertaken. Amendments to the emergency response plan will be made as necessary based on the findings of the meeting.

11.0 SPILL CONTROL AND RESPONSE

11.1 SCOPE

During all active work at the Site involving the transport and handling of excavated drums or other wastes, the Contractor will be required to implement and maintain an on-Site and off-Site Spill Control and Response Plan. This plan, as presented herein, will provide contingency measures for potential releases of material from drummed or other wastes handled on Site.

11.2 MATERIAL HANDLING

a) Bulked Liquids and Solids

All vehicles provided for the handling of bulked liquids (e.g. wastewater) and solids will be required to be in a good state of repair and will be operated by trained operators in a safe manner to prevent spills during handling. Should any tankers be used for hauling bulked liquids, they must be licensed for that purpose and must be inspected to ensure that all valves, manways and other access ports are secured to prevent leaks. Prior to use, the hauler will be required to document that the tanker is clean. Haulage units used for bulked solids will be inspected to ensure that their tailgates are secured and the loads are tarped to avoid spillage or tracking of excavated material.

b) Drummed Waste

The handling and transport of drummed waste will be, at all times, conducted in a controlled and safe manner which will minimize damage to structurally sound drums, repacks or overpacks. Section 2.0 of the Clean-up Plan addresses drum handling procedures and equipment to be used which provides protection for the handling of explosive and/or shock sensitive waste.

Extreme care will be exercised in opening drums or other sealed containers in which the contents may be harmful to sampling personnel. When practical, a drum will not be moved or opened unless the drum appears to be structurally sound.

Drums will be opened in such a manner that excess interior pressure, as evidenced by bulging or swelling, has been safely relieved. If pressure cannot be relieved from a remote location, appropriate shielding will be placed between sampling personnel and the drums to reduce the risks of injury.

Prior to transferring drums to the appropriate staging facility all drums will be overpacked into DOT approved 85-gallon salvage drums. All drums that cannot be moved without rupture, leakage or spillage will be emptied into a DOT approved 85-gallon salvage drum using a portable hand pump (for liquid wastes) or a hand shovel (for solids and sludges). Drums shall be moved by grappler, non-metallic slings, within a backhoe bucket or front-end loader or by other means that will minimize damage to

containers and release of contents therefrom. A minimum inventory of 10 additional overpack units, in addition to those required to overpack the drums, will be provided on Site adjacent to the staging area and each active excavation area.

c) Equipment

The following equipment will be available on Site and used for any unexpected spills:

- i) sand, fill or other non-combustible absorbent;
- ii) 85-gallon DOT approved overpack drums (10 adjacent to staging area and each active excavation area);
- iii) front end loader and/or backhoe; and
- iv) shovels.

Hand tools which are used will generally be discarded with the waste material unless it is determined appropriate to decontaminate the tools. If tools are decontaminated, they will receive a detergent wash in addition to steam cleaning or hot water washing.

11.3 SPILL PREVENTION AND RESPONSE

The handling and transport of drummed waste will be, at all times, conducted in a controlled and safe manner which will minimize damage to the containers and prevent release of the contents. All intact

drums with contents will be overpacked prior to removal to the appropriate staging facility, thereby mitigating the potential of leakage during movement to the staging facility. Additional overpack units will be provided at the excavation area for use in the event of leakage or spillage.

In the event that a drum or container of liquid is spilled outside of the excavation areas, the drum handling team will immediately respond to the spill. The spilled liquids will be confined to the immediate area of the spill and the liquids will be pumped, with the use of a portable hand pump, into a repack drum. The spilled liquids will be confined by diking around the spill with native material or with an inert absorbent. Any residual liquids which cannot be pumped will be absorbed with a sufficient quantity of inert absorbent to ensure that no free liquids remain. If the spill occurred on soil, the visibly affected soil will be treated as contaminated material based on a visual determination of spill contamination. This material will be considered grossly contaminated soil and will be staged accordingly. Spills that occur outside of an area of excavation will be marked and reported to the EPA.

Liquids spilled within excavations will be pumped, with the use of a portable hand pump, into a repack drum. Soil/fill adjacent to the spill area will be placed to absorb any residual liquid. Materials underlying the spill zone will be treated as contaminated materials based on a visual determination of spill contamination. This material will be excavated and staged in the stockpile of grossly contaminated soils , as discussed in Section 3.2.4 of the Clean-up Plan.

In the event that a spill comes into contact with standing water, the effected water will be pumped from the excavation, containerized, and disposed/treated in accordance with applicable regulations. Absorbent material will be available during excavation of buried drums and handling of waste for use in the event of a liquid spill.

12.0 PERSONAL SAFETY AND RELATED EQUIPMENT

The Contractor will ensure that all on-Site personnel are equipped with the proper personal safety equipment and protective clothing appropriate for the hazardous material being handled and the nature of work being completed. The Contractor will ensure that all safety equipment and protective clothing is kept clean and well maintained. The personal protective equipment required for various work activities is summarized on Table 12.1 and described in the following sections. Respiratory protection will be in accordance with Section 6.0.

12.1 NON-HAZARDOUS WORK ACTIVITIES

Safety equipment and apparel required for non-hazardous work activities consists of the following standard issue, Level D protection work wear:

- i) hardhats;
- ii) safety shoes or boots;
- iii) eye protection;
- iv) hearing protection if applicable;
- v) workgloves;
- vi) coveralls and outerwear; and
- vii) safety harnesses and other equipment, as required.

TABLE 12.1

SUMMARY OF PERSONAL PROTECTIVE EQUIPMENT

<i>Work Activity</i>	<i>Personal Protective Equipment Required</i>
1) Site Preparation Activities (e.g. installing fence and geophysical surveying).	Level D or Level C if air monitoring indicates the need
2) Non-Hazardous Work Activities (no dermal or inhalation exposure to waste materials e.g. handling of sealed drums, sampling off-Site potable wells and off-Site shipment of all waste material).	Level D
3) Test Pit Excavations.	Level B if drums are encountered or if organic vapor levels are greater than 5 ppm in worker breathing zones, otherwise Level C
4) Drum Excavation and Removal.	Level B
5) Sampling of Uncharacterized Drums of Waste.	Level B
6) Sampling of Characterized Waste Drums.	Level B or Level C as determined by the Safety Officer
7) Sampling of Soils.	Level C or Level B if organic vapor levels are greater than 5 ppm in worker breathing zones
8) Decontamination Activities.	Level C or Level B if organic vapor levels are greater than 5 ppm in worker breathing zones

Non-hazardous work activities are defined as those activities which would result in neither dermal nor inhalation exposure of workers to hazardous substances. The primary hazard to workers are those associated with heavy construction activities, i.e. moving machinery.

Non-hazardous work activities include:

- i) All Site preparation activities;
- ii) Geophysical surveying;
- iii) Moving overpacked drums;
- iv) Sampling off-Site potable water wells; and
- v) Off-Site shipment of all waste material.

12.2 GENERAL EXCLUSION ZONE ACTIVITIES

The hazards presented to workers conducting general Exclusion Zone activities will include potential inhalation and dermal contact with Site substances in addition to general construction related hazards. There may also be a cut and puncture hazard should metallic debris be encountered. The use of respiratory protection will also increase the potential for "slip and trip" type accidents to occur. General Exclusion Zone activities include:

- i) Test Pit Investigations;
- ii) Drum Excavation and Removal;
- iii) Drum Sampling and Soil Sampling Activities; and

iv) Decontamination Activities.

All excavation activities will be conducted in accordance with OSHA excavation regulations (29 CFR Part 1926 Subpart P) to ensure worker safety during excavation activities.

Safety equipment and apparel required for general exclusion zone work will consist mainly of Level B protection which includes Level D wear supplemented by the following:

- i) Disposable outerwear, (e.g., Saranex® coveralls), the zipper of the outerwear will also be taped;
- ii) Rubber overshoes or overboots taped to disposable outerwear;
- iii) outer nitrile gloves (e.g. Edmont 37-165) taped to disposable outerwear and inner surgical nitrile gloves; and
- iv) Supplied air respirator (MSHA/NIOSH approved) consisting of a full facepiece positive pressure-demand, self contained breathing apparatus (SCBA) or positive pressure airline respirators equipped with a 5-minute escape pack. Breathing air will be certified grade "D".

If Site conditions change and the waste streams become fully characterized, the Safety Officer may determine that Level C protection will be adequate for Site activities. Soil sampling activities and decontamination activities may be conducted in Level C protection as long as

organic vapor readings taken at the time of sampling show less than 5 ppm in breathing zones. In these cases Level C protection will include Level D protection supplemented by the following:

- i) Disposable outerwear, (e.g. Saranex® coveralls). The zipper of the outerwear will also be taped;
- ii) Rubber overshoes or overboots taped to disposable outerwear;
- iii) outer nitrile gloves (e.g. Edmont 37-165) taped to disposable outerwear and inner surgical nitrile gloves; and
- iv) full-facepiece air purifying respirator equipped with appropriate cartridges as determined by the Safety Officer.

Table 12.1 provides the required level of protection for the specific work activities being conducted at this Site.

Additional protective equipment usage guidelines to be implemented include:

- i) Contact lenses will not be permitted;
- ii) All disposable or reusable gloves worn on the Site will be nitrile rubber/elastic gloves or cotton gloves (for operators) with nitrile gloves worn underneath. All reusable gloves will be checked daily for punctures or tearing prior to donning;

- iii) During periods of respirator usage in contaminated areas, respirator filters will be changed daily or upon breakthrough, whichever occurs first;
- iv) Footwear used on Site will be work shoes or boots, and will be covered by rubber overshoes when entering or working in the Exclusion Zone or Contaminant Reduction Zone;
- v) On-Site personnel unable to pass a respirator fit test will not enter or work in the Exclusion Zone or Contaminant Reduction Zone;
- vi) All on-Site personnel will wear an approved hardhat. The Site Safety Officer will determine when the hard hat protection requirement may be waived;
- vii) All reusable personal protective equipment worn on Site will be decontaminated at the end of each work day. The Site Safety Officer will be responsible for ensuring individuals decontaminate personal protective equipment before reuse;
- viii) Duct tape will be used to ensure that disposable coveralls and gloves are tightly secured with the outerwear outside of the gloves when personnel are working within contaminated zones; and
- ix) Off-Site transport drivers will not be permitted out of their vehicles when in any Exclusion and Contaminant Reduction Zones.

**13.0 PROCEDURES FOR DONNING AND DOFFING OF
PROTECTIVE CLOTHING AND EQUIPMENT**

Donning:

- i) Personally inspect all equipment to be worn by wearer;
- ii) Adjust hard hat for proper fit;
- iii) While standing or sitting, step into legs of suit; ensure proper placement of legs and feet within suit, then gather suit around the waist;
- iv) Put on boots; tape leg cuff of suit over the tops of the boots using duct tape;
- v) Don respirator and adjust it;
- vi) Put sleeves of suit over arms;
- vii) Put on inner gloves;
- viii) Put on hard hat;
- ix) Secure the suit by closing all fasteners. Tape over fasteners if protective flap is not already provided;
- x) Put on outer gloves; tape cuff of sleeve to tops of gloves; and

- xi) Have an assistant check to determine if all equipment is secure and functioning normally and that there are no other problems.

Doffing:

- i) Decontaminate the wearer of equipment first. Boots will be washed off in a boot wash with a soapy water solution;
- ii) Remove any extraneous or disposable clothing, boots, outer gloves, hard hat, and tape;
- iii) Remove arms, one at a time, from suit. Be careful not to have any contact between the outer surface of the suit and the wearer's body. Keep the inner gloves on;
- iv) While sitting, remove both legs from suit;
- v) Remove inner gloves by rolling them off the hand, inside out;
- vi) Remove respirator. Wash respirator in disinfecting solution. Suspend respirator to dry and replace cartridges if wearing air purifying respirators. (Cartridges are to be replaced upon breakthrough or at the beginning of each day.); and
- vii) Remove inner clothing, and thoroughly wash the body (Only necessary at end of work day.).

14.0 HEAT STRESS/COLD STRESS

14.1 HEAT STRESS

Heat stress is one of the most common hazards encountered at a Site, and there are a number of factors which have an effect in determining the amount of heat stress experienced by an individual worker. These factors include environmental conditions, type of clothing worn, workload, and individual characteristics. Since heat stress is a common hazard and has the potential to become a serious illness, the Contractor will develop a program to protect its employees which meets the following requirements.

All employees will be trained in the following:

- i) Individual factors which influence an individual's susceptibility to heat;
- ii) Environmental characteristics such as temperature, humidity, wind speed, and cloud cover;
- iii) Body response to heat;
- iv) Effect of personal protective equipment and workload;
- v) The various types of heat disorders and their associated symptoms; and
- vi) Heat stress program - acclimatization, monitoring, work/rest regimen, and fluid intake (balanced electrolytic fluids).

Training for the heat stress program will be included at the time of the initial training.

Drinking water will be supplied to workers on a regular basis as required to prevent dehydration.

14.2 COLD STRESS

If work is performed during cold months, workers may be exposed to cold stress during the response program. The Contractor will provide appropriate cold weather clothing and heated shelter for all workers and will monitor for cold stress. Workers who are exposed to temperatures below -10°F with wind speeds greater than 5 mph will be medically certified as suitable for such exposure. All workers certified for exposure will adhere to the work warm-up schedule as specified in the current ACGIH standards as outlined in the booklet entitled "Threshold Limit Values and Biological Exposure Indices". A copy of the ACGIH standard will be available on Site for reference if it is anticipated that implementation of the work warm-up schedule will be required.

All workers who may be subjected to cold stress will receive training during the initial Site training session in the following:

- i) Environmental characteristics such as temperature, humidity, wind speed, and cloud cover;
- ii) Body response to cold;
- iii) The various types of cold stress and their associated symptoms; and
- iv) Cold stress program.

15.0 PERSONAL HYGIENE PROTOCOLS

The Contractor will be responsible for, and ensure that all Contractor personnel performing or supervising work activities within the Exclusion Zone, or exposed or subject to exposure to vapors, liquids, or solids containing Site constituents, observe and adhere to the personal hygiene-related provisions of this section. On-Site personnel found to be disregarding the personal hygiene-related provisions of this plan will, at the request of the Engineer or Site Safety Officer, be barred from the Site.

The Contractor will ensure that the following equipment/facilities are available for the personal hygiene of all on-Site personnel:

- i) Suitable disposable outerwear (e.g., Saranex® suits, inner and outer gloves, and respirator cartridges), gloves, footwear, and respiratory protection on a daily basis for the use of on-Site personnel;
- ii) Contained storage and disposal for used disposable outerwear;
- iii) Personnel hygiene facility complete with change area, showers, toilets and washbasins with contained storage for all wash waters;
- iv) Lunch area.

The Contractor will also enforce the following regulations for personnel working within the Exclusion Zone:

- i) On-Site personnel will wear disposable outerwear and gloves at all times whenever entering or working in the Exclusion Zone or Contaminant Reduction Zone;
- ii) Used disposable outerwear will not be reused if deemed to be unsuitable to provide the necessary protection, and when removed, will be placed inside disposable containers provided for that purpose;
- iii) Smoking will be prohibited except in a designated smoking area;
- iv) Eating and drinking will be prohibited except in the designated lunch or break area. An exception to this rule will apply to prevent Heat Stress problems as discussed in Section 14.1, whereby workers will be supplied drinking water on a regular basis;
- v) Disposable outerwear will be removed prior to entering the lunch area, and prior to cleansing hands, face, neck, and other exposed areas; and
- vi) On-Site personnel will thoroughly cleanse their hands and other exposed areas before entering the smoking or lunch area.

15.1 GENERAL SITE SANITATION

General Site sanitation will be implemented pursuant to 29 CFR 1910.120.

16.0 EQUIPMENT AND PERSONNEL DECONTAMINATION

16.1 PERSONNEL DECONTAMINATION

Any Site personnel entering and working within the Exclusion Zone will be required to follow the personnel decontamination procedures presented below.

Personnel decontamination will consist of:

- i) Contaminant Reduction Zone - boot and glove wash with detergent, tape removal, and outer glove removal; removal of boots, gloves, disposable suit, respirator, hard hat, and inner gloves. Personnel decontamination will be conducted at the entrance to the Support Zone away from the equipment decontamination area. Protective clothing which is discarded will be collected and disposed of. Typical personnel decontamination procedures are presented on Figure 16.1; and
- ii) Support Zone - redress area.

All personnel will have removed their protective clothing prior to entering the wash area. Personnel will wash their hands and face in the wash area before entering the lunch and break areas to eat, drink or smoke. At the end of their work shift, personnel will wash and redress in the wash area prior to leaving the Site.

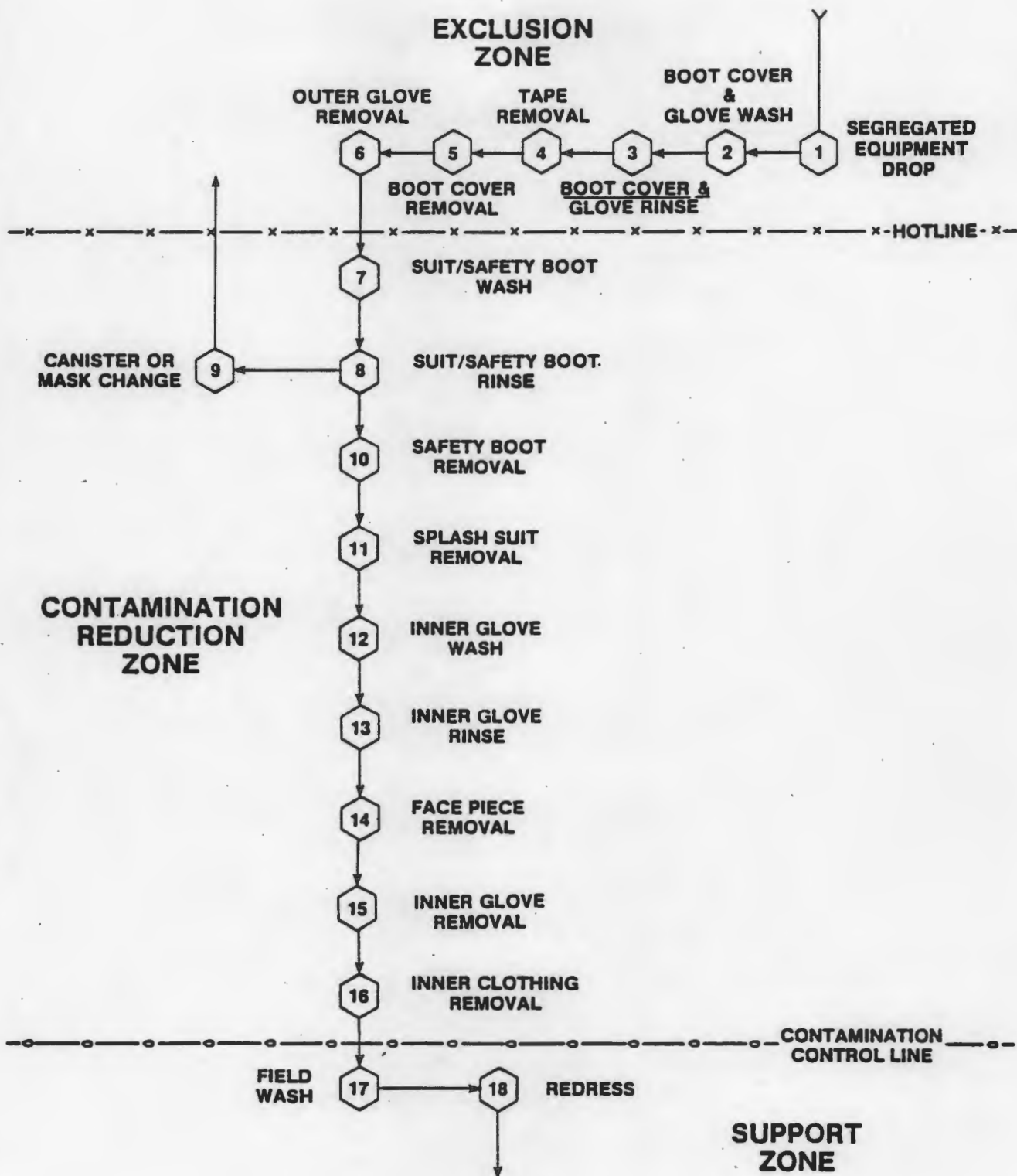


figure 16.1
TYPICAL PERSONNEL DECONTAMINATION PROCEDURES
Onondaga Drum Site

16.2 EQUIPMENT DECONTAMINATION

All equipment used within the Exclusion Zones and which comes in contact with potentially hazardous materials will be decontaminated on the decontamination pad which will be constructed as presented in the Site Work Plan. Decontamination will be in accordance with the protocols presented in Section 8.0 of the Sampling Analysis Plan.

16.3 SAMPLING EQUIPMENT DECONTAMINATION

All sampling equipment used to collect samples for chemical analysis will be decontaminated. Decontamination will be conducted in accordance with the protocols presented in the Sampling and Analysis Plan. Spent cleaning solvents and contaminated rinse water will be collected in a container for future disposal.

17.0 AIR MONITORING

17.1 GENERAL

During the progress of Site activities, the Contractor will complete real-time air monitoring for on-Site air quality. Real-time air monitoring will be conducted for explosive gases, oxygen levels, radiation surveying (instrument to detect alpha, beta and gamma radiation), and total volatile organic vapors. The Contractor's Site Safety Officer will review all of the air data collected during the course of the project on an ongoing basis and in consultation with the Engineer, modify those work practices as necessary.

17.2 BACKGROUND MONITORING

Background monitoring for total organic vapors and radiation levels using real-time monitoring will be conducted prior to initiating Site activities and throughout the period of Site activities. Any departures from general background during this period will be reported to the Engineer who will, in conjunction with the Site Safety Officer, determine the cause of the deviation and need to adjust Site operations.

17.3 REAL-TIME AIR MONITORING

Real-time air monitoring with appropriate instruments that have been properly calibrated will be conducted by the Contractor in

accordance with the requirements of this section of the HSP or as needed. Monitoring will be conducted within the Exclusion Zone, at two Exclusion Zone perimeter locations downwind of excavation or drum handling activities and at one Exclusion Zone perimeter location which is upwind of the activities.

If actual field operations reveal that hourly sampling of the downwind Exclusion Zone perimeter locations is not practical or necessary, adjustments may be made after consultation between the Site Safety Officer and the Engineer. Any such modifications shall be memorialized in writing.

If, during the real-time monitoring, an unexplained meter reading of greater than 1 ppm above background ("background" shall mean the readings obtained at an upwind location which is not being impacted by Site activities) is sustained for a duration of thirty seconds or odors are detected at a downwind Exclusion Zone perimeter monitoring location, the Contractor shall review and modify work procedures at the Site to minimize the potential of air emission levels greater than 1 ppm above the background at the Exclusion Zone. These modifications could include modifying the Exclusion Zone boundaries; reducing the area of open excavation; and/or reducing the rate at which materials are excavated. If these actions are insufficient to control emissions, additional engineering controls such as foam, water, and/or enclosures would be considered. These additional engineering controls are beyond the current scope of work and would have to be further evaluated if deemed necessary.

