

**MANUFACTURED GAS PLANT
SITE SCREENING REPORT
STATE ROAD SITE
LOCKPORT, NEW YORK**

PREPARED FOR:

**NEW YORK STATE ELECTRIC AND GAS
4500 Vestal Parkway, East
Binghamton, New York 13903**

PREPARED BY:

**ATLANTIC ENVIRONMENTAL SERVICES, INC.
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ATLANTIC PROJECT NO.: 1284-02-37

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PROJECT MANAGER

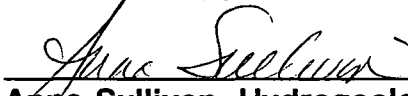

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NEW YORK STATE ELECTRIC & GAS CORPORATION MANUFACTURED GAS PLANT SITE INVESTIGATION FACT SHEET

NYSEG Office:

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Binghamton, NY 13902-3607

Project Coordinators:

J.C. Hyland

Site Location Section

Site Address: Tax Map #109.17; Block #4;
Parcel 5; State Road; Lockport;
Niagara County, NY

Site Description: The site is bordered by the New York State Barge Canal to the northwest, a NYSEG substation to the southwest, State Road to the southeast, and vacant land (formerly Beauman's Garage) to the northeast.

Property Owners/Land Use: Property owned by NYSEG, conveyed by Lockport Light, Heat & Power Co., in 1929. Currently vacant land with NYSEG gas regulator.

Site History-Operations Section

Years of Operation: 1900-1911 (approx.); most structures were demolished by 1954.

Predecessor Companies:

- 1886-1894, Lockport Gas Light Co.
- 1894-1907, Lockport Gas & Electric Light Co. and Economy Light & Power Co.
- 1907-1929, Lockport Light, Heat & Power Co. and Lockport Gas & Electric Light Co.
- 1929-Present, New York State Electric & Gas Corporation

Operations Summary: Served as the tar works for nearby Lockport Transit Street MGP, where annual gas production was 45,000,000 cf and tar production in 1906 was 66,983 gallons.

Site History-Environmental Investigations Section

Contractors Retained: 1990-Present-
Atlantic Environmental Services, Inc.
Colchester, Connecticut (203) 537-0751
Contact: Dennis Unites

Work Activities to Date:

- Historical research
- Site reconnaissance
- Surface soil sampling and analysis
- Streambed sediment sampling and analysis
- Surface water sampling and analysis

Findings Section

Materials Present:

- Volatile organic compounds (VOCs)
- Cyanide compounds
- Polycyclic aromatic hydrocarbons (PAHs) (some are considered carcinogenic)
- Heavy metals including arsenic, lead, zinc and nickel

Location of Materials:

- Heavy metals found in stream sediments and surface soils.
- Cyanide compounds found only in one surface soil sample.
- Low levels of PAHs found in surface soils.

General Conclusions

Residues from past MGP-related practices may be present at the Lockport State Road Site. The surface soils analysis revealed some levels of polycyclic aromatic hydrocarbons and cyanide compounds. No risk assessment can be developed without further study, including subsurface investigations and ground water quality analysis.

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EXECUTIVE SUMMARY

The purpose of this program is to prioritize a number of former manufactured gas plant (MGP) sites for New York State Electric and Gas Corporation (NYSEG). The site evaluated in this report is the State Road Site in Lockport, New York. The intent of the program is to determine if there is any imminent threat to human health or the environment at this site and to establish a relative ranking of sites. The Site Screening and Priority-Setting System (SSPS) developed by the Electric Power Research Institute (EPRI) specifically for use with MGP sites was used to prioritize the NYSEG sites.

MGPs were the primary source of producing combustible gas for heating, cooking, and illumination at 1,500 to 2,500 sites in the United States between 1816 and the 1950s. Gas was manufactured from coke, coal, and oil and had certain by-products and residues associated with the processes. Coal tar was one of the by-products associated with the coal carbonization method of gas production used at the Transit Street MGP. The Transit Street MGP was located approximately one block east of the State Road Site. The State Road Site was established circa 1900 as a secondary processing plant for coal tar generated at the Transit Street MGP. The tar works at the State Road Site were operated until circa 1911 when the plant was converted to a warehouse and storage facility.

The general approach used to investigate MGP residues at the State Road Site was to identify routes of exposure which may result in direct contact with MGP residues and to chemically characterize the media associated with the exposure routes to evaluate potential health risks. The SSPS calculates indicators of actual and perceived risks for each site evaluated. The actual risk is determined from surface water, ground water, air, and direct contact exposure routes. It predicts the actual imminent threat at the site based on available data. The perceived risk reflects economic risks, public image impacts, and similar effects on the previously identified exposure routes. The perceived risk score focuses on the single exposure pathway of greatest risk.

The SSPS scores evaluate several site characteristics which include site size and current use, waste containment efforts, nearby ground water and surface water use, soil and hydrological conditions, precipitation, chemical characteristics, and potential receptors. Site surveys, historical data, state and federal publications as well as a field sampling and analysis program provided the information needed to complete the SSPS analysis. The media sampled at the State Road Site in Lockport, New York included surface water, streambed sediments and surficial soils.

Analyses performed on the samples did not detect any residues associated with MGP processes in the surface water or streambed sediments bordering the State Road Site. Upstream surface water sample SW-1 contained elevated levels of aluminum and surface water sample SW-2, adjacent to the site, contained elevated levels of selenium when compared to the New York State (NYS) Water Quality Standards and Guidance Values. The detection of aluminum in sediments upstream of the site has no apparent relation to former tar works residues due to its upstream location. Elevated levels of selenium are not associated with MGP operations. No volatile or semi-volatile organic compounds were detected in the surface water samples.

Streambed sediment samples, upstream SE-1, adjacent SE-2, and downstream SE-3 had elevated levels of several metals when compared to background levels of metals in surficial materials in the Lockport area as described by Shacklette and Boerngen (1984). The majority of metals detected above average background concentrations for the Lockport, New York area were detected at consistent concentrations in all of the streambed sediment samples. The concentration of chromium, copper, lead, and zinc increases downstream, which could result from a variety of sources; the specific source is unknown.

Three of the five surface soil samples (SS-3, SS-4, and SS-5) contained carcinogenic polycyclic aromatic hydrocarbons (C-PAHs) at total concentrations of 5.7 parts per million (ppm), 7.2 ppm, and 118.4 ppm, respectively (total concentrations include estimated (J) levels). Other polycyclic aromatic hydrocarbons (PAHs) were detected at levels of 10.9 ppm, 10.4 ppm, and 51 ppm in surface soil samples SS-3, SS-4, and SS-5, respectively (total concentrations include estimated (J) levels). Volatile chlorinated hydrocarbons were detected at low levels in surface soil sample SS-5. Volatile chlorinated hydrocarbons are not typically associated with MGP operations as their use became common after this plant ceased operations. All of the surface soil samples contained elevated levels of several metals when compared to background concentrations of metals as described by Shacklette and Boerngen (1984). Elevated concentrations of these metals could originate from a variety of sources. The only sample from the State Road Site in which cyanide was detected was surface soil sample SS-5 which contained 3800 ppm. This sample was taken in the only area observed to have MGP purifier residues at the State Road Site. This surficial area was visually estimated to cover approximately one square meter.

The State Road Site received an actual risk score of 18.5 and a perceived risk score of 18.2. The SSPS scores reflect the assumption that subsurface MGP residues exist at the State Road Site, although no subsurface investigations were conducted. The answers to and assumptions used to answer specific SSPS questions in order to ensure consistency between sites are detailed in Appendix A. The breakdown of exposure route and individual question scores are also listed in Appendix A.

The major route of exposure to MGP residues at the State Road Site, based on available data, was identified as direct contact with surficial soils. Surficial soils at the site contained PAHs associated with MGP operations, as well as combustion, and fuel oils. Only one very limited area of exposed purifier residue was observed and sampled onsite. This sample contained relatively high concentrations of cyanide. Cyanides at MGP sites are associated with purifier residue and are complex cyanides which are stable under normal environmental conditions.

Based on the SSPS score of this site relative to other sites, immediate additional investigations at the State Road Site currently are not recommended. In the future, if changes in land use at the State Road Site are proposed, including any excavation or construction, a focused site investigation should be conducted prior to any development action. These investigations might include ground water and subsurface soil studies focusing in areas where former MGP structures existed, areas of vegetative stress, and where visual or olfactory residuals are evident.

1.0 INTRODUCTION

Combustible gas for heating, cooking, and illumination was manufactured from coke, coal, and oil at 1,500 to 2,500 sites in the United States between 1816 and the 1950s. Manufactured gas was the major gas fuel available during this period for the majority of the country. During the 1940s and 1950s, the manufactured gas industry encountered severe competition from natural gas. Natural gas was being made more readily available through interstate pipelines, was less expensive and had a higher Btu content than manufactured gas. Natural gas became the major base fuel. Eventually manufactured gas processes were phased out and the plants were decommissioned.

The three major processes used to manufacture gas were coal carbonization, carburetted water gas and oil gas. In the coal carbonization process, bituminous coal was heated in a sealed chamber causing the distillation of gas from coal and the formation of coke. Carburetted water gas, containing hydrogen and carbon monoxide, was produced by passing steam through a bed of incandescent coke (or coal). The resultant "blue gas" was then passed through two chambers containing hot firebrick in which oil was sprayed and the oil cracked into gaseous hydrocarbons and tar. Oil gas cracked oil alone into gaseous hydrocarbons, tar, and carbon. The carburetted water gas and the oil gas processes used a variety of oil-based feedstocks such as naphtha, gas oil, fuel oil, and residual oils.

The three processes produced similar by-products, however important differences exist which affect the current character and toxicity of the wastes. Tars produced during coal carbonization were high in phenols and base neutral organics. Tars produced by carburetted water gas and oil gas processes contain lower amounts of these compounds. Substantial amounts of cyanide and ammonia were produced by coal carbonization but only trace amounts of cyanide were produced during carburetted water gas and oil gas processes.

A number of former MGP sites, operated by NYSEG or its predecessor companies, have been investigated for potential risk to human health and/or the environment. If residues of the MGP remain at the sites, they may pose health risks to the surrounding populations and the environment. The sites were screened for size, current use, waste containment, nearby ground water and surface water use, soil and hydrological conditions, rainfall, chemical characteristics, and potential receptors. The information gathered through the screening effort was input into SSPS in order to assign risk-based priorities among sites. The goal of the screening is to identify and prioritize former MGP sites that may then require further investigation.

During the priority setting, no attempt was made to determine the ultimate level of site remediation which might be required. Site prioritization was conducted in order to enable NYSEG to develop plans of action and resource allocation so that any potential risks posed by these sites can be adequately addressed.

2.0 METHODOLOGY

The SSPS (Site Screening and Priority Setting System) is a menu-driven program designed for IBM-compatible PCs. The Electric Power Research Institute (EPRI) developed SSPS to help utilities manage former MGP sites, but it is a general tool that can be applied efficiently to many types of sites. The SSPS assigns scores to individual site characteristics. The individual scores are used to calculate risks associated with four potential routes of exposure, namely surface water, ground water, direct contact and air. The scores are combined to produce final scores which are indicators of actual risk and perceived risk at each site.

The SSPS is simple to use and requires information that is relatively straightforward to obtain. It can screen and rank a large number of MGP sites for further investigation and analysis. It has been tested with a number of MGP sites where complete risk analyses have been conducted and has produced reliable rankings with a strong correlation between the SSPS risk scores and the results of the remedial investigation risk analyses. The system does not attempt to determine the ultimate level of site remediation.

The SSPS requires information regarding the site and the surrounding areas including site size and current use, waste containment efforts, nearby ground water and surface water use, soil and hydrological conditions, rainfall, chemical characteristics, and potential receptors. Initial site surveys were conducted at the NYSEG Western area and North Central area sites on October 23 and 24, 1990. During these surveys, information regarding site size, current use, surface water use, general soil conditions, waste containment, and potential receptors was recorded. Historical data, U.S. Geological Survey (USGS), New York State Department of Environmental Conservation (NYSDEC), Department of Health (DOH), National Oceanic Atmospheric Administration (NOAA), and Soil Conservation Service (SCS) files and publications provided insights to nearby ground water and surface water use, soil and hydrological conditions, rainfall, and waste containment.

The sampling program consisted of surface water samples taken on November 2, 1990 and streambed sediment and surface soil samples collected on November 14 and 15, 1990. No wells for ground water sampling exist at the site. Subsurface investigations were not conducted as part of the site evaluation. The potential effects of MGP residues on ground water and subsurface soils at the site were estimated for purposes of completing the SSPS forms. The quantities of potential MGP residues in the subsurface at the State Road Site were estimated by applying the geometric mean concentration of residues associated with MGPs to a percentage of the average annual volume of tar processed during the operational years of the plant. The geometric mean concentrations of residues associated with MGPs were derived from the GRI-EPRI data base compiled by Atlantic Environmental Services, Inc. Of the annual volume of tar processed at the plant, one percent was assumed to remain onsite. The quantities of potential MGP residues in the subsurface at the State Road Site and the methods used to derive them are listed in Appendix A, questions 18 and 23.

3.0 SCOPE OF WORK

The following sections describe the information gathered concerning site history, current use, physiography, hydrogeology, ground water and surface water use, sensitive habitats, and field activities relating to the State Road Site evaluation.

3.1 Site History

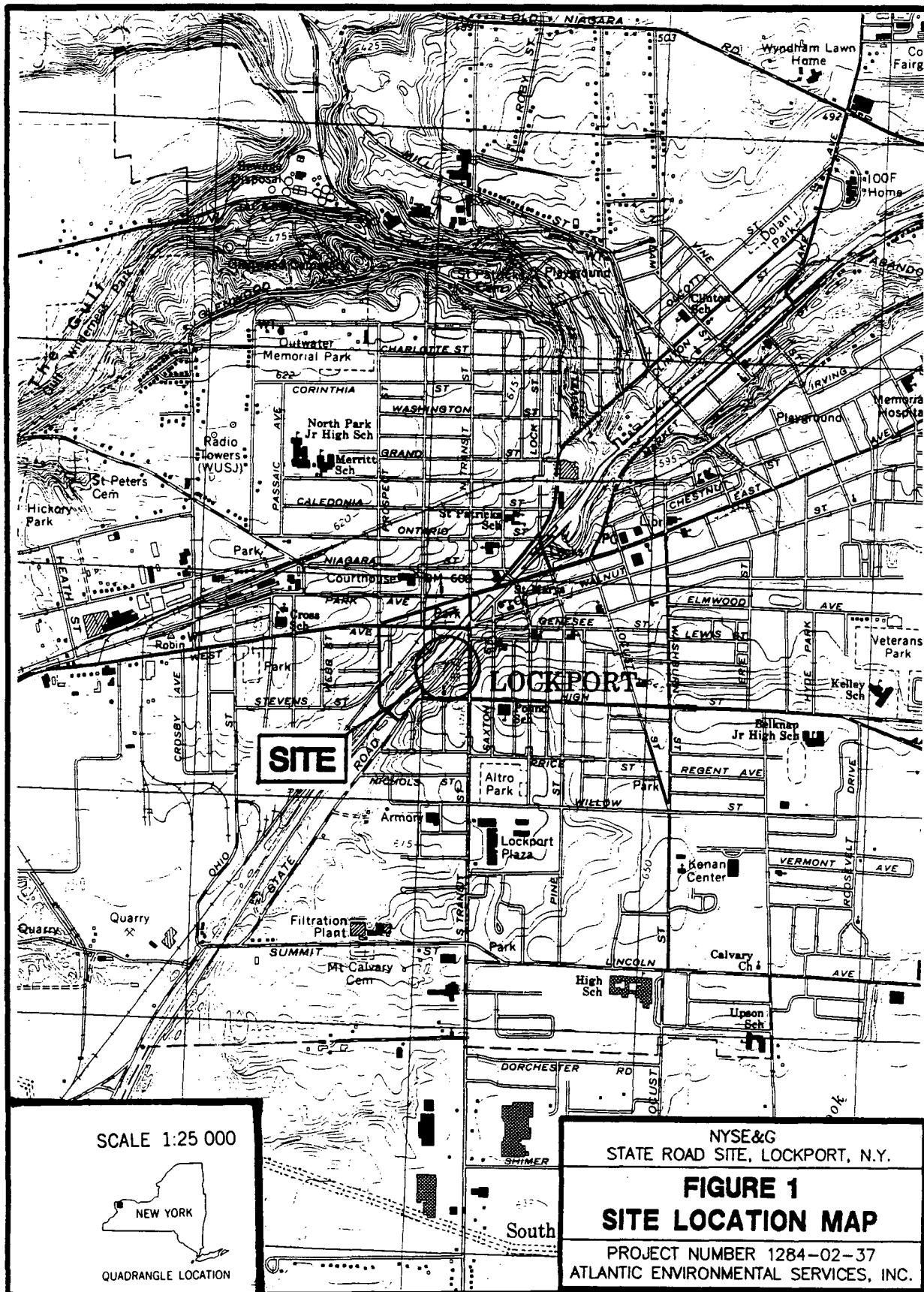
The State Road Site is the location of the former State Road Tar Works in Lockport, Niagara County, New York. The following site history is summarized on a Fact Sheet following the Title Page of this report. The State Road Site acquisition, organization, history, and available Sanborn Maps (Figures B-1 through B-12), which were researched and compiled by NYSEG, are included in Appendix B.

The site location is indicated on the Lockport, New York USGS Quadrangle map (Figure 1). The State Road Tar Works was established as a secondary processing plant for tar generated at the Transit Street MGP. The Transit Street MGP was located approximately one block east of the State Road Tar Works in Lockport. The State Road Site did not appear on 1886 and 1892 Sanborn Maps (Figures B-1 and B-2), suggesting that the site was undeveloped at that time. Figure 2 illustrates the existence and configuration of structures at the State Road Site from 1898 through 1954. The 1898 Sanborn Map (Figure B-3) showed the State Road Site occupied by several warehouses which NYSEG records indicate was owned by Lockport Gas Light Company. The State Road Tar Works was identified on both the 1903 and 1909 Sanborn Maps (Figures B-4 and B-5). Several tar tanks and ammonia tanks are also depicted. Lockport Light, Heat and Power Company acquired the site in 1907, according to NYSEG records. According to 1914 and 1919 Sanborn Maps (Figures B-6 and B-7), the site configuration remained essentially unchanged between 1903 and 1919. The 1928 Sanborn Map (Figure B-8) documented the construction of a 500,000 cubic foot gas holder northeast of the warehouse building between 1919 and 1928. In 1929, NYSEG acquired the Lockport Light, Heat and Power Company, and in the process, the property now referred to as the State Road Site. The warehouse building southwest of the holder was demolished by 1938 (Figure B-9). The old stone building, adjacent to State Road and northwest of the holder, was added onto and converted into a gas compressor building by 1938 (Figure B-9). The 1942, 1946, and 1954 site plan maps (Figures B-10, B-11 and B-12) documented continued existence of the gas holder and compressor building. The date of the demolition and removal of these structures was not determined during this study.

3.2 Site Reconnaissance

3.2.1 Current Use

The State Road Site is located in a mixed commercial/ residential area in the southwest section of Lockport, New York (Figure 1). The closest residence is within 50 feet of the site. The site is bordered by the New York State Barge Canal to the northwest, a NYSEG gas regulator house to the southwest, State Road to the southeast, and by an open lot to the northeast (formerly Beauman's Garage). An adjacent land use map is provided as Figure 3. The site consists of open vegetated and gravel-covered land with the only existing structure being a partially fenced-in gas regulator. A large percentage of the site appears to be fill and rubble emplaced adjacent to the New York State Barge Canal. Purifier residue (at one location), coal, clinker, old tires, and various rubble were



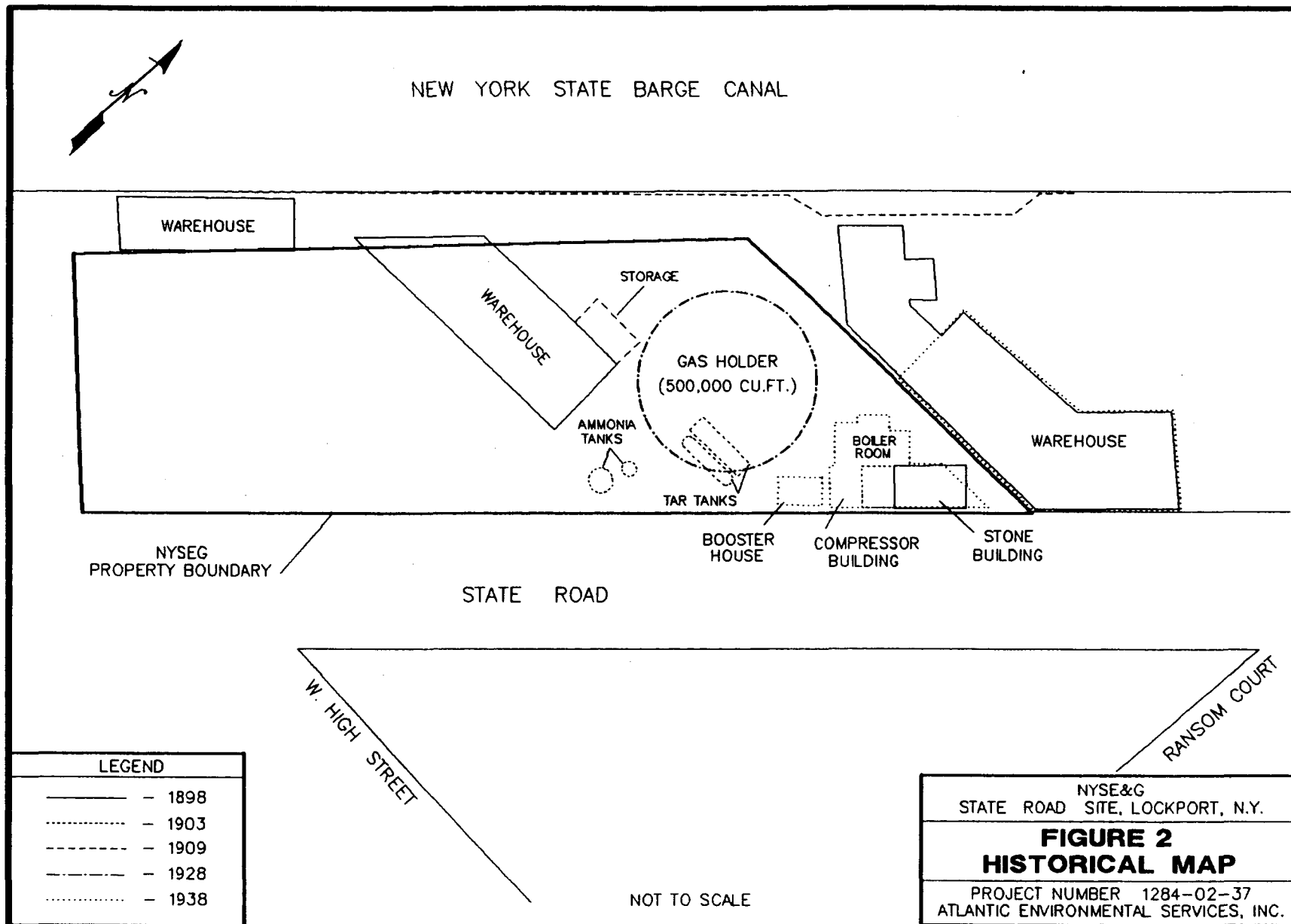
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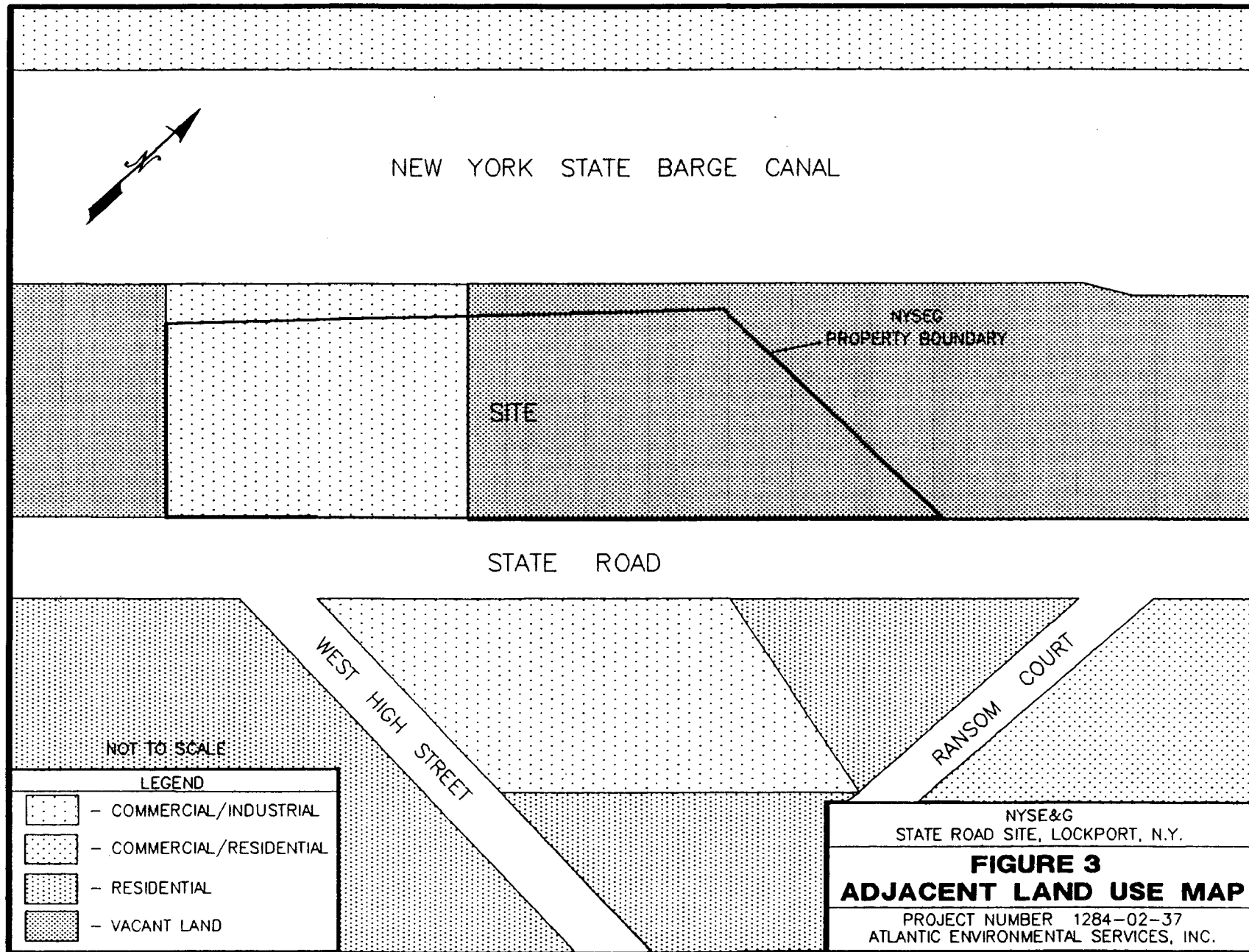
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LOCKPORT, NEW YORK

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observed along the bank leading to the canal. No other odors or residues associated with MGP processes were observed at the site. No tar seeps along the canal wall or sheens on the water surface were observed at the site. While a portion of the site is fenced, public access to the area of the site where the majority of the former tar works existed is not restricted. Xerox copies of aerial photos of the site are included in the field data section of this report (Appendix C).

3.2.2 Physiography

The State Road Site was surveyed by S.Y. Kim Land Surveyors, P.C., Latham, New York. Figure 4 is a reduced topographical map of the site. The State Road Site base map is included in the pocket at the end of this report. Surveyor field notes are included in Appendix D.