If air emission levels are consistently greater than 1 ppm above background, Stauffer may collect air samples to confirm the identity of the detected parameters and modify the action level as appropriate. The Contractor shall notify the Field Engineer of any readings greater than 1 ppm above background recorded at the Exclusion Zone perimeter.

In addition to the Exclusion Zone perimeter monitoring, the Contractor shall monitor the immediate area of active work at a frequency of once per half hour or as needed in the breathing zone for organic vapors to document worker exposure levels and to evaluate requirements for any future respiratory use guidelines. This monitoring will be conducted with either a photoionization detector or flame ionization detector. In addition, monitoring will be conducted for explosive gases, oxygen levels and radiation surveying of waste materials in the Exclusion Zone on an as needed basis. Table 17.1 presents air monitoring action levels.

17.4 PERSONAL MONITORING

In addition to performing real time monitoring for total volatile organics, personal monitoring will be conducted for those employees with the highest potential for exposure to Site contaminants. It is expected that personnel involved in drum excavations and drum sampling, if required, will be the individual(s) on which personal sampling will be performed.

TABLE 17.1

AIR MONITORING AND AIR MONITORING ACTION LEVELS

<i>Monitoring Device</i>	<i>Action Level</i>	<i>Action</i>
Combustible Gas Indicator	>1% LEL 10-20% LEL	Limit ignition sources work with caution be prepared to cease operations
	>20% LEL	Cease operations and move to a safe place. Notify the Site Safety Officer. <u>Do not continue working until conditions are constantly below 20% LEL</u>
Oxygen Meter	<19.5%	Workers must be in supplied air respirators
	>23.5%	Shut down activities. Determine the source and take corrective actions. Notify the Site Safety Officer.
Photoionization or Flame Ionization Device	>5 ppm sustained at downwind perimeter of the Exclusion Zone	Shut down activities. Implement engineering controls.
Radiation Survey Meter	> 2 mR/hr	Shut down activities. Evacuate area. Notify the Engineer, Site Safety Officer and Safety Officer so the situation may be addressed.

The analytical results of the composite sampling of previous drums found at the site (see Appendix A of the Drum Disposal Plan) conducted by the EPA in January and February 1992 indicate that the primary chemicals of concern with the greatest potential to become airborne are the volatile organic compounds: xylene, toluene and benzene. Although concentrations of several semi-volatile organic compounds were detected for composite sample number 10, obtained from six individual drums; these compounds have a much lower potential to become airborne and, therefore, will not be monitored. At a minimum, personal monitoring for xylene, toluene and benzene will be conducted during drum excavation and sampling activities utilizing either air sampling pumps with charcoal adsorber tubes and/or passive dosimeters. If charcoal tubes are used, the National Institute for Occupational Safety and Health (NIOSH) Method 1501 will be employed.

The contractor's health and safety plan will specify the sampling methodology and procedures to be used for conducting the personal monitoring.

The results of the personal monitoring program will be provided to the personnel that were monitored, the Field Engineer and the EPA.

17.5 WIND DIRECTIONAL MONITORING

The Contractor will furnish and maintain a wind circulation sock at the drum staging area to provide information to assist in the determination of the direction of any potential emissions migrating from the Site. Perimeter air monitoring locations may be adjusted based upon the wind directional monitoring.

17.6 ANALYSIS CALIBRATION AND DATA REPORTING

Calibrations of all monitoring equipment will be completed by the Contractor on a daily basis.

The Field Engineer will be immediately advised when results indicate:

- required modifications to existing Site protocols;
- excessive exposure to employees; and
- possibility of excessive contamination having occurred in off-Site regions.

Results will be reported verbally to the Field Engineer immediately if they require a decision on Site operation or daily when no excursions are reported. Written data sheets detailing monitoring results will be presented to the Field Engineer the following day. The air monitoring report forms will include the following information:

- i) Site Location/Date
- ii) Work Process/Operation Name
- iii) Sampling Method Used
- iv) Instrument Calibration Record at Sample Location
- v) Temperature, Pressure, Humidity at Sample Location
- vi) Area Sampling Location Diagram
- vii) Area Sample Description/Location
- viii) Field Notes
 - Description of Operations and Complaints/Symptoms
 - Chemicals/Materials/Equipment in Use
 - Engineering/Administration Controls in Effect
 - Personal Protective Equipment in Use
 - Sampling Observations/Comments

18.0 CONTAMINANT MIGRATION CONTROL

All vehicles and equipment used in the Exclusion Zone will undergo decontamination procedures in the Contaminant Reduction Zone prior to leaving the Site. The Contractor's Site Safety Officer will certify that each piece of equipment has been decontaminated prior to removal from Site.

Decontamination will include the thorough cleaning of equipment with a high pressure hot water cleaner, and will be performed at the equipment decontamination facility constructed within the Contaminant Reduction Zone.

Personnel engaged in vehicle decontamination will wear protective equipment including appropriate disposable clothing and respiratory protection.

19.0 PARTICULATE EMISSION CONTROL

During all Site activities, the Contractor will implement and enforce a dust control program to minimize the generation and off-Site migration of fugitive particulate emissions.

All roadways, designated work areas and other sources of dust generation will be controlled by application of water and/or calcium chloride as determined necessary by the Engineer in consultation with the Site Safety Officer.

20.0 SAFETY MEETINGS

The Site Safety Officer will conduct weekly safety meetings which will be mandatory for all Site personnel. The meetings will provide refresher courses for existing equipment and protocols, and will examine new Site conditions as they are encountered.

Additional safety meetings will be held on an as required basis.

Should any unforeseen or Site-peculiar safety related factor, hazard, or condition become evident during the performance of work at this Site, the Contractor will bring such to the attention of the Engineer in writing as quickly as possible. In the interim, the Contractor will take prudent action to establish and maintain safe working conditions and to safeguard employees, the public, and the environment.

No visitors or personnel will be allowed to enter the Exclusion Zone or Contaminant Reduction Zone unless they have the prior approval of the Site Safety Officer and the Engineer.

21.0 EMERGENCY HAND SIGNALS

In order to maintain a standard form of communication in the field while wearing protective personnel equipment, the following hand signals will be used:

Hand gripping throat:

Out of air, can't breathe!

Grip partner's wrist or
place both hands around
waist:

Leave area immediately,
no debate!

Hands on top of head:

Need assistance.

Thumbs up:

OK, I'm all right, I understand.

Thumbs down:

No, negative.

22.0 CONFINED SPACE ENTRY PROCEDURE

A confined space provides the potential for unusually high concentrations of contaminants, explosive atmospheres, oxygen deficient atmospheres, limited visibility and restricted movement. This Section establishes requirements for safe entry into, continued work in, and safe exit from confined spaces. Additional information regarding confined space entry can be found in 29 CFR 1926.21, 29 CFR 1910 and NIOSH 80-106. At this Site, confined spaces may be encountered during drum removal activities.

22.1 DEFINITIONS

Confined Space: A space or work area not designed or intended for normal human occupancy, having limited means of egress and poor natural ventilation; and/or any structure, including buildings or rooms, which have limited means of egress.

Confined Space Entry Permit (CSEP): A document to be initiated by the supervisor of personnel who are to enter into or work in a confined space. The CSEP will be completed by the personnel involved in the entry and approved by the Site Safety Officer before personnel will be permitted to enter the confined space. The CSEP shall be valid only for the performance of the work identified on the permit and for the location and time specified on the permit. The beginning of a new shift with change of

personnel will require the issuance of a new CSEP. A copy of a CSEP is provided in Appendix D.

Confined Space Observer: An individual assigned to monitor the activities of personnel working within a confined space. The confined space observer monitors and provides external assistance to those inside the confined space. The confined space observer summons rescue personnel in the event of emergency and assists the rescue team.

22.2 GENERAL PROVISIONS

The following general provisions will apply to confined space entry:

- i) when possible, confined spaces should be identified with a posted sign which reads: Caution - Confined Space;
- ii) only personnel trained and knowledgeable of the requirements of these confined space entry procedures will be authorized to enter a confined space or be a confined space observer;
- iii) a CSEP must be issued prior to the performance of any work within a confined space. The CSEP will become a part of the permanent and official health and safety record for the response action at the Site;

- iv) natural ventilation shall be provided for the confined space prior to initial entry and for the duration of the CSEP. Positive/forced mechanical ventilation may be required. However, care should be taken to not spread contamination outside of the enclosed area;
- v) if flammable liquids are anticipated to be within the confined space, explosion proof equipment will be used. All equipment shall be positively grounded;
- vi) the contents of any confined space shall, where necessary and where possible, be removed prior to entry. All sources of ignition must be disconnected and/or removed prior to entry;
- vii) hand tools used in confined spaces shall be in good repair, explosion proof and spark proof, and selected according to intended use. Where possible, pneumatic power tools are to be used;
- viii) hand-held lights and other illumination utilized in confined spaces shall be equipped with guards to prevent contact with the bulb and must be explosion proof;
- ix) compressed gas cylinders, except cylinders used for self-contained breathing apparatus, shall not be taken into confined spaces. Gas hoses shall be removed from the space and the supply turned off at the cylinder valve when personnel exit from the confined space;

- x) if a confined space requires respiratory equipment or where rescue may be difficult, safety belts, body harnesses, extraction equipment and lifelines will be used. The outside observer shall be provided with the same equipment as those working within the confined space;
- xi) a ladder or extraction device is required in all confined spaces deeper than the employee's shoulders. The ladder shall be secured and not removed until all employees have exited the confined space;
- xii) only SCBA or NIOSH approved airline respirators equipped with a 5-minute emergency air supply (egress bottle) shall be used in untested confined spaces or in any confined space with conditions determined immediately dangerous to life and health;
- xiii) where air-moving equipment is used to provide ventilation, chemicals shall be removed from the vicinity to prevent their introduction into the confined space;
- xiv) vehicles shall not be left running near confined space work or near air-moving equipment being used for confined space ventilation;
- xv) smoking in confined spaces will be prohibited at all times; and
- xvi) any deviation from these confined space entry procedures requires the prior permission of the Site Safety Officer.

22.3 PROCEDURE FOR CONFINED SPACE ENTRY

The Site Safety Officer and confined space entry personnel shall adhere to the following confined space entry procedures:

- i) evaluate the job to be done and identify the potential hazards before a job in a confined space is scheduled;
- ii) if possible, ensure removal of any standing fluids that may produce toxic or air displacing gases, vapors or dust;
- iii) initiate a CSEP in concurrence with the Engineer or designated alternative;
- iv) ensure that any hot work (welding, burning, open flames or spark producing operation) that is to be performed in the confined space has been approved by the Engineer and is indicated on the CSEP;
- v) ensure that the confined space is ventilated before starting work in the confined space and for the duration of the time that the work is to be performed in the confined space;
- vi) ensure that the personnel who enter the confined space and the confined space observer helper are familiar with the contents and requirements of this instruction and the CSEP;

- vii) ensure remote atmospheric testing of the confined space prior to and during employee entry and before validation/revalidation of a CSEP to ensure the following requirements:
 - a) oxygen content,
 - b) no concentration of combustible gas in the space. Sampling will be done throughout the confined space and specifically at the lowest point in the space,
 - c) the absence of other atmospheric contaminants if the space has previously contained toxic, corrosive or irritant material, and
- viii) designate whether hot or cold work will be allowed. If all tests are satisfactory, complete the CSEP listing any safety precautions, protective equipment or other requirements; and
- ix) ensure that a copy of the CSEP is posted at the work Site, a copy is filed with the work supervisor and a copy is furnished to the Engineer.

The CSEP shall be considered void if work in the confined space does not start within one hour after the tests in Item vii above are performed or if significant changes within the confined space atmosphere or job scope occurs.

The CSEP posted at the work Site shall be removed at the completion of the job or the end of the shift, whichever is first.

22.4 CONFINED SPACE OBSERVER

The duties of the confined space observer are as follows:

- i) while personnel are inside the confined space, a confined space observer will monitor the activities and provide external assistance to those in the confined space. The observer will not have other duties which may take his attention away from the work or require him to leave the vicinity of the confined space at any time while personnel are in the confined space;
- ii) the confined space observer shall maintain at least voice contact with all personnel in the confined space. Visual contact is preferred, if possible;
- iii) the confined space observer shall be instructed by his supervisor or the Site Safety Officer in the method for contacting rescue personnel in the event of an emergency;
- iv) if irregularities within the confined space are detected by the observer, personnel within the confined space will be ordered to exist;
- v) in the event of an emergency, the confined space observer must not enter the confined space prior to contacting and receiving assistance from a helper. Prior to this time, he should attempt to remove personnel with the lifeline and to perform all other rescue functions from outside the space; and

- vi) a helper shall be designated to provide assistance to the confined space observer in case the observer must enter the confined space to retrieve personnel.

APPENDIX A

TRAINING ACKNOWLEDGEMENT FORM

TRAINING ACKNOWLEDGEMENT FORM

NAME: _____

ADDRESS: _____

SOCIAL SECURITY: _____

EMPLOYER: _____

I have completed and understand the applicable training program, for work to be carried out during site activities at the Onondaga Drum Site, Nedrow, New York, including the following topics:

- a. Work Rules and Safety Requirements,
- b. Personal Protection Equipment,
- c. Potentially Hazardous Chemicals,
- d. Emergency Equipment,
- e. Reporting Injuries and Illnesses,
- f. Emergency Procedures,
- g. Job Assignments,
- h. Personal hygiene,
- i. Medical Tests,
- j. Motor Tests, and
- k. Standard Operating Procedures.

I further confirm that a respirator qualitative fit test was performed and that I have been issued a respirator of the same type.

By signing this form, I relieve Stauffer and its members and their officers, employees and agents of the liability of consequences related to potential hazards associated with site entry and work.

Site Person

Signature: _____ Date: _____

I certify that this Site Person has received adequate safety training and instruction and that this person is proficient in the use of protective clothing and equipment and knowledgeable in all aspects of this Health and Safety Plan.

Safety Officer

Signature: _____ Date: _____

APPENDIX B

HEALTH AND SAFETY PLAN ACKNOWLEDGEMENT FORM

HEALTH AND SAFETY PLAN
ACKNOWLEDGEMENT FORM

I have received and read the Site Health and Safety Plan for the Onondaga Site Phase I Operations Plan. I agree to abide by these safety rules, regulations, and guidelines while working on site; and understand that any violation of these rules will result in my removal from the work site.

Signature: _____ Date: _____

Print Name: _____

APPENDIX C

EMERGENCY TELEPHONE NUMBERS

EMERGENCY CONTACTS

<u>Emergency</u>	<u>Organization/Agency</u>	<u>Emergency #</u>
General	1. Stauffer Project Coordinator (Joe Birkmeier)	(302) 886-4252
	2. Stauffer Project Manager (Lloyd Freese)	(302) 886-4384
	3. EPA Coordinator (Dan Harkay)	(908)-321-6614
	4. Emergency Management Division, Onondaga County	(315) 434-2525
Injury	1. Ambulance	(315) 425-3333
	2. Community General Hospital	(315) 492-5011
Poison	1. Poison Control Center	(800) 962-1253
Fire/ Explosion	1. Fire Emergency	(315) 425-3333
Hazardous Material Spill or Release	1. USEPA National Response Center	(800) 438-2427
	2. Onondaga County Health Dept.	(315) 425-6955
	3. New York State Police	(315) 457-2600
	4. New York State Department of Environmental Conservation (Albany)	(800) 457-7362
	5. New York State Department of Health (Syracuse)	(315) 428-4802
	6. Onondaga Nation (Chief Irving Powless)	(315) 492-4210
Natural	1. General Emergency	(315) 425-3333
	2. New York State Police	(315) 457-2600

APPENDIX D

CONFINED SPACE ENTRY PERMIT

CONFINED SPACE ENTRY PERMIT

SITE NAME/LOCATION/REF. NO.:

WORK ACTIVITY:

Duration: _____ Issue Date: _____ Time: _____ Filled Out by: _____

POTENTIAL HAZARDS:
(System Generated)

(Work Generated)

CONFINED SPACE ENTRY PERMIT

AIR MONITORING: PRE-ENTRY_____ PERIODIC_____ CONTINUOUS_____

[illegible][illegible]

ISOLATION:

Purging Required: YES NO | | **PURGING CONFIRMED:**

Safety Tags Required: YES | | NO | |

VENTILATION REQUIRED: YES | | NO | |

CONTINUOUS _____ OTHER _____

EMERGENCY RESCUE EQUIPMENT REQUIRED:

_____ Communications Device	_____ Winch/Hoist
_____ First Aid Kit	_____ Harness with Lifeline
_____ Stretcher/Backboard	_____ (type)
_____ Fire Extinguisher	_____ PPE (type)
_____ SCBA	_____ Lighting (type)
_____ Other	

CONFINED SPACE ENTRY PERMIT

PERSONAL PROTECTIVE EQUIPMENT REQUIRED:

_____ Hardhat	_____ Respiratory Protection
_____ Safety Glasses	_____ (type)
_____ Face Shield	_____ Coveralls
_____ Ear Plugs/Muff	_____ Chemical Suits
_____ Emergency Escape Pack	_____ Rain Suits
_____ Lanyards	_____ Lifelines
_____ Gloves (type)	
_____ Harnesses (type)	
_____ Other	

ADDITIONAL WORK INSTRUCTIONS:

EMERGENCY CONTACT PHONE NO. _____

PERSONS ENTERING CONFINED SPACE (PRINT NAME)

_____	_____
_____	_____
_____	_____
_____	_____

STANDBY PERSON REQUIRED: YES: _____ NO: _____ (PRINT NAMES)

CONFINED SPACE ENTRY PERMIT

I have reviewed and met the requirements of this permit and expect that this work shall be done safely. Entrants have been instructed on the proper confined space entry procedures, requirements and conditions.

ENTRY AUTHORIZED BY: _____ DATE: _____

All work under this permit has been completed and all materials and entrants have been withdrawn from the confined space.

Attendant or Entrant

Date

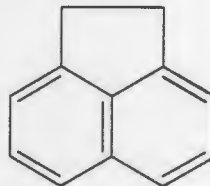
APPENDIX E

MATERIAL SAFETY DATA SHEETS

ACENAPHTHENE

Synonyms: 1,2-Dihydroacenaphthylene; Ethylene naphthalene; 1,8-Ethylene naphthalene; 1,8-Hydroacenaphthylene; Periethylene naphthalene.

Structural Formula:



CHEMICAL DESIGNATIONS

CAS Registry Number: 83-32-9

DOT Designation: None assigned.

Empirical Formula: C₁₂H₁₀

Formula Weight: 154.21

RTECS Number: AB 1255500

PHYSICAL AND CHEMICAL PROPERTIES

Appearance: White crystalline solid.

Boiling Point: 279 °C [1].

Henry's Law Constant: 1.5×10^{-4} atm·m³/mol [2]; 2.41×10^{-4} atm·m³/mol [3]; 1.9×10^{-4} atm·m³/mol [4]; 7.92×10^{-5} atm·m³/mol at 25 °C [5].

Ionization Potential: No data found.

Log K_{oc}: 1.25 [6].

Log K_{ow}: 3.92 [7]; 4.33 [8].

Melting Point: 96.2 °C [1]; 95 °C [9].

2 Acenaphthene

Solubility in Organics: Soluble in ethanol, toluene, chloroform, benzene, and acetic acid [10].

Solubility in Water: 3.47 mg/L at 25 °C [11]; 3.93 mg/L at 25 °C [12]; 1.84 ppm in seawater at 25 °C, 2.42 ppm [13].

Specific Density: 1.0242 at 90/4 °C [1].

Transformation Products: No data found.

Vapor Pressure: 10 mm at 131.2 °C, 40 mm at 168.2 °C, 100 mm at 197.5 °C, 400 mm at 250 °C, 760 mm at 277.5 °C [1]; 0.001-0.01 mm at 20 °C [13]; 0.00155 mm at 25 °C [14]; 0.149 mm at 65 °C, 0.231 mm at 70 °C, 0.351 mm at 75 °C, 0.529 mm at 80 °C, 0.787 mm at 85 °C, 1.151 mm at 90 °C, 1.388 mm at 92.5 °C, 1.463 mm at 93.195 °C [15].

FIRE HAZARDS

Flash Point: No data found.

Lower Explosive Limit (LEL): No data found.

Upper Explosive Limit (UEL): No data found.

HEALTH HAZARD DATA

Immediately Dangerous to Life or Health (IDLH): No data found.

Permissible Exposure Limits (PEL) in Air: No standards set.

MANUFACTURING

Selected Manufacturers:

Fluka Chemical Corp.
980 South Second St.
Ronkonkoma, NY 11779

Pfaltz & Bauer, Inc.
172 East Aurora St.
Waterbury, CT 06708

2 Acenaphthene

Solubility in Organics: Soluble in ethanol, toluene, chloroform, benzene, and acetic acid [10].

Solubility in Water: 3.47 mg/L at 25 °C [11]; 3.93 mg/L at 25 °C [12]; 1.84 ppm in seawater at 25 °C, 2.42 ppm [13].

Specific Density: 1.0242 at 90/4 °C [1].

Transformation Products: No data found.

Vapor Pressure: 10 mm at 131.2 °C, 40 mm at 168.2 °C, 100 mm at 197.5 °C, 400 mm at 250 °C, 760 mm at 277.5 °C [1]; 0.001-0.01 mm at 20 °C [13]; 0.00155 mm at 25 °C [14]; 0.149 mm at 65 °C, 0.231 mm at 70 °C, 0.351 mm at 75 °C, 0.529 mm at 80 °C, 0.787 mm at 85 °C, 1.151 mm at 90 °C, 1.388 mm at 92.5 °C, 1.463 mm at 93.195 °C [15].

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Upper Explosive Limit (UEL): No data found.

HEALTH HAZARD DATA

Immediately Dangerous to Life or Health (IDLH): No data found.

Permissible Exposure Limits (PEL) in Air: No standards set.

MANUFACTURING

Selected Manufacturers:

Fluka Chemical Corp.
980 South Second St.
Ronkonkoma, NY 11779

Pfaltz & Bauer, Inc.
172 East Aurora St.
Waterbury, CT 06708

Uses: Manufacturing of dye intermediates, pharmaceuticals, insecticides, fungicides, and plastics.

REFERENCES

1. Weast, R.C., Ed. *CRC Handbook of Chemistry and Physics*, 67th ed. (Boca Raton, FL: CRC Press, Inc., 1986), 2406 p.
2. Lyman, W.J., Reehl, W.F., and D.H. Rosenblatt. *Handbook of Chemical Property Estimation Methods: Environmental Behavior of Organic Compounds* (New York: McGraw-Hill, Inc., 1982).
3. Warner, H.P., Cohen, J.M., and J.C. Ireland. "Determination of Henry's Law Constants of Selected Priority Pollutants," Office of Science and Development, U.S. EPA Report-600/D-87/229 (1987), 14 p.
4. Petrasek, A.C., Kugelman, I.J., Austern, B.M., Pressley, T.A., Winslow, L.A., and R.H. Wise. "Fate of Toxic Organic Compounds in Wastewater Treatment Plants," *J. Water Poll. Control Fed.*, 55(10):1286-1296 (1983).
5. Hine, J., and P.K. Mookerjee. "The Intrinsic Hydrophilic Character of Organic Compounds. Correlations in Terms of Structural Contributions," *J. Org. Chem.*, 40(3):292-298 (1975).
6. Mihelcic, J.R., and R.G. Luthy. "Microbial Degradation of Acenaphthene and Naphthalene under Denitrification Conditions in Soil-Water Systems," *Appl. Environ. Microbiol.*, 54(5):1188-1198 (1988).
7. Banerjee, S., Yalkowsky, S.H., and S.C. Valvani. "Water Solubility and Octanol/Water Partition Coefficients of Organics. Limitations of the Solubility-Partition Coefficient Correlation," *Environ. Sci. Technol.*, 14(10):1227-1229 (1980).
8. Walton, W.C. *Practical Aspects of Ground Water Modeling* (Worthington, OH: National Water Well Association, 1985), 587 p.
9. Sax, N.I. *Dangerous Properties of Industrial Materials* (New York: Van Nostrand Reinhold Co., 1984), 3124 p.
10. "Chemical, Physical, and Biological Properties of Compounds Present at Hazardous Waste Sites," U.S. EPA Report-530/SW-89-010 (1985), 619 p.
11. Eganhouse, R.P., and J.A. Calder. "The Solubility of Medium Weight Aromatic Hydrocarbons and the Effect of Hydrocarbon Co-solutes and Salinity," *Geochim. Cosmochim. Acta*, 40(5):555-561 (1976).
12. Mackay, D., and W.Y. Shiu. "Aqueous Solubility of Polynuclear Aromatic Hydrocarbons," *J. Chem. Eng. Data*, 22(4):399-402 (1977).
13. Sax, N.I., Ed. *Dangerous Properties of Industrial Materials Report*

4 Acenaphthene

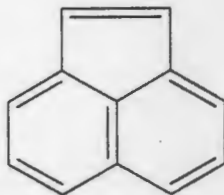
(New York: Van Nostrand Reinhold Co., 1984), 4(1): 112 p.

14. Mabey, W.R., Smith, J.H., Podoll, R.T., Johnson, H.L., Mill, T., Chou, T.-W., Gates, J., Partridge, I.W., Jaber, H., and D. Vandenberg. "Aquatic Fate Process Data for Organic Priority Pollutants - Final Report," Office of Regulations and Standards, U.S. EPA Report-440/4-81-014 (1982), 407 p.
15. Osborn, A.G., and D.R. Douslin. "Vapor Pressures and Derived Enthalpies of Vaporization of Some Condensed-Ring Hydrocarbons," *J. Chem. Eng. Data*, 20(3):229-231 (1975).

ACENAPHTHYLENE

Synonym: Cyclopenta[de]naphthalene.

Structural Formula:



CHEMICAL DESIGNATIONS

CAS Registry Number: 208-96-8

DOT Designation: None assigned.

Empirical Formula: C₁₂H₈

Formula Weight: 152.20

RTECS Number: AB 1254000

PHYSICAL AND CHEMICAL PROPERTIES

Appearance: Solid.

Boiling Point: 280 °C [1].

Henry's Law Constant: 2.8 x 10⁻⁴ atm·m³/mol [2]; 1.14 x 10⁻⁴ atm·m³/mol [3].

Ionization Potential: 8.73 eV [4].

Log K_{ow}: 3.68 using method of Karickhoff and others [5].

Log K_{ow}: 4.07 [6].

Melting Point: 92-93 °C [7].

Solubility in Organics: Soluble in ethanol, ether, and benzene [8].

6 Acenaphthylene

Solubility in Water: 3.93 mg/L at 25 °C [9].

Specific Density: 0.8988 at 16/2 °C [7].

Transformation Products: Based on data for structurally similar compounds, acenaphthylene may undergo photolysis to yield quinones [8].

Vapor Pressure: 0.0290 mm at 20 °C [10].

FIRE HAZARDS

Flash Point: No data found.

Lower Explosive Limit (LEL): No data found.

Upper Explosive Limit (UEL): No data found.

HEALTH HAZARD DATA

Immediately Dangerous to Life or Health (IDLH): No data found.

Permissible Exposure Limits (PEL) in Air: No individual standards have been set, however, as a constituent in coal tar pitch volatiles, the following exposure limits have been established: 0.2 mg/m³ (benzene-soluble fraction) [11]; 0.1 mg/m³ 10-hour TWA (cyclohexane-extractable fraction) [12]; 0.2 mg/m³ TWA (benzene solubles) [13].

MANUFACTURING

Uses: Research chemical. Derived from industrial and experimental coal gasification operations where maximum concentrations detected in gas, liquid, and coal tar streams were 28 mg/m³, 4.1 mg/m³, and 18 mg/m³, respectively [14].

REFERENCES

1. *Catalog Handbook of Fine Chemicals* (Milwaukee, WI: Aldrich

- Chemical Co., 1988), 2212 p.
2. Lyman, W.J., Reehl, W.F., and D.H. Rosenblatt. *Handbook of Chemical Property Estimation Methods: Environmental Behavior of Organic Compounds* (New York: McGraw-Hill, Inc., 1982).
 3. Warner, H.P., Cohen, J.M., and J.C. Ireland. "Determination of Henry's Law Constants of Selected Priority Pollutants," Office of Science and Development, U.S. EPA Report-600/D-87/229 (1987), 14 p.
 4. Franklin, J.L., Dillard, J.G., Rosenstock, H.M., Herron, J.T., Draxl K., and F.H. Field. "Ionization Potentials, Appearance Potentials and Heats of Formation of Gaseous Positive Ions," National Bureau of Standards Report NSRDS-NBS 26, U.S. Government Printing Office (1969), 289 p.
 5. Karickhoff, S.W., Brown, D.S., and T.A. Scott. "Sorption of Hydrophobic Pollutants on Natural Sediments," *Water Res.*, 13:241-248 (1979).
 6. Yoshida, K., Shigeoka, T., and F. Yamauchi. "Non-Steady State Equilibrium Model for the Preliminary Prediction of the Fate of Chemicals in the Environment," *Ecotoxicol. Environ. Safety*, 7(2):179-190 (1983).
 7. Weast, R.C., Ed. *CRC Handbook of Chemistry and Physics*, 67th ed. (Boca Raton, FL: CRC Press, Inc., 1986), 2406 p.
 8. "Chemical, Physical, and Biological Properties of Compounds Present at Hazardous Waste Sites," U.S. EPA Report-530/SW-89-010 (1985), 619 p.
 9. Verschueren, K. *Handbook of Environmental Data on Organic Chemicals* (New York: Van Nostrand Reinhold Co., 1983), 1310 p.
 10. Sims, R.C., Doucette, W.C., McLean, J.E., Grenney, W.J., and R.R. Dupont. "Treatment Potential for 56 EPA Listed Hazardous Chemicals in Soil," U.S. EPA Report-600/6-88-001 (1988), 105 p.
 11. "General Industry Standards for Toxic and Hazardous Substances," U.S. Code of Federal Regulations 1910, Subpart Z Section 1910.1000 (July 1982).
 12. "NIOSH Pocket Guide to Chemical Hazards," U.S. Department of Health and Human Services, U.S. Government Printing Office (1987), 241 p.
 13. *Documentation of the Threshold Limit Values and Biological Exposure Indices* (Cincinnati, OH: American Conference of Governmental Industrial Hygienists, 1986), 744 p.
 14. Cleland, J.G. "Project Summary - Environmental Hazard Rankings of Pollutants Generated in Coal Gasification Processes," Office of Research and Development, U.S. EPA Report-600/S7-81-101 (1981), 19 p.

Material Safety Data Sheet

Genium Publishing Corporation
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From Genium's collection, to be used as reference

Product: BENZENE
MSDS No: Genium / 316
Revision: E
Date: August, 1990.

National Paint
and Coatings
Association

Hazardous Material
Identification
System

HEALTH HAZARD	3 - Serious
FLAMMABILITY HAZARD	3 - Serious
REACTIVITY HAZARD	0 - Minimal
PERSONAL PROTECTION	SEE SECTION 8

SECTION I. MATERIAL IDENTIFICATION

Trade/Material Name: BENZENE

Description: Derived by fractional distillation of coal tar, hydrodealkylation of toluene or pyrolysis of gasoline, catalytic reforming of petroleum, and transalkylation of toluene by disproportionation reaction. Used as a fuel; a chemical reagent; a solvent for a large number of materials such as paints, plastics, rubber, inks, oils, and fats; in manufacturing phenol, ethylbenzene (for styrene monomer), and nitrobenzene (for aniline).*

Other Designations: C_6H_6 ; benzol; carbon oil; coal naphtha; cyclohexatriene; mineral naphtha; nitration benzene; phene; phenyl hydride; pyrobenzol.

CAS: 0071-43-2

R 1
I 4
S 2 - Skin absorption.
K 4

Manufacturer: Contact your supplier or distributor. Consult the latest Chemicalweek Buyers' Guide⁽⁷³⁾ for a suppliers list.

Cautions: Benzene is a confirmed human carcinogen by the IARC. Chronic low-level exposure may cause cancer (leukemia) and bone marrow damage, with injury to blood-forming tissue. It is also a dangerous fire hazard when exposed to heat or flame.

* Additional manufacturing uses dodecylbenzene (for detergents), cyclohexane (for nylon), chlorobenzene, diphenyl, benzene hexachloride, maleic anhydride, benzene-sulfonic acid, artificial leather, linoleum, oil cloth, varnishes, and lacquers; for printing and lithography; in dry cleaning; in adhesives and coatings; for extraction and rectification; as a degreasing agent; in the tire industry; and in shoe factories. Benzene has been banned as an ingredient in products intended for household use and is no longer used in pesticides.

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SECTION II. INGREDIENTS AND HAZARDS

Ingredient Name:	CAS Number:	Percent:	Exposure Limits:
Benzene	0071-43-2	ca 100*	1989 OSHA PELs (29 CFR 1910.1000, Table Z-1-A) 8-hr TWA: 1 ppm, 3 mg/m³ 15-min STEL: 5 ppm, 15 mg/m³ (Table Z-2) 8-hr TWA: 10 ppm Acceptable Ceiling Concentration: 25 ppm Acceptable Maximum Peak: 50 ppm (10 min) ** 1989-90 ACGIH TLV TLV-TWA: 10 ppm, 32 mg/m³ 1988 NIOSH RELs TWA: 0.1 ppm, 0.3 mg/m³ Ceiling: 1 ppm, 3 mg/m³ 1985-86 Toxicity Data*** Man, oral, LD₅₀: 50 mg/kg; no toxic effect noted Man, inhalation, TCLO: 150 ppm inhaled intermittently over 1 yr in a number of discrete, separate doses affects the blood (other changes) and nutritional and gross metabolism (body temperature increase) Rabbit, eye: 2 mg administered over 24 hr produces severe irritation.

* OSHA 29 CFR 1910.1000, Subpart Z, states that the final benzene standard in 29 CFR 1910.1028 applies to all occupational exposures to benzene except in some subsegments of industry where exposures are consistently under the action level (i.e., distribution and sale of fuels, sealed containers and pipelines, coke production, oil

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INGREDIENTS AND HAZARDS continued from page 2

and gas drilling and production, natural gas processing, and the percentage exclusion for liquid mixtures); for the excepted subsegments, the benzene limits in Table Z-2 apply.

** Acceptable maximum peak above the acceptable ceiling concentration for an 8-hr shift.

See NIOSH, RTECS (CY1400000), for additional irritative, mutative, reproductive, tumorigenic, and toxicity data.

SECTION III. PHYSICAL DATA

Appearance & Odor: A colorless liquid with a characteristic sweet, aromatic odor. The odor recognition threshold (100% of panel) is approximately 5 ppm (unfatigued) in air. Odor is not an adequate warning of hazard.

Boiling point: 176°F (80°C)
Vapor pressure: 100 mm Hg at 79°F
(26.1°C)

Evaporation rate: 2.8
Specific gravity (H₂O=1): 0.8787
Melting point: 42°F (5.5°C)
% volatile by volume: 100
Molecular weight: 78.11

Water solubility (%): Slightly (0.180 g/100
g of H₂O at 25°C)

Vapor density (air=1): 2.7

Viscosity: 06468 mPa at 20°C

SECTION IV. FIRE AND EXPLOSION DATA

Flash Point (method): 12°F (-11.1°C), CC Limits: LEL %: 1.3% v/v UEL %: 7.1% v/v

NFPA Fire Hazard Symbol Codes: Flammability: 3 Health: 2 Reactivity: 0 Special: —

Extinguishing Media: Use dry chemical, foam, or carbon dioxide to extinguish benzene fires. Water may be ineffective as an extinguishing agent since it can scatter and spread the fire. Use water spray to cool fire-exposed containers, flush spills away from exposures, disperse benzene vapor, and protect personnel attempting to stop an unignited benzene leak.

Autoignition Temp:
928°F (498°C)

Unusual fire or explosion hazards: Benzene is a Class 1B flammable liquid. A concentration exceeding 3250 ppm is considered a potential fire explosion hazard. Benzene vapor is heavier than air and can collect in low lying areas or travel to an ignition source and flash back. Explosive and flammable benzene vapor-air mixtures can easily form at room temperature. Eliminate all ignition sources where benzene is used, handled, or stored.

Special fire-fighting procedures: Isolate hazard area and deny entry. Since fire may produce toxic fumes, wear a self-contained breathing apparatus (SCBA) with a full

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FIRE AND EXPLOSION DATA continued from page 3

facepiece operated in the pressure-demand or positive-pressure mode and full protective equipment. Structural firefighter's protective clothing provides limited protection. Stay out of low areas. Be aware of runoff from fire control methods. Do not release to sewers or waterways. Runoff to sewer can create pollution, fire, and explosion hazard.

SECTION V. REACTIVITY DATA

Chemical incompatibilities: Benzene explodes on contact with diborane, permanganic acid, bromine pentafluoride, peroxodisulfuric acid, and peroxomonosulfuric acid. It ignites on contact with dioxygen difluoride, dioxygenyl tetrafluoroborate, iodine heptafluoride, and sodium peroxide + water. Benzene forms sensitive, explosive mixture with iodine pentafluoride, ozone, liquid oxygen, silver perchlorate, nitryl perchlorate, nitric acid, and arsenic pentafluoride + potassium methoxide (explodes above 30°C). Benzene is incompatible with oxidizing materials.*

Conditions to avoid: Avoid heat and ignition sources.

Hazardous decomposition Products: Thermal oxidative decomposition of benzene can produce toxic gases and vapors such as carbon monoxide.

Stability/Polymerization: Benzene is stable at room temperature in closed containers under normal storage and handling conditions. Hazardous polymerization cannot occur.

* A vigorous or incandescent reaction occurs with bromine trifluoride, uranium hexafluoride, and hydrogen + Raney nickel [above 410°F (210°C)].

SECTION VI. HEALTH HAZARD INFORMATION

Summary of risks: Prolonged skin contact or excessive inhalation of benzene vapor may cause headache, weakness, appetite loss, and fatigue. The most important health hazards are cancer (leukemia) and bone marrow damage with injury to blood-forming tissue from chronic low-level exposure. Higher level exposures may irritate the respiratory tract and cause central nervous system (CNS) depression.

Medical conditions which may be aggravated by contact: Exposure may worsen ailments of the heart lungs, liver, kidneys, blood, and CNS.

Target organs: Blood, central nervous system, bone marrow, eyes, upper respiratory tract, and skin.

Primary entry route(s): Inhalation, skin contact.

Acute effects: Symptoms of acute overexposure include irritation of the eyes, nose, and respiratory tract, breathlessness, euphoria, nausea, drowsiness, headache, dizziness, and intoxication. Severe exposure may lead to convulsions and unconsciousness. Skin contact may cause a drying rash (dermatitis).

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HEALTH HAZARD INFORMATION continued from page 4

Chronic effect(s): Long-term chronic exposure may result in many blood disorders ranging from aplastic anemia (an inability to form blood cells to leukemia).

First aid:

- Eye contact: Gently lift the eyelids and flush immediately and continuously with flooding amounts of water until transported to an emergency medical facility. Consult a physician immediately.
- Skin contact: Quickly remove contaminated clothing. Immediately rinse with flooding amounts of water for at least 15 min. For reddened or blistered skin, consult a physician. Wash affected area with soap and water.
- Inhalation: Remove exposed person to fresh air. Emergency personnel should protect against inhalation exposure. Provide CPR to support breathing or circulation as necessary. Keep awake and transport to a medical facility.
- Ingestion: Never give anything by mouth to an unconscious or convulsing person. If ingested, do not induce vomiting since aspiration may be fatal. Call a physician immediately.

Carcinogenicity: The ACGIH, OSHA, and IARC list benzene as, respectively, a suspected human carcinogen, a cancer hazard, and, based on sufficient human and animal evidence, a human carcinogen (Group 1).

After first aid, get appropriate in-plant, paramedic, or community medical attention and support.

Physician's Note: Evaluate chronic exposure with a CBC, peripheral smear, and reticulocyte count for signs of myelotoxicity. Follow up any early indicators of leukemia with a bone marrow biopsy. Urinary phenol conjugates may be used for biological monitoring of recent exposure. Acute management is primarily supportive for CNS depression.

SECTION VII. SPILL, LEAK AND DISPOSAL PROCEDURES

Spill / Leak procedures: Design and practice a benzene spill control and countermeasure plan (SCCP). Notify safety personnel, evacuate all unnecessary personnel, eliminate all heat and ignition sources, and provide adequate ventilation. Cleanup personnel should protect against vapor inhalation, eye contact, and skin absorption. Absorb as much benzene as possible with an inert, noncombustible material. For large spills, dike far ahead of spill and contain liquid. Use nonsparking tools to place waste liquid or absorbent into closable containers for disposal. Keep waste out of confined spaces such as sewers, watersheds, and waterways because of explosion danger. Follow applicable OSHA regulations (29 CFR 1910.120).

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SPILL, LEAK AND DISPOSAL PROCEDURES continued from page 5

Waste management / Disposal: Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.

OSHA Designations

Listed as an Air Contaminant (29 CFR 1910.1000, Tables Z-1-A and Z-2)

EPA Designations

Listed as a RCRA Hazardous Waste (40 CFR 261.33), Hazardous Waste No. U019

Listed as a CERCLA Hazardous Substance* (40 CFR 302.4), Reportable Quantity (RQ): 1000 lb (454 kg) [* per Clean Water Act, Sec. 307(a), 311 (b)(4), 112; and per RCRA, Sec. 3001]

SARA Extremely Hazardous Substance (40 CFR 355): Not listed

Listed as SARA Toxic Chemical (40 CFR 372.65)

SECTION VIII. SPECIAL PROTECTION INFORMATION

Personal protective equipment:

Goggles: Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133).

Respirator: Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a NIOSH-approved respirator. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Other: Wear impervious gloves, boots, aprons, and gauntlets to prevent skin contact.

Workplace considerations:

Ventilation: Provide general and local explosion-proof ventilation systems to maintain airborne concentrations below the OSHA PELs (Sec. 2). Local exhaust ventilation is preferred since it prevents contaminant dispersion into the work area by controlling it at its source. (103)

Safety stations:

Make available in the work area emergency eyewash stations, safety/quick-drench showers, and washing facilities.

Contaminated equipment:

Never wear contact lenses in the work area: soft lenses may absorb, and all lenses concentrate, irritants. Launder contaminated clothing before wearing. Remove this material from your shoes and equipment.

Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

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SECTION IX. SPECIAL PRECAUTIONS

Storage segregation: Store in tightly closed containers in a cool, dry, well-ventilated area away from all heat and ignition sources and incompatible materials. **Caution!** Benzene vapor may form explosive mixtures in air. To prevent static sparks, electrically ground and bond all containers and equipment used in shipping, receiving, or transferring operations in production and storage areas. When opening or closing benzene containers, use nonsparking tools. Keep fire extinguishers readily available.

Engineering controls: Because OSHA specifically regulates benzene (29 CFR 1910.1028), educate workers about its potential hazards and dangers. Minimize all possible exposures to carcinogens. If possible, substitute less toxic solvents for benzene; use this material with extreme caution and only if absolutely essential. Avoid vapor inhalation and skin and eye contact. Use only with adequate ventilation and appropriate personal protective gear. Institute a respiratory protection program that includes regular training, maintenance, inspection, and evaluation. Designate regulated areas of benzene use (see CAPS below Transportation Data) and label benzene containers with "DANGER, CONTAINS BENZENE, CANCER HAZARD."

Other precautions: Provide preplacement and periodic medical examinations with emphasis on a history of blood disease or previous exposure.

Transportation Data (49 CFR 172.101, .102)

DOT Shipping Name: Benzene (benzol)
DOT Hazard Class: Flammable liquid
ID No.: UN1114
DOT Label: Flammable liquid
DOT Packaging Exceptions: 173.118
DOT Packaging Requirements: 173.119

IMO Shipping Name: Benzene
IMO Hazard Class: 3.2
ID No.: UN1114
IMO Label: Flammable liquid
IMDG Packaging Group: II

DANGER
BENZENE
CANCER HAZARD
FLAMMABLE-NO SMOKING
AUTHORIZED PERSONNEL ONLY
RESPIRATOR REQUIRED

Data source code(s): 1, 2, 12, 26, 73, 84-94, 100, 101, 103, 109, 124, 126, 127, 132, 134, 136, 138, 139, 143

Prepared/revised by: MJ Allison, BS
August, 1990

Material Safety Data Sheet

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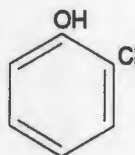
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2-CHLOROPHENOL

Synonyms: 1-Chloro-2-hydroxybenzene; 1-Chloro-*o*-hydroxybenzene; 2-Chlorohydroxybenzene; *o*-Chlorophenol; 1-Hydroxy-2-chlorobenzene; 1-Hydroxy-*o*-chlorobenzene; 2-Hydroxychlorobenzene; RCRA waste number U048; UN 2020; UN 2021.

Structural Formula:



CHEMICAL DESIGNATIONS

CAS Registry Number: 95-57-8

DOT Designation: 2020 (liquid); 2021 (solid).

Empirical Formula: C_6H_5ClO

Formula Weight: 128.56

RTECS Number: SK 2625000

PHYSICAL AND CHEMICAL PROPERTIES

Appearance and Odor: Pale amber liquid with a slight phenolic odor.