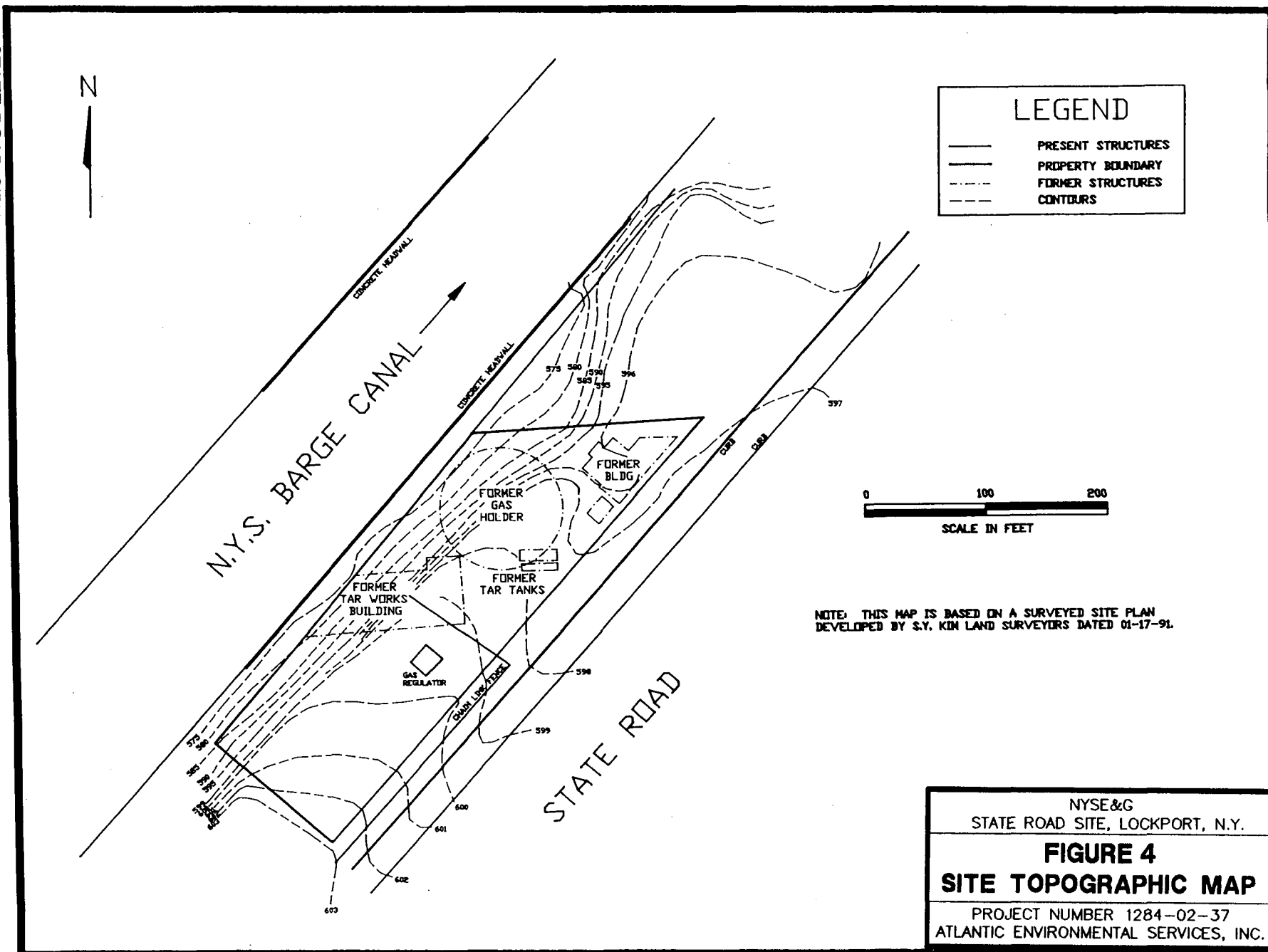
The State Road Site can be divided into two parts for description purposes. The section bordering State Road, at an elevation greater than 596 feet above mean sea level (MSL), can be considered the upland portion of the site where the slope is relatively flat. The lower section bordering the Barge Canal, at an elevation between 575 and 596 feet MSL, is a steep slope (approximately 30 percent) leading from the upland section to the Barge Canal. It is estimated that approximately 23 feet of fill have been added to the site since the gas holder was removed. The northwestern portion of the former holder rim is visible at the base of the slope in the eastern part of the site. The rim is at an elevation of 575 feet MSL, suggesting that the former tar works were at the same elevation. The site surface elevation currently rises to an elevation of 598 feet MSL where the southern rim of the holder was located. The upland section is approximately 50% gravel-covered and 50% vegetated. The lower section is 50% vegetated and 50% soil covered.

The maximum 24 hour rainfall measured in Lockport in 1989 was 2.67 inches (Hadlen, 1989). Precipitation infiltration is not restricted at the site creating the potential for leaching and subsurface release. The wind speed at the site is greater than 4 meters per second, however the gravel and vegetative cover minimize airborne dust particles.

3.2.3 Hydrogeology

Preliminary geologic and hydrogeologic information on the State Road Site has been obtained from Higgins, et al. (1972). The soils at the State Road Site are mapped as cut and fill land, which extends along the length of the Barge Canal. The existence of fill was verified during the surface soil sampling. The closest undisturbed soils which were probably present at the site during the Tar Works operations are mapped as the Hilton and Cayuga Silt Loam, limestone substratum. According to Higgins, et al., 1972, the soils in the area are underlain by bedrock at a depth of 3.5 to 6 feet and have more large cobbles or boulders than other Hilton or Cayuga soils. Depth to bedrock at the State Road Site is greater due to the fill emplaced at the site. The Hilton soils are moderately well drained medium textured soils developed from calcareous glacial till. The Cayuga soils are moderately well drained medium textured soils developed in glacio-lacustrine silts and clays. The permeability of the soils is reported to range from 0.63 to 2.0 inches per year (4.4×10^{-4} to 1.4×10^{-3} centimeters per second) (Higgins et al., 1972). Permeability of the fill material was not determined.

The shallow bedrock underlying the undisturbed soils in the vicinity of the State Road Site is the Lockport Dolomite. The Niagara Escarpment, a major physiographic feature in northwest New York underlain by the Lockport Dolomite, is located 0.5 miles north of the site.



The depth to shallow ground water at the site is not known. The New York State Barge Canal is approximately 24 feet below the average elevation of the upland portion of the site. Shallow ground water probably discharges to the Barge Canal. Therefore, the depth to shallow ground water is most likely less than 24 feet. MGP structures, mainly gas holders, were commonly constructed below grade and are assumed to have been at least within 3 feet (1 meter) of the shallow aquifer at the site. Depth to and flow direction within deeper aquifers below the site are unknown.

3.2.4 Ground Water and Surface Water Use

The State Road Site in Lockport, New York is bordered by the New York State Barge Canal. NYSDEC has classified the New York State Barge Canal as a Class C surface water body. Class C surface water can be used for irrigation, food preparation, fishing, or primary and secondary contact recreation. Water is not withdrawn from the Barge Canal for potable use. The City of Lockport receives its potable water supply from the Niagara River which is upgradient of the State Road Site. The municipal water system served approximately 36,800 people in the early 1980s (Axelrod, 1984).

Several wells exist within 3.11 miles (5 kilometers (km)) of the State Road Site according to USGS well records. Many of these wells are part of the observation well network for the USGS Niagara Project. The remaining wells are used for domestic and livestock purposes. The closest well to the State Road Site is approximately 1.86 miles (3 km) southeast and is used for domestic purposes.

3.2.5 Sensitive Habitats

Federally regulated freshwater wetlands are located within 1.25 miles (2 km) northeast and southwest of the site (NYSDEC Fish and Wildlife Branch Wetland Maps). Several freshwater wetlands are located within a 2.5 mile (4 km) radius of the site (NYSDEC Fish and Wildlife Branch Wetland Maps). No endangered species are known to exist within 2.5 miles (4 km) of the State Road Site (NYSDEC Natural Heritage Files and Maps).

3.3 Field Activities

Prior to the performance of any field activities, a work plan, quality assurance/quality control document and health and safety plan were submitted to and approved by NYSEG. The Health and Safety Plan and the Quality Assurance/Quality Control Document are included in Appendices E and F, respectively.

The general approach used to investigate contamination at the State Road Site was to identify routes of exposure which may result in direct contact with MGP residues and to chemically characterize the media associated with the exposure routes to evaluate potential health risks associated with the site.

Exposure routes with the potential for direct contact identified at the State Road Site include:

- dermal contact/incidental ingestion of surface soils potentially contaminated by tars, fuel oil, coal pile leachate or purifier residues; and
- dermal contact/incidental ingestion of surface water and sediments in the New York State Barge Canal potentially contaminated by runoff or direct discharge.

Surface water, streambed sediment, and surface soils were sampled at the State Road Site. No wells for ground water sampling are present at the site. Subsurface investigations were not conducted as part of this study. The potential effects of MGP residues on ground water and subsurface soils at the site were estimated using geometric mean concentrations of selected parameters commonly found in the subsurface at MGP sites and the average annual volume of tar processed at the State Road Tar Works for purposes of completing the SSPS forms (see Appendix A, questions 18 and 23 for details). Sample locations and rationale are presented in Table 1.

3.3.1 Surface Water and Streambed Sediment Samples

A total of three (3) surface water samples were collected from the New York State Barge Canal at the State Road Site on November 2, 1990. Surface water samples were collected earlier than sediment samples due to the New York State Department of Transportation (DOT) annual Canal drawdown, scheduled for November 8, 1990. Sampling locations are indicated on Figure 5. Surface water samples were obtained from upstream (SW-1, between the old railroad bridge and the public boat ramp), adjacent to the site (SW-2, directly downgradient of the purifier residue), and downstream (SW-3, approximately 200 feet west of the Transit Street Bridge) locations. These locations were selected to evaluate the changes in water quality potentially attributable to discharge of ground water, tar, or surface water runoff from the State Road Site into the Barge Canal. Surface water samples were collected according to Atlantic Procedure 1022 (Appendix G). Surface water samples were analyzed for volatile organic compounds using EPA Method 624, semi-volatile organic compounds using EPA Method 625, metals using EPA Method 200.7, lead using EPA Method 7191, chromium using EPA Method 7421, and cyanide using EPA Method 335.

A total of three (3) streambed sediment samples were collected from the Barge Canal on November 14, 1990. These sample locations are coincident with the surface water sample locations. Sediment samples were collected in accordance with Atlantic Procedure No. 1022 (Appendix G).

Sediment samples were analyzed for volatile organic compounds using EPA Method 8240, semi-volatile organic compounds using EPA Method 8270, metals using EPA Method 6010, lead using EPA Method 7191, chromium using EPA Method 7421, and cyanide using EPA Method 9010.

3.3.2 Surface Soil Samples

A total of five (5) surface soil samples were collected at the State Road Site on November 14 and 15, 1990. Sampling locations are illustrated on the sampling locations map (Figure 5). Surface soils were collected from 0.0 to 0.5 foot depth using dedicated stainless steel sampling spoons. Three of the five sample locations (SS-1, SS-3 and SS-4) were gridded and consisted of 49 nodal points each. Five (5) nodes, randomly selected, were sampled and combined to produce each composite sample. Sample areas and nodal selection are detailed in the field data section, Appendix C, of this report. Sample collection procedures are outlined in Atlantic Procedure 1020 (Appendix G).

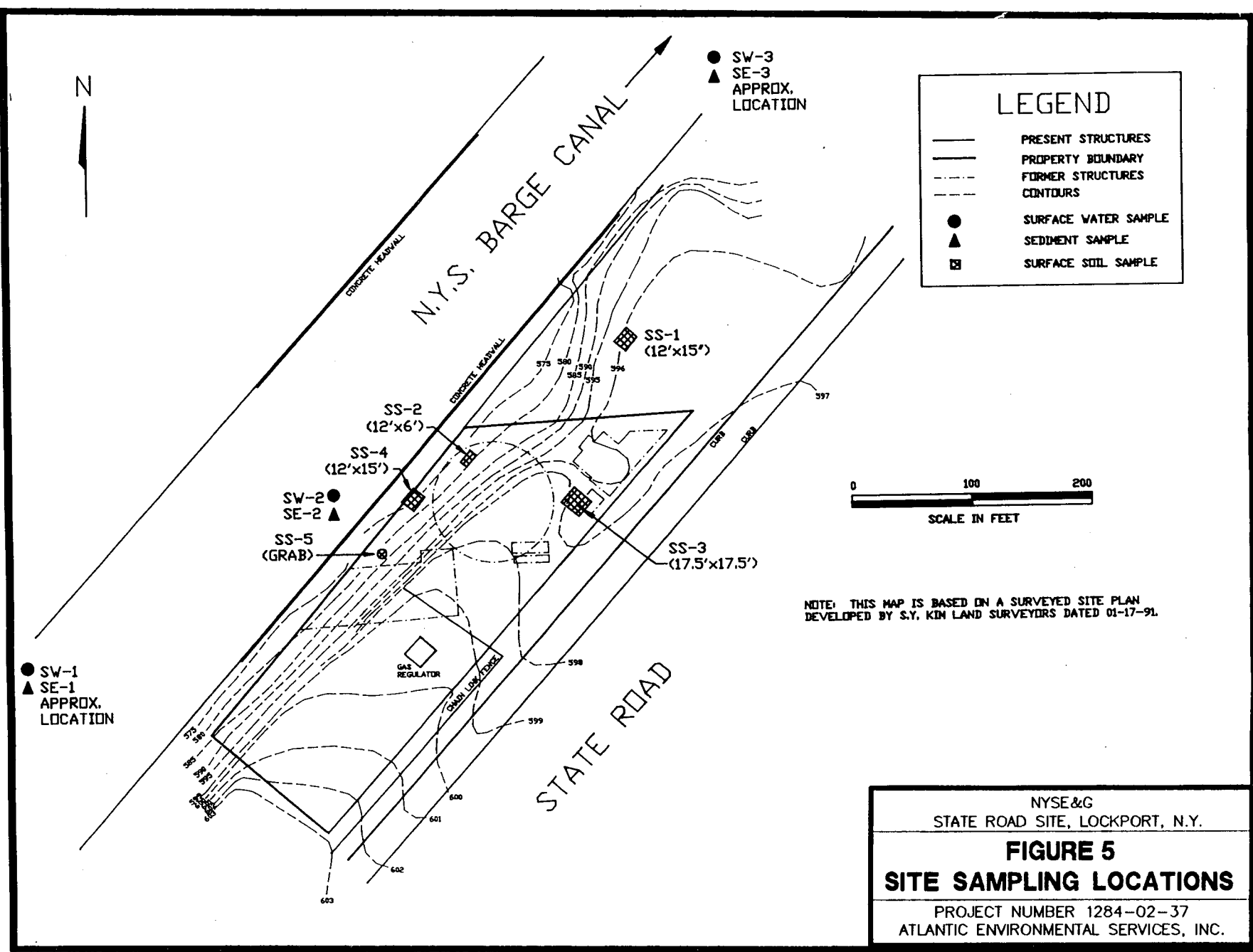
Surface soil sample SS-1 was collected in the area near the former car shop where approximately 20 cars and several trucks had been stored but have subsequently been removed. Old tires, bricks, and plastic container debris had also been observed. Surface soil sample SS-2 was collected inside the former holder rim at the base of the bank along the canal. This sample location was not gridded due to the abundance of large boulders within the sample area. Five randomly

TABLE 1
SAMPLING LOCATIONS AND RATIONALE
FOR THE STATE ROAD SITE, LOCKPORT, NEW YORK

SAMPLE ID	LOCATION AND RATIONALE		ANALYSES
SURFACE WATER			
SW-1	Upstream	To evaluate potential changes in surface water quality which may be attributable to the discharge of groundwater or runoff of surface water from the State Road Site into the New York State Barge Canal.	VOCs-EPA Method 624 SVOCs-EPA Method 625 Metals-EPA Method 200.7 Lead-EPA Method 7191 Chromium-EPA Method 7421 Cyanide-EPA Method 335
SW-2	Mid-site		
SW-3	Downstream		
STREAMBED SEDIMENT			
SE-1	Upstream	To evaluate potential changes in streambed sediment quality which may be attributable to the discharge of ground water, runoff of surface water, or tars from the State Road Site into the New York State Barge Canal.	VOCs-EPA Method 8240 SVOCs-EPA Method 8270 Metals-EPA Method 6010 Lead-EPA Method 7191 Chromium-EPA Method 7421 Cyanide-EPA Method 9010
SE-2	Mid-site		
SE-3	Downstream		
SURFACE SOILS			
SS-1	In the area near the former Beauman's Garage where debris was observed to evaluate potential contamination.		VOCs-EPA Method 8240 SVOCs-EPA Method 8270 Metals-EPA Method 6010 Lead-EPA Method 7191 Chromium-EPA Method 7421 Cyanide-EPA Method 9010
SS-2	In the area of the former gas holder, to evaluate potential contamination from holder contents.		
SS-3	In the vicinity of the former tar tanks to evaluate potential contamination from the tanks contents.		
SS-4	Taken downgradient from the former tar works to evaluate the migration potential of contamination attributable to former tar works operations.		
SS-5	Grab sample from the bank where purifier residue was observed.		

spread locations within the holder rim were sampled and combined to produce a composite sample. Surface soil sample SS-3 was collected approximately 60 feet northeast of the former tar tank area. A sample in the area of the former tar tanks could not be taken due to the gravel covering. Surface soil sample SS-4 was taken along the bank downgradient of the former tar works area. The SS-4 sample area is between SS-2 and SS-5. Surface soil sample SS-5 was a grab sample of the purifier residue identified during the initial site visit.

Surface soil samples were analyzed for the same parameters and using the same EPA methods as the streambed sediments.



4.0 ANALYTICAL RESULTS

This section summarizes the analytical results of the sampling program conducted at the State Road Site. Appendix H lists the results of the analyses performed by Wadsworth/Alert Laboratories, Inc. on the samples gathered from the various media at the site.

4.1 Surface Water Analytical Results

No volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), or cyanides were detected in any of the surface water samples collected at the State Road Site. The upstream sample SW-1 contained an elevated level of aluminum of 0.38 parts per million (ppm) compared to the NYSDEC Ambient Water Quality Standards (Zambrano, 1987) for aluminum in Class C surface waters which is 0.10 ppm. Surface water sample SW-2 (adjacent to the site) had an elevated level of selenium of 0.04 ppm compared to the NYSDEC standard of 0.001 ppm. These levels are not necessarily attributable to former MGP operations. The elevated level of aluminum occurred upstream of the former tar works operations. The elevated level of selenium was detected in the near site sample, but selenium is not associated with MGP residues.

4.2 Streambed Sediment Analytical Results

The streambed sediment samples contained no detectable quantities of VOCs, SVOCs, or cyanides. All of the sediment samples contained elevated levels of several metals which are summarized in Table 2. Complete analytical results from which Table 2 is derived are tabulated in Appendix H. The background concentration of each element was derived from the background concentrations listed for the sampling location closest to Lockport, New York in Shacklette and Boerngen (1984).

The detected levels of the majority of metals found to exceed background concentrations in the streambed sediments were consistent along the reach of the Barge Canal sampled. The concentration of chromium, copper, lead and zinc increases downstream and could result from a variety of sources. Elevated levels of these metals are not associated with MGP residues; the specific source is unknown.

4.3 Surface Soil Analytical Results

Surface soil samples SS-1 and SS-2 contained no detectable concentrations of VOCs, SVOCs, or cyanide. Surface soil samples SS-3, SS-4, and SS-5 contained polycyclic aromatic hydrocarbons (PAHs) and carcinogenic polycyclic aromatic hydrocarbons (C-PAHs), as shown in Table 3.

The total concentrations of C-PAHs in surface soil samples SS-3, SS-4 and SS-5 were 5.7 ppm, 7.2 ppm, and 118.4 ppm respectively (total concentrations include estimated (J) levels). PAHs were detected at 10.9 ppm, 10.4 ppm and 51.0 ppm in surface soil samples SS-3, SS-4, and SS-5 respectively (total concentrations include estimated (J) levels). Volatile chlorinated hydrocarbons were detected at low levels in surface soil sample SS-5 (see Table 3).

TABLE 2

**INORGANIC COMPOUNDS DETECTED IN STREAMBED SEDIMENTS
AT THE STATE ROAD SITE, LOCKPORT, NEW YORK**

	(CONCENTRATIONS IN PPM)			
ELEMENT	SE-1	SE-2	SE-3	BACKGROUND CONCENTRATION
INORGANICS				
Arsenic	3.10	3.90	3.30	2.60(2)
Beryllium	1.20	1.20	*	<1.00(2)
Calcium	31,000	36,000	31,000	12,000(2)
Chromium	26.00	28.00	41.00	20.00(2)
Cobalt	10.00	11.00	--	5.00(2)
Copper	39.00	44.00	44.00	10.00(2)
Iron	23,000	26,000	22,000	500.00(2)
Lead	31.00	46.00	76.00	15.00(2)
Magnesium	11,000	12,000	12,000	36,000(2)
Manganese	540.00	550.00	510.00	300.00(2)
Nickel	29.00	36.00	35.00	10.00(2)
Zinc	190.00	260.00	310.00	45.00(2)
-- None detected * Detected, but below background concentration. J Detected, but below quantification limit (estimated value). (2) Shacklette and Boerngen (1984)				

TABLE 3

**VOLATILE, SEMI-VOLATILE ORGANIC, AND INORGANIC COMPOUNDS DETECTED IN SURFACE SOILS
AT THE STATE ROAD SITE, LOCKPORT, NEW YORK**

ELEMENT	(CONCENTRATIONS IN PPM)					TYPICAL BACKGROUND CONCENTRATION AT SIMILAR SITES
	SS-1	SS-2	SS-3	SS-4	SS-5	
VOLATILE ORGANICS						
Tetrachloroethene	--	--	--	--	0.043	
1,1,1-Trichloroethane	--	--	--	--	0.016	
Trichloroethene	--	--	--	--	0.016	
SEMI-VOLATILE ORGANICS						
NON-CARCINOGENIC PAHS						
Anthracene	--	--	--	--	14.00	
Fluoranthene	--	--	4.10	3.80J	16.00	
Phenanthrene	--	--	2.20J	1.80J	--	
Pyrene	--	--	4.60	5.00	21.00	
TOTAL	--	--	10.90	10.40	51.00	10.00(1)
CARCINOGENIC PAHS						
Benzo(a)anthracene	--	--	2.50	--	15.00	
Benzo(k)fluoranthene	--	--	3.20J	3.90J	43.00	
Benzo(g,h,i)perylene	--	--	--	--	6.90	
Benzo(a)pyrene	--	--	--	--	18.00	
Chrysene	--	--	--	3.30J	25.00	
Indeno(1,2,3-cd)pyrene	--	--	--	--	6.50	
TOTAL	--	--	5.70	7.20	118.40	10.00(1)
INORGANICS						BACKGROUND CONCENTRATIONS
Arsenic	5.80	4.50	5.50	6.70	11.00	2.60(2)
Calcium	82,000	34,000	50,000	27,000	*	12,000(2)
Chromium	*	*	*	*	21.00	0.13(2)
Cobalt	66.00	--	--	--	--	5.00(2)
Copper	46.00	34.00	25.00	34.00	120.00	10.00(2)
Iron	11,000	15,000	15,000	23,000	26,000	10,000(2)
Lead	100.00	190.00	100.00	140.00	160.00	15.00(2)
Manganese	760.00	450.00	840.00	600.00	370.00	300.00(2)
Magnesium	42,000	9,700	20,000	7,900	3,100	3,000(2)
Mercury	0.14	0.41	--	0.24	1.10	0.13(2)
Nickel	88.00	43.00	16.00	39.00	--	
Zinc	120.00	130.00	120.00	140.00	240.00	45.00(2)
Cyanide	--	--	--	--	3,800	500.00(1)
-- None detected * Detected, but below background concentration. J Detected, but below quantification limit (estimated value). (1) Level based on typical background concentrations at similar sites. (2) Shacklette and Boerngen (1984)						

All of the surface soil samples contained elevated levels of various metals (Table 3) when compared to background concentrations of metals in the Lockport area as described by Shacklette and Boerngen (1984). The only sample from the State Road Site in which cyanide was detected was surface soil sample SS-5 which contained 3800 ppm. This sample was taken in the only area observed to have purifier residues at the State Road Site.

The PAHs and C-PAHs detected in the State Road Site surficial soils may be related to former MGP residues. Volatile chlorinated hydrocarbons (detected at low levels in SS-5) are not typically associated with MGP operations as their use became common after this MGP site ceased operations. The elevated levels of metals in the surface soils at the State Road Site could have originated from several sources and do not necessarily indicate association with MGP residues. The detection of cyanide in SS-5, the sample collected from the purifier residue observed onsite is indicative of former MGP operations.

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Surface soil samples SS-1 and SS-2 contained no detectable concentrations of VOCs, SVOCs, or cyanide. Surface soil samples SS-3, SS-4, and SS-5 contained polycyclic aromatic hydrocarbons (PAHs) and carcinogenic polycyclic aromatic hydrocarbons (C-PAHs), as shown in Table 3.

The total concentrations of C-PAHs in surface soil samples SS-3, SS-4 and SS-5 were 5.7 ppm, 7.2 ppm, and 118.4 ppm respectively (total concentrations include estimated (J) levels). PAHs were detected at 10.9 ppm, 10.4 ppm and 51.0 ppm in surface soil samples SS-3, SS-4, and SS-5 respectively (total concentrations include estimated (J) levels). Volatile chlorinated hydrocarbons were detected at low levels in surface soil sample SS-5 (see Table 3).

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INORGANICS				
Arsenic	3.10	3.90	3.30	2.60(2)
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Calcium	31,000	36,000	31,000	12,000(2)
Chromium	26.00	28.00	41.00	20.00(2)
Cobalt	10.00	11.00	--	5.00(2)
Copper	39.00	44.00	44.00	10.00(2)
Iron	23,000	26,000	22,000	500.00(2)
Lead	31.00	46.00	76.00	15.00(2)
Magnesium	11,000	12,000	12,000	36,000(2)
Manganese	540.00	550.00	510.00	300.00(2)
Nickel	29.00	36.00	35.00	10.00(2)
Zinc	190.00	260.00	310.00	45.00(2)
-- None detected * Detected, but below background concentration. J Detected, but below quantification limit (estimated value). (2) Shacklette and Boerngen (1984)				

TABLE 3

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AT THE STATE ROAD SITE, LOCKPORT, NEW YORK**

ELEMENT	(CONCENTRATIONS IN PPM)					TYPICAL BACKGROUND CONCENTRATION AT SIMILAR SITES
	SS-1	SS-2	SS-3	SS-4	SS-5	
VOLATILE ORGANICS						
Tetrachloroethene	-	-	-	-	0.043	
1,1,1-Trichloroethene	-	-	-	-	0.016	
Trichloroethene	-	-	-	-	0.016	
SEMI-VOLATILE ORGANICS						
NON-CARCINOGENIC PAHS						
Anthracene	-	-	-	-	14.00	
Fluoranthene	-	-	4.10	3.60J	16.00	
Phenanthrene	-	-	2.20J	1.80J	-	
Pyrene	-	-	4.60	5.00	21.00	
TOTAL	-	-	10.90	10.40	51.00	10.00(1)
CARCINOGENIC PAHS						
Benzo(a)anthracene	-	-	2.50	-	15.00	
Benzo(k)fluoranthene	-	-	3.20J	3.90J	43.00	
Benzo(g,h,i)perylene	-	-	-	-	6.90	
Benzo(a)pyrene	-	-	-	-	16.00	
Chrysene	-	-	-	3.30J	25.00	
Indeno(1,2,3-cd)pyrene	-	-	-	-	6.50	
TOTAL	-	-	5.70	7.20	116.40	10.00(1)
INORGANICS						BACKGROUND CONCENTRATIONS
Arsenic	5.80	4.50	5.50	6.70	11.00	2.60(2)
Calcium	82,000	34,000	50,000	27,000	-	12,000(2)
Chromium	-	-	-	-	21.00	0.13(2)
Cobalt	66.00	-	-	-	-	5.00(2)
Copper	46.00	34.00	25.00	34.00	120.00	10.00(2)
Iron	11,000	15,000	15,000	23,000	26,000	10,000(2)
Lead	100.00	190.00	100.00	140.00	160.00	15.00(2)
Manganese	760.00	450.00	640.00	600.00	370.00	300.00(2)
Magnesium	42,000	9,700	20,000	7,900	3,100	3,000(2)
Mercury	0.14	0.41	-	0.24	1.10	0.13(2)
Nickel	88.00	43.00	16.00	39.00	-	
Zinc	120.00	130.00	120.00	140.00	240.00	45.00(2)
Cyanide	-	-	-	-	3,800	500.00(1)
-- None detected * Detected, but below background concentration. J Detected, but below quantification limit (estimated value). (1) Level based on typical background concentrations at similar sites. (2) Shacklette and Boemgen (1964)						

All of the surface soil samples contained elevated levels of various metals (Table 3) when compared to background concentrations of metals in the Lockport area as described by Shacklette and Boerngen (1984). The only sample from the State Road Site in which cyanide was detected was surface soil sample SS-5 which contained 3800 ppm. This sample was taken in the only area observed to have purifier residues at the State Road Site.

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5.0 SCREENING RESULTS

The State Road Site was a secondary processing plant for tar generated at the Transit Street MGP. Gas was produced by the coal carbonization method at the Transit Street MGP. Residuals commonly produced by the coal carbonization method of producing gas were coal tar, coke, ammoniacal liquor, ash and clinker, purifier residue, and phenolic compounds. Purifier residue, clinker and coal debris were observed along the bank of the Barge Canal at the State Road Site. PAHs associated with MGP operations, combustion, and fuel oils were detected in surficial soils at the State Road Site. Elevated levels of cyanide were detected in the sample taken from the isolated location of purifier residue. These findings suggest the possibility that other residues of the MGP operations at Transit Street could have been disposed of on land at the State Road Site.

The State Road Site in Lockport, New York received an actual risk score of 18.5 and a perceived risk score of 18.2 from the SSPS program. Direct contact with surficial soils containing constituents associated with MGP residues was identified as the major route of exposure to MGP residues at the State Road Site. The SSPS scores reflect the assumptions that subsurface MGP residues exist at the State Road Site, although no subsurface investigations were conducted. The answers to and the assumptions used to answer specific SSPS questions in order to ensure consistency between sites are detailed in Appendix A. The breakdown of exposure route and individual question scores also are listed in Appendix A.

6.0 RECOMMENDATIONS

The major route of exposure to MGP residues at the State Road Site according to the SSPS program was identified as direct contact with surficial soils. Surficial soils at the State Road Site contained PAHs which can be associated with MGP operations, combustion, and/or fuel oils. PAHs can be harmful if ingested. One very limited area of exposed MGP residue was observed and sampled onsite. This sample contained a relatively high concentration of cyanide. Cyanides at MGP sites are associated with purifier residue and are complex cyanides which are stable under normal environmental conditions.

Based on the SSPS score of this site relative to other sites, immediate additional investigations at the State Road Site currently are not recommended. In the future, if changes in land use at the site are proposed, a focused site investigation should be conducted prior to any development. These investigations might include ground water and subsurface soil studies focusing in areas where former MGP structures existed, areas of vegetative stress, and where visual or olfactory residuals are evident.

7.0 REFERENCES

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- Hadlen, Kenneth, D.; Climatological Data Monthly Summary, New York, 1989; Volume 101, Number 9; National Oceanic and Atmospheric Administration; 1989.
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SSPS DATA ENTRY FORM

Site Name: LOCKPORT-STATE ROAD SITE Actual Risk: 18.5
Type of Site: MGP SITE Perceived Risk: 18.2

ACTUAL RISK: 18.5
 Surface Water: 16.8
 Target: 22.4
 Runoff Potential: 4.2
 Near-surface Contamination: 14.3
 Containment: 75.0
 Mobility: 38.9
 Subsurface Release Potential: 5.0
 Subsurface Contamination: 14.3
 Containment: 66.7
 Mobility: 52.4
 Observed Release: 75.0
 Ground Water: 10.7
 Target: 10.7
 Release Potential: 4.2
 Subsurface Contamination: 14.3
 Containment: 66.7
 Mobility: 44.4
 Observed Release: 100.0
 Direct Contact: 31.0
 Target: 43.4
 Surface Contamination: 71.4
 Air: 4.1
 Target: 31.7
 Release Potential: 12.9
 Subsurface Contamination: 71.4
 Containment: 30.0
 Mobility: 60.0
 Observed Release: 0.0

PERCEIVED RISK: 18.2
 Site Characteristics: 43.4
 Surface Water: 22.4
 Target: 22.4
 Runoff Potential: 28.4
 Near-surface Contamination: 90.9
 Containment: 75.0
 Mobility: 41.7
 Subsurface Release Potential: 40.4
 Subsurface Contamination: 90.9
 Containment: 66.7
 Mobility: 66.7
 Observed Release: 100.0

Ground Water:	10.7
Target:	10.7
Release Potential:	60.6
Subsurface Contamination:	90.9
Containment:	66.7
Mobility:	100.0
Observed Release:	100.0
Direct Contact:	43.4
Target:	43.4
Surface Contamination:	100.0
Air:	5.7
Target:	31.7
Release Potential:	18.0
Subsurface Contamination:	100.0
Containment:	30.0
Mobility:	60.0
Observed Release:	0.0
Community Characteristics:	0.4

Q1) Site Description: TAR PROCESSING PLANT

Q2) Service Region: W
Service Division: LPT
Neighborhood Type: R/C

Q3) How is the surface water used?

- ☐ Not currently used (score = 1)
- ☐ Industrial (2)
- ☐ Recreational (3)
- ☒ Irrigation, food preparation, or fishing (4)
- ☐ Drinking water (5)

Select the appropriate answer with the highest score.

Based on NYSDEC stream classifications. The Erie Canal bordering the Lockport Site is classified as a Class C surface water body which is used for irrigation, food preparation, or fishing.

Score: 4.0

- Q4) For each distance, check the appropriate row to indicate the number of people using the downstream surface water for the highest scoring purpose above.

Population	Distance			
	Within 5 km	Within 3 km	Within 1 km	Within 1/2 km
0	_____ (0)	_____ (0)	_____ (0)	_____ (0)
1 to 100	_____ (1)	_____ (2)	_____ (3)	<u>X</u> (4)
101 to 1,000	_____ (2)	_____ (3)	<u>X</u> (4)	_____ (6)
1,001 to 10,000	<u>X</u> (3)	<u>X</u> (4)	_____ (6)	_____ (8)
10,001 to 100,000	_____ (4)	_____ (6)	_____ (8)	_____ (10)
100,001 and up	_____ (6)	_____ (8)	_____ (10)	_____ (12)

Based on Donnelly Demographic Data.

Score: 4.0

- Q5) Check the appropriate downstream distance from the site to the nearest of each type of sensitive surface water environment:

Target	Distance				
	Outside 4 km	Within 4 km	Within 2 km	Within 1 km	Within 1/2 km
Coastal wetland	<u>X</u> (0)	_____ (1)	_____ (6)	_____ (12)	_____ (16)
Freshwater wetland	_____ (0)	<u>X</u> (1)	_____ (3)	_____ (7)	_____ (16)
Endangered species	<u>X</u> (0)	_____ (1)	_____ (3)	_____ (8)	_____ (16)

Based on NYSDEC regulated wetlands and federally designated endangered species.

Score: 1.0

- Q6) What is the slope of the terrain near the site:

On-site slope	Less than 3%	3% or greater	5% or greater	8% or greater	No intervening terrain
Less than 3%	_____ (0)	_____ (1)	_____ (1)	_____ (2)	_____ (9)
Less than 5%	_____ (0)	_____ (1)	_____ (2)	<u>X</u> (2)	_____ (9)
Less than 8%	_____ (0)	_____ (2)	_____ (2)	_____ (3)	_____ (9)
8% or greater	_____ (0)	_____ (2)	_____ (3)	_____ (3)	_____ (9)

Based on site observations and the USGS 7.5 Minute Quadrangle Map of Lockport.

Score: 2.0

Q7) What is the expected maximum 24-hour rainfall over a year?

- ☐ Less than 2 cm (0)
- ☐ Less than 5 cm (1)
- ☒ Less than 8 cm (2)
- ☐ 8 cm or greater (3)

Based on the greatest of 24-hour rainfall in 1989 for Lockport, referenced in NOAA Climatological Data Annual Summary New York, 1989.

Score: 2.0

Q8) What is the distance to the nearest body of surface water?

- ☐ Greater than 2 km (0)
- ☐ Less than 2 km (1)
- ☐ Less than 1/2 km (2)
- ☒ Less than 100 meters (3)

Based on site observations and the Lockport Quadrangle map.

Score: 3.0

Q9) What is the physical state of the wastes within one-tenth of one meter (10 cm) of the site surface?

- ☒ Solid, consolidated and stabilized (0)
- ☐ Solid, unconsolidated and unstabilized (1)
- ☐ Powder or fine material (2)
- ☐ Liquid, gas, or sludge (3)

Default value - solid, consolidated, and stabilized because the only waste observed at the site fell into this category.

Score: 0.0

Q10) How well is the site designed to reduce runoff?

- ☐ Runoff blocked by high terrain (0)
☐ Waste covered (1)
☐ Exposed waste, sound diversion system (2)
☒ Exposed waste, poor diversion system (3)
☐ Site in surface water (4)

Select the appropriate answer with the highest score.

Based on site observations made by Atlantic
Environmental Services, Inc.

Score: 3.0

Q11) Fill out the table below describing the wastes present within one-tenth of a meter (10 cm) of the surface of the site. If data is not known exactly, approximations must be made. Include up to six chemicals.

Chemical Waste Name	Concentration (ppm)	Established Values (ppm)	Persistence (0-3)	Quantity (kg)
<u>Arsenic</u>	<u>11.0</u>	<u>2.6</u>	<u>3</u>	<u>0.2261</u>
<u>Cyanide</u>	<u>3800.0</u>	<u>500</u>	<u>3</u>	<u>0.38</u>
<u>Lead</u>	<u>190.0</u>	<u>15</u>	<u>3</u>	<u>5.316</u>
<u>C-PAH</u>	<u>118.4</u>	<u>10</u>	<u>3</u>	<u>0.1408</u>
<u>PAH</u>	<u>53.2</u>	<u>10</u>	<u>3</u>	<u>0.2181</u>

Chemical
Waste:

Types of wastes were determined by mutual consent. They are defined below with C-PAHs and PAHs broken down into the specific compound detected in the surface soils at the Lockport site.

Arsenic

Cyanide

Lead

C-PAHs: Benzo(a)anthracene, benzo(k)fluoranthene, benzo(g,h,i)perylene, benzo(a)pyrene, chrysene, indeno(1,2,3-cd)pyrene

PAHs: Anthracene, fluoranthene, phenanthrene, pyrene

Concentration:

The highest concentration detected in any of the samples was used. If none was detected, concentration = 0.

Concentration: C-PAHs: Concentration represents the sum of the highest concentrations of all C-PAHs detected.

PAHs: Concentration represents the sum of the highest concentrations of all PAHs detected, not including C-PAHs.

Established Values:

Arsenic and Lead - Used the background concentrations for arsenic and lead from Shacklette and Boermgen (1984).

Cyanide, C-PAHs, PAHs - Used default values:

Cyanide - 50 ppm (domestic land use)

500 ppm (industrial land use)

C-PAHs - 10 ppm

PAHs - 10 ppm

Persistence: Based on values supplied in the SSPS help screen.

Quantity: The quantity of waste represents the summation of the concentration of waste detected in each surface soil sample multiplied by the volume of soil contaminated. For samples SS-1 through SS-4, this volume was assumed to be 10 m^3 ($10\text{m} \times 10\text{m} \times 10\text{cm}$). For SS-5, the extent of the contaminated soil was visually estimated to be 0.1 m^3 ($1\text{m} \times 1\text{m} \times 10\text{cm}$).

Score: 5.0

Q12) What is the physical state of all of the wastes at the site surface?

- ☒ Solid, consolidated and stabilized (0)
- ☐ Solid, unconsolidated and unstabilized (1)
- ☐ Powder or fine material (2)
- ☐ Liquid, gas, or sludge (3)

Default value - solid, consolidated and stabilized.

Score: 0.0

Q13) What is the distance from the bottom of the site to the top of the water table?

- ☐ Greater than 15 m (0)
- ☐ Less than 15 m (1)
- ☐ Less than 5 m (2)
- ☒ Less than 1 m (3)
- ☐ Site in water table (6)

Default value - less than 1m as established by mutual consent. Assumed former MGP structures were below land surface, placing the bottom of the site below grade and therefore closer to the water table.

Score: 3.0

Q14) What is the expected annual net precipitation?

- ☐ Less than -25 cm (0)
- ☐ Greater than -25 cm (1)
- ☐ Greater than 10 cm (2)
- ☒ Greater than 25 cm (3)

Default value - greater than 25 cm as established by mutual consent.

Score: 3.0

Q15) What is the permeability of the soil between the site and the water table?

- ☐ Less than 1×10^{-7} (0)
- ☐ Greater than 1×10^{-7} (1)
- ☒ Greater than 1×10^{-5} (2)
- ☐ Greater than 1×10^{-3} (3)

Value based on Soil Conservation Survey data for HmA - Hilton and Cayuga Silt Loams - (the nearest undisturbed soil type to the Lockport Site).

Score: 2.0

Q16) What is the mobility of the primary chemicals in the saturated zone?

- ☒ Greater than 10,000 (0)
- ☐ Less than 10,000 (1)
- ☐ Less than 100 (2)
- ☐ Less than 1 (3)

Default value of greater than 10,000 - assuming the primary chemical to be benzene as established by mutual consent.

Score: 0.0

Q17) How well is the site designed to reduce leaching and subsurface release?

- ☐ Non-permeable barrier and no ponding (0)
- ☐ Non-permeable barrier and ponding (1)
- ☒ Inadequate barrier and no ponding (2)
- ☐ Inadequate barrier and ponding (3)

Based on site observations made by Atlantic Environmental Services, Inc. in 1990.

Score: 2.0

Q18) Fill out the table below describing all of the wastes present at the site. If data is not known exactly, approximations must be made. Include up to six chemicals.

Chemical Waste Name	Concentration (ppm)	Established Values (ppm)	Persistence (0-3)	Quantity (kg)
VOAs	706.6	1.0	2	8.82
PAH	52,889.0	10	3	660.42
Cyanide	3,800.0	500	3	0.035
Lead	190.0	15	3	0.69
Nickel	88.0	10	3	0.19
Zinc	240.0	45	3	0.75

Chemical Waste: Determined to be volatile organics, PAHs, cyanide, as arrived at by mutual consent.

Concentration: Used the geometric mean concentrations for tar waste, and conversion factor for tar (gallons) to tar (weight in kilograms) from the GRI EPRI data base. Cyanide concentration represents level detected in surface soil samples. Metals concentration represents the highest level detected in surface soil samples.

Established Values: Determined by mutual consent as follows:
 Volatile Organics - 1 ppm
 PAHs - 10 ppm
 Cyanide - 50 ppm (domestic land use)
 500 ppm (industrial land use)
 Others: Based on background concentrations of metals as reported in Shacklette and Boerngen (1984).

Persistence: Based on values supplied in the SSPS help screen.

Quantity: Used the radian report to determine the average gas production for the years that the State Road Tar Works were in operation to be 39.5 MCF (1900 and 1910 production figures averaged). This average was multiplied by the years of operation (11) and then by a constant (7.3) representing the assumption that 730 gallons of tar are produced for every 1,000,000 ft³ of gas manufactured (radian report) and approximately 1% is lost as waste onsite.

Score: 5.0

Q19) Fill out the table below describing wastes that have been detected in the nearest body of surface water. If wastes have not been detected, enter zeros for the concentrations. If a waste release was detected by sight or smell but not sampled analytically, an approximation must be made. Include up to six chemicals.

Chemical Waste Name	Concentration (ppb)	Government Standard (ppb)
<u>VOCs</u>	<u>0</u>	<u>--</u>
<u>Aluminum</u>	<u>380</u>	<u>100</u>
<u>Selenium</u>	<u>41</u>	<u>1</u>

Chemical Waste: Determined to be volatile organics, C-PAHs, PAHs, metals, and cyanide.

Concentration: Determined from Surface Water Sample Analysis.

Government Standard: Based on NYSDEC surface water classifications or as a default, drinking water standards. ONLY considered elements which exceeded NYSDEC ambient water quality standards and guidance values for Class C surface waters.

Score: 75.0

Q20) How is the ground water used?

- ☐ Not currently used (score = 1)
- ☐ Industrial with alternative (2)
- ☒ Drinking water with alternative or industrial with no alternative (6)
- ☐ Drinking water with no alternative (9)

Select the appropriate answer with the highest score.

Assumed the use of ground water selected occurred within 5 km of the site. The selection is based on USGS well records and the following DOH publications:

- 1) Report on Ground Water Dependence in New York State, NYSDOH Division of Environmental Health Bureau of Public Water Supply, 1981.
- 2) Inventory of Community Water Systems - New York State Vol. 1 - Municipal, NYSDOH - Bureau of Public Water Supply, 1984.
- 3) Inventory of Community Water Systems - New York State Vol. 2 - Non-Municipal, NYSDOH - Bureau of Public Water Supply, 1984.

Score: 6.0

- Q21) For each distance, check the appropriate row to indicate the number of people using the downgradient drinking water for the highest scoring purpose above:

Population	Distance				
	Within 5 km	Within 3 km	Within 1 km	Within 1/2 km	Onsite
0	<u>0</u> (0)	<u>0</u> (0)	<u>X</u> (0)	<u>X</u> (0)	<u>X</u> (0)
1 to 100	<u>0</u> (4)	<u>X</u> (6)	<u>0</u> (8)	<u>0</u> (10)	<u>0</u> (20)
101 to 1,000	<u>X</u> (8)	<u>0</u> (12)	<u>0</u> (16)	<u>0</u> (20)	<u>0</u> (30)
1,001 to 10,000	<u>0</u> (12)	<u>0</u> (18)	<u>0</u> (24)	<u>0</u> (30)	<u>0</u> (40)
10,001 to 100,000	<u>0</u> (16)	<u>0</u> (24)	<u>0</u> (32)	<u>0</u> (35)	<u>0</u> (45)
100,001 and up	<u>0</u> (20)	<u>0</u> (30)	<u>0</u> (35)	<u>0</u> (40)	<u>0</u> (50)

Downgradient is defined as being within 45 degrees of the gradient. If the ground water direction is not known, assume the worst possible direction.

Assumed every direction was downgradient of the site since ground water flow direction is unknown. Estimated population figure based on USGS well records, Donnelly Demographics data, and the NYSDOH publications referenced in Question 20.

Score: 8.0

- Q22) What is the distance from the bottom of the site to the top of the aquifer in use?

- ☐ Greater than 50 m (0)
☐ Less than 50 m (1)
☐ Less than 25 m (2)
☒ Less than 5 m (3)
☐ Site in aquifer (6)

Used less than 5 m if ground water is being used. If ground water is not used in area, greater than 50 m is the default value.

Score: 3.0

- Q23) Fill out the table below describing wastes that have been detected in the ground water. If wastes have not been detected, enter zeros for the concentrations. If a waste release was detected by sight or smell but not sampled analytically, an approximation must be made. Include up to six chemicals.

Chemical Waste Name	Concentration (ppb)	Government Standard (ppb)
<u>Benzene</u>	<u>195.6</u>	<u>0.0</u>
<u>Xylene</u>	<u>214.1</u>	<u>5.0</u>
<u>Toluene</u>	<u>94.1</u>	<u>5.0</u>
<u>Cyanide</u>	<u>106.1</u>	<u>100.0</u>
<u>Naphthalene</u>	<u>237.6</u>	<u>10.0</u>
<u>Benzo(a)pyrene</u>	<u>32.9</u>	<u>0.0</u>

Chemical Waste:	Benzene, xylene, toluene, cyanide, naphthalene, benzo(a)pyrene as determined by mutual consent.
Concentration:	Geometric mean concentration derived from the GRI EPRI data base.
Government Standard:	NYSDEC Class GA standards for ground water quality and (TOGS 1.1.1).

Score: 100.0

Q24) Indicate the distance from the site to the nearest instance of each of the land uses below:

Land Use	Distance					
	Outside 4 km	Within 4 km	Within 2 km	Within 1 km	Within 1/2 km	Onsite
Commercial/ Industrial	____ (0)	____ (1)	____ (2)	<u>x</u> (3)	____ (6)	____ (9)
National Parks	<u>x</u> (0)	____ (1)	____ (1)	____ (2)	____ (3)	____ (4)
Agriculture	____ (0)	<u>x</u> (1)	____ (1)	____ (2)	____ (4)	____ (6)
Residential	____ (0)	____ (1)	____ (3)	____ (8)	<u>x</u> (8)	____ (15)

Based on USGS 7.5 Minute Quadrangle Maps and site observations made by Atlantic Environmental Services, Inc.

Score: 8.0

- Q25) Indicate the number of people living or working within each of the specified distances.

Population	Distance				
	Within 5 km	Within 3 km	Within 1 km	Within 1/2 km	Onsite
0	____ (0)	____ (0)	____ (0)	____ (0)	<u>X</u> (0)
1 to 100	____ (9)	____ (12)	____ (15)	____ (18)	____ (28)
101 to 1,000	____ (12)	____ (15)	____ (18)	____ (21)	____ (31)
1,001 to 10,000	____ (15)	____ (18)	<u>X</u> (21)	<u>X</u> (24)	____ (34)
10,001 to 100,000	<u>X</u> (18)	<u>X</u> (21)	____ (24)	____ (27)	____ (37)
100,001 and up	____ (21)	____ (24)	____ (27)	____ (30)	____ (40)

Based on information from Donnelly Demographics.

Score: 24.0

- Q26) Check the appropriate distance from the site to the nearest of each type of sensitive environments, without regard to direction:

Target	Distance				
	Outside 2 km	Within 2 km	Within 1 km	Within 1/2 km	Onsite
Coastal wetland	<u>X</u> (0)	____ (1)	____ (2)	____ (3)	____ (6)
Freshwater wetland	____ (0)	<u>X</u> (0)	____ (1)	____ (2)	____ (6)
Endangered species	<u>X</u> (0)	____ (0)	____ (1)	____ (2)	____ (6)

Based on NYSDEC regulated wetlands and federally designated endangered species.

Score: 0.0

- Q27) What is the vapor pressure of the primary wastes?

- ____ 1×10^{-5} mm Hg or less (0)
 ____ Greater than 1×10^{-5} mm Hg (1)
 ____ Greater than 1×10^{-3} mm Hg (2)
X Greater than 10 mm Hg (3)

Used default value for benzene assumed to be onsite.

Score: 3.0

Q28) What natural or artificial characteristics of the site prevent volatilization?

- ☐ Covered by more than 10 cm of soil or other impermeable barrier (1)
- ☒ Covered by 1 to 10 cm of soil (3)
- ☐ Uncovered contaminated soil (7)
- ☐ Covered by less than 1 cm soil (8)
- ☐ Uncovered pure contaminants (10)

Select the appropriate answer with the highest score.

Based on site observations made by Atlantic Environmental Services, Inc.

Score: 3.0

Q29) What is the average wind speed at the site?

- ☐ Less than 2 m/s (1)
- ☐ More than 2 m/s (2)
- ☒ More than 4 m/s (3)
- ☐ More than 6 m/s (4)

Used default value from SSPS help screen for the region in which the site is located. More than 4 m/s.

Score: 3.0

Q30) What natural or artificial characteristics of the site prevent dust production?

- ☐ Urban (1)
- ☐ Woodland or forest (2)
- ☒ Grassland (4)
- ☐ Open field (10)

Select the appropriate answer with the highest score.

Based on site observations made by Atlantic Environmental Services, Inc.

Score: 4.0

Q31) Fill out the table below describing the wastes present at the surface of the site. If the data is not known exactly, approximations must be made. Include up to six chemicals.

Chemical Waste Name	Concentration (ppm)	Established Values (ppm)	Persistence (0-3)	Contaminated Area (m ²)
<u>Arsenic</u>	<u>11.0</u>	<u>2.6</u>	<u>3</u>	<u>401.0</u>
<u>Cyanide</u>	<u>3,800.0</u>	<u>500</u>	<u>3</u>	<u>1.0</u>
<u>Lead</u>	<u>190.0</u>	<u>15</u>	<u>3</u>	<u>401.0</u>
<u>C-PAH</u>	<u>118.4</u>	<u>10</u>	<u>3</u>	<u>201.0</u>
<u>PAH</u>	<u>53.2</u>	<u>10</u>	<u>3</u>	<u>201.0</u>
<u>Nickel</u>	<u>88.0</u>	<u>10</u>	<u>3</u>	<u>401.0</u>

Chemical Waste:	<p>Wastes are defined below with C-PAHs and PAHs broken down into the specific compound detected in the surface soils at the Lockport Site.</p> <p>Arsenic</p> <p>Cyanide</p> <p>Lead</p> <p>C-PAHs: Benzo(a)anthracene, benzo(k)fluoranthene, benzo(g,h,i)fluoranthene, benzo(a)pyrene, chrysene, indeno(1,2,3-cd)pyrene</p> <p>PAHs: Anthracene, fluoranthene, phenanthrene, pyrene</p>
Concentration:	<p>The highest concentration detected in any of the samples was used. If none was detected, concentration = 0.</p> <p>C-PAHs: Concentration represents the sum of the highest concentrations of all C-PAHs detected.</p> <p>PAHs: Concentration represents the sum of the highest concentrations of all PAHs detected (not including C-PAHs).</p>
Established Values:	<p>Arsenic, lead, and nickel - Used the background concentrations for arsenic and lead from Shacklette and Boerngen (1984).</p> <p>Cyanide, C-PAHs, PAHs - Used default values assigned at the NYSEG 12/12/90 meeting:</p> <p>Cyanide - 50 ppm (domestic land use) 500 ppm (industrial land use)</p> <p>C-PAHs - 10 ppm</p> <p>PAHs - 10 ppm</p>

Persistence: Based on values supplied in the SSPS help screen.

Contaminated Area: Assumed 100 square meters for composite samples (SS-1 through SS-4). Used visually estimated extent for Sample SS-5 (1 square meter).

Score: 25.0

- Q32) Fill out the table below describing wastes that have been detected in the air. If wastes have not been detected, enter zeros for the concentrations. If a waste release was detected by sight or smell but not sampled analytically, an approximation must be made. Include up to six chemicals.

Chemical Waste Name	Concentration (ppm)	Government Standard (ppm)
<u>None detected</u>	<u>0</u>	<u>—</u>

No wastes were detected in the air.

Score: 0.0

- Q33) What steps have been taken to reduce public access to the site?

- ☐ Full barrier and guard (0)
- ☐ Full barrier (1)
- ☐ Guard (2)
- ☒ Incomplete barrier (3)
- ☐ No barrier, no guard (4)

Based on site observations made by Atlantic Environmental Services, Inc. and site plan showing former and present structures.

Score: 3.0

- Q34) What is the distance from the site to the nearest residence or gathering point for children?

- ☐ 100 m or more (1)
- ☒ 10 m to 100 m (2)
- ☐ 0 to 10 meters (5)
- ☐ Onsite (10)

Based on site observations made by Atlantic
Environmental Services, Inc.

Score: 2.0

Q35) What is the distance from the site to the nearest ground water well in use?

- ☐ 10 km or more (1)
- ☒ 1 km to 10 km (3)
- ☐ 100 m to 1 km (6)
- ☐ less than 100 m (10)

Based on USGS well records.

Score: 3.0

Q36) What are the characteristics of the site wastes?

- ☐ Other types of wastes (1)
- ☐ Acute, deadly toxins (4)
- ☒ Carcinogens (7)
- ☐ Radioactive wastes (10)

Select the appropriate answer with the highest score.

Used carcinogenic PAHs as default value.

Score: 7.0

Q37) Is offsite contamination evident?

- ☒ No (1)
- ☐ Yes, has been measured (7)
- ☐ Yes, is visible (9)
- ☐ Yes, has been smelled (10)

Select the appropriate answer with the highest score.

Used default value of no, unless wastes were detected in
streambed sediment samples.

Score: 1.0

Q38) Describe the area near the site:

- ☐ Rural (1)
- ☐ Agricultural (2)
- ☐ Industrial (3)
- ☐ Commercial (4)
- ☒ Residential/Commercial (8)
- ☐ Residential (9)
- ☐ Urban (10)

Based on site observations made by Atlantic
Environmental Services, Inc.

Score: 8.0

Q39) What is the total volume of soil that is contaminated above regulatory limits?

- ☒ Less than 10 m³ (1)
- ☐ More than 10 m³ (2)
- ☐ More than 100 m³ (3)
- ☐ More than 1,000 m³ (4)
- ☐ More than 10,000 m³ (5)

Use default of less than 10 m³. No applicable
regulatory limit for soils in New York state.

Score: 1.0

Q40) How is onsite land used?

- ☒ Other Substation (1)
- ☐ Agricultural (2)
- ☐ Industrial (6)
- ☐ Residential (9)

Based on site observations made by Atlantic
Environmental Services, Inc.

Score: 1.0

LOCKPORT, NY MGP SITE

Location: State Street

Owner: NYSEG

Acquisition, Organization & History

NYSEG

to

Lockport Light, Heat and Power Co.

Acquired: October 31, 1929

to

Lockport Gas and Electric Light Co.

Organized: July 17, 1894

Acquired: July 31, 1917

to

Lockport Light, Heat and Power Co.

Organized: May 28, 1907

Acquired: July 31, 1917

to

Lockport Gas & Electric Light Co.

Organized: July 17, 1894

Acquired: December 31, 1907

and

Economy Light, Fuel & Power Co.

Organized: May 31, 1905

Acquired: December 31, 1907

to

Lockport Gas Light Co.

Organized: February 2, 1852

Acquired: July 17, 1894

Remarks:

Site called "Tar Works" on 1909 Sanborn Map and "Saturating Works" on 1903 map. Lumber yard on site 1892. Gas holder, compressor and substation shown on 1942-1954 maps.