Boiling Point: 174.9 °C [1].

Dissociation Constant: 8.48 [2].

Henry's Law Constant: 8.28×10^{-6} atm·m³/mol (calculated) [3]; 5.6×10^{-7} atm·m³/mol at 25 °C (estimated) [4].

Ionization Potential: 9.28 eV [5].

Log K_{oc} : 2.56 using method of Kenaga and Goring [6].

Log K_{ow} : 2.16 [7]; 2.19 [8]; 2.15 [9].

Melting Point: 9.0 °C [1].

Solubility in Organics: Soluble in ethanol, benzene, and ether [1].

Solubility in Water: 28,500 mg/L at 20 °C [10]; 28,000 mg/L at 25 °C [11]; 11,350 mg/L at 25 °C [12]; 0.2 M at 25 °C [13].

Specific Density: 1.2634 at 20/4 °C [1]; 1.256 at 25/25 °C [14]; 1.257 at 25/4 °C [15]; 1.262 at 20/4 °C [16].

Transformation Products: Monochlorophenols exposed to sunlight (ultraviolet light radiation) produced catechol and other hydroxybenzenes [17].

Vapor Density: 5.25 g/L at 25 °C, 4.44 (air = 1).

Vapor Pressure: 1 mm at 12.1 °C, 10 mm at 51.2 °C, 40 mm at 82.0 °C, 100 mm at 106.0 °C, 400 mm at 149.8 °C, 760 mm at 174.5 °C [1]; 1.42 mm at 25 °C [4].

FIRE HAZARDS

Flash Point: 64 °C [18].

Lower Explosive Limit (LEL): Unknown [19].

Upper Explosive Limit (UEL): Unknown [19].

HEALTH HAZARD DATA

Immediately Dangerous to Life or Health (IDLH): No data found.

Permissible Exposure Limits (PEL) in Air: No standards set.

MANUFACTURING

Selected Manufacturers:

Dow Chemical Co.
Midland, MI 48640

Aldrich Chemical Co.
940 West Saint Paul Ave.
Milwaukee, WI 53233

Fluka Chemical Corp.
980 South Second St.
Ronkonkoma, NY 11779

Uses: Component of disinfectant formulations; chemical intermediate for phenolic resins; solvent for polyester fibers, antiseptic (veterinarian); organic synthesis.

REFERENCES

1. Weast, R.C., Ed. *CRC Handbook of Chemistry and Physics*, 67th ed. (Boca Raton, FL: CRC Press, Inc., 1986), 2406 p.
2. Dean, J.A., Ed., *Lange's Handbook of Chemistry*, 11th ed. (New York: McGraw-Hill, Inc., 1973), 1570 p.
3. "Treatability Manual - Volume 1: Treatability Data," Office of Research and Development, U.S. EPA Report-600/8-80-042a (1980), 1035 p.
4. Howard, P.H. *Handbook of Environmental Fate and Exposure Data for Organic Chemicals* (Chelsea, MI: Lewis Publishers, Inc., 1989), 574 p.
5. Franklin, J.L., Dillard, J.G., Rosenstock, H.M., Herron, J.T., Draxl K., and F.H. Field. "Ionization Potentials, Appearance Potentials and Heats of Formation of Gaseous Positive Ions," National Bureau of Standards Report NSRDS-NBS 26, U.S. Government Printing Office (1969), 289 p.
6. Kenaga, E.E., and C.A.I. Goring. "Relationship Between Water Solubility, Soil Sorption, Octanol-Water Partitioning and Concentration of Chemicals in Biota," in *Aquatic Toxicology, ASTM STP 707*, Eaton, J.G., Parrish, P.R., and A.C. Hendricks, Eds. (Philadelphia, PA: American Society for Testing and Materials, 1980), pp 78-115.
7. Veith, G.D., Macek, K.J., Petrocelli, S.R., and J. Carroll. "An Evaluation of Using Partition Coefficients and Water Solubility to Estimate Bioconcentration Factors for Organic Chemicals in Fish," in *Aquatic Toxicology, ASTM STP 707*, Eaton, J.G., Parrish, P.R., and A.C. Hendricks, Eds. (Philadelphia, PA: American Society for Testing and Materials, 1980), pp 116-129.
8. Leo, A., Hansch, C., and D. Elkins. "Partition Coefficients and

- Their Uses," *Chem. Rev.*, 71(6):525-616 (1971).
9. Fujita, T., Iwasa, J., and C. Hansch. "A New Substituent Constant, π , Derived from Partition Coefficients," *J. Am. Chem. Soc.*, 86(23):5175-5180 (1964).
 10. Verschueren, K. *Handbook of Environmental Data on Organic Chemicals* (New York: Van Nostrand Reinhold Co., 1983), 1310 p.
 11. Morrison, R.T., and R.N. Boyd. *Organic Chemistry* (Boston: Allyn and Bacon, Inc., 1971), 1258 p.
 12. Banerjee, S., Yalkowsky, S.H., and S.C. Valvani. "Water Solubility and Octanol/Water Partition Coefficients of Organics. Limitations of the Solubility-Partition Coefficient Correlation," *Environ. Sci. Technol.*, 14(10):1227-1229 (1980).
 13. Caturla, F., Martin-Martinez, J.M., Molina-Sabio, M., Rodriguez-Reinoso, F., and R. Torregrosa. "Adsorption of Substituted Phenols on Activated Carbon," *J. Colloid Interface Sci.*, 124(2):528-534 (1988).
 14. Sax, N.I. *Dangerous Properties of Industrial Materials* (New York: Van Nostrand Reinhold Co., 1984), 3124 p.
 15. Krijgsheld, K.R., and A. van der Gen. "Assessment of the Impact of the Emission of Certain Organochlorine Compounds on the Aquatic Environment - Part I: Monochlorophenols and 2,4-Dichlorophenol," *Chemosphere*, 15(7):825-860 (1986).
 16. *Fluka Catalog 1988/89 - Chemika-Biochemika* (Ronkonkoma, NY: Fluka Chemical Corp., 1988), 1536 p.
 17. Hwang, H.-M., Hodson, R.E., and R.F. Lee. "Degradation of Phenol and Chlorophenols by Sunlight and Microbes in Estuarine Water," *Environ. Sci. Technol.*, 20(10):1002-1007 (1986).
 18. *Fire Protection Guide on Hazardous Materials* (Quincy, MA: National Fire Protection Association, 1984), 443 p.
 19. "NIOSH Pocket Guide to Chemical Hazards," U.S. Department of Health and Human Services, U.S. Government Printing Office (1987), 241 p.

Material Safety Data Sheet

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Product: CRESOL*
MSDS No: Genium / 409
Revision: A
Date: August, 1988.

National Paint
and Coatings
Association

Hazardous Material
Identification
System

HEALTH HAZARD	3 - Serious
FLAMMABILITY HAZARD	2 - Moderate
REACTIVITY HAZARD	1 - Slight
PERSONAL PROTECTION	SEE SECTION 8

SECTION I. MATERIAL IDENTIFICATION

Trade/Material Name: CRESOL*

Description: Used as a solvent, disinfectant, fumigant; in photographic developers and explosives; and to make synthetic resins.

Other Designations: Cresylic Acid; $\text{CH}_3\text{C}_6\text{H}_4\text{OH}$

CAS: 1319-77-3

Contact your supplier or distributor. Consult the latest edition of Chemicalweek Buyers' Guide (Genium ref. 73) for list of suppliers.

* See Genium Industrial MSDS 560 for data specific to ortho-cresol.

SECTION II. INGREDIENTS AND HAZARDS

Ingredient Name:	CAS Number:	Percent:	Exposure Limits:
Cresol	1319-77-3	*	OSHA PEL (Skin**) 8-Hr TWA: 5 ppm, 22 mg/m ³ (All Isomers)
<u>ortho</u> -Cresol	0095-48-7	*	ACGIH TLV (Skin**), 1987-88 TLV-TWA: 5 ppm, 22 mg/m ³
<u>meta</u> -Cresol	0108-39-4	*	Toxicity Data*** Rat, Oral, LD ₅₀ : 1454 mg/kg Mouse, Oral, LD ₅₀ : 760 mg/kg Rabbit, Skin, LD ₅₀ : 2000 mg/kg
<u>para</u> -Cresol	0106-44-5	*	

* Cresol is a commercial mixture of three isomers (ortho, meta, and para). Contact your supplier to determine the percent by weight of each isomer and to determine if hazardous ingredients/contaminants such as phenol, xylene, benzene are present in reportable quantities.

** This material can be absorbed through intact skin, which contributes to overall

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INGREDIENTS AND HAZARDS continued from page 1

exposure.

*** See NIOSH, RTECS (G05950000, mixed cresol; G06125000, meta; G06300000, ortho; G06475000, para), for additional data with references to reproductive, tumorigenic, mutagenic, and irritative effects.

SECTION III. PHYSICAL DATA

Appearance & Odor: A colorless, yellowish, brownish yellow, or pinkish liquid that darkens upon exposure to air and light; phenolic odor. Appearance and odor depend upon the supplier and the exact composition of the purchased cresol.

Boiling point: *
Vapor pressure: *
Water solubility (%): Slight
pH: Acidic

Specific gravity (H₂O=1): 1.1
Molecular weight: 108 Grams/Mole

* Contact your supplier to determine the specific physical properties of the cresol product.

SECTION IV. FIRE AND EXPLOSION DATA

Flash Point (method): *

Limits: LEL %: *

UEL %: *

Extinguishing Media: * Contact your supplier for this data. Autoignition Temp: *
Cresol burns; treat it as a moderate fire hazard and a slight explosion hazard when exposed to heat or flame. Use foam, dry chemical, carbon dioxide, and water spray to extinguish cresol fires.

Special fire-fighting procedures: Wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in the pressure-demand or positive-pressure mode.

NFPA Hazard Ratings

ortho**

F 2
H 3
R 0
S -

meta and para**

F 1
H 3
R 0
S -

** Fire diamond for Cresol mixture not found.

Material Safety Data Sheet

Genium Publishing Corporation
1145 Catalyn Street, Schenectady, NY 12303
(518) 377-8854

From Genium's collection, to be used as reference

Product: CRESOL*

MSDS No: Genium / 409

Revision: A

Date: August, 1988

SECTION V. REACTIVITY DATA

Material is stable in closed containers at room temperature under normal storage and handling conditions. Hazardous polymerization cannot occur

Chemical incompatibilities: Cresol reacts dangerously with chlorosulfonic acid, nitric acid, oleum, and strong oxidizing agents.

Conditions to avoid: Hot cresol can attack copper, aluminum, magnesium, zinc, and lead. Stainless steel is recommended for use with cresol. Avoid direct contact with incompatible chemicals or exposure to sources of ignition. Many organic polymers will dissolve or soften when exposed to hot cresol.

Hazardous decomposition Products: Toxic gases such as carbon monoxide and heated cresol and/or cresol derivatives like phenol may be produced during fires.

SECTION VI. HEALTH HAZARD INFORMATION

This product is not considered a carcinogen by the NTP, IARC, or OSHA.

Summary of risks: Cresol is corrosive to any body tissue it touches. Skin absorption can occur and may lead to delayed, possibly fatal, systemic poisoning. Absorption of cresol causes central nervous system (CNS) depression characterized by mental confusion, depression, dyspnea, irregular and rapid respiration, and weak pulse. Damage to the liver, kidneys, lungs, skin, and eyes are also expected from exposure to cresol. Exposures to cresol are emergencies; immediately consult a qualified physician.

Medical conditions which may be aggravated by contact: Preexisting kidney or hepatic (liver) problems.

Target organs: Central nervous system, respiratory system, skin, eyes, liver, and kidneys.

Primary entry route(s): Skin contact/absorption, inhalation

Acute effects: Skin and eye burns, difficulty in breathing, and respiratory failure.

Chronic effect(s): Infrequently, prolonged skin contact with cresol results in a chronic disorder called ochronosis which is a darkening of the skin, conjunctiva, and cartilage of the nose and ears.

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HEALTH HAZARD INFORMATION continued from page 3

First aid:

- Eye contact:** Immediately flush eyes, including under the eyelids, gently but thoroughly with plenty of running water for at least 15 minutes. Treat for eye burns.
- Skin contact:** Immediately wash the affected area with soap and water because of the increased exposure hazard from skin absorption. Watch for chemical skin burns and treat them accordingly. If contact is gross, remove contaminated clothes and shoes under the safety shower. Further washing of skin with isopropyl alcohol or 20% glycerine in water, followed by a water rinse, may be useful.
- Inhalation:** Remove the exposed person to fresh air; restore and/or support his or her breathing as needed. Have trained personnel administer oxygen.
- Ingestion:** Call a poison control center. Never give anything by mouth to someone who is unconscious or convulsing. If he or she responsive, give the exposed person 1 to 2 glasses of milk or water to drink to dilute the material. Induce vomiting with emetic.

GET MEDICAL HELP (IN PLANT, PARAMEDIC, COMMUNITY) FOR ALL EXPOSURES. Seek prompt medical assistance for further treatment, observation, and support after first aid.

NOTE TO PHYSICIAN: Wash the affected skin area with a mixture of polyethylene glycol 300/industrial methylated spirits (PEG 300/IMS-2:1 by volume) or a similar preparation that will absorb the phenolic component. Personnel administering this treatment should wear rubber gloves. Hospitalize persons with serious exposures to monitor acidosis, shock, convulsions, and fluid balance. Thorough cleaning of the exposed person is required, especially matted hair, skin folds, and underneath fingernails, where the cresol may concentrate.

SECTION VII. SPILL, LEAK AND DISPOSAL PROCEDURES

Spill / Leak procedures: Notify safety personnel, provide ventilation, and eliminate sources of ignition immediately. Limit access to the spill area to necessary personnel only. Cleanup personnel need protection against contact with and inhalation of cresol (see sect. 8). Contain large spills and collect waste. Use water spray to direct cresol away from incompatible chemicals (see sect. 5). Absorb the waste with sand, earth, or vermiculite and place it into containers suitable for eventual disposal or reclamation. Do not flush waste to a sewer.

Waste management / Disposal: Consider reclamation, recycling, or destruction rather than disposal in a landfill. Contact your supplier or a licensed contractor for detailed recommendations. Follow Federal, state, and local regulations.

OSHA Designations

Material Safety Data Sheet

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Date: August, 1988

SPILL, LEAK AND DISPOSAL PROCEDURES continued from page 4

Air Contaminant (29 CFR 1910.1000 Subpart Z)

EPA Designations (40 CFR 302.4)

RCRA Hazardous Waste: No. U052

CERCLA Hazardous Substance, Reportable Quantity: 1000 lbs (454 kg), per the Clean Water Act (CWA), Section 311 (b) (4) and the Resource Conservation and Recovery Act (RCRA), Section 3001

SECTION VIII. SPECIAL PROTECTION INFORMATION

Personal protective equipment:

Goggles: Always wear protective eyeglasses or chemical safety goggles. Where splashing is possible, wear a full face shield as a supplementary protective measure. Follow OSHA eye- and face-protection regulations (29 CFR 1910.133).

Respirator: Wear a NIOSH-approved respirator per the NIOSH Pocket Guide to Chemical Hazards (Genium ref. 88) for the maximum-use concentrations and/or the exposure limits cited in section 2. Follow OSHA respirator regulations (29 CFR 1910.134). For emergency or nonroutine operations (leaks or cleaning reactor vessels and storage tanks), wear an SCBA with a full facepiece operated in the pressure-demand or positive-pressure mode.*

Other: Wear impervious gloves, boots, aprons, gauntlets, etc., to prevent skin contact with cresol.

Workplace considerations:

Ventilation: Install and operate both general and local exhaust-ventilation systems powerful enough to maintain airborne concentrations of cresol below the OSHA PEL standard cited in section 2.

Safety stations:

Make emergency eyewash stations, safety/quick-drench showers, and washing facilities available in work areas.

Contaminated equipment:

Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them. Do not wear contact lenses in any work area. Remove contaminated clothing and launder it before wearing it again; clean this material from shoes and equipment.

Practice good personal hygiene; always wash thoroughly after using this material. Keep it off of your clothing and equipment. Avoid transferring it from your hands to your mouth while eating, drinking, or smoking. Do not eat, drink, or smoke in any work area.

* Warning: Air-purifying respirators will not protect workers in oxygen-deficient atmospheres.

Material Safety Data Sheet

Genium Publishing Corporation
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From Genium's collection, to be used as reference

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Revision: A

Date: August, 1988

SECTION IX. SPECIAL PRECAUTIONS

Storage segregation: Store cresol in a cool, dry, well-ventilated area away from incompatible chemicals (see sect. 5) sources of ignition.

Special handling / storage: Preplan for routine use and emergency response. Build all storage facilities of nonflammable materials that are resistant to chemical attack by cresol. Protect containers from physical damage. Avoid using alloys of zinc, copper, or brass in storage and processing equipment that could be in contact with cresol.

Transportation Data (49 CFR 172.101-2)

DOT Shipping Name: Cresol

DOT label: Corrosive

IMO Label: Poison

IMO Class: 6.1

DOT Class: Corrosive Material

UN Register: UN2076

Data source code(s): 1, 2, 26, 38, 84-94, 100, 112, 113, 114.

Prepared/revised by: Genium Publishing Corporation

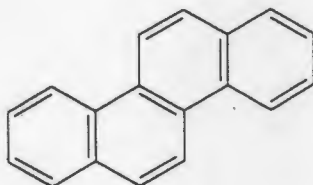
August 26, 1988

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CHRYSENE

Synonyms: Benz[*a*]phenanthrene; Benzo[*a*]phenanthrene; Benzo[α]phenanthrene; 1,2-Benzophenanthrene; 1,2-Benzphenanthrene; 1,2-Dibenzonaphthalene; 1,2,5,6-Dibenzonaphthalene; RCRA waste number U050.

Structural Formula:



CHEMICAL DESIGNATIONS

CAS Registry Number: 218-01-9

DOT Designation: None assigned.

Empirical Formula: C₁₈H₁₂

Formula Weight: 228.30

RTECS Number: GC 0700000

PHYSICAL AND CHEMICAL PROPERTIES

Appearance: Orthorhombic plates exhibiting strong fluorescence under ultraviolet light.

Boiling Point: 448 °C [1].

Henry's Law Constant: 7.26 x 10⁻²⁰ atm·m³/mol (calculated).

Ionization Potential: 7.85 ± 0.15 eV [2].

Log K_{oc}: 5.39 using method of Karickhoff and others [3].

Log K_{ow}: 5.60 [4]; 5.61 [5]; 5.91 [6].

Melting Point: 255-256 °C [1].

166 Chrysene

Solubility in Organics: Soluble in ether, ethanol, and acetic acid [7].

Solubility in Water: 0.0015 mg/L at 15 °C, 0.006 mg/L at 25 °C; 0.001-0.05 ppm in seawater at 22 °C, 0.017 mg/L in seawater at 24 °C (practical grade) [8]; 0.0020 mg/L at 25 °C [9]; 0.0018 mg/L at 25 °C, 0.0022 mg/L at 29 °C [10]; 0.0015 mg/L [11]; 0.017 mg/L at 24 °C [12].

Specific Density: 1.274 at 20/4 °C [1].

Transformation Products: Based on structurally related compounds, chrysene may undergo photolysis to yield quinones [7].

Vapor Pressure: 6.3×10^{-9} mm at 25 °C [13]; 6.3×10^{-7} mm at 20 °C [14].

FIRE HAZARDS

Flash Point: No data found.

Lower Explosive Limit (LEL): No data found.

Upper Explosive Limit (UEL): No data found.

HEALTH HAZARD DATA

Immediately Dangerous to Life or Health (IDLH): Potential human carcinogen [15].

Permissible Exposure Limits (PEL) in Air: No individual standards have been set, however, as a constituent in coal tar pitch volatiles, the following exposure limits have been established: 0.2 mg/m³ (benzene-soluble fraction) [16]; 0.1 mg/m³ 10-hour TWA (cyclohexane-extractable fraction) [15]; 0.2 mg/m³ TWA (benzene solubles) [17].

MANUFACTURING

Selected Manufacturers:

Aldrich Chemical Co.
940 West Saint Paul Ave.
Milwaukee, WI 53233

Fluka Chemical Corp.
980 South Second St.
Ronkonkoma, NY 11779

Use: Organic synthesis. Derived from industrial and experimental coal gasification operations where maximum concentrations detected in gas, liquid, and coal tar streams were 7.3 mg/m³, 0.16 mg/m³, and 8.6 mg/m³, respectively [18].

REFERENCES

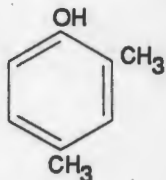
1. Weast, R.C., Ed. *CRC Handbook of Chemistry and Physics*, 67th ed. (Boca Raton, FL: CRC Press, Inc., 1986), 2406 p.
2. Franklin, J.L., Dillard, J.G., Rosenstock, H.M., Herron, J.T., Draxl K., and F.H. Field. "Ionization Potentials, Appearance Potentials and Heats of Formation of Gaseous Positive Ions," National Bureau of Standards Report NSRDS-NBS 26, U.S. Government Printing Office (1969), 289 p.
3. Karickhoff, S.W., Brown, D.S., and T.A. Scott. "Sorption of Hydrophobic Pollutants on Natural Sediments," *Water Res.*, 13:241-248 (1979).
4. Mills, W.B., Porcella, D.B., Unga, M.J., Gherini, S.A., Summers, K.V., Mok, L., Rupp, G.L., and G.L. Bowie. "Water Quality Assessment: A Screening Procedure for Toxic and Conventional Pollutants in Surface and Groundwater-Part I," Office of Research and Development, U.S. EPA Report-600/6-85-002a (1985), 638 p.
5. Walton, W.C. *Practical Aspects of Ground Water Modeling* (Worthington, OH: National Water Well Association, 1985), 587 p.
6. Yoshida, K., Shigeoka, T., and F. Yamauchi. "Non-Steady State Equilibrium Model for the Preliminary Prediction of the Fate of Chemicals in the Environment," *Ecotoxicol. Environ. Safety*, 7(2):179-190 (1983).
7. "Chemical, Physical, and Biological Properties of Compounds Present at Hazardous Waste Sites," U.S. EPA Report-530/SW-89-010 (1985), 619 p.
8. Verschueren, K. *Handbook of Environmental Data on Organic Chemicals* (New York: Van Nostrand Reinhold Co., 1983), 1310 p.
9. Mackay, D., and W.Y. Shiu. "Aqueous Solubility of Polynuclear Aromatic Hydrocarbons," *J. Chem. Eng. Data*, 22(4):399-402 (1977).
10. May, W.E., Wasik, S.P., and D.H. Freeman. "Determination of the Solubility Behavior of Some Polycyclic Aromatic Hydrocarbons in Water," *Anal. Chem.*, 50(7):997-1000 (1978).