Real Estate Divestments

None

From Second Annual Report of the NYS Commission of Gas & Electricity:

Lockport Gas and Electric Light Co.:

- o produced: 43,882,800 cubic feet of coal gas, 1906
- o Gas unaccounted for: 11.4%
- o Tar: 66,983 gallons

From Directory of Gas Utilities, Federal Power Commission, 1942:

- o On manufactured gas supplied by NYSEG

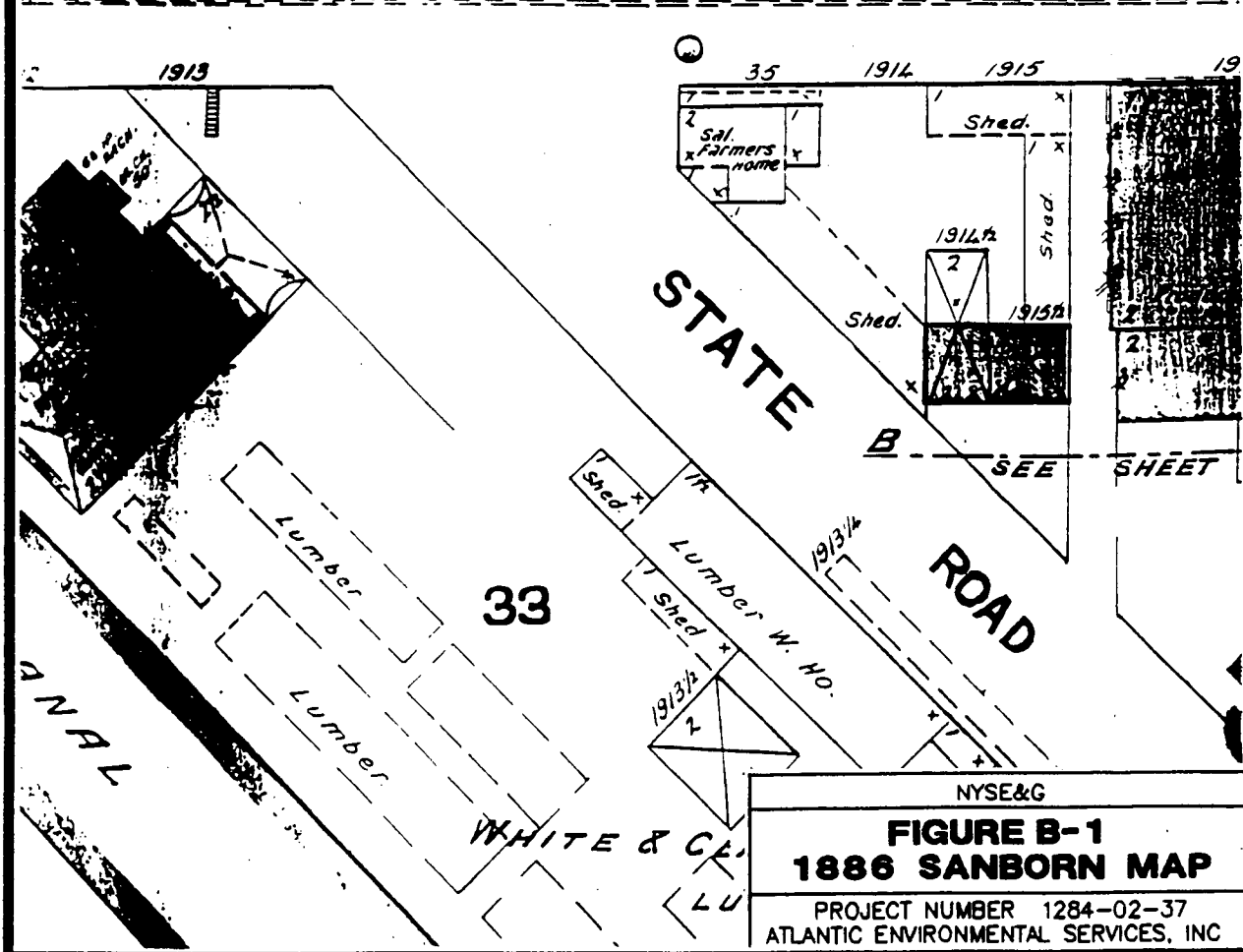
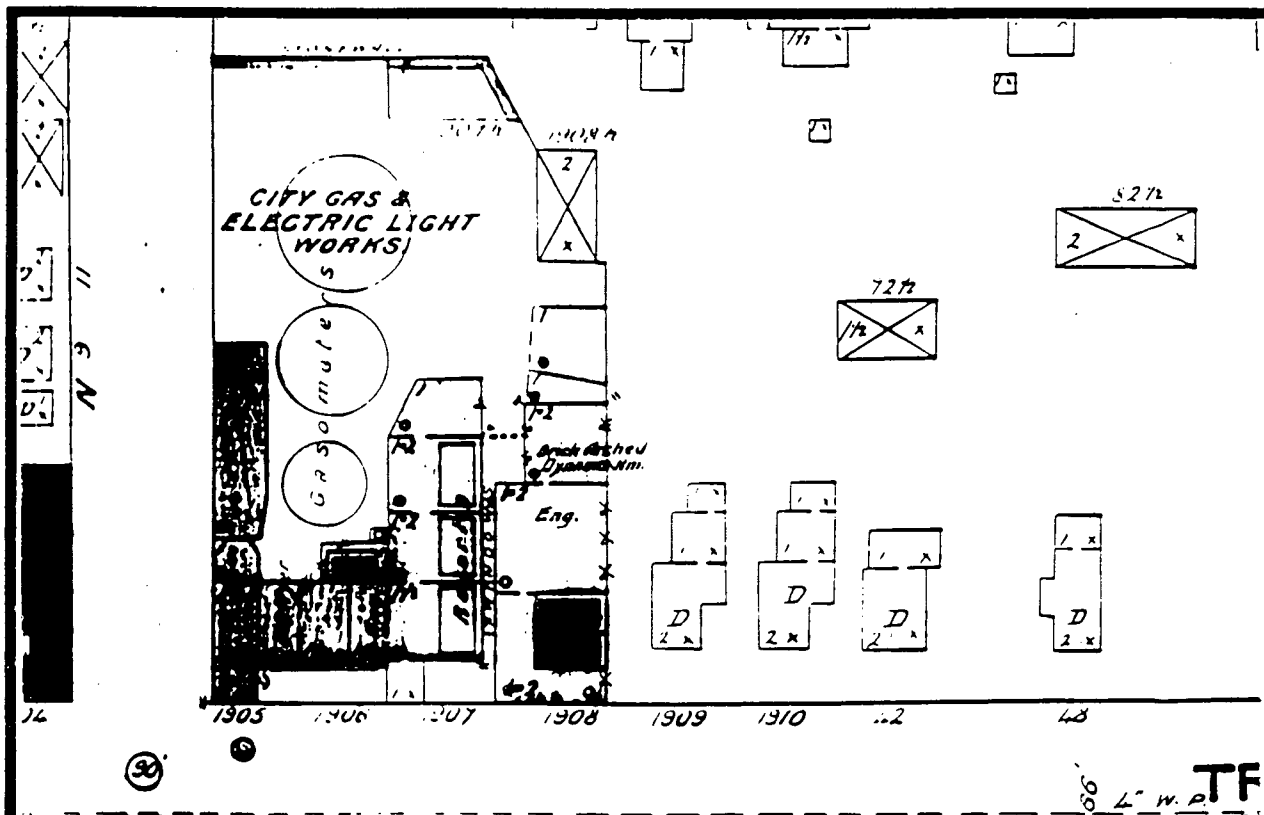
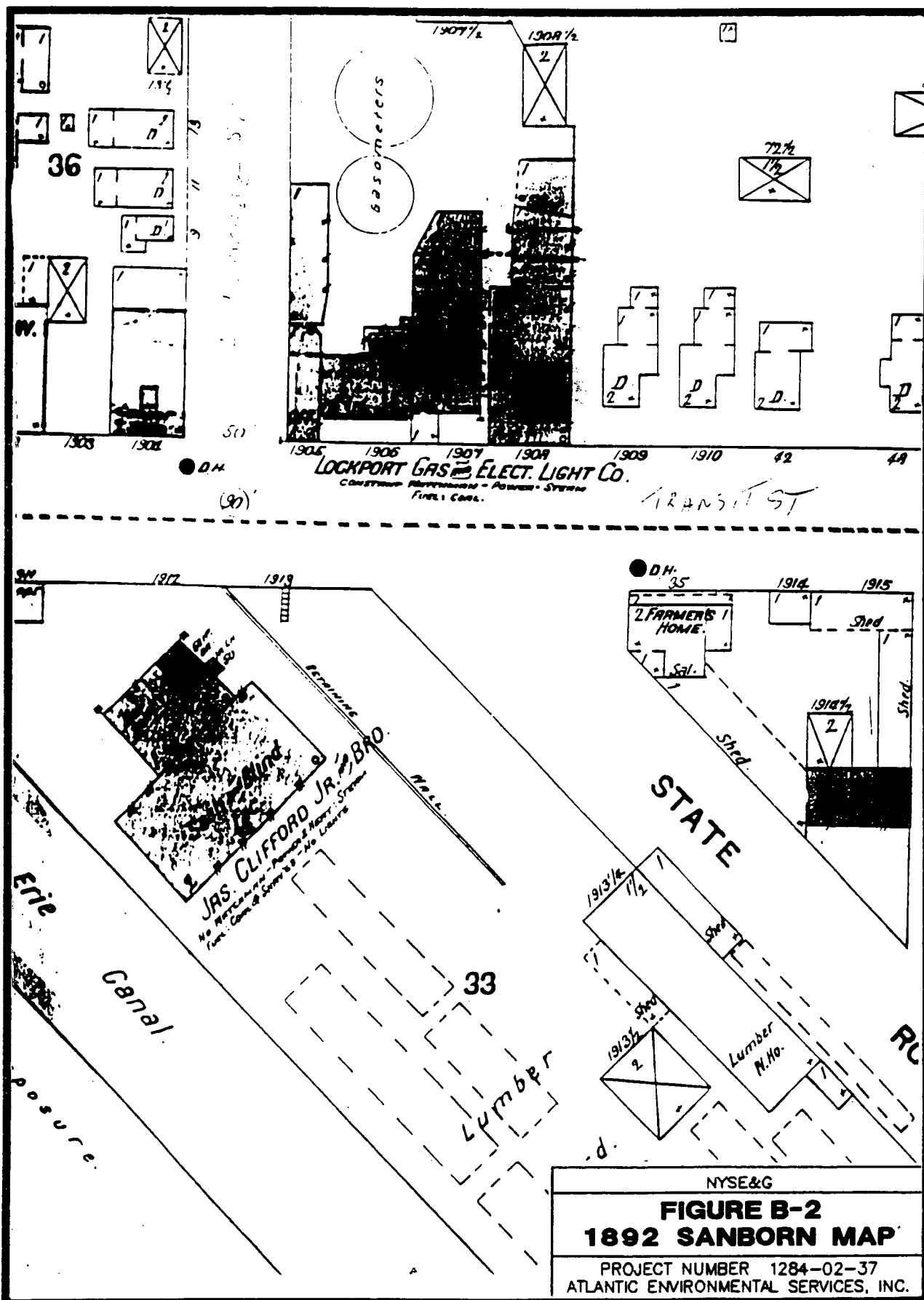
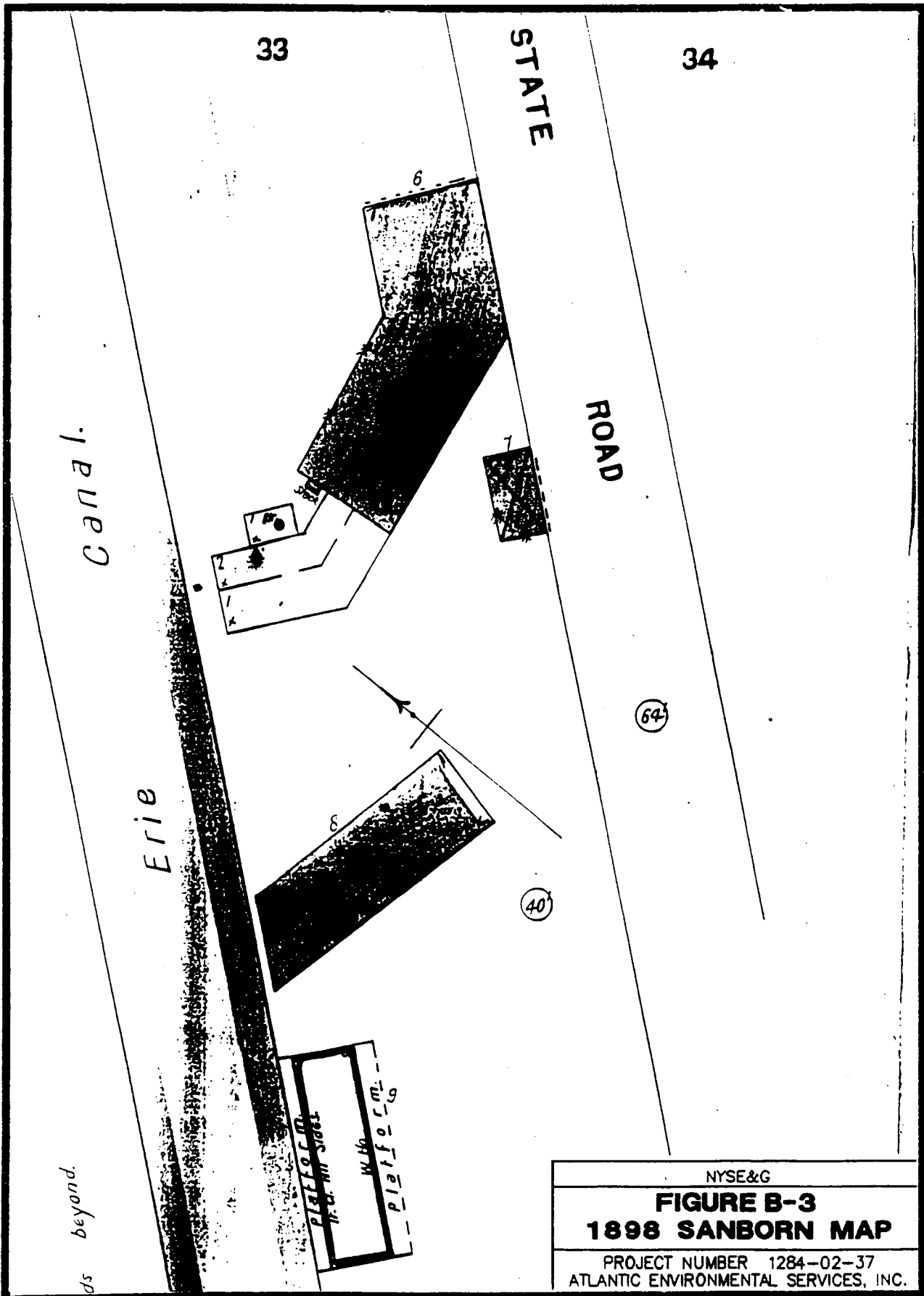


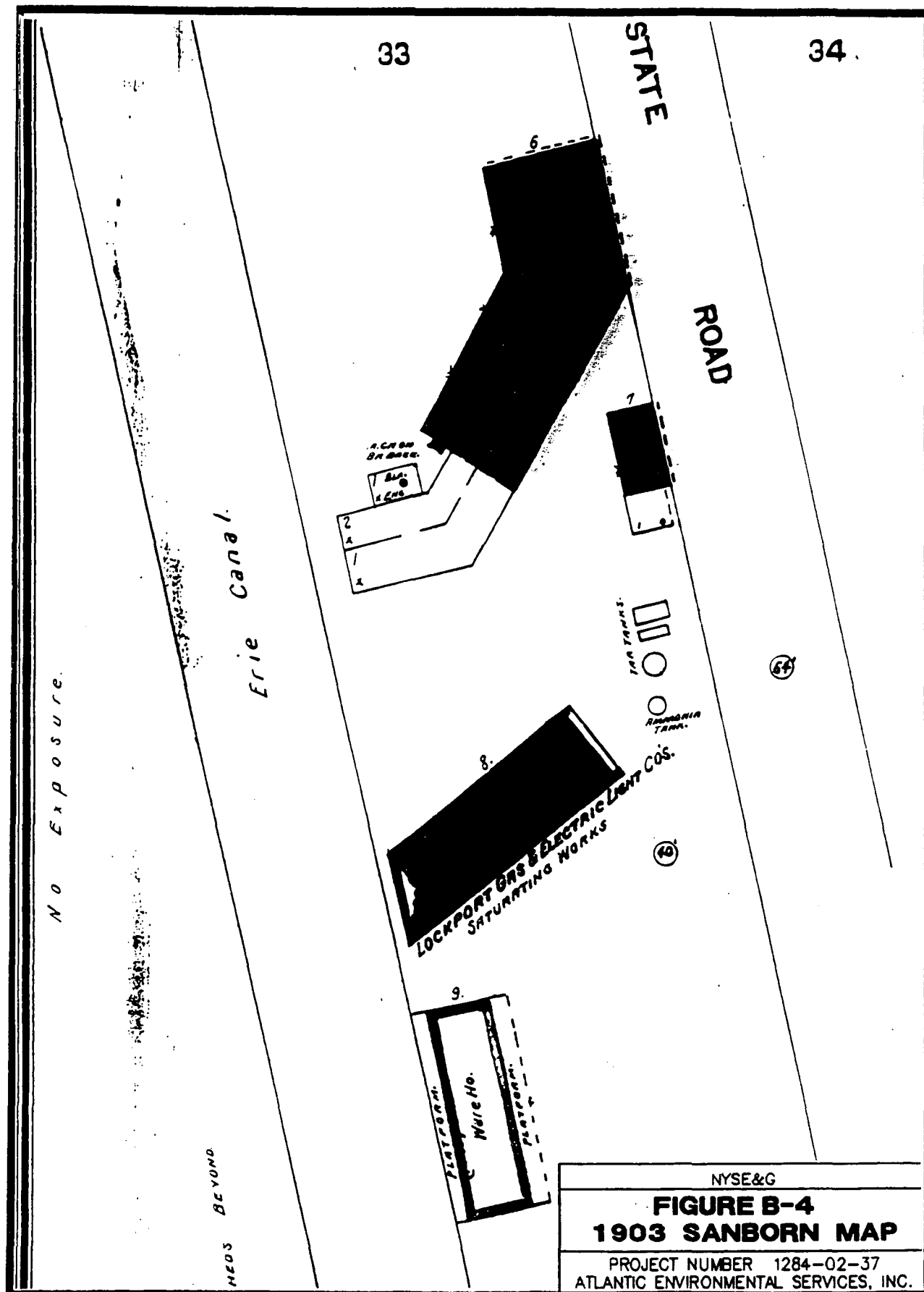
FIGURE B-1
1886 SANBORN MAP

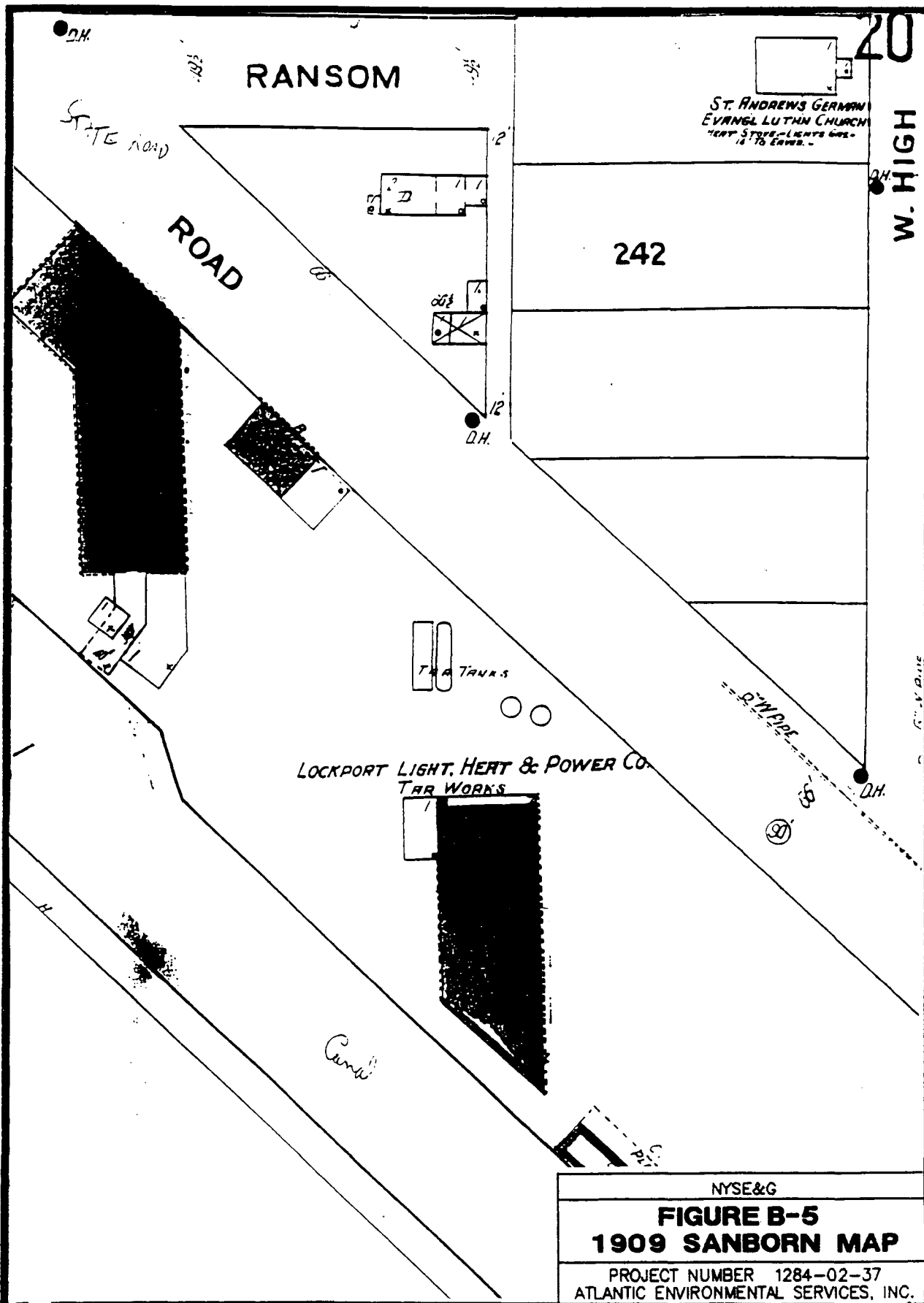
PROJECT NUMBER 1284-02-37
ATLANTIC ENVIRONMENTAL SERVICES, INC

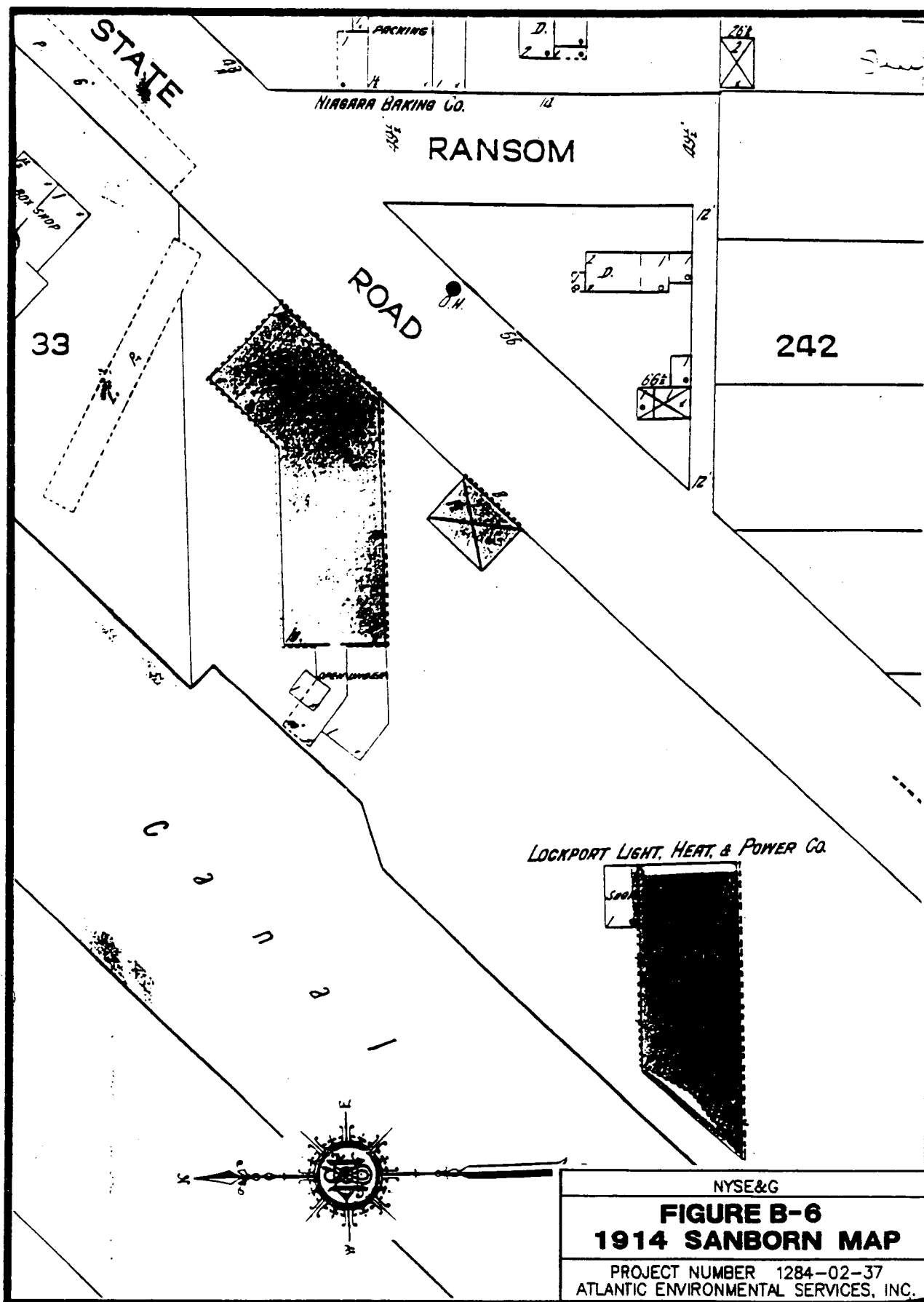




NYSE&G
FIGURE B-3
1898 SANBORN MAP
PROJECT NUMBER 1284-02-37
ATLANTIC ENVIRONMENTAL SERVICES, INC.







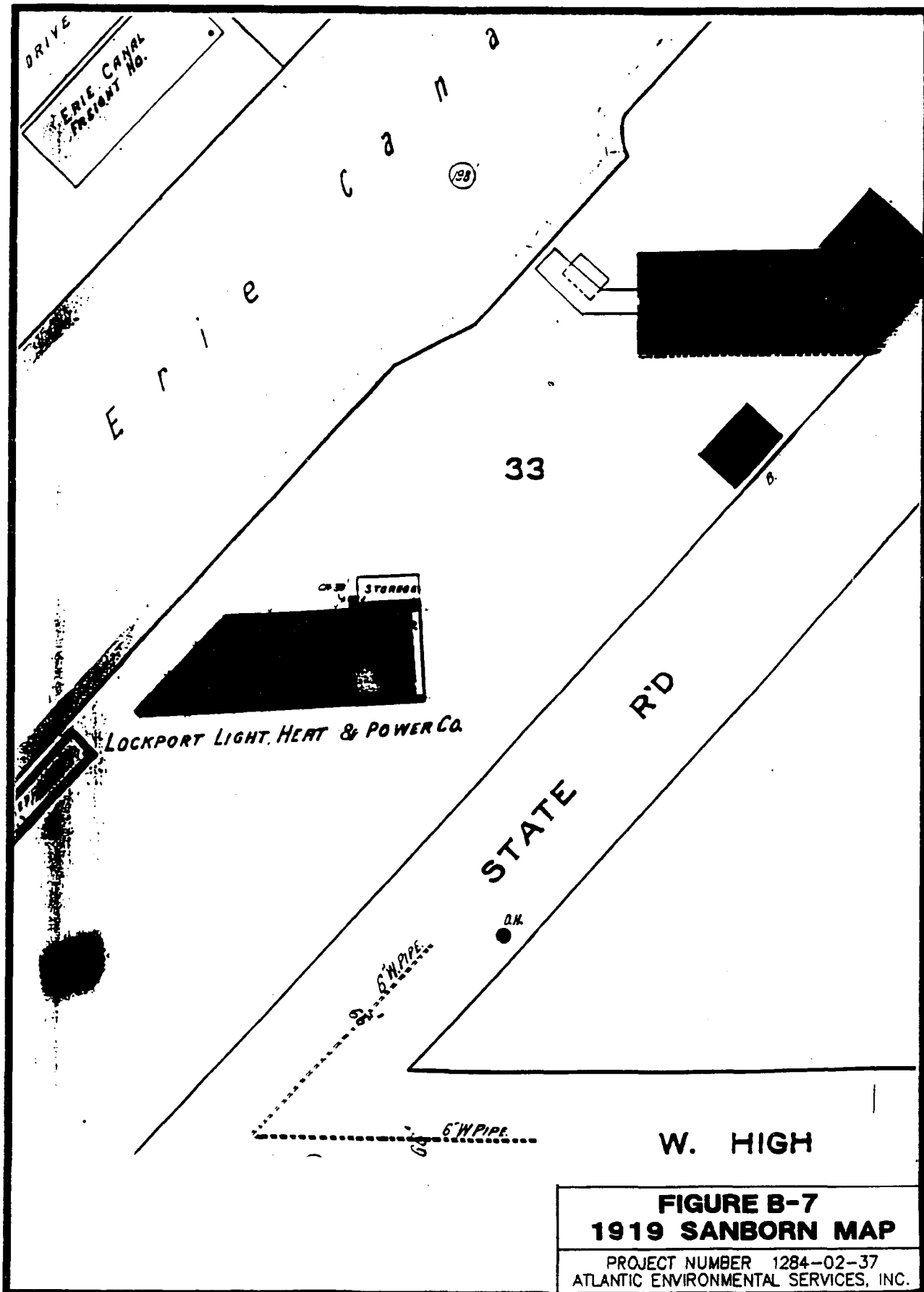
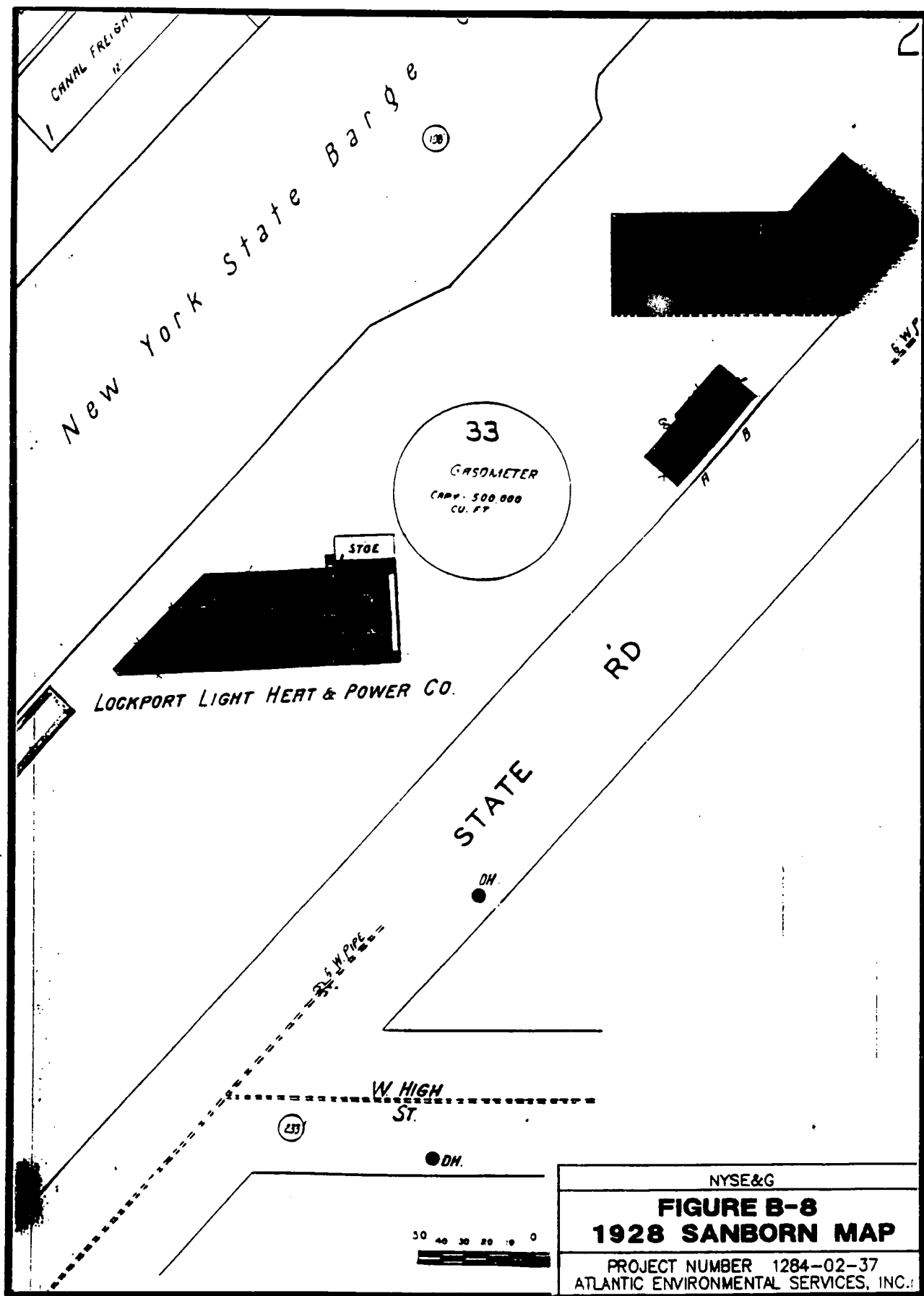
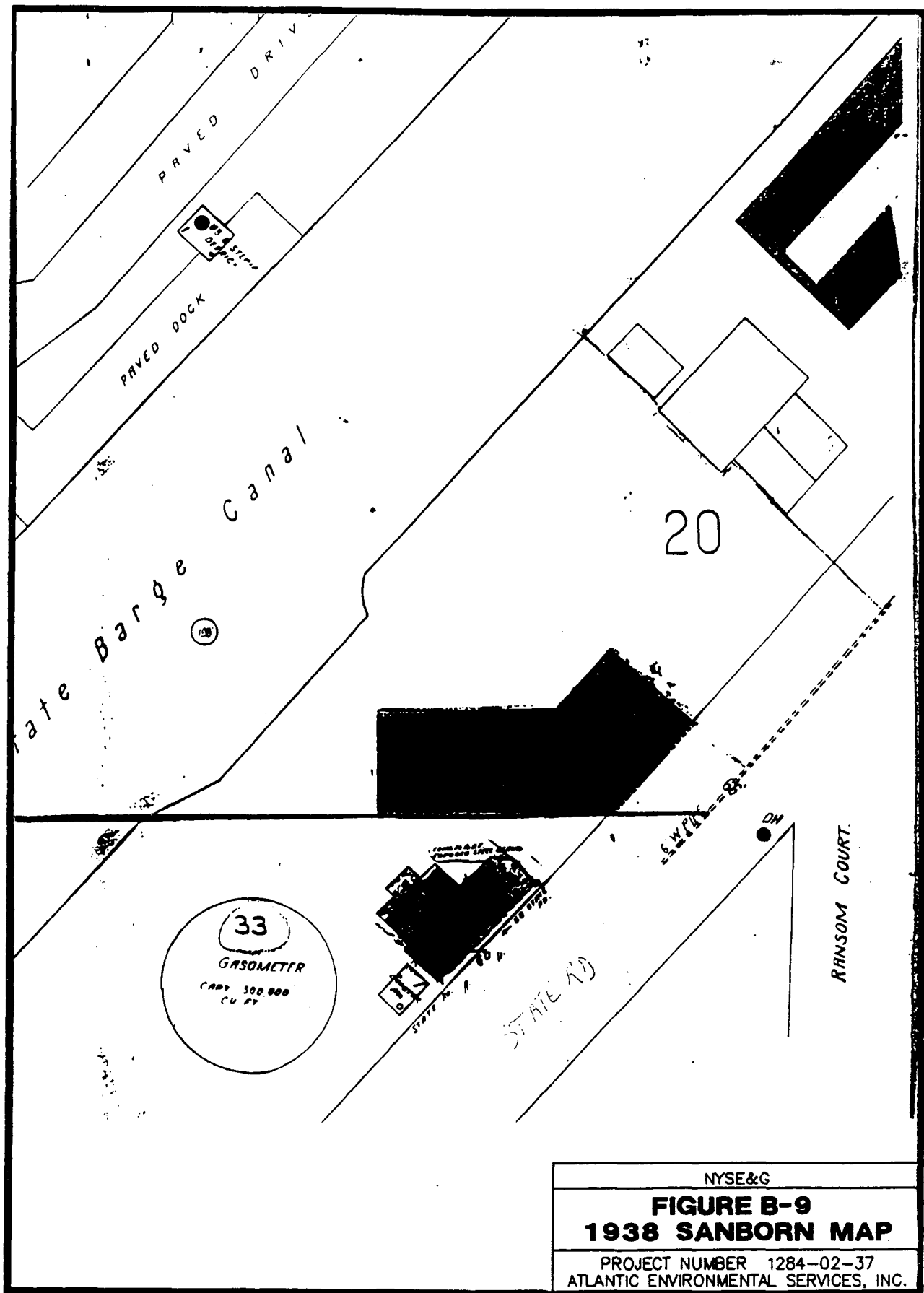



FIGURE B-7
1919 SANBORN MAP

PROJECT NUMBER 1284-02-37
ATLANTIC ENVIRONMENTAL SERVICES, INC.







Gas Holder
31.6 Dia
5' above base

Fig. 1

Me. 6. 4

ROAD

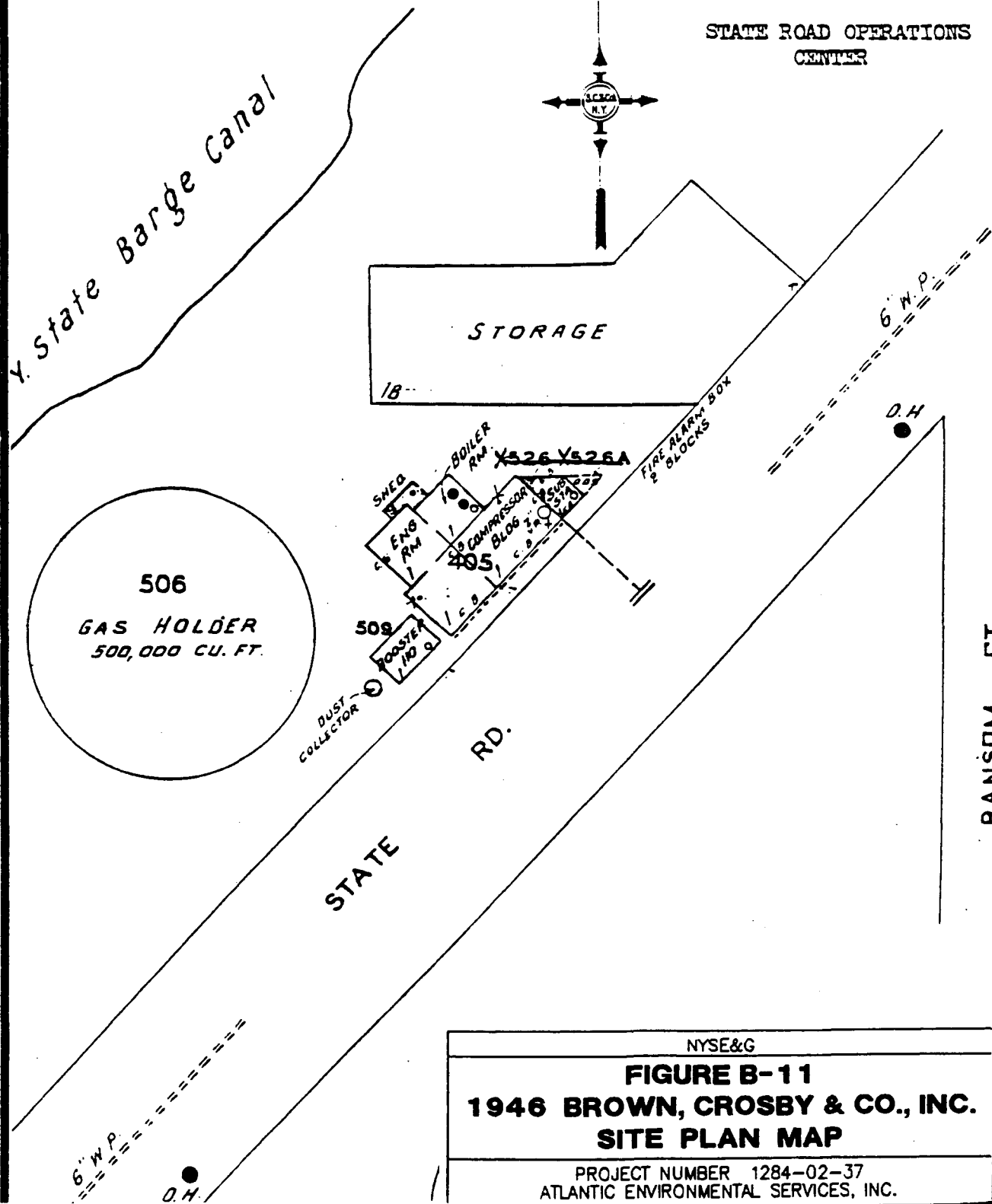
<p align="center">NYSE&G</p> <p align="center">FIGURE B-10</p> <p align="center">1942 SITE PLAN MAP</p> <p align="center">PROJECT NUMBER 1284-02-37</p> <p align="center">ATLANTIC ENVIRONMENTAL SERVICES, INC.</p>
--

NEW YORK STATE ELECTRIC & GAS CORP. LOCKPORT, N.Y.

SCALE: 1" = 50'

OCT. 1946

STATE ROAD OPERATIONS
CENTER



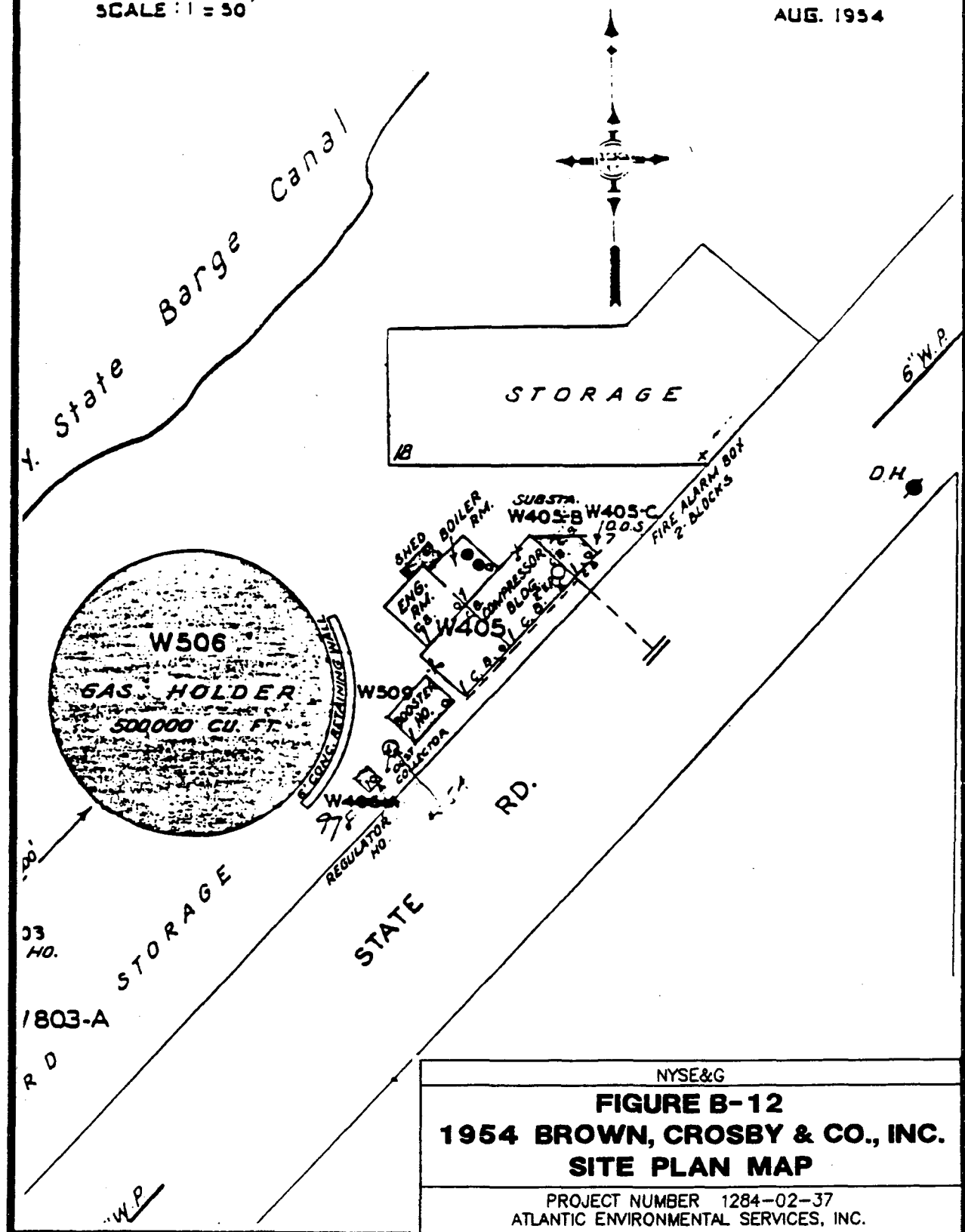
NYSE&G
FIGURE B-11
1946 BROWN, CROSBY & CO., INC.
SITE PLAN MAP

PROJECT NUMBER 1284-02-37
ATLANTIC ENVIRONMENTAL SERVICES, INC.

NEW YORK STATE ELECTRIC & GAS CO. LOCKPORT, N.Y.

SCALE: 1" = 50'

AUG. 1954



Lockport

10-24-90

Photo 29 - Possible older foundation ^{Beaumont}
near bank of canal _{Garage}

Wooden fence along old fence
kind of gate - easily got behind
- plastic barrier - ? -

Small gravelled area +
Grassy area - some old
foundations - No evidence
of ponding - some wet
surface soil due to rain
yesterday / early today

Rubble covering - throughout
grassy + tree area

5' Concrete walls along canal -

Site / road to canal wall
Appear 20 feet deep from

old tire along bank -
"recreational place" Berp's forbs

* - Blueberry along bank - Soil sample

Here faint tan odor - lots
of Junk / Garbage laying around

Chlorine Gas above on bank

Nothing in pit in fenced in
area (Gas this March)

Photo 30 - from area from fence
of NYSEB area towards
Ransom St.

Commercial +
residents 2.3 mi

Random Surface Soil

Surface Water + Sed

NO Air

Get HHS from NYSEB

93+78 S to Right on State
Street - Soil on Right Right
past Ransom St.

11-2-90

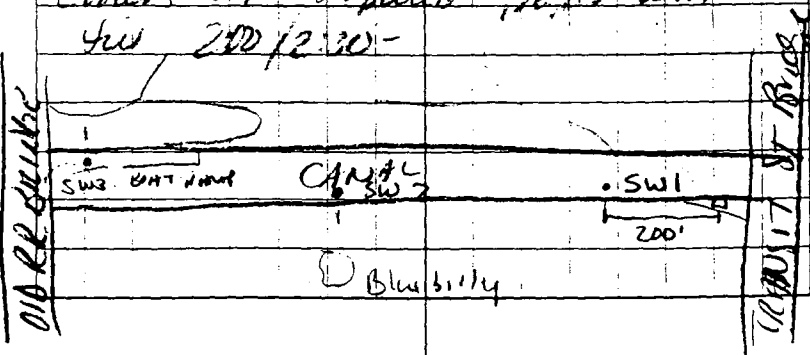
SW Sampling @ Lockport.

SW1 - North side of canal
approx 25' west of boat ramp
up bank (rocky)

SW2 - South side of canal -
along line with observed blue-
belly

SW3 - "200' W of transit St
Bridge on South side of
canal - (Counted from first
large square joint in bridge foundation)

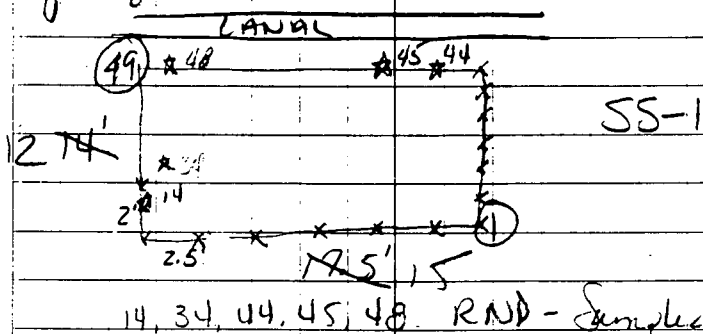
Sampled from 11:30 - 1:30 - parked
trailers + completed some work
till 2:00 / 2:30 -



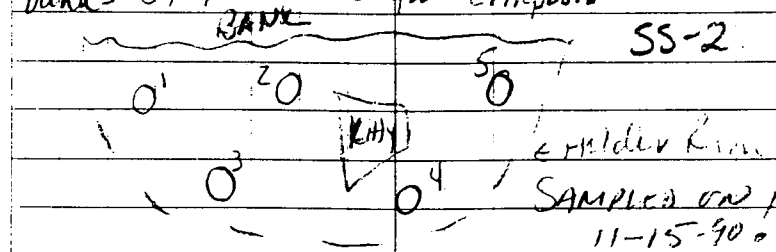
Surface Water Sampling Field Notes
Notes Recorded by Anna Sullivan

Locust SE + SS Sampling
Climbed down into drained canal
and sampled SE 3, SE 2 + SE 1
at locations where SWs
were taken - Marked with 3'
witness stake labeled CGLB SWSE-1
etc -

SS-1 to the left of frame - garage structure

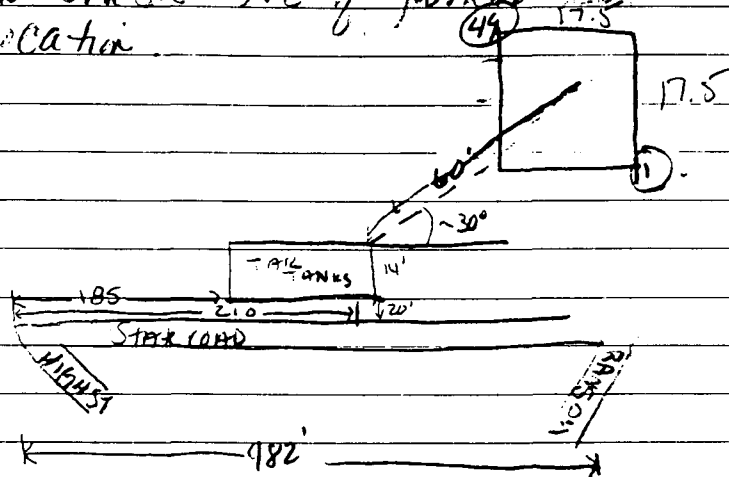


SS 2 Inside old holder v.v. dense
bank - sampled at 1-5 for composite 1



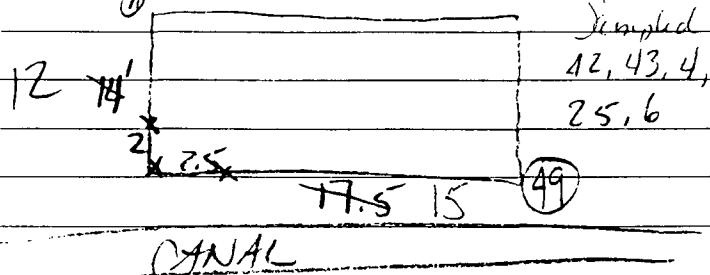
Notes recorded by Anna Sullivan

SS-3 - Supposed to be over the tunnel -
 however this area is full covered w/
 forest ground - Mand Sample Area
 to be NE of former track
 location.



Stand of grid every 2.5' on both
 sides - Sampled 31, 41, 33, 39, 29
 SE corner is 1, NW is 49 -

SS-4 Along bank between SS-2 + SS-5



Streambed Sediment and Surface Soil Sampling
 Field Notes (p. 2)

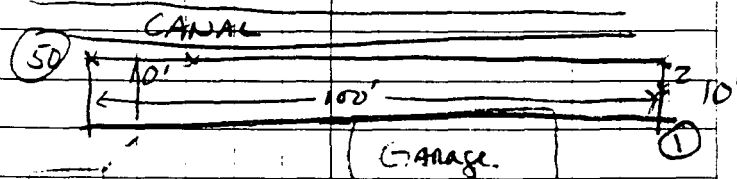
Notes recorded by Anna Sullivan

SS-5- Grab @ Blue belly location
on bank - Pungent waste odor

11-15-90- Albion

Sampled SE1 - SE3 @ locations
of SW1 - SW3 - Canal not
drained. Bent extender, etc. on
SE2.

SS-1



SD
SD

Graded 100' x 10'

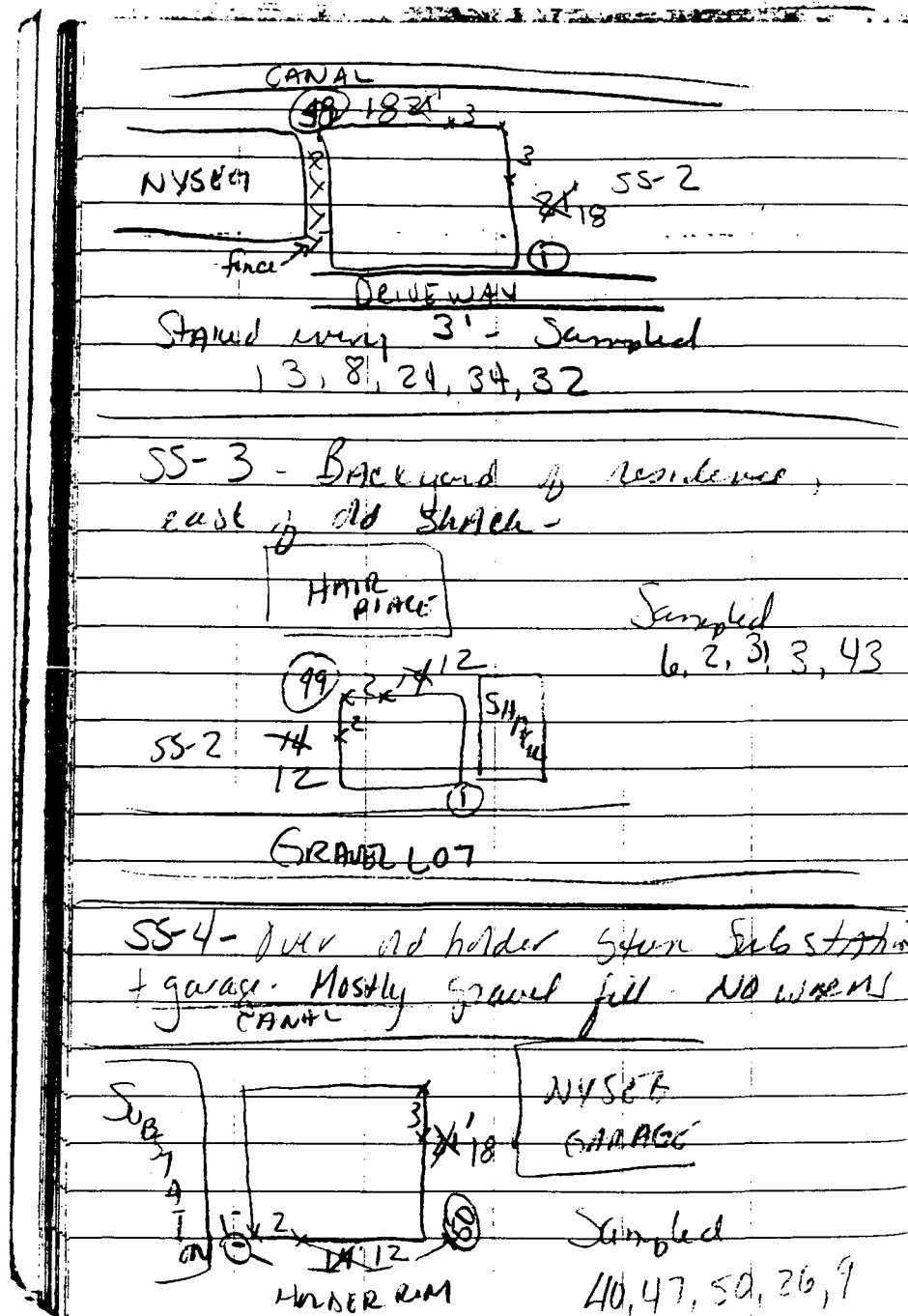
Graded - 15, 35, 23, 28, 10

SS-2 Moved to front of NYSCB

Grassy area including lawn
along N side of gravel drive -
Man still has part of border - Could not
sample original location - concrete -
gravel drive -

Streambed Sediment and Surface Soil Sampling
Field Notes (p. 3)

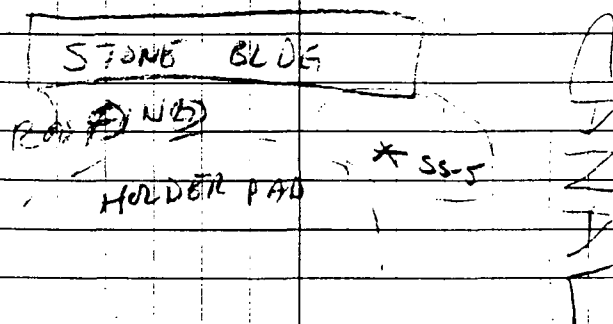
Notes Recorded by Anna Sullivan



Streambed Sediment and Surface Soil Sampling
 Field Notes (p. 4)

Notes recorded by Anna Sullivan

SS-5- Changed to grab sample -
 Not enough space to grid
 in order to avoid red roofing
 material - sampled in small
 vegetated area - littered w/
 wine cooler bottles -