11. Davis, W.W., Krah, M.E., and G.H.A. Clowes. "Solubility of Carcinogenic and Related Hydrocarbons in Water," *J. Am. Chem. Soc.*, 64(1):108-110 (1942).
12. Hollifield, H.C. "Rapid Nephelometric Estimate of Water Solubility of Highly Insoluble Organic Chemicals of Environmental Interest," *Bull. Environ. Contam. Toxicol.*, 23(4/5):579-586 (1979).
13. Mabey, W.R., Smith, J.H., Podoll, R.T., Johnson, H.L., Mill, T., Chou, T.-W., Gates, J., Partridge, I.W., Jaber, H., and D. Vandenberg. "Aquatic Fate Process Data for Organic Priority Pollutants - Final Report," Office of Regulations and Standards, U.S. EPA Report-440/4-81-014 (1982), 407 p.
14. Sims, R.C., Doucette, W.C., McLean, J.E., Greeney, W.J., and R.R. Dupont. "Treatment Potential for 56 EPA Listed Hazardous Chemicals in Soil," National Technical Information Service, U.S. EPA Report-600/6-88-001 (1988), 105 p.
15. "NIOSH Pocket Guide to Chemical Hazards," U.S. Department of Health and Human Services, U.S. Government Printing Office (1987), 241 p.
16. "General Industry Standards for Toxic and Hazardous Substances," U.S. Code of Federal Regulations 1910, Subpart Z, Section 1910.1000 (July 1982).
17. *Documentation of the Threshold Limit Values and Biological Exposure Indices for 1986-1987* (Cincinnati, OH: American Conference of Governmental Industrial Hygienists, 1986), 111 p.
18. Cleland, J.G. "Project Summary - Environmental Hazard Rankings of Pollutants Generated in Coal Gasification Processes," Office of Research and Development, U.S. EPA Report-600/S7-81-101 (1981), 19 p.

2,4-DIMETHYLPHENOL

Synonyms: 4,6-Dimethylphenol; 2,4-DMP; 1-Hydroxy-2,4-dimethylbenzene; 4-Hydroxy-1,3-dimethylbenzene; RCRA waste number U101; 1,3,4-Xylenol; 2,4-Xylenol; *m*-Xylenol.

Structural Formula:



CHEMICAL DESIGNATIONS

CAS Registry Number: 105-67-9

DOT Designation: None assigned.

Empirical Formula: C₈H₁₀O

Formula Weight: 122.17

RTECS Number: ZE 5600000

PHYSICAL AND CHEMICAL PROPERTIES

Appearance: Colorless solid, slowly turning brown on exposure to air.

Boiling Point: 210 °C [1].

Dissociation Constant: 10.63 [2].

Henry's Law Constant: 6.55 x 10⁻⁶ atm·m³/mol at 25 °C (estimated) [3].

Ionization Potential: No data found.

Log K_{ow}: 2.07 (estimated) [4].

Log K_{ow}: 2.42 [5]; 2.50 [6]; 2.30 [7].

Melting Point: 27-28 °C [1].

264 2,4-Dimethylphenol

Solubility in Organics: Freely soluble in ethanol, chloroform, ether, and benzene [8].

Solubility in Water: 4,200 mg/L at 20 °C [9]; 7,868 mg/L at 25 °C [10]; 6.2 g/L at 25 °C [3].

Specific Density: 0.9650 at 20/4 °C [1].

Transformation Products: No data found.

Vapor Pressure: As a supercooled liquid - 0.0621 mm at 20 °C [11]; 1 mm at 51.8 °C, 10 mm at 92.3 °C, 40 mm at 121.5 °C, 100 mm at 143.0 °C, 400 mm at 184.2 °C, 760 mm at 211.5 °C [1]; 0.098 mm at 25.0 °C [3].

FIRE HAZARDS

Flash Point: > 110 °C [12].

Lower Explosive Limit (LEL): No data found.

Upper Explosive Limit (UEL): No data found.

HEALTH HAZARD DATA

Immediately Dangerous to Life or Health (IDLH): No data found.

Permissible Exposure Limits (PEL) in Air: No standards set.

MANUFACTURING

Selected Manufacturers:

Aldrich Chemical Co.
940 West Saint Paul Ave.
Milwaukee, WI 53233

Fluka Chemical Corp.
980 South Second St.
Ronkonkoma, NY 11779

Pfaltz & Bauer, Inc.
172 East Aurora St.
Waterbury, CT 06708

Uses: Wetting agent; dyestuffs; preparation of phenolic antioxidants; plastics, resins, solvent, disinfectant, pharmaceuticals, insecticides, fungicides, and rubber chemicals manufacturing; lubricant and gasoline additive; possibly used a pesticide; plasticizers.

REFERENCES

1. Weast, R.C., Ed. *CRC Handbook of Chemistry and Physics*, 67th ed. (Boca Raton, FL: CRC Press, Inc., 1986), 2406 p.
2. Howard, P.H. *Handbook of Environmental Fate and Exposure Data for Organic Chemicals* (Chelsea, MI: Lewis Publishers, Inc., 1989), 574 p.
3. Leuenberger, C., Ligocki, M.P., and J.F. Pankow. "Trace Organic Compounds in Rain. 4. Identities, Concentrations, and Scavenging Mechanisms for Phenols in Urban Air and Rain," *Environ. Sci. Technol.*, 19(11):1053-1058 (1985).
4. Montgomery, J.H. Unpublished results (1989).
5. Veith, G.D., Macek, K.J., Petrocelli, S.R., and J. Carroll. "An Evaluation of Using Partition Coefficients and Water Solubility to Estimate Bioconcentration Factors for Organic Chemicals in Fish," in *Aquatic Toxicology, ASTM STP 707*, Eaton, J.G., Parrish, P.R., and A.C. Hendricks, Eds. (Philadelphia, PA: American Society for Testing and Materials, 1980), pp 116-129.
6. "Treatability Manual - Volume 1: Treatability Data," Office of Research and Development, U.S. EPA Report-600/8-80-042a (1980), 1035 p.
7. Mabey, W.R., Smith, J.H., Podoll, R.T., Johnson, H.L., Mill, T., Chou, T.-W., Gates, J., Partridge, I.W., Jaber, H., and D. Vandenberg. "Aquatic Fate Process Data for Organic Priority Pollutants - Final Report," Office of Regulations and Standards, U.S. EPA Report-440/4-81-014 (1982), 407 p.
8. "Chemical, Physical, and Biological Properties of Compounds Present at Hazardous Waste Sites," U.S. EPA Report-530/SW-89-010 (1985), 619 p.
9. Verschueren, K. *Handbook of Environmental Data on Organic Chemicals* (New York: Van Nostrand Reinhold Co., 1983), 1310 p.
10. Banerjee, S., Yalkowsky, S.H., and S.C. Valvani. "Water Solubility and Octanol/Water Partition Coefficients of Organics. Limitations

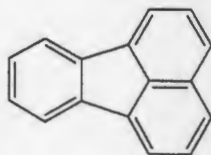
of the Solubility-Partition Coefficient Correlation," *Environ. Sci. Technol.*, 14(10):1227-1229 (1980).

11. Andon, R.J.L., Biddiscombe, D.P., Cox, F.D., Handley, R., Harrop, D., Herington, E.F.G., and J.F. Martin. "Thermodynamic Properties of Organic Oxygen Compounds. Part 1. Preparation of Physical Properties of Pure Phenol, Cresols and Xylenols," *J. Chem. Soc. (London)*, (1960), pp 5246-5254.
12. *Catalog Handbook of Fine Chemicals* (Milwaukee, WI: Aldrich Chemical Co., 1988), 2212 p.

FLUORANTHENE

Synonyms: 1,2-Benzacenaphthene; Benzo[*jk*]fluorene; Idryl; 1,2-(1,8-Naphthylene)benzene; 1,2-(1,8-Naphthalenediyl)benzene; RCRA waste number U120.

Structural Formula:



CHEMICAL DESIGNATIONS

CAS Registry Number: 206-44-0

DOT Designation: None assigned.

Empirical Formula: $C_{16}H_{10}$

Formula Weight: 202.26

RTECS Number: LL 4025000

PHYSICAL AND CHEMICAL PROPERTIES

Appearance: Colorless crystals.

Boiling Point: 375 °C [1]; 384 °C [2]; 367 °C [3].

Henry's Law Constant: 0.0169 atm·m³/mol at 25 °C [4].

Ionization Potential: 8.54 eV [5].

Log K_{ow} : 4.62 [6].

Log K_{ow} : 5.22 [6].

Melting Point: 107 °C [7]; 111 °C [8]; 120 °C [3]; 109-110 °C [9].

Solubility in Organics: Soluble in acetic acid, benzene, chloroform, carbon disulfide, ethanol, and ether [10].

314 Fluoranthene

Solubility in Water: 0.265 mg/L at 25 °C [11]; 0.120 mg/L at 24 °C, 0.1 ppm in seawater at 22 °C [7]; 0.26 mg/L at 25 °C [12]; 0.206 mg/L at 25 °C; 0.264 mg/L at 29 °C [13]; 0.236 mg/L at 25 °C [14]; 0.240 mg/L [15]; 0.133, 0.275 mg/L at 15 °C, 0.166 mg/L at 20 °C, 0.222, 0.373 mg/L at 25 °C [16].

Specific Density: 1.252 at 0/4 °C [1].

Transformation Products: No data found.

Vapor Pressure: 0.01 mm at 20 °C [3]; estimated as 10^{-6} - 10^{-4} mm at 20 °C based on data for structurally similar compounds [8]; 5.0×10^{-6} mm at 25 °C [17].

FIRE HAZARDS

Flash Point: No data found.

Lower Explosive Limit (LEL): No data found.

Upper Explosive Limit (UEL): No data found.

HEALTH HAZARD DATA

Immediately Dangerous to Life or Health (IDLH): Potential human carcinogen [18].

Permissible Exposure Limits (PEL) in Air: No individual standards have been set, however, as a constituent in coal tar pitch volatiles, the following exposure limits have been established: 0.2 mg/m³ (benzene-soluble fraction) [19]; 0.1 mg/m³ 10-hour TWA (cyclohexane-extractable fraction) [18]; 0.2 mg/m³ TWA (benzene solubles) [20].

MANUFACTURING

Selected Manufacturers:

Aldrich Chemical Co.
940 West Saint Paul Ave.
Milwaukee, WI 53233

Fluka Chemical Corp.
980 South Second St.
Ronkonkoma, NY 11779

Use: Research chemical.

REFERENCES

1. Weast, R.C., Ed. *CRC Handbook of Chemistry and Physics*, 67th ed. (Boca Raton, FL: CRC Press, Inc., 1986), 2406 p.
2. *Catalog Handbook of Fine Chemicals* (Milwaukee, WI: Aldrich Chemical Co., 1988), 2212 p.
3. Sax, N.I. *Dangerous Properties of Industrial Materials* (New York: Van Nostrand Reinhold Co., 1984), 3124 p.
4. Hine, J., and P.K. Mookerjee. "The Intrinsic Hydrophilic Character of Organic Compounds. Correlations in Terms of Structural Contributions," *J. Org. Chem.*, 40(3):292-298 (1975).
5. Franklin, J.L., Dillard, J.G., Rosenstock, H.M., Herron, J.T., Draxl K., and F.H. Field. "Ionization Potentials, Appearance Potentials and Heats of Formation of Gaseous Positive Ions," National Bureau of Standards Report NSRDS-NBS 26, U.S. Government Printing Office (1969), 289 p.
6. Abdul, S.A., Gibson, T.L., and D.N. Rai. "Statistical Correlations for Predicting the Partition Coefficient for Nonpolar Organic Contaminants Between Aquifer Organic Carbon and Water," *Haz. Waste Haz. Mater.*, 4(3):211-222 (1987).
7. Verschuere, K. *Handbook of Environmental Data on Organic Chemicals* (New York: Van Nostrand Reinhold Co., 1983), 1310 p.
8. "Treatability Manual - Volume I: Treatability Data," Office of Research and Development, U.S. EPA Report-600/8-80-042a (1980), 1035 p.
9. *Fluka Catalog 1988/89 - Chemika-Biochemika* (Ronkonkoma, NY: Fluka Chemical Corp., 1988), 1536 p.
10. "Chemical, Physical, and Biological Properties of Compounds Present at Hazardous Waste Sites," U.S. EPA Report-530/SW-89-010 (1985), 619 p.
11. Harrison, R.M., Perry, R., and R.A. Wellings. "Polynuclear Aromatic Hydrocarbons in Raw, Potable and Waste Waters," *Water Res.*, 9:331-346 (1975).
12. Mackay, D., and W.Y. Shiu. "Aqueous Solubility of Polynuclear Aromatic Hydrocarbons," *J. Chem. Eng. Data*, 22(4):399-402 (1977).
13. May, W.E., Wasik, S.P., and D.H. Freeman. "Determination of the

- Aqueous Solubility of Polynuclear Aromatic Hydrocarbons by a Coupled Column Liquid Chromatographic Technique," *Anal. Chem.*, 50(1):175-179 (1978).
14. Schwarz, F.P., and S.P. Wasik. "Fluorescence Measurements of Benzene, Naphthalene, Anthracene, Pyrene, Fluoranthene, and Benzo[e]pyrene in Water," *Anal. Chem.*, 48(3):524-528 (1976).
 15. Davis, W.W., Krah, M.E., and G.H.A. Clowes. "Solubility of Carcinogenic and Related Hydrocarbons in Water," *J. Am. Chem. Soc.*, 64(1):108-110 (1942).
 16. Kishi, H., and Y. Hashimoto. "Evaluation of the Procedures for the Measurement of Water Solubility and *n*-Octanol/Water Partition Coefficient of Chemicals Results of a Ring Test in Japan," *Chemosphere*, 18(9/10):1749-1749 (1989).
 17. Mabey, W.R., Smith, J.H., Podoll, R.T., Johnson, H.L., Mill, T., Chou, T.-W., Gates, J., Partridge, I.W., Jaber, H., and D. Vandenberg. "Aquatic Fate Process Data for Organic Priority Pollutants - Final Report," Office of Regulations and Standards, U.S. EPA Report-440/4-81-014 (1982), 407 p.
 18. "NIOSH Pocket Guide to Chemical Hazards," U.S. Department of Health and Human Services, U.S. Government Printing Office (1987), 241 p.
 19. "General Industry Standards for Toxic and Hazardous Substances," U.S. Code of Federal Regulations 1910, Subpart Z Section 1910.1000 (July 1982).
 20. *Documentation of the Threshold Limit Values and Biological Exposure Indices for 1986-1987* (Cincinnati, OH: American Conference of Governmental Industrial Hygienists, 1986), 111 p.

FLUORENE

Synonyms: 2,3-Benzindene; *o*-Biphenylenemethane; *o*-Biphenylmethane; Diphenylenemethane; *o*-Diphenylenemethane; 9*H*-Fluorene; 2,2'-Methylenebiphenyl.

Structural Formula:



CHEMICAL DESIGNATIONS

CAS Registry Number: 86-73-7

DOT Designation: None assigned.

Empirical Formula: $C_{13}H_{10}$

Formula Weight: 166.22

RTECS Number: LL 5670000

PHYSICAL AND CHEMICAL PROPERTIES

Appearance: Small white leaflets or flakes. Fluorescent when impure.

Boiling Point: 298 °C [1]; 294 °C [2].

Henry's Law Constant: 2.1×10^{-4} atm·m³/mol [3].

Ionization Potential: 8.63 eV [4]; 8.56 eV [5].

Log K_{oc} : 3.70 [6].

Log K_{ow} : 4.12 [7]; 4.18 [8]; 4.38 [9].

318 Fluorene

Melting Point: 116-117 °C [10]; 116 °C [2]; 113-115 °C [11].

Solubility in Organics: Soluble in most solvents [12].

Solubility in Water: 0.8 ppm [13]; 1.69 mg/L at 25 °C [14]; 1.98 mg/L at 25 °C [15]; 0.190 mg/L at 25 °C [16]; 1.6622 mg/L at 25 °C [17].

Specific Density: 1.203 at 0/4 °C [10].

Transformation Products: No data found.

Vapor Pressure: 10 mm at 146 °C, 40 mm at 185.2 °C, 100 mm at 214.7 °C, 400 mm at 268.6 °C, 760 mm at 295 °C [10]; estimated as 0.001-0.01 mm at 20 °C based on data for structurally similar compounds [18]; 7.1×10^{-4} mm [19]; 0.113 mm at 75 °C, 0.167 mm at 80 °C, 0.242 mm at 85 °C, 0.356 mm at 90 °C, 0.512 mm at 95 °C, 0.744 mm at 100 °C, 1.061 mm at 105 °C, 1.500 mm at 110 °C, 1.943 mm at 114 °C [20]; 0.000195 mm at 34.85 °C, 0.000250 mm at 37.20 °C, 0.000164 mm at 33.30 °C, 0.000281 mm at 38.45 °C, 0.000343 mm at 40.30 °C, 0.000543 mm at 45.00 °C, 0.000708 mm at 47.75 °C, 0.000818 mm at 49.25 °C, 0.000833 mm at 49.55 °C [21].

FIRE HAZARDS

Flash Point: No data found.

Lower Explosive Limit (LEL): No data found.

Upper Explosive Limit (UEL): No data found.

HEALTH HAZARD DATA

Immediately Dangerous to Life or Health (IDLH): Potential human carcinogen [22].

Permissible Exposure Limits (PEL) in Air: No individual standards have been set, however, as a constituent in coal tar pitch volatiles, the following exposure limits have been established: 0.2 mg/m³ (benzene-soluble fraction) [23]; 0.1 mg/m³ 10-hour TWA (cyclohexane-extractable fraction) [22]; 0.2 mg/m³ TWA (benzene solubles) [24].

MANUFACTURING

Selected Manufacturers:

Aldrich Chemical Co.
940 West Saint Paul Ave.
Milwaukee, WI 53233

Fluka Chemical Corp.
980 South Second St.
Ronkonkoma, NY 11779

Uses: Chemical intermediate in numerous applications and in the formation of polyradicals for resins; insecticides and dyestuffs. Derived from industrial and experimental coal gasification operations where maximum concentrations detected in gas, liquid, and coal tar streams were 9.1 mg/m^3 , 0.057 mg/m^3 , and 8.0 mg/m^3 , respectively [25].

REFERENCES

1. *Catalog Handbook of Fine Chemicals* (Milwaukee, WI: Aldrich Chemical Co., 1988), 2212 p.
2. Huntress, E.H., and S.P. Mulliken. *Identification of Pure Organic Compounds - Tables of Data on Selected Compounds of Order I* (New York: John Wiley and Sons, Inc., 1941), 691 p.
3. Petrasek, A.C., Kugelman, I.J., Austern, B.M., Pressley, T.A., Winslow, L.A., and R.H. Wise. "Fate of Toxic Organic Compounds in Wastewater Treatment Plants," *J. Water Poll. Control Fed.*, 55(10):1286-1296 (1983).
4. Franklin, J.L., Dillard, J.G., Rosenstock, H.M., Herron, J.T., Draxl K., and F.H. Field. "Ionization Potentials, Appearance Potentials and Heats of Formation of Gaseous Positive Ions," National Bureau of Standards Report NSRDS-NBS 26, U.S. Government Printing Office (1969), 289 p.
5. Yoshida, K., Shigeoka, T., and F. Yamauchi. "Non-Steady State Equilibrium Model for the Preliminary Prediction of the Fate of Chemicals in the Environment," *Ecotoxicol. Environ. Safety*, 7(2):179-190 (1983).
6. Abdul, S.A., Gibson, T.L., and D.N. Rai. "Statistical Correlations for Predicting the Partition Coefficient for Nonpolar Organic Contaminants Between Aquifer Organic Carbon and Water," *Haz. Waste Haz. Mater.*, 4(3):211-222 (1987).

7. Chou, J.T., and P.C. Jurs. "Computer Assisted Computation of Partition Coefficients from Molecular Structures using Fragment Constants," *J. Chem. Info. Comp. Sci.*, 19:172-178 (1979).
8. Hansch, C., Leo, A., and D. Nikaitani. "On the Additive-Constitutive Character of Partition Coefficients," *J. Org. Chem.*, 37(20):3090-3092 (1972).
9. Isnard, S., and S. Lambert. "Estimating Bioconcentration Factors from Octanol-Water Partition Coefficient and Aqueous Solubility," *Chemosphere*, 17(1):21-34 (1988).
10. Weast, R.C., Ed. *CRC Handbook of Chemistry and Physics*, 67th ed. (Boca Raton, FL: CRC Press, Inc., 1986), 2406 p.
11. *Fluka Catalog 1988/89 - Chemika-Biochemika* (Ronkonkoma, NY: Fluka Chemical Corp., 1988), 1536 p.
12. "Chemical, Physical, and Biological Properties of Compounds Present at Hazardous Waste Sites," U.S. EPA Report-530/SW-89-010 (1985), 619 p.
13. Verschueren, K. *Handbook of Environmental Data on Organic Chemicals* (New York: Van Nostrand Reinhold Co., 1983), 1310 p.
14. May, W.E., Wasik, S.P., and D.H. Freeman. "Determination of the Aqueous Solubility of Polynuclear Aromatic Hydrocarbons by a Coupled Column Liquid Chromatographic Technique," *Anal. Chem.*, 50(1):175-179 (1978).
15. Mackay, D., and W.Y. Shiu. "Aqueous Solubility of Polynuclear Aromatic Hydrocarbons," *J. Chem. Eng. Data*, 22(4):399-402 (1977).
16. Wauchope, R.D., and F.W. Getzen. "Temperature Dependence of Solubilities in Water and Heats of Fusion of Solid Aromatic Hydrocarbons," *J. Chem. Eng. Data*, 17:38-41 (1972).
17. Sahyun, M.R.V. "Binding of Aromatic Compounds to Bovine Serum Albumin," *Nature*, 209(5023):613-614 (1966).
18. "Treatability Manual - Volume 1: Treatability Data," Office of Research and Development, U.S. EPA Report-600/8-80-042a (1980), 1035 p.
19. Mabey, W.R., Smith, J.H., Podoll, R.T., Johnson, H.L., Mill, T., Chou, T.-W., Gates, J., Partridge, I.W., Jaber, H., and D. Vandenberg. "Aquatic Fate Process Data for Organic Priority Pollutants - Final Report," Office of Regulations and Standards, U.S. EPA Report-440/4-81-014 (1982), 407 p.
20. Osborn, A.G., and D.R. Douslin. "Vapor Pressures and Derived Enthalpies of Vaporization of Some Condensed-Ring Hydrocarbons," *J. Chem. Eng. Data*, 20(3):229-231 (1975).
21. Bradley, R.S., and T.G. Cleasby. "The Vapour Pressure and Lattice Energy of Some Aromatic Ring Compounds," *J. Chem. Soc. (London)*, pp 1690-1692 (1953).