Streambed Sediment and Surface Soil Sampling
 Field Notes (p. 5)

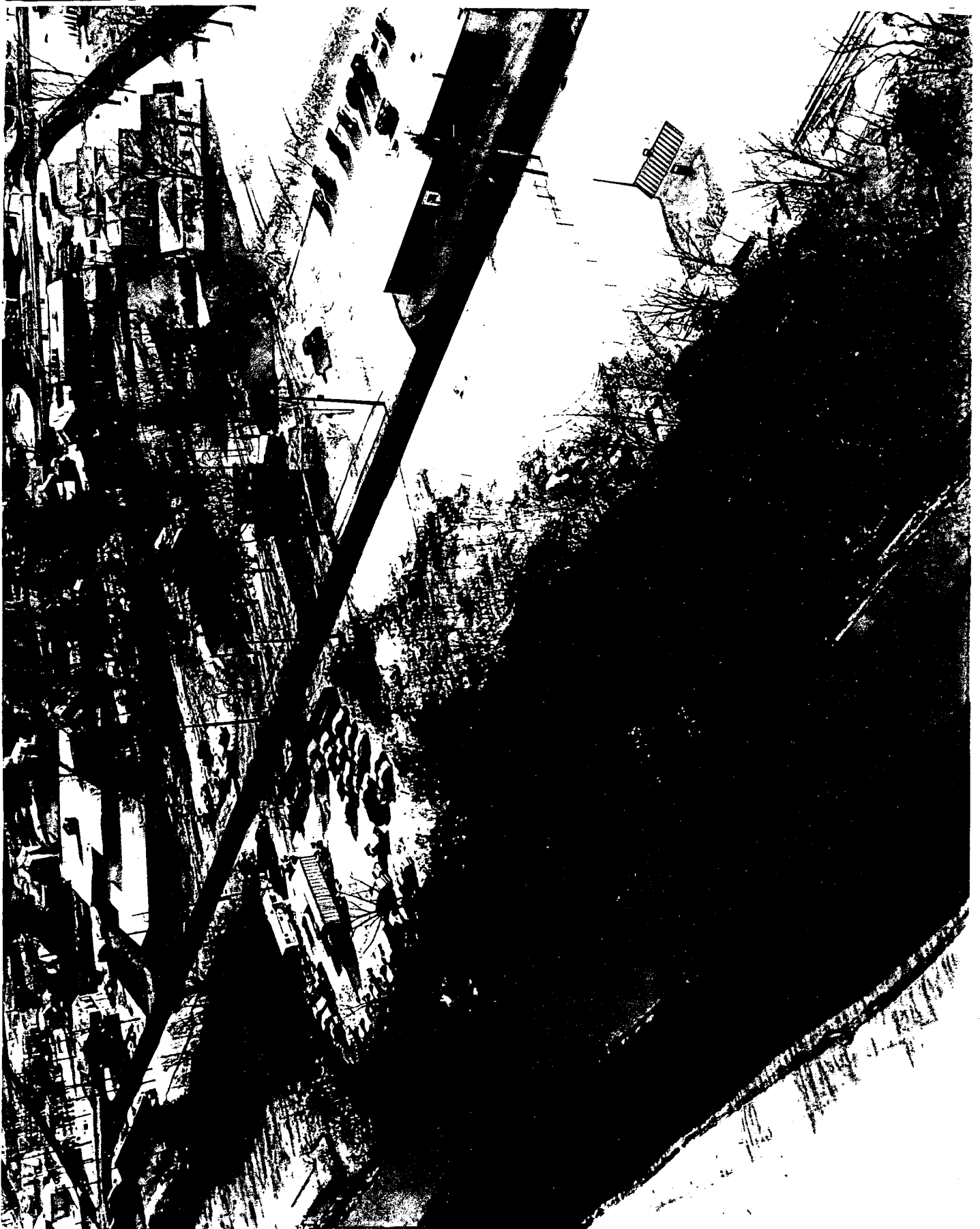
Notes recorded by Anna Sullivan



STATE ROAD SITE
LOCKPORT, NY



STATE ROAD SITE
LOCKPORT, NY



STATE ROAD SITE
LOCKPORT, NY

JOB #6 STATE ST. LOCKPORT 5N-212-90
 BEARING DIST ELEV DESCRIP PNT NORTHING EASTING TYPE

-----01-04-1980-----11:30:37-----

PNT # 10 TO 13
 PNT # 20 TO 128
 PNT # 130 TO 138
 PNT # 200 TO 211
 PNT # 300 TO 303

	ironpipe	10	10000.0000	50000.0000
	BASELINE	11	10208.5214	50056.7166
	BASELINE	12	9971.4818	49792.6752
572.38	BASELINE	13	10122.0157	49648.9953
599.01	POWERPOL	20	9965.2413	49970.2913
596.78	ironpipe	21	10095.0509	50019.7103
595.71	ironpipe	22	10215.4056	50138.4067
596.35	CURB	23	10237.9534	50173.3853
596.97	centroad	24	10234.4104	50186.5040
596.34	edgepave	25	10222.6164	50191.7331
596.92	edgepave	26	10152.6867	50130.7202
597.24	centroad	27	10161.7052	50122.3269
596.62	CURB	28	10178.1047	50120.9572
596.85	CATCHBAS	29	10127.6030	50107.3128
597.58	HYDRANT	30	10096.8414	50088.4839
597.13	edgepave	31	10078.4611	50065.5194
597.58	centroad	32	10086.6629	50056.7854
597.20	edgepave	33	10095.1162	50047.8411
597.39	POWERPOL	34	10068.9655	50011.9897
597.20	CATCHBAS	35	10039.8018	49999.1942
597.64	MANHOLE	36	10028.7516	50012.2182
597.11	CATCHBAS	37	10023.9482	50017.3966
597.40	CURB	38	10029.0643	49989.6863
597.65	CURB	39	9965.4257	49933.5799
597.79	centroad	40	9983.4556	49966.4249
597.72	edgepave	41	9943.8351	49947.1220
597.90	edgepave	42	9889.7174	49899.5092
598.27	centroad	43	9898.2815	49891.1908
597.80	edgepave	44	9905.2293	49880.9700
598.67	POWERPOL	45	9891.3601	49853.2344
598.73	POWERPOL	46	9886.2477	49856.9303
599.09	POWERPOL	47	9859.5632	49877.0995
597.87	CATCHBAS	48	9864.8632	49845.3556
599.95	fence	49	9837.2234	49801.4314
600.20	MANHOLE	50	9813.3632	49790.2686
599.51	MANHOLE	51	9811.7758	49795.0196
599.49		52	9811.8466	49796.4564

599.83	centroad	53	9805.3079	49809.1685
599.34	edgepave	54	9799.2429	49820.0386
598.69	fence	55	9895.9165	49852.3238
603.07	fence	56	9732.1473	49708.9828
603.31		57	9754.8375	49671.2738
603.31		58	9780.4570	49621.2492
601.00		59	9816.4570	49667.0375
601.50	POWERPOL	60	9802.5051	49702.2313
602.32	GUYWIRE	61	9766.9567	49727.2898
602.04	GUYWIRE	62	9767.1096	49737.1647
600.40		63	9835.6256	49751.6978
599.33		64	9887.8087	49705.9240
599.76		65	9887.2359	49784.5452
599.66		66	9902.3343	49798.1577
599.63		67	9911.9362	49786.8560
599.69	POWERPOL	68	9907.2555	49795.0587
599.97	VALVE	69	9868.3474	49814.5860
599.55	VALVE	70	9863.2759	49822.6300
599.04	HYDRANT	71	9840.6194	49864.9091
599.17	VALVE	72	9841.4852	49863.8635
602.21	CURB	73	9711.7189	49742.8887
602.41	centroad	74	9718.9750	49733.2019
602.14	edgepave	75	9726.2423	49723.2409
601.19	edgepave	76	9760.8556	49753.6419
601.25	centroad	77	9759.4411	49768.5397
600.89	centroad	78	9751.8568	49777.6478
601.81	POWERPOL	79	9725.0631	49758.1677
599.97	POWERPOL	80	9787.0098	49814.3705
597.85	ironpipe	81	9967.8972	49988.6205
597.12	POWERPOL	82	10069.0998	50011.9251
	ironpipe	83	10275.6541	50008.3522
	ironpipe	84	10288.3853	49992.7067
595.39	ironpipe	85	10097.9223	49930.6300
597.14	ironpipe	86	10089.6330	49923.0084
595.39	ironpipe	87	10089.4295	49922.9886
596.40		88	10050.7701	49877.7869
597.97		89	10029.5392	49899.3882
596.22		90	10008.8680	49922.8111
595.92		91	10054.5139	49965.8809
596.17		92	10081.9974	49949.7980
595.47		93	10113.4356	49935.9592
596.47		94	10134.7908	49930.1226
595.87		95	10174.5998	49945.4213
596.17	SAMFLOCA	96	10159.5010	49959.4176
596.27		97	10140.6192	49989.9908
596.57		98	10117.9026	50027.2156
596.67		99	10156.0077	50063.8796
596.47		100	10178.5989	50037.8009
596.47		101	10208.9285	50002.8182
595.17		102	10230.7245	49972.9079
594.97		103	10285.9312	50016.7899
595.37		104	10267.4527	50044.4225
595.67		105	10253.1914	50063.6181
574.35		106	10292.9118	50057.9923
574.35		107	10319.4228	50022.7035

581.45	HEADWL	108	10305.4056	49995.5070
579.85	HEADWL	109	10264.7982	49955.3967
582.75	HEADWL	110	10208.2346	49916.6169
578.00	MONUMENT	111	10088.4576	49824.6387
600.65	ironpipe	112	9783.3801	49826.1038
596.81		113	10011.7161	49829.4372
598.11		114	9988.3427	49850.1532
597.71		115	9959.9035	49882.8348
576.82	MONUMENT	116	10088.4208	49824.6231
583.72		117	10098.0960	49902.7705
575.82		118	10120.0817	49894.5877
574.62	HEADWL	119	10195.3544	49914.9694
573.32	HEADWL	120	10138.2905	49865.7853
573.32	HEADWL	121	10116.3736	49846.7148
575.42		122	10094.8006	49847.6397
577.27	SAMPLOCA	123	10062.1395	49827.4164
573.92	HEADWL	124	10090.3013	49805.2085
572.72	HEADWL	125	10034.3882	49755.7335
575.27	SAMPLOCA	126	10027.7157	49781.5191
578.22	SAMPLOCA	127	9982.6879	49754.5548
573.62	SAMPLOCA	128	10003.4705	49732.6677
575.22		130	9973.9122	49733.4679
573.02	HEADWL	131	9928.3328	49663.1578
573.72	HEADWL	132	9895.9838	49636.0896
574.92		133	9898.0178	49648.0133
578.67	ironpipe	134	10420.4863	50102.8089
572.62	HEADWL	135	10124.1602	49652.7224
571.92	HEADWL	136	10332.0099	49838.8586
571.92	HEADWL	137	10253.4684	49769.9008
	SAMPLOCA	138	10276.2070	50163.8507
		200	10102.3359	50060.8475
		201	10207.8278	50153.6468
		202	10193.8684	49916.0565
		203	10283.5461	49995.8756
		204	9727.8284	49731.4000
		205	9833.7253	49611.0191
		206	9749.6247	49706.6226
		207	10099.6128	50014.5007
		208	9601.7863	49620.5230
		209	9588.8087	49399.6439
		210	9719.9392	49515.3992
		211	9597.6693	49405.7018

ATLANTIC ENVIRONMENTAL SVCS
STATE ST. LOCKPORT NY

JOB # 5N - 212 - 90

DESC.	+	HI	-	ELEV.
RM-1	9.648	597.965		607.613
T.P. 1	-0.755	597.929	-0.791	597.174
RM-1			+9.640	607.509 607.613

K 10 BS 12 FS RT 11

Hor. A	Hor. d.	VD	ROD	ELEV.
0-0-0.	209.218	-0.335		

1st	113-06-30			
2nd	226-02-50			
AVG	113-02-55	216.099	-1.620	
1st	113-02-57			
2nd	176-05-50			
AVG	113-02-55			

TBM 10				599.01
20	318-21-11	45.725	+1.037	5.02
21	109-32-50	97.073	-1.19	
22	130-33-16	256.039	-2.26	
23	133-54-40	294.422	-1.62	
24	136-20-20	299.553	-1.02	
25	138-34-10	293.802	-1.63	
26	138-24-00	201.000	-1.05	
27	134-56-20	202.762	-0.75	
28	132-00-50	215.295	-1.35	5.02

92-6

2-17-90

10

ES

-77

12' NE, NE COR NIAGARA CO. COURTHOUSE
TPO CONC. CURB

INT 500 @ 10' SPIKE 20' SIDE 24.
= 5.03 @ 11' SPIKE 1st CORNER SITE (EDGE SIDE)
= 4.97 @ 12' SPIKE TPOB (WEST EDGE SITE)

HYEELG (SEE PP. 3 FOR LEVEL NOTES)

POLE 87-1-D T 37 R.R. SPIKE @ W. FACE

I.R.F.

ER⁺⁴² TOP @ F.O.C. TYP. UNLESS NOTED

@ RD (STATE)

ER

ER @ KANSON ST

@ STATE RD

ER @ 40' W C.C.

ATLANTIC ENVIRONMENTAL
JOB # SN-212-90 CONT

11 10 BS 12 0°

HOZ 12 L HOZ 0 V.D. ROD ELEV.

29 137-53-44 166.729 -1.12 5.02

30 140.15-00 131.178 -0.39

31 137-41-45 102.22 -0.84

32 131-04-0 103.61 -0.39

33 124-32-00 106.47 -0.77

34 107-41-40 70.00 -0.58

35 96-40-20 39.91 -0.77

36 120-61-20 31.24 -0.33

37 133-49-40 29.60 -0.86

38 78-17-40 30.84 -0.57

39 340-20-0 74.88 -0.32

40 341-36-0 37.43 -0.18

41 321-06-20 77.14 -0.25

42 320-10-20 149.20 -0.07

43 324-45-40 148.95 +0.30

44 329-18-20 152.15 -0.17

45 331-19-20 182.60 +0.70

46 329-20-40 182.78 +0.75

47 319-01-20 186.62 +1.12

48 326-41-0 205.37 -0.10

49 328-29-20 256.76 +1.98

50 326-10-0 280.75 +2.23

51 325-16-20 278.29 +1.54

52 324-48-0 275.72 +1.52 5.02

12-17-90

ES 8 ②
JT 1

CB

KVD

EE

Δ

ER

POC NYSE # 6 T 45-X 36

CURB INLET

M.H. (PAVED CURB)

CURB INLET

END

STATE RD.

EA

STATE RD.

EA

POC T 44

--- KVD #

--- T 44 S

CURB INLET

IT

M.H.

ATLANTIC ENVIRONMENTAL

JOB # SN-212-90 CONT

T-10 BS 12 0° —

	HORIZ &	HOR D	V.D.	ROD	ELEV.
53	322-15-30	272.62	+1.86	5.02	
54	319-42-20	269.61	+1.37	↓	
55	332-39-20	180.67	+0.72	↓	

	BS	HI	FS	ELEV
TP 1	5.35	602.49		597.14
TBM-10			5.48	599.01
TP 2	3.42	602.43		
			5.29	597.14

ATLANTIC ENVIRONMENTAL CONT

T-10 BS 12 w/ 0° — 209.153

	HORIZ &	HOR D	V.D.	ROD	ELEV.
4 (12)	0° —	209.153	-0.41	5.02	
56	325-12-20	395.52	4.92	↓	
57	331-02-0	410.88	5.16	↓	
58	337-44-0	437.78	8.81	8.67	
59	338-58-0	380.2	6.5		
60	334-16-40	357.31	7.00		
61	327-19-0	358.72	7.82		
62	326-17-20	351.17	7.54		
63	334-17-40	297.78	5.90	✓	
64	346-57	314.75	4.83	8.57	

12-17-90

ES. φ
JT π ③

STATE RD.

ER

COR 6' H CL #

BS ✓

TOP CONC CURB

B/R SPIKE POLE NYSEG 87-1-01/T37 ON STATE RD.

TOP CONC CURB

12-18-90

ROD = 5.02 TBM 10 599.01

V.D. = 0.86

#

GR

TOP

POLE T-43

GW

BUY POLE

GR

T-1

	$\pi 10$	BS 12	Corr	
	Horiz $\frac{1}{2}$	Hor D	V.D.	Rod
65	340-12-20	243.18	5.26	5.11
66	342-00-40	224.23	5.16	
67	345-23-0	230.62	5.13	
68	343-29-0	224.95	5.19	
69	332-27-20	227.40	5.47	
70	330-12-20	223.95	5.05	
71	318-07-0	208.93	0.89	-0.02
72	318-29-20	208.95	1.02	
73	319-33-40	386.25	4.06	
74	321-20-40	387.50	4.26	
75	323-08-40	389.28	3.99	
76	323-41-0	343.34	3.04	
77	321-43-40	333.83	3.10	
78	317-41-40	333.19	2.71	
79	319-10-00	366.16	3.66	
80	318-54-0	282.51	1.82	
81	297-21-0	34.06	-0.30	
		OVER		

10011967 2017

4

2. 4. 5.

H. E. Oak

N 4 C...

704	54-1
-----	------

14

117

1/2

1946

44 0 Doc. 785

LLD

24.

H L

14

Handwritten musical notation on a five-line staff, featuring a treble clef and a key signature of one sharp (F#).

~~File~~ File 87-10-0153 / T35

27-10/53/73/0

	γ 11	BS. 10	Cent	
	Horiz. A	Horiz. D	V.D.	Red.
101	75-13	53.1	-1.1	5.02
102	89-37-20	86.7	-1.7	↓
103	100-30	87.1	-1.9	
104	100-00	60.2	-1.0	
105	173-34	45.7	-1.2	5.02
106	165-39	24.1	-7.6	9.94
107	147-44	116.0	-7.6	11.74
108	132-30	114.6	-4.5	15.74
109	103-50	115.9	-6.1	15.94
110	74-40	140.1	-3.2	1.14
	γ 12	BS. 11	FS. 10	
	Horiz. A	Horiz. D	V.D.	Red.
111	0° —	354.832	-1.79	5.12
Sing. Δ 10	(34-04-58)	209.304	-0.22	
Diff.	68-09-40			
Avg.	34-04-58			
Sing. Δ (13)	268-14-55	208.097	-25.91	5.02
Diff.	176-20-00			
Avg.	268-15-00			
(11) MCW	327-11-48	121.263	-20.20	5.02
Double primed	294-20-38			
	327-11-49			

LOCK PORT Sec-

12.19

6

AS TO TOWN & RANGE

Town

Range

Section

Top Half Wall

1

A 10 HT = 5'8"

A 11 HE = 5'2"

A 12 HT = 5'2"

L 13 HT = 5'02" CROWN L.C.

P/K GET HORTON'S LINE BROW
CROWN

Con 14

CONT

V.D.

10.50

* 2.44

5.02

1

—

5.02

ES 12

VD

5012

+ 4.20

* 11.1

- 3.2

+2.0

 $+ 0.7$

+0.7

72.8

+ 4.65

+ 1.3

40.1

+ 2.65

15.6

7/10

4 0.3



151

178

10. $\log_2 16 = 4$

24" 21" 15" (SEE SKETCH FOR FENCE OVERALL DIMS)

15

Mon

SE

Con Bot.

— + 2 TO REMAINS CONC. HEAD WALL

TOP WALL

\$B.

B.B. 3 SS-2

A.P. Top H. Wall

TOP WALL

SE 4 @ EL'

1. 1. 1. 1.

Sw 2 / SE 2

TOP H WALL

	Horiz. A	Hor. D	V.D.	1.
130	13-58	170.5	+2.6	1.02
131	39-29	194.2	-0.4	↓
132	46-56	226.4	+1.1	↓
133	43-55	224.6	+2.3	5.02
134	280-19.58	543.168	+6.05	✓
135	353-45	4.3	+0.0	✓
136	265-47.0	283.1	-0.7	✓
137	266-16.70	178.6	-0.7	✓

	7 10	B5.	11	
	Horiz. A	Hor. P.	V.D.	200
SW-3 (138)	15-27-40	321.15	-0.33	15.94

LOCKPORT Con 2

③

B. 2

Top 4 W.K. 12

B. 2

B. 2

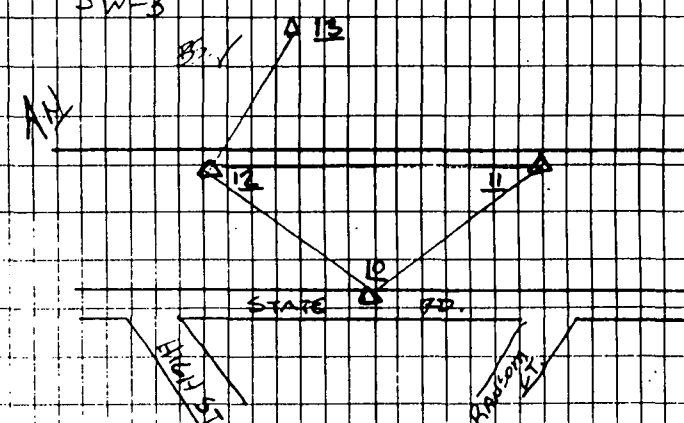
Top 4 W.K. 12

B. 2 ✓

A 11 Ht. 5.18

A 10 Ht. 5.40

SW-3



TRAV. SKETCH

HEALTH AND SAFETY PLAN

This Health and Safety Plan (HASP) addresses the health and safety practices that will be employed by all site workers participating in the preliminary investigation of the NYSEG manufactured gas plant sites. The HASP takes into account the specific hazards inherent to the sites and presents procedures to be followed by Atlantic Environmental Services, Inc. (Atlantic) and its subcontractors in order to avoid and, if necessary, deal with potential health and/or safety problems. All activities performed under this HASP will comply with OSHA Regulations 29 CFR Part 1926 and 1910, particularly 1910.26.

This plan is based on an initial assessment of health and safety risks associated with the sites. The plan will be updated if necessary as additional information is obtained on the materials present at the sites and their associated health and safety risks. For example, additional hazardous substance data sheets may need to be included as more data are gathered.

Medical Surveillance Program

Atlantic maintains a continuous in-house medical surveillance program designed specifically for field personnel engaged in work at sites where hazardous or toxic materials may be present. Atlantic employs a company physician, Dr. Martin Cherniak, who is a specialist in occupational health. Yearly comprehensive examinations are conducted on all field personnel on Atlantic's staff.

Dr. Cherniak's address and telephone number are:

Office:

Lawrence & Memorial Occupational Health Center
Suite 2B, 404 Thames Street
Groton, Connecticut 06340

Telephone: 203-445-4551

Upon employment with Atlantic and prior to performing any major site investigation activities, all field personnel undergo a complete physical examination, including a detailed medical and occupational history. The following tests are performed as part of the examination:

- Complete blood workup (38 analyses), including screens for particular toxicants anticipated at various types of sites (see Exhibit E-1 for list of recommended blood tests).
- Urine analysis, including screens for metals and indicators of proper kidney and liver function.
- Pulmonary Function
- Electrocardiogram
- Chest X-ray
- Hearing and eye exam

Upon completion of these tests, the physician certifies whether personnel are fit for field work in general, and fit to use all levels of respiratory protection, in particular.

In the event that an employee of Atlantic or any other member of the field team is exposed to some form of hazardous substance or wishes to be rechecked because he shows symptoms of exposure, he must inform the site safety supervisor who will send the employee for an examination. The company's physician also acts as a consultant to all subcontractors participating in the field effort and will provide information on health risks associated with various chemical substances when needed. Material Safety Data Sheets for potential site contaminants are presented in Exhibit E-2.

Preparation for Medical Emergencies

Before field work on the site commences, each person who will be working there or observing the operations will complete a medical data sheet that includes the following information:

1. Name, address, home phone
2. Age, height, weight
3. Name of person to be notified in case of emergency
4. All prescription and non-prescription medications currently being used
5. Allergies
6. Particular sensitivities
7. Does he/she wear contact lenses
8. Short medical history including list of previous illnesses
9. Name of personal physician and phone

These data sheets will be filled out before any work begins on the site. Their maintenance will be the responsibility of the designated site safety supervisor (see Exhibit E-3 for sample data sheet).

In the event of an incident where a team member becomes exposed to or suffers from an acute symptom of exposure to site materials, a copy of his/her medical data sheet will be presented to the attending physician upon arrival at the hospital.

First Aid for Injuries Incurred During Field Work

All injuries, no matter how slight, will be reported to the site safety supervisor immediately. An accident report (Exhibit E-4) will be completed by the safety supervisor for all accidents.

First-aid equipment will be available onsite under the control of the site safety supervisor.

When possible, site workers will refrain from administering first aid for serious injury or illness and await the arrival of professional paramedics at the site to take the appropriate action. Unless they are in immediate danger, injured persons will not be moved until paramedics can attend to them. Some injuries, such as severe cuts and lacerations or burns, may require immediate

treatment. Any first aid instructions that can be obtained from doctors or paramedics, before an emergency-response squad arrives at the site or before the injured person can be transported to the hospital, will be followed closely.

First Aid Equipment List

The first aid kit that will be kept at the site will consist of a weatherproof container with individually sealed packages for each type of item.

The kit will include at least the following items:

- Gauze roller bandages, 1 inch and 2 inch
- Gauze compress bandages, 4 inch
- Gauze pads, 2 inch
- Adhesive tape, 1 inch
- Band-aids, 1 inch
- Butterfly bandages
- Triangular bandages, 40 inch
- Ampules of ammonia inhalants
- Antiseptic applicators or swabs
- Burn dressing and sterilized towels
- Surgical scissors
- Eye dressing
- Emergency eye wash
- Tourniquet
- Alcohol
- Hydrogen peroxide

Record of Injuries Incurred Onsite

Occupational Injuries and Illnesses Form (OSHA 200)

All occupational injuries and illnesses that are required to be recorded under the Occupational Safety and Health Act will be registered on OSHA Form 200 (Exhibit E-5). Occupational injuries and illnesses will be recorded by the site safety supervisor within 48 hours of occurrence as required by statute.

Employer's First Report of Injury

This form (Exhibit E-6) will be completed by the site safety supervisor for all accidents involving worker injury at the site. Follow-up procedures will include investigation of each accident or near-miss by the safety engineer to assure that no similar accidents that may lead to injuries occur.

Training Programs

Formal health and safety training and specific onsite training are essential aspects of any successful investigation of a site suspected of containing hazardous or potentially hazardous materials. The following subsections address both formal health and safety training requirements and a specific onsite training program.

Health and Safety Training

All of Atlantic's field personnel have attended a health and safety training course in which they were taught the potential hazards of site work and how to avoid and deal with them. A list of Atlantic personnel who may work at the NYSEG sites are provided below with the titles and dates of the most recent safety courses they attended.

<u>ATLANTIC PERSONNEL</u>	<u>COURSE</u>	<u>DATE</u>
James Gould	Health and Safety Training for Hazardous Waste Activities - Geraghty and Miller	9/16/88
Anna Sullivan	Health and Safety Training for Hazardous Waste Activities - Geraghty and Miller	8/13/90
Peter Georgetti	Health and Safety Operations at Hazardous Materials Sites - Geo-Environmental Consultants	10/19/90

The training courses consist of classroom instruction, field demonstrations, use of respirators, use of appropriate protective clothing, and written and field tests. The training covers the OSHA and HAZWOPER requirements. They cover the following topics:

1. Identification of hazardous substances
2. Properties of hazardous substances
3. Routes of exposure
4. Toxicity of different substances and their synergistic effects
5. Practical considerations in health and safety management
6. Physical properties of chemicals
7. References for threshold limit values (TLV), lower explosion limits (LEL), toxicity data, cross references

8. Technical assistance organization
9. Air monitoring and survey instruments
10. Site entry and egress procedures
11. Heat stress monitoring
12. Levels of personal protection
13. Controlling access to work zones and other contaminated areas
14. Personnel decontamination
15. Equipment decontamination
16. Site/area safety planning

Everyone attending the courses was tested for the fit of their personal respirator and was trained in using self-contained breathing apparatus and Level B equipment. The courses also emphasized the importance and procedures of decontamination.

Health and safety training is an ongoing activity at Atlantic. Yearly refresher courses or site-specific training programs are presented as needed to keep field personnel up to date with proper health and safety practices.

Levels of Protection for Site Workers

Levels of protection specified by the EPA refer largely to requirements for respiratory protection. The lists below stipulate equipment for respiratory, clothing, and other types of protection that will be required for different tasks during the NYSEG site investigation. The designated levels of protection are based on evaluation of potential hazards and risks associated with work at the NYSEG site, and Atlantic's experience on other MGP sites.

Based on HNu (PID) readings in the work zone for each site activity, the criteria for maintaining or revising levels of protection are as follows:

Background (ambient)	Level D - Splash suit, rubber boots and goggles
5-50 ppm above ambient	Level C - Facepiece respirator, splash suit, rubber boots, gloves and goggles
50-500 ppm above ambient	Level B - Positive Pressure SCBA, hooded disposable coveralls, rubber boots, gloves and radio.
500-1000 ppm above ambient	Level A - Positive Pressure SCBA, chemical resistant encapsulated suit, inner and outer gloves and two-way radio.

If HNu (PID) readings greater than 50 ppm are detected, work will be stopped and workers will retreat and call for advice.

Anticipated Levels of Protection for Specific Site Activities

<u>Site Activity</u>	<u>Health Risk</u>	<u>Level of Protection</u>
1. Topographic Survey	Low	Modified D
2. Surface Soil Sampling	Low	Modified D
3. Surface Water Sampling	Low	Modified D
4. Sediment Sampling	Low	Modified D
5. Air Sampling	Low	Modified D

Modified Level D protection consists of long pants and shirts, and gloves and goggles (if needed) when sampling.

Signatures of Field Team Members and Observers

THIS SITE HEALTH AND SAFETY PLAN HAS BEEN READ BY:

(Signatures of site investigation team members and observers who have been through site safety briefing and have read this health and safety plan.)

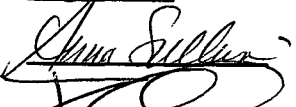

<u>Name</u>	<u>Signature</u>	<u>Date</u>	<u>Firm</u>	<u>Phone</u>
Anna Sullivan		11/1/90	Atlantic Env.	(203) 537-0751
Peter Georgetti		11/13/90	Atlantic Env.	(203) 537-0751

EXHIBIT E-1

RECOMMENDED BLOOD TESTS

EXHIBIT E-1 RECOMMENDED BLOOD TESTS

MEDICAL SURVEILLANCE PROGRAM

Function	Test	Example
Liver:	Blood Tests	Total protein, albumin globulin, total bilirubin (direct bilirubin if total is elevated).
Kidney:	Blood Tests	Blood urea nitrogen (BUN), creatinine, uric acid.
Blood-Forming Function:	Blood Tests	Complete blood count (CBC) with differential and platelet evaluation, including white cell count (WBC), red blood count (RBC), hemoglobin (HGB), hematocrit or packed cell volume (HCT), and desired erythrocyte indices. Reticulocyte count may be appropriate if there is a likelihood of exposure to hemolytic chemicals.

NOTE:

From Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities; October 1985; DHHS (NIOSH) Publication No. 85-115.

EXHIBIT E-2

MATERIAL DATA SAFETY SHEETS

Material Safety Data Sheet

From Genium's Reference Collection
Genium Publishing Corporation
1145 Catalyn Street
Schenectady, NY 12303-1836 USA
(518) 377-8855



No. 316

BENZENE
(Revision D)
Issued: November 1978
Revised: April 1988

25

SECTION 1. MATERIAL IDENTIFICATION

Material Name: BENZENE

Description (Origin/Uses): Used in the manufacture of medicinal chemicals, dyes, linoleum, airplane dopes, varnishes, and lacquers; and as a solvent for waxes, resins, and oils.

Other Designations: Benzol; Phene; Phenylhydride; C_6H_6 ; NIOSH RTECS No. CY1400000;
CAS No. 0071-43-2

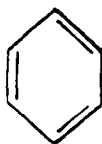
Manufacturer: Contact your supplier or distributor. Consult the latest edition of the *Chemicalweek*
Buyers Guide (Genium ref. 73) for a list of suppliers.

HMIS
H 2
F 3 R 1
R 0 I 4
PPG* S 2
*See sect. 8 K 4



SECTION 2. INGREDIENTS AND HAZARDS

Benzene, CAS No. 0071-43-2



*See NIOSH, RTECS, for additional data with references to irritative, mutagenic, tumorigenic, and reproductive effects.

%
Ca 100

EXPOSURE LIMITS

OSHA PEL

8-Hr TWA: 1 ppm
15-Min Ceiling: 5 ppm
Action Level: 0.5 ppm

ACGIH TLV, 1987-88

TLV-TWA: 10 ppm, 30 mg/m³

Toxicity Data*

Human, Inhalation, LC₅₀: 2000 ppm/5 Min
Human, Oral, TD₅₀: 130 mg/kg
Human, Inhalation, TC₅₀: 210 ppm

SECTION 3. PHYSICAL DATA

Boiling Point: 176°F (80°C)

Melting Point: 42°F (5.5°C)

Vapor Pressure: 75 Torr at 68°F (20°C)

Vapor Density (Air = 1): >1

Water Solubility (%): Slight

% Volatile by Volume: 100

Molecular Weight: 78 Grams/Mole

Specific Gravity ($H_2O = 1$): 0.87865 at 68°F (20°C)

Appearance and Odor: A colorless liquid; characteristic aromatic odor.

SECTION 4. FIRE AND EXPLOSION DATA

LOWER

UPPER

Flash Point and Method

Autoignition Temperature

Flammability Limits in Air

12°F (-11.1°C) CC

928°F (498°C)

% by Volume

1.3%

7.1%

Extinguishing Media: Use dry chemical, foam, or carbon dioxide to put out benzene fires. Water may be ineffective as an extinguishing agent because it can scatter and spread the fire. Use water to cool fire-exposed containers, flush spills away from exposures, disperse benzene vapor, and protect personnel attempting to stop an unignited benzene leak.

Unusual Fire or Explosion Hazards: Benzene vapor is heavier than air and can collect in low-lying areas such as sumps or wells.

Eliminate all sources of ignition there to prevent a dangerous flashback to the original liquid benzene. Danger: Explosive and flammable benzene vapor-air mixtures can easily form at room temperature; always use this material in a way that minimizes dispersion of its vapor into general work areas.

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

Benzene is stable in closed containers during routine operations. It does not undergo hazardous polymerization.

Chemical Incompatibilities: Hazardous chemical reactions involving benzene and the following materials are reported in Genium reference 84: bromine pentafluoride, chlorine, chlorine trifluoride, chromic anhydride, nitryl perchlorate, oxygen, ozone, perchlorates, perchloryl fluoride and aluminum chloride, permanganates and sulfuric acid, potassium peroxide, silver perchlorate, and sodium peroxide.

Conditions to Avoid: Avoid all exposure to sources of ignition and to incompatible chemicals.

Hazardous Products of Decomposition: Toxic gases like carbon monoxide (CO) may be produced during benzene fires.

SECTION 6. HEALTH HAZARD INFORMATION

Benzene is listed as a suspected human carcinogen by the ACGIH.

Summary of Risks: Prolonged skin contact with benzene or excessive inhalation of its vapor may cause headache, weakness, loss of appetite, and lassitude. Continued exposure can cause collapse, bronchitis, and pneumonia. The most important health hazards are cancer (leukemia), bone marrow effects, and injuries to the blood-forming tissue from chronic low-level exposure.

Medical Conditions Aggravated by Long-Term Exposure: Ailments of the heart, lungs, liver, kidneys, blood, and central nervous system (CNS) may be worsened by exposure. Administer preplacement and periodic medical exams emphasizing these organs' functions and reassign workers who test positive. **Target Organs:** Blood, CNS, bone marrow, eyes, and upper respiratory tract (URT). **Primary Entry:** Skin contact, inhalation. **Acute Effects:** Dizziness, mental dullness, nausea, headache, fatigue, and giddiness. **Chronic Effects:** Possible cancer (leukemia).

FIRST AID

Eyes: Immediately flush eyes, including under the eyelids, gently but thoroughly with plenty of running water for at least 15 minutes.

Skin: 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.

Ingestion: Never give anything by mouth to someone who is unconscious or convulsing. Do not induce vomiting because of the possibility of aspiration.

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 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, waterheds, and waterways.

Waste Disposal: Contact your supplier or a licensed contractor for detailed recommendations for disposal. 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. U019

CERCLA Hazardous Substance, Reportable Quantity: 1000 lbs (454 kg)

SECTION 8. SPECIAL PROTECTION INFORMATION

Goggles: Always wear protective eyeglasses or chemical safety goggles. Where splashing is possible, wear a full face shield. Follow the eye- and face-protection guidelines in 29 CFR 1910.133. **Respirator:** Wear a NIOSH-approved respirator per the *NIOSH Pocket Guide to Chemical Hazards* for the maximum-use concentrations and/or the exposure limits cited in section 2. Follow the respirator guidelines in 29 CFR 1910.134. For emergency or nonroutine use (e.g., cleaning reactor vessels or storage tanks), wear 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:** Wear impervious gloves, boots, aprons, gauntlets, etc., to prevent any possibility of skin contact with this suspected human carcinogen. **Ventilation:** Install and operate general and local ventilation systems powerful enough to maintain airborne levels of benzene below the OSHA PEL standard cited in section 2.

Safety Stations: Make eyewash stations, washing facilities, and safety showers available in use and handling 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. **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 benzene vapor!

SECTION 9. SPECIAL PRECAUTIONS AND COMMENTS

Storage/Segregation: Store benzene in a cool, dry, well-ventilated area away from sources of ignition and incompatible chemicals.

Special Handling/Storage: Protect containers from physical damage. Electrically ground and bond all metal containers used in shipping or transferring operations. Follow all parts of 29 CFR 1910.1028.

Engineering Controls: All engineering systems (production, transportation, etc.) must be of maximum explosion-proof design (non-sparking, electrically grounded and bonded, etc.)

Comments: If possible, substitute less toxic solvents for benzene; use this material with extreme caution and only if it is absolutely essential.

Transportation Data (49 CFR 172.101-2)

DOT Shipping Name: Benzene

DOT Label: Flammable Liquid

IMO Label: Flammable Liquid

DOT Class: Flammable Liquid

DOT ID No. UN1114

IMO Class: 3.2

References: 1, 2, 12, 73, 84-94, 100, 103.

Judgments as to the suitability of information herein for purchaser's purposes are necessarily purchaser's responsibility. Therefore, although reasonable care has been taken in the preparation of such information, Cansler Publishing Corp. extends no warranty, makes no representations and assumes no responsibility as to the accuracy or suitability of such information for application to purchaser's intended purposes or for consequences of its use.

Prepared by PJ Igoe, BS

Industrial Hygiene Review: DJ Wilson, CIH

Medical Review: MJ Hardies, MD

Material Safety Data Sheet

Genium Publishing Corporation

1145 Catalyn Street

Schenectady, NY 12303-1836 USA

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GENIUM PUBLISHING CORP.

No. 317

TOLUENE

(Revision D)

Issued: August 1979

Revised: April 1986

20

SECTION 1. MATERIAL IDENTIFICATION

MATERIAL NAME: Toluene

OTHER DESIGNATIONS: Methyl Benzene, Methyl Benzol, Phenylmethane, Toluol, C₇H₈, CAS #0108-88-3

MANUFACTURER/SUPPLIER: Available from many suppliers, including:
Allied Corp., PO Box 2064R, Morristown, NJ 07960; Telephone: (201) 455-4400
Ashland Chemical Co., Industrial Chemicals & Solvents Div., PO Box 2219,
Columbus, OH; Telephone: (614) 889-3844

HIMIS

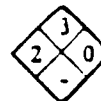
H: 2

F: 3

R: 0

PPE*

*See sect. 8



R 1

I 3

S 2

K 4

SECTION 2. INGREDIENTS AND HAZARDS

%

HAZARD DATA

Toluene



ca 100

8-hr TLV: 100 ppm, or
375 mg/m³ (Skin)**

Man. Inhalation, TClO:
100 ppm; Psychotropic***

Rat. Oral, LD₅₀: 5000 mg/kg

Rat. Inhalation, LCLo:
4000 ppm/4 hrs.

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 3. PHYSICAL DATA

Boiling Point ... 231°F (111°C)

Vapor Pressure @ 20°C, mm Hg ... 22

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)

Percent Volatile by Volume ... ca 100

Molecular Weight ... 92.15

Appearance and 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.

SECTION 4. FIRE AND EXPLOSION DATA

LOWER

UPPER

Flash Point and Method

Autoignition Temp.

Flammability Limits in Air

40°F (4°C) CC

896°F (480°C)

% by Volume

1.27

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.

UNUSUAL FIRE/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.

SECTION 5. REACTIVITY DATA

CHEMICAL INCOMPATIBILITIES: Toluene is stable in closed containers at room temperature under normal storage and handling conditions. It does not undergo hazardous polymerization. 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 6. HEALTH HAZARD INFORMATION | TLV

Toluene 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. **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 7. SPILL, LEAK, AND DISPOSAL PROCEDURES

SPILL/LEAK: 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 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. **COMMENTS:** 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. TLV 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 8. SPECIAL PROTECTION INFORMATION

Provide general and local exhaust ventilation to meet TLV 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 fpm (linear feet per minute) and be designed to capture heavy vapor. For emergency or nonroutine exposures where the TLV may be exceeded, use as 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. Safety glasses or splash goggles should be worn in all work areas. Neoprene gloves, 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.

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 9. SPECIAL PRECAUTIONS AND COMMENTS

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.

COMMENTS: Empty containers contain product residues. Handle accordingly!

Toluene is designated as a hazardous substance by the EPA (40 CFR 116). DOT Classification: Flammable liquid. UN1294. Data Sources) Code: 1-9, 12, 16, 20, 21, 24, 25, 34, 81, 82, CR

Judgments as to the suitability of information herein for purchaser's purposes are necessarily purchaser's responsibility. Therefore, although reasonable care has been taken in the preparation of such information, Cessna Publishing Corp. extends no warranties, makes no representations and assumes no responsibility as to the accuracy or suitability of such information for application to purchaser's intended purposes or for consequences of its use.

Approvals *J.O. Reardon, 11/86.*

Indust. Hygiene/Safety *JW 12-86*

Medical Review *[Signature]*

Material Safety Data Sheet

From Genium's Reference Collection
Genium Publishing Corporation
1145 Catalyn Street
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(518) 377-8855



No. 318

XYLENE (Mixed Isomers)
(Revision D)
Issued: November 1980
Revised: August 1988

SECTION 1. MATERIAL IDENTIFICATION

26

Material Name: XYLENE (Mixed Isomers)

Description (Origin/Uses): 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_6H_{10} ; CAS No. 1330-20-7

Manufacturer: 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 isomers are very similar. This MSDS is written for a xylene mixture of all three isomers, which is usually commercial xylene.



NFPA

HMIS

H	2	R	1
F	3	I	3
R	0	S	2
PPG*		K	3

*See sect. 8

SECTION 2. INGREDIENTS AND HAZARDS

%

EXPOSURE LIMITS

Xylene (Mixed Isomers), CAS No. 1330-20-7*

**

IDLH*** Level: 1000 ppm

*o-Xylene, CAS No. 0095-47-6

m-Xylene, CAS No. 0108-38-3

p-Xylene, CAS No. 0106-42-3

OSHA PEL
8-Hr TWA: 100 ppm, 435 mg/m³
ACGIH TLVs, 1987-88
TLV-TWA: 100 ppm, 435 mg/m³
TLV-STEL: 150 ppm, 655 mg/m³

**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.

Toxicity Data****
Human, Inhalation, TC₅₀: 200 ppm
Man, Inhalation, LC₅₀: 10000 ppm/6 Hrs
Rat, Oral, LD₅₀: 4300 mg/kg

**** See NIOSH, RTECS (No. ZE2100000), for additional data with references to reproductive, irritative, and mutagenic effects.

SECTION 3. PHYSICAL DATA

Boiling Point: 275°F to 293°F (135°C to 145°C)*

Melting Point: -13°F (-25°C)

Evaporation Rate: 0.6 Relative to BuAc = 1

Specific Gravity ($H_2O = 1$): 0.86

Water Solubility (%): Insoluble

Molecular Weight: 106 Grams/Mole

% Volatile by Volume: Ca 100

Vapor Pressure: 7 to 9 Torrs at 68°F (20°C)

Vapor Density (Air = 1): 3.7

Appearance and Odor: A clear liquid; aromatic hydrocarbon odor.

*Materials with wider and narrower boiling ranges are commercially available.

SECTION 4. FIRE AND EXPLOSION DATA

LOWER

UPPER

Flash Point and Method

Autoignition Temperature

Flammability Limits in Air

81°F to 90°F (27°C to 32°C)

867°F (464°C)

% by Volume

1%

7%

Extinguishing Media: Use foam, dry chemical, or carbon dioxide. Use water sprays to reduce the rate of burning and to cool containers.

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.

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

Xylene is stable in closed containers during routine operations. It does not undergo hazardous polymerization.

Chemical Incompatibilities: This material may react dangerously with strong oxidizers.

Conditions to Avoid: Avoid any exposure to sources of ignition and to strong oxidizers.

Hazardous Products of Decomposition: Carbon monoxide (CO) may be evolved during xylene fires.

SECTION 6. HEALTH HAZARD INFORMATION

Xylene is not listed as a carcinogen by the IARC, NTP, 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 Aggravated by Long-Term Exposure: 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: 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 Effects: Reversible eye damage, headache, loss of appetite, nervousness, pale skin, and skin rash.

FIRST AID: Eyes. Immediately flush eyes, including under the eyelids, gently but thoroughly with plenty of running water for at least 15 minutes. Skin. 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 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 7. SPILL, LEAK, AND DISPOSAL PROCEDURES

Spill/Leak: Notify safety personnel, provide ventilation, and eliminate all sources of ignition immediately. Cleanup personnel need protection against contact with and inhalation of xylene 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 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)

SECTION 8. SPECIAL PROTECTION INFORMATION

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:** Use a NIOSH-approved respirator per the *NIOSH Pocket Guide to Chemical Hazards* 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. **Warning:** Air-purifying respirators will not protect workers in oxygen-deficient atmospheres. **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. **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 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. **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.

SECTION 9. SPECIAL PRECAUTIONS AND COMMENTS

Storage/Segregation: Store xylene in a cool, dry, well-ventilated area away from sources of ignition and strong oxidizers. Protect containers from physical damage.

Special Handling/Storage: 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 ID No. UN1307

DOT Label: Flammable Liquid

DOT Hazard Class: Flammable Liquid

IMO Label: Flammable Liquid

IMO Class: 3.2 or 3.3

References: 1, 2, 12, 73, 84-94, 100, 103.

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Occupational Health Guideline for Coal Tar Pitch Volatiles

INTRODUCTION

This guideline is intended as a source of information for employees, employers, physicians, industrial hygienists, and other occupational health professionals who may have a need for such information. It does not attempt to present all data; rather, it presents pertinent information and data in summary form.

SUBSTANCE IDENTIFICATION

Anthracene

- Formula: $C_{14}H_{10}$
- Synonyms: None
- Appearance and odor: Pale green solid with a faint aromatic odor.

Phenanthrene

- Formula: $C_{14}H_{10}$
- Synonyms: None
- Appearance and odor: Colorless solid with a faint aromatic odor.

Pyrene

- Formula: $C_{16}H_{10}$
- Synonyms: None
- Appearance: Bright yellow solid

Carbazole

- Formula: $C_{12}H_9N$
- Synonyms: None
- Appearance and odor: Colorless solid with a faint aromatic odor.

Benzo(a)pyrene

- Formula: $C_{20}H_{12}$
- Synonyms: BaP, 3,4-benzopyrene

- Appearance and odor: Colorless solid with a faint aromatic odor.

PERMISSIBLE EXPOSURE LIMIT (PEL)

The current OSHA standard for coal tar pitch volatiles is 0.2 milligram of coal tar pitch volatiles per cubic meter of air (mg/m^3) averaged over an eight-hour work shift. NIOSH has recommended that the permissible exposure limit for coal tar products be reduced to 0.1 mg/m^3 (cyclohexane-extractable fraction) averaged over a work shift of up to 10 hours per day, 40 hours per week, and that coal tar products be regulated as occupational carcinogens. The NIOSH Criteria Document for Coal Tar Products and NIOSH Criteria Document for Coke Oven Emissions should be consulted for more detailed information.

HEALTH HAZARD INFORMATION

• Routes of exposure

Coal tar pitch volatiles can affect the body if they are inhaled or if they come in contact with the eyes or skin.

• Effects of overexposure

Repeated exposure to coal tar pitch volatiles has been associated with an increased risk of developing bronchitis and cancer of the lungs, skin, bladder, and kidneys. Pregnant women may be especially susceptible to exposure effects associated with coal tar pitch volatiles. Repeated exposure to these materials may also cause sunlight to have a more severe effect on a person's skin. In addition, this type of exposure may cause an allergic skin rash.

• Reporting signs and symptoms

A physician should be contacted if anyone develops any signs or symptoms and suspects that they are caused by exposure to coal tar pitch volatiles.

• Recommended medical surveillance

The following medical procedures should be made available to each employee who is exposed to coal tar pitch volatiles at potentially hazardous levels:

These recommendations reflect good industrial hygiene and medical surveillance practices and their implementation will assist in achieving an effective occupational health program. However, they may not be sufficient to achieve compliance with all requirements of OSHA regulations.

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Public Health Service Centers for Disease Control
National Institute for Occupational Safety and Health

U.S. DEPARTMENT OF LABOR
Occupational Safety and Health Administration

1. Annual Medical Examination:

—A complete history and physical examination: The purpose is to detect pre-existing conditions that might place the exposed employee at increased risk, and to establish a baseline for future health monitoring. Examination of the oral cavity, respiratory tract, bladder, and kidneys should be stressed. The skin should be examined for evidence of chronic disorders, for premalignant and malignant lesions, and evidence of hyperpigmentation or photosensitivity.

—Urinalysis: Coal tar pitch volatiles are associated with an excess of kidney and bladder cancer. A urinalysis should be obtained to include at a minimum specific gravity, albumin, glucose, and a microscopic on centrifuged sediment, as well as a test for red blood cells.

—Urinary cytology: Coal tar pitch volatiles are associated with an excess of kidney and bladder cancer. Employees having 5 or more years of exposure or who are 45 years of age or older should have a urinary cytology examination.

—Sputum cytology: Coal tar pitch volatiles are associated with an excess of lung cancer. Employees having 10 or more years of exposure or who are 45 years of age or older should have a sputum cytology examination.

—14" x 17" chest roentgenogram: Coal tar pitch volatiles are associated with an excess of lung cancer. Surveillance of the lungs is indicated.

—FVC and FEV (1 sec): Coal tar pitch volatiles are reported to cause an excess of bronchitis. Periodic surveillance is indicated.

—A complete blood count: Due to the possibility of benzene exposure associated with coal tar pitch volatiles, a complete blood count is considered necessary to search for leukemia and aplastic anemia.

—Skin disease: Coal tar pitch volatiles are defatting agents and can cause dermatitis on prolonged exposure. Persons with pre-existing skin disorders may be more susceptible to the effects of these agents.

2. Periodic Medical Examination: The aforementioned medical examinations should be repeated on an annual basis, and semi-annually for employees 45 years of age or older or with 10 or more years' exposure to coal tar pitch volatiles.

Summary of toxicology

Coal tar pitch volatiles (CTPV) are products of the destructive distillation of bituminous coal and contain polynuclear aromatic hydrocarbons (PNA's). These hydrocarbons sublime readily, thereby increasing the amounts of carcinogenic compounds in working areas. Epidemiologic evidence suggests that workers intimately exposed to the products of combustion or distillation of bituminous coal are at increased risk of cancer at many sites. These include cancer of the respiratory tract, kidney, bladder, and skin. In a study of coke oven workers, the level of exposure to CTPV and the length of time exposed were related to the development of cancer. Coke oven workers with the highest risk of cancer were those employed exclusively at topside jobs 5 or more years, for whom the increased risk of

dying from lung cancer was 10-fold; all coke oven workers had a 7-1/2-fold increase in risk of dying from kidney cancer. Although the causative agent or agents of the cancer in coke oven workers is unidentified, it is suspected that several PNA's in the CTPV generated during the coking process are involved. Certain industrial populations exposed to coal tar products have a demonstrated risk of skin cancer. Substances containing PNA's which may produce skin cancer also produce contact dermatitis; examples are coal tar, pitch, and cutting oils. Although allergic dermatitis is readily induced by PNA's in guinea pigs, it is only rarely reported in humans from occupational contact with PNA's; these have resulted largely from the therapeutic use of coal tar preparations. Components of pitch and coal tar produce cutaneous photosensitization; skin eruptions are usually limited to areas exposed to the sun or ultraviolet light. Most of the phototoxic agents will induce hypermelanosis of the skin; if chronic photodermatitis is severe and prolonged, leukoderma may occur. Some oils containing PNA's have been associated with changes of follicular and sebaceous glands which commonly take the form of acne. There is evidence that exposures to emissions at coke ovens and gas retorts may be associated with an increased occurrence of chronic bronchitis. Coal tar pitch volatiles may be associated with benzene, an agent suspected of causing leukemia and known to cause aplastic anemia.

CHEMICAL AND PHYSICAL PROPERTIES

• Physical data—Anthracene

1. Molecular weight: 178.2
2. Boiling point (760 mm Hg): 340 C (644 F)
3. Specific gravity (water = 1): 1.24
4. Vapor density (air = 1 at boiling point of anthracene): 6.15
5. Melting point: 217 C (423 F)
6. Vapor pressure at 20 C (68 F): Less than 1 mm Hg
7. Solubility in water, g/100 g water at 20 C (68 F): Insoluble
8. Evaporation rate (butyl acetate = 1): Not applicable

• Physical data—Phenanthrene

1. Molecular weight: 178.2
2. Boiling point (760 mm Hg): 340 C (644 F)
3. Specific gravity (water = 1): 1.18
4. Vapor density (air = 1 at boiling point of phenanthrene): 6.15
5. Melting point: 100.5 C (213 F)
6. Vapor pressure at 20 C (68 F): Less than 1 mm Hg
7. Solubility in water, g/100 g water at 20 C (68 F): Insoluble
8. Evaporation rate (butyl acetate = 1): Not applicable

• Physical data—Pyrene

1. Molecular weight: 202.3
2. Boiling point (760 mm Hg): Greater than 360 C (greater than 680 F)

3. Specific gravity (water = 1): 1.28
4. Vapor density (air = 1 at boiling point of pyrene): 6.9
5. Melting point: 150.4 C (303 F)
6. Vapor pressure at 20 C (68 F): Less than 1 mm Hg
7. Solubility in water, g/100 g water at 20 C (68 F): Insoluble

8. Evaporation rate (butyl acetate = 1): Not applicable

• **Physical data—Carbazole**

1. Molecular weight: 167.2
2. Boiling point (760 mm Hg): 355 C (671 F)
3. Specific gravity (water = 1): Greater than 1
4. Vapor density (air = 1 at boiling point of carbazole): 5.8
5. Melting point: 246 C (475 F)
6. Vapor pressure at 20 C (68 F): Less than 1 mm Hg
7. Solubility in water, g/100 g water at 20 C (68 F): Insoluble

8. Evaporation rate (butyl acetate = 1): Not applicable

• **Physical data—Benzo(a)pyrene**

1. Molecular weight: 252.3
2. Boiling point (760 mm Hg): Greater than 360 C (greater than 680 F)
3. Specific gravity (water = 1): Greater than 1
4. Vapor density (air = 1 at boiling point of benzo(a)pyrene): 8.7
5. Melting point: 179 C (354 F)
6. Vapor pressure at 20 C (68 F): Less than 1 mm Hg
7. Solubility in water, g/100 g water at 20 C (68 F): Insoluble

8. Evaporation rate (butyl acetate = 1): Not applicable

• **Reactivity**

1. Conditions contributing to instability: None hazardous
2. Incompatibilities: Contact with strong oxidizers may cause fires and explosions.
3. Hazardous decomposition products: None
4. Special precautions: None

• **Flammability**

1. Flash point: Anthracene: 121 C (250 F) (closed cup); Others: Data not available
2. Autoignition temperature: Anthracene: 540 C (1004 F); Others: Data not available
3. Flammable limits in air, % by volume: Anthracene: Lower: 0.6; Others: Data not available
4. Extinguishant: Foam, dry chemical, and carbon dioxide

• **Warning properties**

Grant states that "coal tar and its various crude fractions appear principally to cause reddening and squamous eczema of the lid margins, with only small erosions of the corneal epithelium and superficial changes in the stroma, which disappear in a month following exposure. Chronic exposure of workmen to tar fumes and dust has been reported to cause conjunctivitis and discoloration of the cornea in the palpebral fissure.

either near the limbus or, in extreme cases, across the whole cornea. Occasionally, epithelioma of the lid margin has been attributed to contact with coal tar."

MONITORING AND MEASUREMENT PROCEDURES

• **General**

Measurements to determine employee exposure are best taken so that the average eight-hour exposure is based on a single eight-hour sample or on two four-hour samples. Several short-time interval samples (up to 30 minutes) may also be used to determine the average exposure level. Air samples should be taken in the employee's breathing zone (air that would most nearly represent that inhaled by the employee).

• **Method**

Coal tar products may be sampled by collection on a glass fiber filter with subsequent ultrasonic extraction and weighing. An analytical method for coal tar pitch volatiles is in the *NIOSH Manual of Analytical Methods*, 2nd Ed., Vol. 1, 1977, available from the Government Printing Office, Washington, D.C. 20402 (GPO No. 017-033-00267-3).