22. "NIOSH Pocket Guide to Chemical Hazards," U.S. Department of Health and Human Services, U.S. Government Printing Office (1987), 241 p.
23. "General Industry Standards for Toxic and Hazardous Substances," U.S. Code of Federal Regulations 1910, Subpart Z Section 1910.1000 (July 1982).
24. *Documentation of the Threshold Limit Values and Biological Exposure Indices for 1986-1987* (Cincinnati, OH: American Conference of Governmental Industrial Hygienists, 1986), 111 p.
25. Cleland, J.G. "Project Summary - Environmental Hazard Rankings of Pollutants Generated in Coal Gasification Processes," Office of Research and Development, U.S. EPA Report-600/S7-81-101 (1981), 19 p.



CALEDON
LABORATORIES LTD

40 ARMSTRONG AVENUE, GEORGETOWN, ONTARIO, CANADA L7G 4R9

416-877-0101

FAX: 416-877-6666

MATERIAL SAFETY DATA SHEET

HEXANE

PRODUCT IDENTIFICATION

Chemical Name and Synonyms: *Hexane; Normal Hexane; Hexanes*
Chemical Family: *Aliphatic hydrocarbon*
Chemical Formula: C_6H_{14}
Product Use: *Laboratory Solvent*
Manufacturer's Name: *Caledon Laboratories Ltd.*
Street Address: *40 Armstrong Avenue*
City: *Georgetown*
Province: *Ontario*
Postal Code: *L7G 4R9*
Telephone No.: *(416) 877-0101*
Emergency Telephone No.: *CANUTEC (613) 996-6666*
Poison Control Centre: *1-800-268-9017*

HAZARDOUS INGREDIENTS OF MATERIALS

<u>Ingredients</u>	<u>%</u>	<u>TLV Units</u>	<u>CAS No.</u>
n-Hexane	>85	50 ppm	110-54-3
Methylpentanes, may include 2-methylpentane	<5	not established 500 ppm	107-83-5
Methylcyclopentane	<10	not established	96-37-7
Methylpentanes	3	not established	N/A
Benzene	~200 ppm	5 ppm	71-43-2

PHYSICAL DATA

Physical State: *Liquid*
Odour and Appearance: *Clear liquid, mild odour*
Odour Threshold (ppm): *64-244 ppm*
Vapour Pressure (mm Hg): *132 mm Hg at 37.7°C (100°F)*
Vapour Density (Air = 1): *3*
Evaporation Rate: *0.3 (Ethyl Ether = 1)*
Boiling Point (°C): *67-69°C*
Freezing Point (°C): *-95°C*
pH: *Not Applicable*
Specific Gravity: *0.67 to 0.68*
Coefficient of Water/Oil distribution: *No Data*

SHIPPING DESCRIPTION

PIN: *1208*
T.D.G. Class: *3.1*
Pkg. Group: *II*

REACTIVITY DATA

Chemical Stability: *Stable*
Incompatibility with other substances: *Oxygen and strong oxidizing agents*
Reactivity: *Avoid heat, sparks and open flame*
Hazardous Decomposition Products: *Carbon oxides form when burned*

FIRE AND EXPLOSION DATA

Flammability: *Flammable*
Extinguishing Media: *Dry chemical, foam, or carbon dioxide*
Flash Point (Method Used): *-21°C (TCC)*
Autoignition Temperature: *260°C*
Upper Flammable Limit (% by volume): *7.7*
Lower Flammable Limit (% by volume): *1.2*
Hazardous Combustion Products: *Carbon Oxides*
Sensitivity to Impact: *No Data*
Sensitivity to Static discharge: *No Data*

TOXICOLOGICAL PROPERTIES AND HEALTH DATA

Toxicological Data:

LD₅₀: *(rat, oral) 28,710 mg/kg*
LC₅₀: *(inhalation, mouse) 35,000 ppm/1 hour*

Effects of Acute Exposure to Product:

Inhaled: *Dizziness, headache, excitation, central nervous system depression.*
In contact with skin: *May cause mild irritation. Can be absorbed through skin in harmful amounts.*
In contact with eyes: *May cause mild irritation*
Ingested: *May cause irritation to intestines. May be aspirated into the lungs if swallowed, which may result in pulmonary edema and chemical pneumonitis.*

Effects of Chronic Exposure to Product:

Causes harm to the nervous system producing a lack of feeling in the extremities and more severe nerve damage. Methyl pentanes have produced kidney damage in male rats only, but no comparable health hazard for kidney disease is known to occur in humans.
Carcinogenicity: *Not carcinogenic in animal tests*
Teratogenicity: *Negative*
Reproductive Effects: *Insufficient human data*
Mutagenicity: *Insufficient data*
Synergistic Products: *None known*

PREVENTIVE MEASURES

Engineering Controls: *Local exhaust recommended.*
Respiratory Protection: *Approved air-purifying respirator or self-contained breathing apparatus required for concentrations exceeding TLV*
Eye Protection: *Chemical safety goggles*
Skin Protection: *Neoprene gloves, overalls, apron or protective clothing.*
Other Personal Protective Equipment: *Safety shower and eye wash*
Leak and Spill Procedure: *Evacuate area. Provide maximum ventilation and protect from ignition. Contain spill and collect using absorbent material.*

Waste Disposal: All waste material should be packaged, labelled, transported and disposed of in accordance with federal and local regulations.

Handling Procedures and Equipment: Keep away from heat, sparks and open flame. Bond and ground containers during liquid transfer.

Storage Requirements: Store in cool, dry place.

FIRST AID MEASURES

Specific Measures:

Eyes: IMMEDIATELY FLUSH EYES with warm running water for a minimum of fifteen (15) minutes. (Using any available clean container, pour water in a gentle steady stream, over the eye(s). Position casualty lying on back, face tilted to one side.) HOLD eyelids open while flushing. REPEAT flushing if irritation persists. Obtain MEDICAL ADVICE immediately. (Flushing may be continued while casualty is transported to medical facility.)

Skin: IMMEDIATELY FLUSH exposed area with large amounts of warm running water WHILE REMOVING contaminated clothing (including rings, watches and shoes). CONTINUE flushing the area up to twenty (20) minutes. If irritation persists, REPEAT FLUSHING. Obtain MEDICAL ADVICE immediately. (Call Poison Control Centre.)

Inhalation: IMMEDIATELY remove casualty from contaminated area to fresh air. (CAUTION must be used by rescuers to avoid exposure to contaminating fumes.) If BREATHING HAS STOPPED give artificial respiration. If BREATHING and PULSE ARE ABSENT, give CPR. IMMEDIATELY OBTAIN MEDICAL ATTENTION. Stay with casualty until medical assistance is reached.

Ingestion: DO NOT INDUCE VOMITING. DANGER OF ASPIRATION WITH EMESIS. If casualty is ALERT and NOT CONVULSING, rinse out mouth with water. Give up to 4 to 8 glasses of water to dilute material. CALL POISON CONTROL CENTRE. (Have all available information at hand.) IMMEDIATELY GET MEDICAL ATTENTION. If SPONTANEOUS VOMITING occurs have casualty lean forward with head down to avoid breathing in of vomitus.

ADDITIONAL INFORMATION AND SOURCES USED

CCINFO disc:

Date Issued: January 31, 1989

Date Revised: March 31, 1989

Prepared by: The Caledon Safety Committee
(416) 877-0101

MSDS: 5600

Caledon Laboratories Ltd. believes the information contained herein is reliable and accurate. Caledon makes no warranty with respect thereto and expressly disclaims all liability for reliance thereon. Such information is solely for your consideration, investigation, and verification.

Material Safety Data Sheet

Genium Publishing Corporation
1145 Catalyt Street, Schenectady, NY 12303
(518) 377-8854
From Genium's collection, to be used as reference

Product: ISOPROPYL ALCOHOL

MSDS No: Genium / 324

Revision: D

Date: September, 1985

SECTION I. MATERIAL IDENTIFICATION

Trade/Material Name: ISOPROPYL ALCOHOL

Other Designations: Isopropanol, 2-Propanol, sec-Propyl Alcohol, Dimethyl Carbinol, Isohol, Petrohol, IPA, C_3H_8O

CAS: 0067-63-0

Available from several sources, including:

Manufacturer: Allied Corporation
PO Box 2064R
Morristown, NJ 07960

Phone: (201) 455-4400
(800) 631-8050

SECTION II. INGREDIENTS AND HAZARDS

Ingredient Name:	Percent:	Exposure Limits:
ISOPROPYL ALCOHOL	ca 100	8-hr TWA: 400 ppm or 980 mg/m^3 *
		Human, Eye: 20 ppm Primary irritation dose
		Human, Inhalation: 400 ppm: IRR
		Man, Oral LDLo: 8600 mg/kg
		Rat, Oral: 5840 mg/kg

*Current OSHA PEL and ACGIH TLV (1985-86).

The ACGIH STEL is 500 ppm, 1225 mg/m^3 .

NIOSH has recommended a 15-minute ceiling of 800 ppm.

NOTE: NTP and IARC list CAS #0067-63-0, "isopropyl alcohol manufacture (strong acid process)" as a human carcinogen. We believe this refers to the process and not necessarily the product. Check with your suppliers.

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Product: ISOPROPYL ALCOHOL

MSDS No: Genium / 324

Revision: 0

Date: September, 1985

SECTION III. PHYSICAL DATA

Appearance & Odor: Clear, colorless liquid with a slight non-residual alcohol type odor. Threshold odor concentration, 100% recognition by test panel, is 28.2 ppm.

Boiling point: 180°F, (82°C), 1 atm
Vapor pressure: 33 @ 20°C, mmHg
Water solubility (%): Completely soluble
Vapor density (air=1): 2.07

Evaporation rate: 2.6 (CCl₄=1)
Specific gravity (H₂O=1): 0.786
Melting point: -127.3°F
(-88.5°C)
% volatile by volume: ca 100, 20°C
Molecular weight: 60.11

Viscosity, 20°C, cps - 2.4

SECTION IV. FIRE AND EXPLOSION DATA

Flash Point (method): 53°F (11.7°C)
closed cup

Limits: LEL %: 2.0

UEL %: 12.0

Extinguishing Media: Carbon dioxide, dry chemical, alcohol foam. Use water spray to cool fire-exposed tanks/containers. A fine water mist may be used to smother fire or to disperse vapors. Do not use a solid stream of water since the stream will scatter and spread the fire.

Autoignition Temp:
750°F (399°C)

Unusual fire or explosion hazards: Isopropyl alcohol is an OSHA Class IB flammable liquid. It is a dangerous fire hazard and a moderate explosion hazard when exposed to heat, flames or oxidizers. At 20°C, the vapor space (saturated) above isopropyl alcohol contains about 4.3 volume % of vapor. Vapors are heavier than air and may travel a considerable distance to an ignition source and flashback.

Special fire-fighting procedures: Firefighters should wear self-contained breathing apparatus and full protective clothing when fighting fires involving this material.

SECTION V. REACTIVITY DATA

Material is stable in closed containers at room temperature under normal storage and handling conditions. Hazardous polymerization cannot occur

Chemical incompatibilities: Isopropyl alcohol is incompatible with acetaldehyde, chlorine, ethylene oxide, hydrogen-palladium combination, hydrogen peroxide-sulfuric acid combination, potassium tert-butoxide, hypochlorous acid, isocyanates, nitroform, phosgene, oleum, perchloric acid, and strong oxidizing agents.

Do not store isopropyl alcohol in aluminum containers.
Thermal-oxidative degradation products can include carbon monoxide.

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Revision: D

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SECTION VI. HEALTH HAZARD INFORMATION

Summary of risks: At 400 ppm, vapors of isopropanol (IPA) may cause mild irritation of the eyes, nose, and throat. Prolonged exposures above the TLV may cause nausea, headache, and mild narcosis. The liquid is irritating to the eyes and produces intense stinging and burning. If not promptly removed, IPA may cause eye damage. Repeated or prolonged contact with the skin may cause irritation and dermatitis. While toxic skin absorption is unlikely, it should be considered in meeting the TLV. Ingestion of IPA will cause burning of the gastrointestinal tract, nausea, vomiting, bleeding, CNS depression, hemolysis, and pulmonary damage. Ingestion of as little as 10 ml may cause serious injury, while ingestion of 100 ml can be fatal. The single lethal dose for an adult is approximately 250 ml. The TLV for this material is set on the basis of eye, nose, and throat irritation. IPA has good warning properties.

First aid:

Eye contact: Flush eyes, including under eyelids, with running water for at least 15 minutes. Get medical attention (In-plant, community, paramedic).

Skin contact: Flush exposed area with water while removing contaminated clothing. Get medical attention if irritation persists.

Inhalation: Remove victim to fresh air. Restore and/or support breathing as required. Get medical help.

Ingestion: Give victim milk or water. Induce vomiting by sticking finger to back of throat. Contact a physician or Poison Control Center. Never give anything by mouth to a person who is unconscious or is having convulsions.

SECTION VII. SPILL, LEAK AND DISPOSAL PROCEDURES

Spill / Leak procedures: Notify safety personnel of large spills or leaks. Remove all sources of heat and ignition. Provide maximum explosion-proof ventilation. Evacuate all personnel from area, except for those involved in cleanup. Remove leaking container to safe place if feasible. Cleanup personnel need protection against liquid contact and vapor inhalation. Absorb small spills with paper towels, evaporate flammable alcohol in exhaust hood and burn dry paper. Contain large spills and collect liquid, if feasible, or absorb with vermiculite or sand. Place waste or absorbent into closed container (using non-sparking tools) for disposal. Water spray can be used to dilute and flush spill if necessary, but do not flush to water course or to sewer or enclosed area.

Waste management / Disposal: Burn waste liquid in an approved incinerator or dispose of via licensed waste disposal company. Absorbed liquid can be landfilled. Follow Federal, state and local regulations.

AQUATIC TOXICITY TLM 96: 1000-100 ppm.

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Date: September, 1985

SECTION VIII. SPECIAL PROTECTION INFORMATION

Personal protective equipment:

Goggles: Wear safety glasses to prevent contact with the eyes.

Gloves: Wear impervious gloves to prevent contact with the skin.

Respirator: For emergency or nonroutine exposure where the TLV may be exceeded, use an appropriate NIOSH approved respirator.

Other: If repeated or prolonged contact with liquid or mist is likely, wear protective clothing including boots, apron, and face-shield or splash goggles. Remove contaminated clothing immediately and do not reuse until it has been properly laundered.

Workplace considerations:

Ventilation: Provide general and local exhaust ventilation (explosion-proof) to meet TLV requirements. Fume hoods should have a minimum face velocity of 100 fpm.

Safety stations:

Eyewash stations and safety showers should be available in use and handling areas.

Other: All electrical service in use or storage areas should have an explosion-proof design.

Contact lenses pose a special hazard; soft lenses may absorb and all lenses concentrate irritants.

SECTION IX. SPECIAL PRECAUTIONS

Storage segregation: Store in closed containers in a cool, dry, well-ventilated area away from oxidizers, heat, sparks, and open flame. Protect containers from physical damage.

Other precautions: Use only with adequate ventilation. Avoid inhalation of vapor and repeated or prolonged contact with the skin. Remove contaminated clothing immediately. Wash thoroughly after handling. Ground and bond containers and equipment when transferring or pouring liquid. Use non-sparking tools. Do not eat or smoke in areas where this material is being used or handled.

DOT Class: Flammable Liquid

UN Register: UN1219

Data source code(s): 1-12,19,20,23,26,31,34,37,39,43,47,59,79. R

Material Safety Data Sheet

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1145 Catalyn Street
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(518) 377-8855



GENIUM PUBLISHING CORP.

No. 624

NAPHTHALENE

Issued: November 1987

24

SECTION 1. MATERIAL IDENTIFICATION

Material Name: NAPHTHALENE

Description (Origin/Uses): Used as a moth repellent and in many industrial processes.

Other Designations: Naphthalin; Naphthene; Tar Camphor; $C_{10}H_8$;
NIOSH RTECS No. QJ0525000; **CAS No.** 0091-20-3

Manufacturer: Contact your supplier or distributor. Consult the latest edition of the *Chemicalweek Buyer's Guide* (Genium ref. 73) for a list of suppliers.

HMIS

H 2

F 2

R 0

PPG*

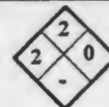
*See sect. 8

R 1

I 4

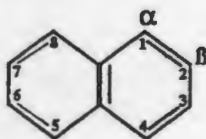
S 1

K 2



SECTION 2. INGREDIENTS AND HAZARDS

Naphthalene, CAS No. 0091-20-3



*Immediately dangerous to life and health

**See NIOSH RTECS for additional data with references to irritative, mutagenic, reproductive, and tumorigenic effects.

%

ca 100

EXPOSURE LIMITS

IDLH* Level: 500 ppm

ACGIH TLVs, 1987-88

TLV-TWA: 10 ppm, 50 mg/m³

OSHA PEL

8-Hr TWA: 10 ppm, 50 mg/m³

Toxicity Data**

Child, Oral, LD₅₀: 100 mg/kg

Man, Unknown, LD₅₀: 74 mg/kg

Rat, Oral, LD₅₀: 1250 mg/kg

SECTION 3. PHYSICAL DATA

Boiling Point: 424°F (218°C)

Vapor Density (Air = 1): 4.4

Vapor Pressure: 0.087 Torr at 77°F (25°C)

Water Solubility: Insoluble

Specific Gravity (H₂O = 1): 1.162 at 68°F (20°C)

Melting Point: 176°F (80°C)

Molecular Weight: 128 Grams/Mole

% Volatile by Volume: ca 100

Appearance and Odor: White crystalline flakes; strong coal tar odor.

SECTION 4. FIRE AND EXPLOSION DATA

LOWER

UPPER

Flash Point and Method

Autoignition Temperature

Flammability Limits in Air

174°F (79°C) OC; 190°F (88°C) CC

979°F (526°C)

% by Volume

0.9

5.9

Extinguishing Media: Use water spray, dry chemical, or carbon dioxide to fight fires involving naphthalene. Caution: Foam or direct water spray applied to molten naphthalene may cause extensive foaming.

Unusual Fire or Explosion Hazards: Naphthalene is a volatile solid that gives off flammable vapor when heated (as in fire situations). This vapor is much denser than air and will collect in enclosed or low-lying areas like sumps. In these areas an explosive air-vapor mixture may form, and extra caution is required to prevent any ignition sources from starting an explosion or fire.

Special Fire-fighting Procedures: Wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in the pressure-demand or positive-pressure mode.

SECTION 5. REACTIVITY DATA

Naphthalene is stable in closed containers at room temperature under normal storage and handling conditions. It does not undergo hazardous polymerization.

Chemical Incompatibilities: Naphthalene is incompatible with strong oxidizing agents, chromic anhydride, and mixtures of aluminum trichloride and benzoyl chloride.

Conditions to Avoid: Ignition sources like open flame, unprotected heaters, excessive heat, lighted tobacco products, and electric sparks must not occur in work areas where naphthalene vapor may become concentrated.

Hazardous Products of Decomposition: Toxic gases like carbon monoxide are produced during fire conditions. Irritating, flammable vapor forms below the melting point because even solid naphthalene has a significant vapor pressure.

SECTION 6. HEALTH HAZARD INFORMATION

Naphthalene is not listed as a carcinogen by the NTP, IARC, or OSHA.

Summary of Risks: Renal shutdown (kidney failure), hemolytic effects (breakdown of red blood cells), hematuria (blood in the urine), oliguria (low volume of urine), jaundice, eye damage, and depression of the central nervous system (CNS) are the primary health concerns associated with exposure to naphthalene. The ACGIH TLVs in section 2 are set to prevent eye damage. These recommended exposure limits may not be low enough to prevent blood changes in genetically hypersensitive individuals.

Medical Conditions Aggravated by Long-Term Exposure: Diseases of the blood, liver, and kidneys. Administer medical exams emphasizing these organs. **Target Organs:** Eyes, skin, kidneys, liver, blood (red blood cell effects), and CNS.

Primary Entry: Inhalation, skin contact. **Acute Effects:** Inhalation of naphthalene vapor causes excitement, confusion, headache, nausea, and loss of appetite. **Chronic Effects:** Increased incidence of cataracts.

FIRST AID

Eye Contact: Immediately flush eyes, including under the eyelids, gently but thoroughly with plenty of running water for at least 15 minutes to remove particles.

Skin Contact: Immediately wash the affected area with soap and water.

Inhalation: Remove victim to fresh air; restore and/or support his breathing as needed.

Ingestion: Call a poison control center. Never give anything by mouth to someone who is unconscious or convulsing. Administer a gastric lavage followed by saline catharsis. Monitor blood and electrolytic balance. Other sources recommend giving the victim several glasses of water to drink.

GET MEDICAL HELP (IN PLANT, PARAMEDIC, COMMUNITY) FOR ALL EXPOSURES. Seek prompt medical assistance for further treatment, observation, and support after first aid.

SECTION 7. SPILL, LEAK, AND DISPOSAL PROCEDURES

Spill/Leak: Notify safety personnel, provide ventilation, and eliminate all ignition sources immediately. Cleanup personnel need protection against contact and inhalation of vapor (see sect. 8). Contain large spills and collect waste. Use nonsparking tools to place naphthalene into closable containers for disposal. Keep waste out of sewers, watersheds, and waterways.

Waste Disposal: Consider reclamation, recycling, or destruction rather than disposal in a landfill. Contact your supplier or a licensed contractor for detailed recommendations. Follow Federal, state, and local regulations.

OSHA Designations

Air Contaminant (29 CFR 1910.1000, Subpart Z)

EPA Designations (40 CFR 302.4)

RCRA Hazardous Waste, No. U165

CERCLA Hazardous Substance, Reportable Quantity: 100 lbs (45.4 kg)

SECTION 8. SPECIAL PROTECTION INFORMATION

Goggles: Always wear protective eyeglasses or chemical safety goggles. Follow the eye- and face-protection guidelines of 29 CFR 1910.133. **Respirator:** Use a NIOSH-approved respirator per the *NIOSH Pocket Guide to Chemical Hazards* (Genium ref. 88) for the maximum-use concentrations and/or the exposure limits cited in section 2. Respirator usage must be in accordance with the OSHA regulations of 29 CFR 1910.134. IDLH or unknown concentrations require an SCBA with a full facepiece operated in the pressure-demand or positive-pressure mode. **Warning:** Air-purifying respirators will *not* protect workers in oxygen-deficient atmospheres.

Other Equipment: Wear impervious gloves, boots, aprons, gauntlets, etc., as required by the specific work environment to prevent skin contact. **Ventilation:** Install and operate general and local maximum explosion-proof ventilation systems of sufficient power to maintain airborne levels of naphthalene below the OSHA PEL standard cited in section 2. **Safety Stations:** Make eyewash stations, washing facilities, and safety showers available in areas of use and handling. **Contaminated Equipment:** Contact lenses pose a special hazard; soft lenses may absorb irritants, and all lenses concentrate them. Do *not* wear contact lenses in any work area. Remove and launder contaminated clothing before wearing it again; clean this material from shoes and equipment.

Comments: Practice good personal hygiene; always wash thoroughly after using this material. Keep this material off of your clothing and equipment. Avoid transferring this material from hands to mouth while eating, drinking, or smoking. Do *not* smoke, eat, or drink in any immediate work area. Avoid inhalation of vapor!

SECTION 9. SPECIAL PRECAUTIONS AND COMMENTS

Storage Segregation: Store naphthalene in a cool, dry, well-ventilated area away from chemical incompatibles (see sect. 5).

Special Handling/Storage: Protect containers from physical damage. All bulk storage facilities must be built with an explosion-proof design. All containers used in shipping/transferring operations must be electrically grounded to prevent static sparks. Use monitoring equipment to measure the extent of vapor present in any storage facility containing naphthalene because of potential fire and explosion hazards.

Comments: All operations with naphthalene must be done carefully to prevent accidental ignition of its flammable/explosive vapor. If the weather is warm, more naphthalene vapor forms and the potential for explosion increases. Do *not* smoke in any use or storage area!

Transportation Data (49 CFR 172.101-2)

DOT Shipping Name: Naphthalene

DOT Hazard Class: ORM-A

IMO Class: 4.1

DOT ID No. UN1334

IMO Label: Flammable Solid

DOT Label: None

References: 1, 2, 12, 73, 84-94, 103. PJI

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Approvals *[Signature]*

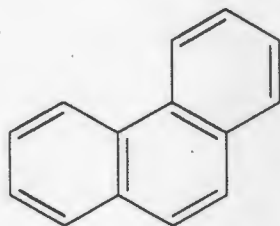
Indust. Hygiene/Safety *[Signature]*

Medical Review *[Signature]*

PHENANTHRENE

Synonyms: Phenanthren; Phenantrin.

Structural Formula:



CHEMICAL DESIGNATIONS

CAS Registry Number: 85-01-8

DOT Designation: None assigned.

Empirical Formula: $C_{14}H_{10}$

Formula Weight: 178.24

RTECS Number: SF 7175000

PHYSICAL AND CHEMICAL PROPERTIES

Appearance: Colorless, monoclinic crystals.

Boiling Point: 340 °C [1]; 341.2 °C [2].

Henry's Law Constant: 3.9×10^{-5} atm·m³/mol [3]; 1.3×10^{-4} atm·m³/mol [4]; 2.56×10^{-5} atm·m³/mol at 25 °C [5]; 5.48×10^{-5} atm·m³/mol [6].

Ionization Potential: 8.22 ± 0.29 eV [7].

Log K_{oc} : 3.72 [8]; 4.36 [9]; 4.59 [10].

Log K_{ow} : 4.568 [9]; 4.46 [11]; 4.52 [12]; 4.517 [13]; 4.16 [14].

Melting Point: 100.5 °C [15]; 98-100 °C [16].

468 Phenanthrene

Solubility in Organics: Soluble in acetone, ethanol, ether, benzene, acetic acid [17], benzene, and carbon disulfide [18].

Solubility in Water: 0.423 ppm at 8.5 °C, 1.6 mg/L at 15 °C, 0.816 ppm at 21 °C, 1.277 ppm at 30 °C, 0.6 ppm in seawater at 22 °C [19]; 1.18 mg/L at 25 °C [20]; 1.29 mg/L at 25 °C [21]; 0.994 mg/L at 25 °C [22]; 1.002 mg/L at 25 °C, 1.220 mg/L at 29 °C [23]; 1.07 mg/L at 25 °C [24]; 1.600 mg/L [25]; 0.71 mg/L at 25 °C [26]; 423 µg/L at 8.5 °C, 468 µg/L at 10.0 °C, 512 µg/L at 12.5 °C, 601 µg/L at 15 °C, 816 µg/L at 21.0 °C, 995 µg/L at 24.3 °C, 1,277 µg/L at 29.9 °C [27]; 2.81×10^{-6} M at 8.4 °C, 3.09×10^{-6} M at 11.1 °C, 3.59×10^{-6} M at 14.0 °C, 4.40×10^{-6} M at 17.5 °C, 4.94×10^{-6} M at 20.2 °C, 6.09×10^{-6} M at 23.3 °C, 6.46×10^{-6} M at 25.0 °C, 7.7×10^{-6} M at 29.3 °C, 9.13×10^{-6} M at 31.8 °C [28]; 0.235 ppm at 20-25 °C in Narragansett Bay water (pH = 7.7, dissolved organic carbon = 2.9 mg/L, and salinity = 27 wt%) [29].

Specific Density: 0.9800 at 4/4 °C [1]; 1.179 at 25/4 °C [30].

Transformation Products: Catechol is the central metabolite in the bacterial degradation of phenanthrene. Intermediate byproducts include 1-hydroxy-2-naphthoic acid, 1,2-dihydroxynaphthalene, and salicylic acid [31]. It was reported that *Beijerinckia*, under aerobic conditions, degraded phenanthrene to *cis*-3,4-dihydroxy-3,4-dihydrophenanthracene [32].

Vapor Pressure: 6.80×10^{-4} mm at 25 °C [33]; 2.1×10^{-4} mm at 20 °C [34]; 1 mm at 118.2 °C, 10 mm at 173.0 °C, 40 mm at 215.8 °C, 100 mm at 249.0 °C, 400 mm at 308.0 °C, 760 mm at 340.2 °C [1]; 0.228 mm at 100 °C, 0.309 mm at 105 °C, 0.410 mm at 110 °C, 0.552 mm at 115 °C, 0.720 mm at 120 °C, 0.936 mm at 125 °C, 1.208 mm at 130 °C, 1.554 mm at 135 °C, 1.987 mm at 140 °C, 2.515 mm at 145 °C, 3.156 mm at 150 °C [35]; 0.00349 mm at 51.60 °C, 0.00610 mm at 57.00 °C, 0.00991 mm at 61.85 °C, 0.0159 mm at 67.35 °C, 0.0232 mm at 71.80 °C, 0.0424 mm at 78.90 °C, 0.0667 mm at 83.40 °C, 0.109 mm at 90.3 °C [36]; 0.000064 mm at 36.70 °C, 0.000081 mm at 39.15 °C, 0.000089 mm at 39.85 °C, 0.000111 mm at 42.10 °C, 0.000120 mm at 42.60 °C, 0.000145 mm at 44.62 °C, 0.000185 mm at 46.70 °C, 0.000223 mm at 48.80 °C, 0.000241 mm at 49.65 °C [37].

FIRE HAZARDS

Flash Point: 171 °C (open cup) [38].

Lower Explosive Limit (LEL): No data found.

Upper Explosive Limit (UEL): No data found.

HEALTH HAZARD DATA

Immediately Dangerous to Life or Health (IDLH): Potential human carcinogen [39].

Permissible Exposure Limits (PEL) in Air: No individual standards have been set, however, as a constituent in coal tar pitch volatiles, the following exposure limits have been established: 0.2 mg/m³ (benzene-soluble fraction) [40]; 0.1 mg/m³ 10-hour time weighted average (cyclohexane-extractable fraction) [39]; 0.2 mg/m³ TWA (benzene solubles) [41].

MANUFACTURING

Selected Manufacturers:

Aldrich Chemical Co.
940 West Saint Paul Ave.
Milwaukee, WI 53233

Fluka Chemical Corp.
980 South Second St.
Ronkonkoma, NY 11779

Pfaltz & Bauer, Inc.
172 East Aurora St.
Waterbury, CT 06708

Uses: Explosives; dyestuffs; biochemical research; synthesis of drugs; organic synthesis.

REFERENCES

1. Weast, R.C., Ed. *CRC Handbook of Chemistry and Physics*, 67th ed. (Boca Raton, FL: CRC Press, Inc., 1986), 2406 p.

2. Zwolinski, B.J., and R.C. Wilhoit. *Handbook of Vapor Pressure and Heats of Vaporization of Hydrocarbons and Related Compounds*, Publication 101 (College Station, TX: Thermodynamics Research Station 371), 329 p.
3. Mackay, D., Shiu, W.Y., and R.P. Sutherland. "Determination of Air-Water Henry's Law Constants for Hydrophobic Pollutants," *Environ. Sci. Technol.*, 13(3):333-337 (1979).
4. Petrasek, A.C., Kugelman, I.J., Austern, B.M., Pressley, T.A., Winslow, L.A., and R.H. Wise. "Fate of Toxic Organic Compounds in Wastewater Treatment Plants," *J. Water Poll. Control Fed.*, 55(10):1286-1296 (1983).
5. Hine, J., and P.K. Mookerjee. "The Intrinsic Hydrophilic Character of Organic Compounds. Correlations in Terms of Structural Contributions," *J. Org. Chem.*, 40(3):292-298 (1975).
6. Southworth, G.R. "The Role Volatilization in Removing Polycyclic Aromatic Hydrocarbons from Aquatic Environments," *Bull. Environ. Contam. Toxicol.*, 21(4/5):507-514 (1979).
7. Franklin, J.L., Dillard, J.G., Rosenstock, H.M., Herron, J.T., Draxl K., and F.H. Field. "Ionization Potentials, Appearance Potentials and Heats of Formation of Gaseous Positive Ions," National Bureau of Standards Report NSRDS-NBS 26, U.S. Government Printing Office (1969), 289 p.
8. Abdul, S.A., Gibson, T.L., and D.N. Rai. "Statistical Correlations for Predicting the Partition Coefficient for Nonpolar Organic Contaminants Between Aquifer Organic Carbon and Water," *Haz. Waste Haz. Mater.*, 4(3):211-222 (1987).
9. Karickhoff, S.W., Brown, D.S., and T.A. Scott. "Sorption of Hydrophobic Pollutants on Natural Sediments," *Water Res.*, 13:241-248 (1979).
10. Socha, S.B., and R. Carpenter. "Factors Affecting the Pore Water Hydrocarbon Concentrations in Puget Sound Sediments," *Geochim. Cosmochim. Acta*, 51(5):1273-1284 (1987).
11. Hansch, C., and T. Fujita. " ρ - σ - π Analysis. A Method for the Correlation of Biological Activity and Chemical Structure," *J. Am. Chem. Soc.*, 86(8):1616-1617 (1964).
12. Yoshida, K., Shigeoka, T., and F. Yamauchi. "Non-Steady State Equilibrium Model for the Preliminary Prediction of the Fate of Chemicals in the Environment," *Ecotoxicol. Environ. Safety*, 7(2):179-190 (1983).
13. Kenaga, E.E., and C.A.I. Goring. "Relationship Between Water Solubility, Soil Sorption, Octanol-Water Partitioning and Concentration of Chemicals in Biota," in *Aquatic Toxicology, ASTM STP 707*, Eaton, J.G., Parrish, P.R., and A.C. Hendricks, Eds.

- (Philadelphia, PA: American Society for Testing and Materials 1980), pp 78-115.
14. Landrum, P.F., Nihart, S.R., Eadie, B.J., and W.S. Gardner. "Reverse-Phase Separation Method for Determining Pollutant Binding to Aldrich Humic Acid and Dissolved Organic Carbon of Natural Waters," *Environ. Sci. Technol.*, 19(3):187-192 (1984).
 15. Dean, J.A., Ed., *Lange's Handbook of Chemistry*, 11th ed. (New York: McGraw-Hill, Inc., 1973), 1570 p.
 16. *Fluka Catalog 1988/89 - Chemika-Biochemika* (Ronkonkoma, NY: Fluka Chemical Corp., 1988), 1536 p.
 17. "Chemical, Physical, and Biological Properties of Compounds Present at Hazardous Waste Sites," U.S. EPA Report-530/SW-89-010 (1985), 619 p.
 18. *Toxic and Hazardous Industrial Chemicals Safety Manual for Handling and Disposal with Toxicity and Hazard Data* (Tokyo, Japan: International Technical Information Institute, 1986), 700 p.
 19. Verschueren, K. *Handbook of Environmental Data on Organic Chemicals* (New York: Van Nostrand Reinhold Co., 1983), 1310 p.
 20. Wauchope, R.D., and F.W. Getzen. "Temperature Dependence of Solubilities in Water and Heats of Fusion of Solid Aromatic Hydrocarbons," *J. Chem. Eng. Data*, 17:38-41 (1972).
 21. Mackay, D., and W.Y. Shiu. "Aqueous Solubility of Polynuclear Aromatic Hydrocarbons," *J. Chem. Eng. Data*, 22(4):399-402 (1977).
 22. Andrews, L.J., and R.M. Keefer. "Cation Complexes of Compounds Containing Carbon-Carbon Double Bonds. IV. The Argentation of Aromatic Hydrocarbons," *J. Am. Chem. Soc.*, 71(11):3644-3647 (1949).
 23. May, W.E., Wasik, S.P., and D.H. Freeman. "Determination of the Aqueous Solubility of Polynuclear Aromatic Hydrocarbons by a Coupled Column Liquid Chromatographic Technique," *Anal. Chem.*, 50(1):175-179 (1978).
 24. Eganhouse, R.P., and J.A. Calder. "The Solubility of Medium Weight Aromatic Hydrocarbons and the Effect of Hydrocarbon Co-solutes and Salinity," *Geochim. Cosmochim. Acta*, 40(5):555-561 (1976).
 25. Davis, W.W., Krah, M.E., and G.H.A. Clowes. "Solubility of Carcinogenic and Related Hydrocarbons in Water," *J. Am. Chem. Soc.*, 64(1):108-110 (1942).
 26. Sahyun, M.R.V. "Binding of Aromatic Compounds to Bovine Serum Albumin," *Nature*, 209(5023):613-614 (1966).
 27. May, W.E., Wasik, S.P., and D.H. Freeman. "Determination of the Solubility Behavior of Some Polycyclic Aromatic Hydrocarbons in Water," *Anal. Chem.*, 50(7):997-1000 (1978).
 28. Schwarz, F.P. "Determination of Temperature Dependence of Solubilities of Polycyclic Aromatic Hydrocarbons in Aqueous

- Solutions by a Fluorescence Method," *J. Chem. Eng. Data*, 22(3):273-277 (1977).
29. Boehm, P.D., and J.G. Quinn. "Solubilization of Hydrocarbons by the Dissolved Organic Matter in Sea Water," *Geochim. Cosmochim. Acta*, 37(11):2459-2477 (1973).
 30. Sax, N.I. *Dangerous Properties of Industrial Materials* (New York: Van Nostrand Reinhold Co., 1984), 3124 p.
 31. Chapman, P.J. "An Outline of Reaction Sequences Used for the Bacterial Degradation of Phenolic Compounds" in *Degradation of Synthetic Organic Molecules in the Biosphere: Natural, Pesticidal, and Various Other Man-Made Compounds* (Washington, DC: National Academy of Sciences, 1972), pp 17-55.
 32. Kobayashi, H., and B.E. Rittman. "Microbial Removal of Hazardous Organic Compounds," *Environ. Sci. Technol.*, 16(3):170A-183A (1982).
 33. Radding, S.B., Mill, T., Gould, C.W., Lia, D.H., Johnson, H.L., Bomberger, D.S., and C.V. Fojo. "The Environmental Fate of Selected Polynuclear Aromatic Hydrocarbons," Office of Toxic Substances, U.S. EPA Report-560/5-75-009 (1976), 122 p.
 34. Lyman, W.J., Reehl, W.F., and D.H. Rosenblatt. *Handbook of Chemical Property Estimation Methods: Environmental Behavior of Organic Compounds* (New York: McGraw-Hill, Inc., 1982).
 35. Osborn, A.G., and D.R. Douslin. "Vapor Pressures and Derived Enthalpies of Vaporization of Some Condensed-Ring Hydrocarbons," *J. Chem. Eng. Data*, 20(3):229-231 (1975).
 36. Macknick, A.B., and J.M. Prausnitz. "Vapor Pressures of High Molecular Weight Hydrocarbons," *J. Chem. Eng. Data*, 24(3):175-178 (1979).
 37. Bradley, R.S., and T.G. Cleasby. "The Vapour Pressure and Lattice Energy of Some Aromatic Ring Compounds," *J. Chem. Soc. (London)*, pp 1690-1692 (1953).
 38. *Fire Protection Guide on Hazardous Materials* (Quincy, MA: National Fire Protection Association, 1984), 443 p.
 39. "NIOSH Pocket Guide to Chemical Hazards," U.S. Department of Health and Human Services, U.S. Government Printing Office (1987), 241 p.
 40. General Industry Standards for Toxic and Hazardous Substances," U.S. Code of Federal Regulations 1910, Subpart Z Section 1910.1000 (July 1982).
 41. *Documentation of the Threshold Limit Values and Biological Exposure Indices* (Cincinnati, OH: American Conference of Governmental Industrial Hygienists, 1986), 744 p.

Material Safety Data Sheet

Genium Publishing Corporation
1145 Catalyn Street, Schenectady, NY 12303
(518) 377-8854

from Genium's collection, to be used as reference

Product: PYRENE

MSDS No: Genium / 711

Date: April, 1990

National Paint
and Coatings
Association

Hazardous Material
Identification
System

HEALTH HAZARD	2 - Moderate
FLAMMABILITY HAZARD	1 - Slight
REACTIVITY HAZARD	0 - Minimal
PERSONAL PROTECTION	SEE SECTION 8

SECTION I. MATERIAL IDENTIFICATION

Trade/Material Name: PYRENE

Description: A condensed ring, polyaromatic hydrocarbon compound derived from coal tar. Also synthesized from o,o'-ditolyl. Used in biochemical research and as starting material for synthesizing benzo(a)pyrene. An ingredient of smoked and broiled meat, tobacco smoke, and air pollution.

Other Designations: $C_{16}H_{10}$; beta-pyrene; benzo(d,e,f)phenanthrene; benzo(d,e,f)phenanthrene.

CAS: 0129-00-0

R 1
I 3
S 2 - Skin absorption
X -

Manufacturer: Contact your supplier or distributor. Consult the latest Chemicalweek Buyers' Guide⁽⁷⁹⁾ for a suppliers list.

SECTION II. INGREDIENTS AND HAZARDS

Ingredient Name:	CAS Number:	Percent:	Exposure Limits:
Pyrene	0129-00-0	ca 100	OSHA PEL 8-hr TWA: 0.2 mg/m ³ ACGIH TLV, 1989-90 None established NIOSH REL, 1987 None established Toxicity Data* Rat, oral, LD ₅₀ : 2700 mg/kg ingested produces conjunctiva irritation, excitement, and muscle contraction

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MSDS No: Genium / 711
Date: April, 1990

INGREDIENTS AND HAZARDS continued from page 1

Rat, inhalation,
LC₅₀: 170 mg/m³.
inhaled produces
conjunctiva
irritation,
excitement, and
muscle contraction
Gene mutation in
mammalian cells;
human cell types: 12
μmol/l

* See NIOSH, RTECS (UR2450000), for additional mutative, tumorigenic, and toxicity data.

SECTION III. PHYSICAL DATA

Appearance & Odor: Colorless solid or a slight blue florescent solution. Tetracene impurities give pyrene a yellow color.

Boiling point: 759°F/404°C
Vapor pressure: 6.85×10^{-7} torr at
68°F/20°C

Specific gravity (H₂O=1): 1.271 at
73°F/23°C*

Water solubility (%): Insoluble (0.135 mg/l)

Melting point: 313°F/156°C
Molecular weight: 202.26 g/mol

* Water's specific gravity is 1 at 39°F/4°C.

SECTION IV. FIRE AND EXPLOSION DATA

Flash Point (method): None reported

Limits: LEL %: None
reported

UEL %: None
reported

NFPA Fire Hazard Symbol Codes: Flammability: 1 Health: 2 Reactivity: 0 Special: —*

Extinguishing Media: Use foam, dry chemical, and CO₂ to
extinguish fire.

Autoignition Temp:
None reported

Unusual fire or explosion hazards: Pyrene is a flammable and combustible material that heat and ignition sources may ignite. It burns rapidly with a flare-like effect.

Special fire-fighting procedures: Since fire may produce toxic fumes, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in the pressure-demand or positive-pressure mode. Avoid skin contact. Be aware of runoff from fire control methods. Do not release to sewers or waterways.

* Genium determined these hazard values because the NFPA Guidebook did not.

Material Safety Data Sheet

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MSDS No: Genium / 711

Date: April, 1990

SECTION V. REACTIVITY DATA

Hazardous decomposition Products: Thermal oxidative decomposition of pyrene can emit irritating fumes and acrid smoke.

Stability/Polymerization: Pyrene is stable at room temperature in closed containers under normal storage and handling conditions. Hazardous polymerization cannot occur.

SECTION VI. HEALTH HAZARD INFORMATION

Summary of risks: Pyrene is irritating to exposed skin and eyes, moderately toxic by ingestion and intraperitoneal routes, and a poison by inhalation. Experimental studies show pyrene is a tumorigen in animals and a mutagen in humans. Workers exposed to concentrations between 3 and 5 mg/m³ showed some unspecified teratogenic effects. In general, human exposure occurs mainly through inhalation of tobacco smoke and polluted air. Although ingesting smoked and broiled meats may expose humans to pyrene, there is little indication of serious health effects.

Medical conditions which may be aggravated by contact: None reported.

Target organs: Skin, eyes, respiratory tract.

Primary entry route(s): Inhalation, ingestion, skin contact.

Acute effects: Vapor inhalation may irritate the nose mucosa and respiratory tract. Vapors may also cause conjunctival irritation. Pyrene is absorbed through intact skin and causes dermal irritation. Ingestion may irritate and burn the esophagus and gastrointestinal tract.

Chronic effect(s): None reported.

First aid:

Eye contact: Flush immediately, including under the eyelids, gently but thoroughly with flooding amounts of running water for at least 15 min.

Skin contact: Quickly remove contaminated clothing. After rinsing affected skin with flooding amounts of water, wash it with soap and water.

Inhalation: Remove exposed person to fresh air and support breathing as needed.

Ingestion: Never give anything by mouth to an unconscious or convulsing person. If ingested, have a conscious person drink 1 to 2 glasses of milk or water. Do not induce vomiting.

Carcinogenicity: Neither the NTP, IARC, nor OSHA lists pyrene as a carcinogen.

After first aid, get appropriate in-plant, paramedic, or community medical attention and support.

Material Safety Data Sheet

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Date: April, 1990

HEALTH HAZARD INFORMATION continued from page 3

Physician's Note: Observe patients with dermal exposure for systemic poisoning since pyrene is absorbed through intact skin.

SECTION VII. SPILL, LEAK AND DISPOSAL PROCEDURES

Spill / Leak procedures: Notify safety personnel, evacuate all unnecessary personnel, and remove all heat and ignition sources. Cleanup personnel should protect against vapor inhalation and skin and eye contact. Scoop spilled material into appropriate disposal containers. Absorb liquid with inert, noncombustible material and place waste in appropriate disposal containers. Follow applicable OSHA regulations (29 CFR 1910.120).

Waste management / Disposal: Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.

OSHA Designations

Air Contaminant (29 CFR 1910.1000, Subpart Z): Not listed

EPA Designations

RCRA Hazardous Waste (40 CFR 261.33): Not listed

Listed as a CERCLA Hazardous Substance* (40 CFR 302.4), Reportable Quantity (RQ):

5000 lb (2270 kg) [* per Clean Water Act, Sec. 307(a)]

Listed as SARA Extremely Hazardous Substance (40 CFR 355), Reportable Quantity: 5000

lb, Threshold Planning Quantity (TPQ): 1000/10,000 lb

SARA Toxic Chemical (40 CFR 372.65): Not listed

SECTION VIII. SPECIAL PROTECTION INFORMATION

Personal protective equipment:

Goggles: Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133).

Respirator: Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a NIOSH-approved respirator. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. Warning: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Other: Wear impervious gloves, boots, aprons, and gauntlets to prevent skin contact.

Workplace considerations:

Material Safety Data Sheet

Genium Publishing Corporation
1145 Catalyn Street, Schenectady, NY 12303
(518) 377-8854

From Genium's collection, to be used as reference

Product: PYRENE

MSDS No: Genium / 711

Date: April, 1990

SPECIAL PROTECTION INFORMATION continued from page 4

Ventilation: Provide general and local explosion-proof ventilation systems to maintain airborne concentrations below the OSHA PEL (Sec. 2). Local exhaust ventilation is preferred since it prevents contaminant dispersion into the work area by controlling it at its source.
(103)

Safety stations:

Make available in the work area emergency eyewash stations, safety/quick-drench showers, and washing facilities.

Contaminated equipment:

Never wear contact lenses in the work area: soft lenses may absorb, and all lenses concentrate, irritants. Launder contaminated clothing before wearing. Remove this material from your shoes and equipment.

Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

SECTION IX. SPECIAL PRECAUTIONS

Storage segregation: Store in closed containers in a cool, well-ventilated area. Protect containers from physical damage.

Engineering controls: Avoid vapor inhalation and skin contact. Practice good personal hygiene and housekeeping procedures. To prevent static sparks, electrically ground and bond all containers and equipment used in shipping, receiving, or transferring operations in production and storage areas. Provide preplacement and periodic medical examinations, including comprehensive medical histories with emphasis on the oral cavity, respiratory tract, bladder, and kidneys. Examine the skin for premalignant and malignant lesion.

Transportation Data (49 CFR 172.101, .102): Not listed

Data source code(s): 7, 73, 87, 103, 123, 124, 126, 127, 136

Prepared/revised by: MJ Allison, BS

April, 1990

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Material Safety Data Sheet

Gennum Publishing Corporation
1145 Broadway Street, Schenectady, NY 12302
(518) 377 8854

From Gennum's collection. To be used as reference

Product: TOLUENE

MSDS No: Gennum / 317

Revision: 0

Date: April, 1996

National Paint
and Coatings
Association

Hazardous Material
Identification
System

HEALTH HAZARD	2 - Moderate
FLAMMABILITY HAZARD	3 - Serious
REACTIVITY HAZARD	0 - (Stable)
PERSONAL PROTECTION	SEE SECTION VI

SECTION I. MATERIAL IDENTIFICATION

Trade/Material Name: TOLUENE

Other Designations: Methyl Benzene, Methyl Benzol, Phenylmethane, Toluol, C₇H₈

CAS: 0198-00-2

Available from many suppliers, including:

Manufacturers: Allied Corp.
PO Box 20648
Morristown, NJ 07060

Phone: (201) 455-4400

Ashland Chemical Co.
Industrial Chemicals & Solvents Div.

PO Box 1000
Columbus, OH 43216

Phone: (614) 759-2711

SECTION II. INGREDIENTS AND HAZARDS

Ingredient Name:	Percent:	Exposure Limits:
Toluene	ca 100	8-hr TLV: 100 ppm, or 375 mg/m ³ (skin) ** Man. Inhalation, TLV: 100 ppm: Psychotropic *** Rat. Oral, LD ₅₀ : 5000 mg/kg Rat. Inhalation, LCLo: 4000 ppm/4 hrs.

Material Safety Data Sheet

Genium Publishing Corporation
1145 Catalyn Street, Schenectady, NY 12303
(513) 377-8864
From Genium's collection, to be used as reference

Product: TOLUENE

MSDS No: Genium / 317
Revision: 0
Date: April, 1986

INGREDIENTS AND HAZARDS continued from page 1

Rabbit, Skin.
LD₅₀: 14 gm/kg

Human, Eye: 300 ppm

* Current (1985-86) ACGIH TLV. The OSHA PEL is 200 ppm with an acceptable ceiling concentration of 300 ppm and an acceptable maximum peak of 500 ppm/10 minutes.

** Skin designation indicates that toluene can be absorbed through intact skin and contribute to overall exposure.

*** Affects the mind.

SECTION III. PHYSICAL DATA

Appearance & Odor: Clear, colorless liquid with a characteristic aromatic odor. The odor is detectable to most individuals in the range of 10 to 15 ppm. Because olfactory fatigue occurs rapidly upon exposure to toluene, odor is not a good warning property.

Boiling point: 231°F (111°C)
Vapor pressure: @ 20°C, mm Hg: 2
Water solubility (%): @ 20°C, wt. %: 0.05
Vapor density (air=1): 3.14

Evaporation rate: (BuAc=1): 2.24
Specific gravity (H₂O=1): 0.866
Melting point: -139°F (-95°C)
% volatile by volume: ca 100
Molecular weight: 92.15

SECTION IV. FIRE AND EXPLOSION DATA

Flash Point (method): 40°F (4°C) CC Limits: LEL %: 1.27 UEL %: 7.1

Extinguishing Media: Carbon dioxide, dry chemical, alcohol foam. Do not use a solid stream of water because the stream will scatter and spread the fire. Use water spray to cool tanks/containers that are exposed to fire and to disperse vapors.

Autoignition Temp:
396°F (430°C)

Unusual fire or explosion hazards: This OSHA class IB flammable liquid is a dangerous fire hazard. It is a moderate fire hazard when exposed to oxidizers, heat, sparks, or open flame. Vapors are heavier than air and may travel a considerable distance to an ignition source and flash back.

Special fire-fighting procedures: Fire fighters should wear self-contained breathing apparatus with full facepiece operated in a positive-pressure mode when fighting fires involving toluene.

Material Safety Data Sheet

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From Genium's collection, to be used as reference

Product: TOLUENE

MSDS No: Genium / 017

Revision: 0

Date: April, 1986

SECTION V. REACTIVITY DATA

Material is stable in closed containers at room temperature under normal storage and handling conditions. Hazardous polymerization does not occur.

Chemical incompatibilities: This material is incompatible with strong oxidizing agents, dinitrogen tetroxide, silver perchlorate, tetranitromethane, and uranium hexafluoride. Contact with these materials may cause fire or explosion. Nitric acid and toluene, especially in the presence of sulfuric acid, will produce nitrated compounds that are dangerously explosive.

Conditions to avoid: Avoid exposure to sparks, open flame, hot surfaces, and all sources of heat and ignition. Toluene will attack some forms of plastics, rubber, and coatings. Thermal decomposition or burning produces carbon dioxide and/or carbon monoxide.

SECTION VI. HEALTH HAZARD INFORMATION

This product is not considered a carcinogen by the NTP, IARC, or OSHA.

Summary of risks: Vapors of toluene may cause irritation of the eyes, nose, upper respiratory tract, and skin. Exposure to 200 ppm for 8 hours causes mild fatigue, weakness, confusion, lacrimation (tearing), and paresthesia (a sensation of prickling, tingling, or creeping on the skin that has no objective cause). Exposure to higher concentrations may cause headache, nausea, dizziness, dilated pupils, and euphoria, and, in severe cases, may cause unconsciousness and death. The liquid is irritating to the eyes and skin. Contact with the eyes may cause transient corneal damage, conjunctival irritation, and burns if not promptly removed. Repeated and/or prolonged contact with the skin may cause drying and cracking. It may be absorbed through the skin in toxic amounts. Ingestion causes irritation of the gastrointestinal tract and may cause effects resembling those from inhalation of the vapor. Chronic overexposure to toluene may cause reversible kidney and liver injury.

First aid:

Eye contact: Immediately flush eyes, including under eyelids, with running water for at least 15 minutes. Get medical attention if irritation persists.*

Skin contact: Immediately flush skin (for at least 15 minutes) while removing contaminated shoes and clothing. Wash exposed area with soap and water. Get medical attention if irritation persists or if a large area has been exposed.*

Inhalation: Remove victim to fresh air. Restore and/or support breathing as required. Keep victim warm and quiet. Get medical help.*

Material Safety Data Sheet

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Revision: 0
Date: April, 1986

HEALTH HAZARD INFORMATION continued from page 3

Ingestion: Give victim 1 to 2 glasses of water or milk. Contact a poison control center. Do not induce vomiting unless directed to do so. Transport victim to a medical facility. Never give anything by mouth to a person who is unconscious or convulsing.

* GET MEDICAL ASSISTANCE = In plant, paramedic, community. Get medical help for further treatment, observation, and support after first aid, if indicated.

SECTION VII. SPILL, LEAK AND DISPOSAL PROCEDURES

Spill / Leak procedures: Notify safety personnel of large spills or leaks. Remove all sources of heat and ignition. Provide maximum explosion-proof ventilation. Limit access to spill area to necessary personnel only. Remove leaking containers to safe place if feasible. Cleanup personnel need protection against contact with liquid and inhalation of vapor (see sect. 8).

Waste management / Disposal: Absorb small spills with paper towel or vermiculite. Contain large spills and collect if feasible, or absorb with vermiculite or sand. Place waste solvent or absorbent into closed containers for disposal using nonsparking tools. Liquid can be flushed with water to an open holding area for handling. Do not flush to sewer, watershed, or waterway.

Place in suitable container for disposal by a licensed contractor or burn in an approved incinerator. Consider reclaiming by distillation. Contaminated absorbent can be buried in a sanitary landfill. Follow all Federal, state, and local regulations. Tlm 96: 100-10 ppm. Toluene is designated as a hazardous waste by the EPA. The EPA (RCRA) HW No. is U220 (40 CFR 261). The reportable quantity (RQ) is 1000 lbs/454 kg (40 CFR 117).

SECTION VIII. SPECIAL PROTECTION INFORMATION

Personal protective equipment:

Goggles: Safety glasses or splash goggles should be worn in all work areas.

Gloves: Neoprene gloves should be worn.

Respirator: For emergency or nonroutine exposures where the TLV may be exceeded, use an organic chemical cartridge respirator if concentration is less than 200 ppm and an approved canister gas mask or self-contained breathing apparatus with full facepiece if concentration is greater than 200 ppm.

Material Safety Data Sheet

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Revision: 0
Date: April, 1986

SPECIAL PROTECTION INFORMATION continued from page 4

Other: Apron, face shield, boots, and other appropriate protective clothing and equipment should be available and worn as necessary to prevent skin and eye contact.

Remove contaminated clothing immediately and do not wear it until it has been properly laundered.

Workplace considerations:

Ventilation: Provide general and local exhaust ventilation to meet NIV requirements. Ventilation fans and other electrical service must be nonsparking and have an explosion-proof design. Exhaust hoods should have a face velocity of at least 100 lfm (linear feet per minute) and be designed to capture heavy vapor.

Safety stations:

Eyewash stations and safety showers should be readily available in use and handling areas.

Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.

SECTION IX. SPECIAL PRECAUTIONS

Storage segregation: Store in a cool, dry, well-ventilated area away from oxidizing agents, heat, sparks, or open flame. Storage areas must meet OSHA requirements for class IB flammable liquids. Use metal safety cans for handling small amounts. Protect containers from physical damage. Use only with adequate ventilation. Avoid contact with eyes, skin, or clothing. Do not inhale or ingest. Use caution when handling this compound because it can be absorbed through intact skin in toxic amounts.

Special handling / storage: Ground and bond metal containers and equipment to prevent static sparks when making transfers. Do not smoke in use or storage areas. Use nonsparking tools.

Engineering controls: Preplacement and periodic medical exams emphasizing the liver, kidneys, nervous system, lungs, heart, and blood should be provided. Workers exposed to concentrations greater than the action level (50 ppm) should be examined at least once a year. Use of alcohol can aggravate the toxic effects of toluene.

Emptied containers contain product residues. Handle accordingly! Toluene is designated as a hazardous substance by the EPA (40 CFR 116).

DOT Class: Flammable Liquid UN Register: UN1294
Data source code(s): 1-9, 12, 16, 20, 21, 24, 26, 34, 81, 82, CR

Prepared/revised by: Genium Publishing Corp.

Material Safety Data Sheet

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Product: TOLUENE

MSDS No: Genium / 317

Revision: 0

Date: April, 1986

SPECIAL PRECAUTIONS continued from page 5

April, 1986

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Material Safety Data Sheet

Genium Publishing Corporation
1145 Catalyn Street, Schenectady, NY 12303
(518) 377-8854

From Genium's collection, to be used as reference

Product: XYLENE (MIXED ISOMERS)

MSDS No: Genium / 318

Revision: D

Date: August, 1988

National Paint
and Coatings
Association

Hazardous Material
Identification
System

HEALTH HAZARD	2 - Moderate
FLAMMABILITY HAZARD	3 - Serious
REACTIVITY HAZARD	0 - Minimal
PERSONAL PROTECTION	SEE SECTION 8

SECTION I. MATERIAL IDENTIFICATION

Trade/Material Name: XYLENE (MIXED ISOMERS)

Description: Used as a raw material for the production of benzoic acid, phthalic anhydride, isophthalic and terephthalic acids and their dimethyl esters in the manufacture of polyester fibers; in sterilizing catgut; with Canadian balsam as oil-immersion in microscopy; and as a cleaning agent in microscopic techniques.

Other Designations: Dimethylbenzene; Xylol; C_8H_{10}

CAS: 1330-20-7

R 1
I 3
S 2
K 3

Contact your supplier or distributor. Consult the latest edition of the Chemicalweek Buyers' Guide (Genium ref. 73) for a list of suppliers.

Comments: Although there are three different isomers of xylene (ortho, meta, and para), the health and physical hazards of all three are very similar. This MSDS is written for a xylene mixture of all three isomers, which is usually commercial xylene.

SECTION II. INGREDIENTS AND HAZARDS

Ingredient Name:	CAS Number:	Percent:	Exposure Limits:
Xylene (Mixed Isomers)	1330-20-7*	**	IDLH*** Level: 1000 ppm OSHA PEL 8-Hr TWA: 100 ppm, 435 mg/m ³ ACGIH TLVs, 1987-88 TLV-TWA: 100 ppm, 435 mg/m ³ TLV-STEL: 150 ppm, 655 mg/m ³

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MSDS No: Genium / 318
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INGREDIENTS AND HAZARDS continued from page 1

Toxicity Data****
Human, Inhalation,
TC_{Lo}: 200 ppm
Man, Inhalation,
LC_{Lo}: 10000 ppm/6
Hrs
Rat, Oral, LD₅₀:
4300 mg/kg

* o-Xylene, CAS No. 0005-47-6
m-Xylene, CAS No. 0108-38-3
p-Xylene, CAS No. 0106-42-3

** Check with your supplier to determine if there are additions, contaminants or impurities (such as benzene) that are present in reportable quantities per 29 CFR 1910.

*** Immediately dangerous to life and health.

**** See NIOSH, RTECS (ZE2100000), for additional data with references to reproductive, irritative, and mutagenic effects.

SECTION III. PHYSICAL DATA

Appearance & Odor: A clear liquid; aromatic hydrocarbon odor.

Boiling point: 275°F to 293°F (135°C to 145°C)*

Evaporation rate: 0.6 Relative to BuAc=1

Vapor pressure: 7 to 9 Torrs at 68°F (20°C)

Specific gravity (H₂O=1): 0.86

Melting point: -13°F (-25°C)

Water solubility (%): Insoluble

% volatile by volume: Ca 100

Vapor density (air=1): 3.7

Molecular weight: 106 Grams/Mole

* Materials with wider and narrower boiling ranges are commercially available.

SECTION IV. FIRE AND EXPLOSION DATA

Flash Point (method): 81°F to 90°F (27°C Limits: LEL %: 1 to 32°C)

UEL %: 7

NFPA Fire Hazard Symbol Codes: Flammability: 3 Health: 2 Reactivity: 0 Special: —

Extinguishing Media: Use foam, dry chemical, or carbon dioxide. Use water sprays to reduce the rate of burning and to cool containers.

Autoignition Temp:
867°F (464°C)

Unusual fire or explosion hazards: Xylene vapor is heavier than air and may travel a considerable distance to a low-lying source of ignition and flash back.

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MSDS No: Genium / 318

Revision: D

Date: August, 1988

FIRE AND EXPLOSION DATA continued from page 2

Special fire-fighting procedures: Wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in the pressure-demand or positive-pressure mode.

SECTION V. REACTIVITY DATA

Material is stable in closed containers during routine operations. Hazardous polymerization cannot occur

Chemical incompatibilities: Xylene may react dangerously with strong oxidizers.

Conditions to avoid: Avoid any exposure to sources of ignition and to strong oxidizers.

Hazardous decomposition Products: Carbon monoxide (CO) may be evolved during xylene fires.

SECTION VI. HEALTH HAZARD INFORMATION

This product is not considered a carcinogen by the NTP, IARC, or OSHA.

Summary of risks: Liquid xylene is a skin irritant and causes erythema, dryness, and defatting; prolonged contact may cause blistering. Inhaling xylene can depress the central nervous system (CNS), and ingesting it can result in gastrointestinal disturbance; and possibly hematemesis (vomiting blood). Effects on the eyes, kidneys, liver, lungs, and the CNS are also reported.

Medical conditions which may be aggravated by contact: Problems with eyes, skin, central nervous system, kidneys, and liver may be worsened by exposure to xylene.

Target organs: CNS, eyes, gastrointestinal tract, blood, liver, kidneys, skin.

Primary entry route(s): Inhalation, skin contact/absorption.

Acute effects: Dizziness; excitement; drowsiness; incoordination; staggering gait, irritation of eyes, nose, and throat; corneal vacuolization; anorexia; nausea; vomiting; abdominal pain; and dermatitis.

Chronic effect(s): Reversible eye damage, headache, loss of appetite, nervousness, pale skin, and skin rash.

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HEALTH HAZARD INFORMATION continued from page 3

First aid:

Eye contact: Immediately flush eyes, including under the eyelids, gently but thoroughly with plenty of running water for at least 15 minutes.

Skin contact: Immediately wash the affected area with soap and water.

Inhalation: Remove the exposed person to fresh air; restore and/or support his or her breathing as needed. Have a trained person administer oxygen.

Ingestion: Never give anything by mouth to someone who is unconscious or convulsing. Vomiting may occur spontaneously, but do not induce it. If vomiting should occur, keep the exposed person's head below his or her hips to prevent aspiration (breathing the liquid xylene into the lungs). Severe hemorrhagic pneumonitis with grave, possibly fatal, pulmonary injury can occur from aspirating very small quantities of xylene.

Get medical help (in plant, paramedic, community) for all exposures. Seek prompt medical assistance for further treatment, observation, and support after first aid. If exposure is severe, hospitalization for at least 72 hours with careful monitoring for delayed onset of pulmonary edema is recommended.

SECTION VII. SPILL, LEAK AND DISPOSAL PROCEDURES

Spill / Leak procedures: Notify safety personnel, provide ventilation, and eliminate all sources of ignition immediately. Cleanup personnel need protection against contact with and inhalation of vapor (see sect. 8). Contain large spills and collect waste or absorb it with an inert material such as sand, earth, or vermiculite. Use nonsparking tools to place waste liquid or absorbent into closable containers for disposal. Keep waste out of sewers, watersheds, and waterways.

Waste management / Disposal: Contact your supplier or a licensed contractor for detailed recommendations. Follow Federal, state, and local regulations.

OSHA Designations

Air Contaminant (29 CFR 1910.1000 Subpart Z)

EPA Designations (40 CFR 302.4)

RCRA Hazardous Waste, No. U239

CERCLA Hazardous Substance, Reportable Quantity: 1000 lbs (454 kg), per the Clean Water Act (CWA), section 311 (b) (9)

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Date: August, 1988

SECTION VIII. SPECIAL PROTECTION INFORMATION

Personal protective equipment:

Goggles: Always wear protective eyeglasses or chemical safety goggles. Where splashing is possible, wear a full face shield as a supplementary protective measure. Follow OSHA eye- and face-protection regulations (29 CFR 1910.133).

Respirator: Wear a NIOSH-approved respirator per the NIOSH Pocket Guide to Chemical Hazards (Genium ref. 88) for the maximum-use concentrations and/or the exposure limits cited in section 2. Follow OSHA respirator regulations (29 CFR 1910.134). For emergency or nonroutine use (leaks or cleaning reactor vessels and storage tanks), wear an SCBA with a full facepiece operated in the pressure-demand or positive-pressure mode.*

Other: Wear impervious gloves, boots, aprons, gauntlets, etc., as required by the specifics of the work operation to prevent prolonged or repeated skin contact with xylene.

Workplace considerations:

Ventilation: Install and operate general and local maximum explosion-proof ventilation systems powerful enough to maintain airborne levels of xylene below the OSHA PEL standard cited in section 2. Local exhaust ventilation is preferred because it prevents dispersion of xylene into general work areas by eliminating it at its source. Consult the latest edition of the Genium reference 103 for detailed recommendations.

Safety stations:

Make eyewash stations, safety/quick-drench showers, and washing facilities available in areas of use and handling.

Contaminated equipment:

Contact lenses pose a special hazard; soft lenses may absorb irritants, and all lenses concentrate them. Do not wear contact lenses in any work area. Remove contaminated clothing and launder it before wearing it again; clean xylene from shoes and equipment.

* Warning: Air-purifying respirators will not protect workers in oxygen-deficient atmospheres.

Comments: Practice good personal hygiene; always wash thoroughly after using this material. Keep it off of your clothing and equipment. Avoid transferring it from your hands to your mouth while eating, drinking, or smoking. Do not eat, drink, or smoke in any work area. Do not inhale xylene vapor.

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SECTION IX. SPECIAL PRECAUTIONS

Storage segregation: Store xylene in a cool, dry, well-ventilated area away from sources of ignition and strong oxidizers. Protect containers from physical damage.

Engineering controls: Make sure all engineering systems (production, transportation) are of maximum explosion-proof design. Ground and bond all containers, pipelines, etc., used in shipping, transferring, reacting, producing, and sampling operations.

Transportation Data (49 CFR 172.101-2)

DOT Shipping Name: Xylene

DOT Label: Flammable Liquid

IMO Label: Flammable Liquid

IMO Class: 3.2 or 3.3

DOT Class: Flammable Liquid

UN Register: UN1307

Data source code(s): 1, 2, 12, 73, 84-94, 100, 103.

Prepared/revised by: Genium Publishing Corporation

November, 1987

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