RESPIRATORS

• Good industrial hygiene practices recommend that engineering controls be used to reduce environmental concentrations to the permissible exposure level. However, there are some exceptions where respirators may be used to control exposure. Respirators may be used when engineering and work practice controls are not technically feasible, when such controls are in the process of being installed, or when they fail and need to be supplemented. Respirators may also be used for operations which require entry into tanks or closed vessels, and in emergency situations. If the use of respirators is necessary, the only respirators permitted are those that have been approved by the Mine Safety and Health Administration (formerly Mining Enforcement and Safety Administration) or by the National Institute for Occupational Safety and Health.

• In addition to respirator selection, a complete respiratory protection program should be instituted which includes regular training, maintenance, inspection, cleaning, and evaluation.

PERSONAL PROTECTIVE EQUIPMENT

• Employees should be provided with and required to use impervious clothing, gloves, face shields (eight-inch minimum), and other appropriate protective clothing necessary to prevent skin contact with condensed coal tar pitch volatiles, where skin contact may occur.

• If employees' clothing may have become contaminated with coal tar pitch volatiles, employees should change into uncontaminated clothing before leaving the work premises.

• Clothing contaminated with coal tar pitch volatiles

should be placed in closed containers for storage until it can be discarded or until provision is made for the removal of coal tar pitch volatiles from the clothing. If the clothing is to be laundered or otherwise cleaned to remove the coal tar pitch volatiles, the person performing the operation should be informed of coal tar pitch volatiles's hazardous properties.

- Employees should be provided with and required to use splash-proof safety goggles where condensed coal tar pitch volatiles may contact the eyes.

SANITATION

- Workers subject to skin contact with coal tar pitch volatiles should wash with soap or mild detergent and water any areas of the body which may have contacted coal tar pitch volatiles at the end of each work day.
- Employees who handle coal tar pitch volatiles should wash their hands thoroughly with soap or mild detergent and water before eating, smoking, or using toilet facilities.
- Areas in which exposure to coal tar pitch volatiles may occur should be identified by signs or other appropriate means, and access to these areas should be limited to authorized persons.

COMMON OPERATIONS AND CONTROLS

The following list includes some common operations in which exposure to coal tar pitch volatiles may occur and control methods which may be effective in each case:

Operation	Controls
Liberation from extraction and packaging from coal tar fraction of coking	Process enclosure; local exhaust ventilation; general dilution ventilation; personal protective equipment
Use as a binding agent in manufacture of coal briquettes used for fuel; use as a dielectric in the manufacture of battery electrodes, electric-arc furnace electrodes, and electrodes for alumina reduction	Process enclosure; local exhaust ventilation; general dilution ventilation; personal protective equipment
Use in manufacture of roofing felts and papers and roofing	Process enclosure; local exhaust ventilation; general dilution ventilation; personal protective equipment

Operation

Use for protective coatings for pipes for underground conduits and drainage; use as a coating on concrete as waterproofing and corrosion-resistant material; use in road paving and sealing

Use in manufacture and repair of refractory brick; use in production of foundry cores; use in manufacture of carbon ceramic items

Controls

Process enclosure; local exhaust ventilation; general dilution ventilation; personal protective equipment

Process enclosure; local exhaust ventilation; general dilution ventilation; personal protective equipment

EMERGENCY FIRST AID PROCEDURES

In the event of an emergency, institute first aid procedures and send for first aid or medical assistance.

• Eye Exposure

If condensed coal tar pitch volatiles get into the eyes, wash eyes immediately with large amounts of water, lifting the lower and upper lids occasionally. If irritation is present after washing, get medical attention. Contact lenses should not be worn when working with these chemicals.

• Skin Exposure

If condensed coal tar pitch volatiles get on the skin, wash the contaminated skin using soap or mild detergent and water. Be sure to wash the hands before eating or smoking and to wash thoroughly at the close of work.

• Breathing

If a person breathes in large amounts of coal tar pitch volatiles, move the exposed person to fresh air at once. If breathing has stopped, perform artificial respiration. Keep the affected person warm and at rest. Get medical attention as soon as possible.

• Rescue

Move the affected person from the hazardous exposure. If the exposed person has been overcome, notify someone else and put into effect the established emergency rescue procedures. Do not become a casualty. Understand the facility's emergency rescue procedures and know the locations of rescue equipment before the need arises.

SPILL AND DISPOSAL PROCEDURES

- Persons not wearing protective equipment and clothing should be restricted from areas of releases until cleanup has been completed.
- If coal tar pitch volatiles are released in hazardous concentrations, the following steps should be taken:
 1. Ventilate area of spill.

2. Collect released material in the most convenient and safe manner for reclamation or for disposal in sealed containers in a secured sanitary landfill.

- Waste disposal method:

Coal tar pitch volatiles may be disposed of in sealed containers in a secured sanitary landfill.

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RESPIRATORY PROTECTION FOR COAL TAR PITCH VOLATILES

Condition	Minimum Respiratory Protection* Required Above 0.2 mg/m ³
Particulate and Vapor Concentration	
2 mg/m ³ or less	A chemical cartridge respirator with an organic vapor cartridge(s) and with a fume or high-efficiency filter. Any supplied-air respirator. Any self-contained breathing apparatus.
10 mg/m ³ or less	A chemical cartridge respirator with a full facepiece and an organic vapor cartridge(s) and with a fume or high-efficiency filter. A gas mask with a chin-style or a front- or back-mounted organic vapor canister and with a full facepiece and a fume or high-efficiency filter. Any supplied-air respirator with a full facepiece, helmet, or hood. Any self-contained breathing apparatus with a full facepiece.
200 mg/m ³ or less	A Type C supplied-air respirator operated in pressure-demand or other positive pressure or continuous-flow mode. A powered air-purifying respirator with an organic vapor cartridge and a high-efficiency particulate filter.
400 mg/m ³ or less	A Type C supplied-air respirator with a full facepiece operated in pressure-demand or other positive pressure mode or with a full facepiece, helmet, or hood operated in continuous-flow mode.
Greater than 400 mg/m ³ or entry and escape from unknown concentrations	Self-contained breathing apparatus with a full facepiece operated in pressure-demand or other positive pressure mode. A combination respirator which includes a Type C supplied-air respirator with a full facepiece operated in pressure-demand or other positive pressure or continuous-flow mode and an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.
Fire Fighting	Self-contained breathing apparatus with a full facepiece operated in pressure-demand or other positive pressure mode.
Escape	Any gas mask providing protection against organic vapors and particulates, including pesticide respirators which meet the requirements of this class. Any escape self-contained breathing apparatus.

*Only NIOSH-approved or MSHA-approved equipment should be used.

Occupational Health Guideline for Naphtha (Coal Tar)

INTRODUCTION

This guideline is intended as a source of information for employees, employers, physicians, industrial hygienists, and other occupational health professionals who may have a need for such information. It does not attempt to present all data; rather, it presents pertinent information and data in summary form.

SUBSTANCE IDENTIFICATION

- Formula: $C_{10}H_8 - C_{18}H_{12}$ (approximately)
- Synonyms: Naphtha, 49 degrees Be-coal tar type; crude solvent coal tar naphtha; high-solvent coal tar naphtha
- Appearance and odor: Reddish-brown, mobile liquid with an aromatic odor.

PERMISSIBLE EXPOSURE LIMIT (PEL)

The current OSHA standard for coal tar naphtha is 100 parts of coal tar naphtha per million parts of air (ppm) averaged over an eight-hour work shift. This may also be expressed as 400 milligrams of coal tar naphtha per cubic meter of air (mg/m^3).

HEALTH HAZARD INFORMATION

• Routes of exposure

Coal tar naphtha can affect the body if it is inhaled, comes in contact with the eyes or skin, or is swallowed.

• Effects of overexposure

1. *Short-term Exposure:* Overexposure to coal tar naphtha can cause lightheadedness, drowsiness, and unconsciousness. It also may cause mild irritation of the eyes, nose, and skin.

2. *Long-term Exposure:* Prolonged overexposure to coal tar naphtha may cause irritation of the skin.

3. *Reporting Signs and Symptoms:* A physician should be contacted if anyone develops any signs or symptoms and suspects that they are caused by exposure to coal tar naphtha.

• Recommended medical surveillance

The following medical procedures should be made available to each employee who is exposed to coal tar naphtha at potentially hazardous levels:

1. *Initial Medical Screening:* Employees should be screened for history of certain medical conditions (listed below) which might place the employee at increased risk from coal tar naphtha exposure.

—Skin disease: Coal tar naphtha is a defatting agent and can cause dermatitis on prolonged exposure. Persons with pre-existing skin disorders may be more susceptible to the effects of this agent.

—Liver disease: Although coal tar naphtha is not known as a liver toxin in humans, the importance of this organ in the biotransformation and detoxification of foreign substances should be considered before exposing persons with impaired liver function.

—Kidney disease: Although coal tar naphtha is not known as a kidney toxin in humans, the importance of this organ in the elimination of toxic substances justifies special consideration in those with impaired renal function.

—Chronic respiratory disease: In persons with impaired pulmonary function, especially those with obstructive airway diseases, the breathing of coal tar naphtha might cause exacerbation of symptoms due to its irritant properties.

2. *Periodic Medical Examination:* Any employee developing the above-listed conditions should be referred for further medical examination.

• Summary of toxicology

Coal tar naphtha vapor is narcotic. Rats survived continuous exposure at 3200 ppm for two months; at 1800 ppm some animals showed damage to the liver and kidneys; above 1000 ppm there was evidence of narcotic action. Rats exposed at 567 ppm and 312 ppm for 18 to 20 hours a day for 7 days had some reduction in blood leukocytes, possibly the result of the presence of benzene. There are few if any well documented reports of industrial injury resulting from the inhalation of

These recommendations reflect good industrial hygiene and medical surveillance practices and their implementation will assist in achieving an effective occupational health program. However, they may not be sufficient to achieve compliance with all requirements of OSHA regulations.

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Occupational Safety and Health Administration

naphtha. However, exposure to high concentrations might be expected to cause lightheadedness, drowsiness, and possibly irritation of the eyes, nose, and throat. Repeated or prolonged contact with the liquid may result in drying and cracking skin due to defatting action. Coal tar (naphtha) is a non-uniform mixture of aromatic hydrocarbons and may contain benzene.

CHEMICAL AND PHYSICAL PROPERTIES

• Physical data

1. Molecular weight: 110 (approximately)
2. Boiling point (760 mm Hg): 110 to 190 C (230 to 374 F)
3. Specific gravity (water = 1): 0.97
4. Vapor density (air = 1 at boiling point of coal tar naphtha): 3 (approximately)
5. Melting point: Data not available
6. Vapor pressure at 20 C (68 F): Less than 5 mm Hg
7. Solubility in water, g/100 g water at 20 C (68 F): Insoluble
8. Evaporation rate (butyl acetate = 1): Greater than 1

• Reactivity

1. Conditions contributing to instability: Heat
2. Incompatibilities: Contact with strong oxidizing agents may cause fires and explosions.
3. Hazardous decomposition products: Toxic gases and vapors (such as carbon monoxide) may be released in a fire involving coal tar naphtha.
4. Special precautions: Coal tar naphtha will attack some forms of plastics, rubber, and coatings.

• Flammability

1. Flash point: 38 to 43 C (100 to 109 F) (closed cup)
2. Autoignition temperature: 482 to 510 C (900 to 950 F)
3. Flammable limits in air, % by volume: Data not available
4. Extinguishant: Dry chemical, foam, carbon dioxide

• Warning properties

1. Odor Threshold: Since the odor thresholds of the main constituents of coal tar naphtha are below their permissible exposure limits, the odor threshold of coal tar naphtha is assumed to be below the permissible exposure limit.
2. Eye Irritation Level: According to Grant, Gafafer states that the naphthas cause conjunctival irritation. Two of the main constituents of coal tar naphtha, xylene and toluene, cause noticeable eye irritation at concentrations of 200 and 300 ppm, respectively.
3. Evaluation of Warning Properties: Since the odor threshold of the main constituents of coal tar naphtha are well below their permissible exposure limits, coal tar naphtha is treated as a material with adequate warning properties.

MONITORING AND MEASUREMENT PROCEDURES

• General

Measurements to determine employee exposure are best taken so that the average eight-hour exposure is based on a single eight-hour sample or on two four-hour samples. Several short-time interval samples (up to 30 minutes) may also be used to determine the average exposure level. Air samples should be taken in the employee's breathing zone (air that would most nearly represent that inhaled by the employee).

• Method

Sampling and analyses may be performed by collection of coal tar naphtha vapors using an adsorption tube with subsequent desorption with carbon disulfide and gas chromatographic analysis. Also, detector tubes certified by NIOSH under 42 CFR Part 84 or other direct-reading devices calibrated to measure coal tar naphtha may be used. An analytical method for coal tar naphtha is in the *NIOSH Manual of Analytical Methods*, 2nd Ed., Vol. 3, 1977, available from the Government Printing Office, Washington, D.C. 20402 (GPO No. 017-033-00261-4). 026).

RESPIRATORS

- Good industrial hygiene practices recommend that engineering controls be used to reduce environmental concentrations to the permissible exposure level. However, there are some exceptions where respirators may be used to control exposure. Respirators may be used when engineering and work practice controls are not technically feasible, when such controls are in the process of being installed, or when they fail and need to be supplemented. Respirators may also be used for operations which require entry into tanks or closed vessels, and in emergency situations. If the use of respirators is necessary, the only respirators permitted are those that have been approved by the Mine Safety and Health Administration (formerly Mining Enforcement and Safety Administration) or by the National Institute for Occupational Safety and Health.
- In addition to respirator selection, a complete respiratory protection program should be instituted which includes regular training, maintenance, inspection, cleaning, and evaluation.

PERSONAL PROTECTIVE EQUIPMENT

- Employees should be provided with and required to use impervious clothing, gloves, face shields (eight-inch minimum), and other appropriate protective clothing necessary to prevent repeated or prolonged skin contact with liquid coal tar naphtha.
- Clothing wet with liquid coal tar naphtha should be placed in closed containers for storage until it can be discarded or until provision is made for the removal of

coal tar naphtha from the clothing. If the clothing is to be laundered or otherwise cleaned to remove the coal tar naphtha, the person performing the operation should be informed of coal tar naphtha's hazardous properties.

- Non-impervious clothing which becomes wet with liquid coal tar naphtha should be removed promptly and not reworn until the coal tar naphtha is removed from the clothing.

- Employees should be provided with and required to use splash-proof safety goggles where liquid coal tar naphtha may contact the eyes.

SANITATION

- Skin that becomes wet with liquid coal tar naphtha should be promptly washed or showered with soap or mild detergent and water to remove any coal tar naphtha.

COMMON OPERATIONS AND CONTROLS

The following list includes some common operations in which exposure to coal tar naphtha may occur and control methods which may be effective in each case:

Operation	Controls
Use in preparation of coal-tar paints	Process enclosure; general dilution ventilation; personal protective equipment
Use in preparation of coumarone and indene	General dilution ventilation; personal protective equipment
Use as a solvent in rubber industry in manufacture of water-proof cloth, shoe adhesives, and rubber tires	Process enclosure; general dilution ventilation; local exhaust ventilation; personal protective equipment
Use as a solvent, diluent, or thinner in paint, varnish, and lacquer industries	General dilution ventilation; local exhaust ventilation; personal protective equipment
Use in formulations of nitrocellulose and ethylcellulose	General dilution ventilation; local exhaust ventilation; personal protective equipment

Operation

Use as a solvent for polymerized styrol, short-oil phenolic varnishes, urea, resins, melamine, and other synthetic resins; use as a solvent for pesticides as DDT and Gammexane

Controls

General dilution ventilation; local exhaust ventilation; personal protective equipment

EMERGENCY FIRST AID PROCEDURES

In the event of an emergency, institute first aid procedures and send for first aid or medical assistance.

• Eye Exposure

If coal tar naphtha gets into the eyes, wash eyes immediately with large amounts of water, lifting the lower and upper lids occasionally. If irritation persists after washing, get medical attention. Contact lenses should not be worn when working with this chemical.

• Skin Exposure

If coal tar naphtha gets on the skin, promptly wash the contaminated skin using soap or mild detergent. If coal tar naphtha soaks through the clothing, remove the clothing immediately and wash the skin using soap or mild detergent. If irritation persists after washing, get medical attention.

• Breathing

If a person breathes in large amounts of coal tar naphtha, move the exposed person to fresh air at once. If breathing has stopped, perform artificial respiration. Keep the affected person warm and at rest. Get medical attention as soon as possible.

• Swallowing

If coal tar naphtha has been swallowed, do not induce vomiting. Get medical attention immediately.

• Rescue

Move the affected person from the hazardous exposure. If the exposed person has been overcome, notify someone else and put into effect the established emergency rescue procedures. Do not become a casualty. Understand the facility's emergency rescue procedures and know the locations of rescue equipment before the need arises.

SPILL, LEAK, AND DISPOSAL PROCEDURES

- Persons not wearing protective equipment and clothing should be restricted from areas of spills or leaks until cleanup has been completed.

- If coal tar naphtha is spilled or leaked, the following steps should be taken:

1. Remove all ignition sources.
2. Ventilate area of spill or leak.
3. For small quantities, absorb on paper towels. Evaporate in a safe place (such as a fume hood). Allow sufficient time for evaporating vapors to completely

clear the hood ductwork. Burn the paper in a suitable location away from combustible materials. Large quantities can be collected and atomized in a suitable combustion chamber. Coal tar naphtha should not be allowed to enter a confined space, such as a sewer, because of the possibility of an explosion.

• Waste disposal methods:

Coal tar naphtha may be disposed of:

1. By absorbing it in vermiculite, dry sand, earth or a similar material and disposing in a secured sanitary landfill.
2. By atomizing in a suitable combustion chamber.

REFERENCES

- American Conference of Governmental Industrial Hygienists: "Naphtha (Coal Tar)." *Documentation of the Threshold Limit Values for Substances in Workroom Air* (3rd ed., 2nd printing), Cincinnati, 1974.
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- American Industrial Hygiene Association: "Toluene." *Hygienic Guide Series*, Detroit, Michigan, 1964.
- American Industrial Hygiene Association: "Xylene." *Hygienic Guide Series*, Detroit, Michigan, 1971.
- Browning, E.: *Toxicity and Metabolism of Industrial Solvents*, Elsevier, New York, 1965.
- Grant, W. M.: *Toxicology of the Eye* (2nd ed.), C. C. Thomas, Springfield, Illinois, 1974.
- Sax, N. I.: *Dangerous Properties of Industrial Materials* (3rd ed.), Van Nostrand Reinhold, New York, 1968.

RESPIRATORY PROTECTION FOR NAPHTHA (COAL TAR)

Condition	Minimum Respiratory Protection* Required Above 100 ppm
Vapor Concentration	
1000 ppm or less	A chemical cartridge respirator with a full facepiece and an organic vapor cartridge(s).
5000 ppm or less	A gas mask with a chin-style or a front- or back-mounted organic vapor canister. Any supplied-air respirator with a full facepiece, helmet, or hood. Any self-contained breathing apparatus with a full facepiece.
10,000 ppm or less	A Type C supplied-air respirator with a full facepiece operated in pressure-demand or other positive pressure mode or with a full facepiece, helmet, or hood operated in continuous-flow mode.
Greater than 10,000 ppm or entry and escape from unknown concentrations	Self-contained breathing apparatus with a full facepiece operated in pressure-demand or other positive pressure mode.
	A combination respirator which includes a Type C supplied-air respirator with a full facepiece operated in pressure-demand or other positive pressure or continuous-flow mode and an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.
Fire Fighting	Self-contained breathing apparatus with a full facepiece operated in pressure-demand or other positive pressure mode.
Escape	Any gas mask providing protection against organic vapors.
	Any escape self-contained breathing apparatus.

*Only NIOSH-approved or MSHA-approved equipment should be used.

Material Safety Data Sheet

from Genium's Reference Collection
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GENIUM PUBLISHING CORP.

No. 351

STYRENE MONOMER

(Revision C)

Issued: August 1979

Revised: November 1988

SECTION 1. MATERIAL IDENTIFICATION

27

Material Name: STYRENE MONOMER

Description (Origin/Uses): Used widely in making polystyrene plastics, protective coatings, styrenated polyesters, copolymer resins, and as a chemical intermediate. Styrene-butadiene rubber (SBR) is the most extensively used type of synthetic rubber.

Other Designations: Phenyl Ethylene; Vinyl Benzene; Cinnamene; Ethylenylbenzene; Styrol; $C_6H_5CH=CH_2$; CAS No. 0100-42-5

Manufacturers: Contact your supplier or distributor. Consult the latest edition of the *Chemicalweek Buyers' Guide* (Genium ref. 73) for a list of suppliers.

HMIS

H	2	R	1
F	3	I	3
R	2	S	2
PPG*		K	0

*See sect. 8



NFPA

SECTION 2. INGREDIENTS AND HAZARDS

%

EXPOSURE LIMITS

Styrene, CAS No. 0100-42-5

Ca 100

OSHA PELs
8-Hr TWA: 50 ppm, 215 mg/m³
15-Min STEL: 100 ppm, 425 mg/m³

ACGIH TLVs (Skin*), 1988-89
TLV-TWA: 50 ppm, 215 mg/m³
TLV-STEL: 100 ppm, 425 mg/m³

Toxicity Data**

Human, Inhalation, LC₅₀: 10000 ppm (30 Mins)
Human, Inhalation, TC₅₀: 600 ppm

*This material can be absorbed through intact skin, which contributes to overall exposure.

**See NIOSH, RTECS (WL3675000), for additional data with references to reproductive, mutagenic, tumorigenic, and irritative effects.

SECTION 3. PHYSICAL DATA

Boiling Point: 293°F (145°C)

Melting Point: -23.08°F (-30.6°C)

Vapor Density (Air = 1): 3.6

Vapor Pressure: 4.3 Torrs at 59°F (15°C) and 10 Torrs at 87.44°F (30.8°C)

Evaporation Rate (n-Butylacetate = 1): 0.5

Molecular Weight: 104 Grams/Mole

Solubility in Water (%): Slight

Specific Gravity (H₂O = 1): 0.9059 at 68°F (20°C)

% Volatile by Volume: Ca 100

Appearance and Odor: A colorless-to-yellow, oily liquid; sweet, pleasant aromatic odor at low concentrations and unpleasant odor at high concentrations. The odor recognition threshold (100% of test panel, unfatigued) is 0.15 ppm in air.

SECTION 4. FIRE AND EXPLOSION DATA

Flash Point and Method: 88°F (31°C) CC

Autoignition Temperature: 914°F (490°C)

LEL: 1.1% v/v

UEL: 6.1% v/v

Extinguishing Media: Use foam, dry chemical, or carbon dioxide. Use water spray to cool fire-exposed containers, to disperse the styrene vapor, and to protect personnel who are attempting to stop a styrene leak. In the case of large fires the fire-fighting should be done from a distance or from a remote, explosion-proof position. Unusual Fire or Explosion Hazards: Styrene vapor is heavier than air and may travel a considerable distance to a low-lying source of ignition and flash back to its origin. Violent polymerization inside heated containers of styrene can occur at elevated temperatures; explosive rupturing of these containers is possible. Styrene vapor is uninhibited and can form polymers that will block the vents or flame arresters of storage tanks. 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

Stability/Polymerization: Styrene is stable in closed containers during routine operations. Hazardous polymerization can occur if the inhibitor fails or if the styrene monomer is exposed to excessive heat, light, or catalytic materials such as peroxides and strong acids.

Chemical Incompatibilities: Styrene reacts dangerously with oxidizing materials such as chlorosulfonic acid, oleum, and sulfuric acid.

Additionally, it can self-polymerize if the inhibitor becomes depleted, is removed, or is otherwise rendered ineffective. Conditions to Avoid: Avoid any exposure to sources of ignition and to incompatible chemicals, especially catalytic materials that can initiate or promote hazardous polymerization. Hazardous Products of Decomposition: Toxic gases such as carbon monoxide are formed by the thermal-oxidative decomposition of styrene during fires.

SECTION 6. HEALTH HAZARD INFORMATION

Carcinogenicity: Styrene is not listed as a carcinogen by the NTP, IARC, or OSHA. Some studies indicate that styrene may be mutagenic and teratogenic. Summary of Risks: Workers exposed to styrene vapor at 200 to 700 ppm experienced drowsiness, nausea, headache, fatigue, dizziness, and possibly a metallic taste in their mouths. Exposures above 800 ppm are immediately irritating to the eyes, nose, and the respiratory system. Repeated or prolonged skin contact with liquid styrene can cause defatting, dermatitis, and irritation. Excessive exposure through inhalation can cause narcotic effects and even death. A death has been reported from a 30-minute exposure at 10000 ppm. "Styrene sickness" has been described with symptoms of nausea, vomiting, and an intoxicated sensation. Medical Conditions Aggravated by Long-Term Exposure: None reported. Target Organs: Skin, eyes, respiratory system, and the central nervous system (CNS). Primary Entry: Inhalation, skin contact and absorption. Acute Effects: Skin and eye irritation; depression of the CNS symptomized by drowsiness.

SECTION 6. HEALTH HAZARD INFORMATION. cont.

unsteady gait, weakness, and loss of coordination. **Chronic Effects:** None reported. **FIRST AID:** **Eyes.** Immediately flush eyes, including under the eyelids, gently but thoroughly with flooding amounts of running water for at least 15 minutes. **Skin.** Rinse the affected area with flooding amounts of water and then wash it with soap and water. If large skin areas are involved, continue to carefully monitor the exposed person for signs of developing depression of the CNS, because liquid styrene can penetrate intact skin rapidly by absorption. **Inhalation.** Remove the exposed person to fresh air; restore and/or support his or her breathing as needed. Have qualified medical personnel administer oxygen as required. **Ingestion.** Unlikely. Should this type of exposure occur, slowly give the exposed person 4 to 8 glasses of milk or water to dilute the material, but do *not* induce vomiting. Never give anything by mouth to someone who is unconscious or convulsing. 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:** Treat CNS effects symptomatically. Styrene is excreted as hippuric acid; urine levels of this metabolite can be useful in determining the level of exposure to the styrene.

SECTION 7. SPILL, LEAK, AND DISPOSAL PROCEDURES

Spill/Leak: Notify safety personnel, evacuate unnecessary personnel, eliminate all sources of ignition immediately, and provide adequate ventilation. Cleanup personnel need protection against skin or eye contact with this liquid as well as inhalation of its 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 Disposal:** Dispose of contaminated styrene promptly; do not store contaminated liquid styrene for any length of time. Reclamation of spilled liquid styrene is not recommended; its reactivity and the possibility of contaminant-induced polymerization make reclamation unattractive. Contact your supplier or a licensed contractor for detailed recommendations. Follow Federal, state, and local regulations.

OSHA Designations

Listed as an Air Contaminant (29 CFR 1910.1000 Subpart Z).

EPA Designations (40 CFR 302.4)

CERCLA Hazardous Substance, Reportable Quantity: 1000 lbs (454 kg), per the Clean Water Act (CWA), § 311 (b) (4).

SECTION 8. SPECIAL PROTECTION INFORMATION

Goggles: Always wear protective eyeglasses or chemical safety goggles. Where splashing is possible, wear a full face shield. Follow OSHA eye- and face-protection regulations (29 CFR 1910.133). **Respirator:** Use a NIOSH-approved respirator per Genium reference 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 (spills or cleaning reactor vessels and storage tanks), wear an SCBA. **Warning:** Air-purifying respirators will *not* protect workers in oxygen-deficient atmospheres. **Other:** Wear impervious gloves, boots, aprons, and gauntlets, etc., to prevent prolonged or repeated skin contact with this material. **Ventilation:** Install and operate general and local maximum, explosion-proof ventilation systems powerful enough to maintain airborne levels of this material below the OSHA PEL standard cited in section 2. Local exhaust ventilation is preferred because it prevents dispersion of the contaminant into the general work area by eliminating it at its source. Consult the latest edition of Genium reference 103 for detailed recommendations. **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 your shoes and equipment. **Comments:** Practice good personal hygiene; always wash thoroughly after using this material and before eating, drinking, smoking, using the toilet, or applying cosmetics. Keep it off 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 its vapor.

SECTION 9. SPECIAL PRECAUTIONS AND COMMENTS

Storage/Segregation: Store styrene in closed containers in a cool, dry, well-ventilated area away from sources of ignition and strong oxidizers. Keep them out of direct sunlight. Protect containers from physical damage. Outside, isolated, or detached storage is recommended. **Special Handling/Storage:** Contamination of storage facilities, especially with polymerization initiators, must not occur. Store styrene in its original containers and remove from the storage area only the amount that is immediately needed. Control inventory carefully. Prolonged storage is strongly discouraged, and a first-in, first-out rotation system may be useful for proper stock rotation requirements. Check the styrene at least weekly to determine the inhibitor and polymer content if the material is being stored for any period of time in excess of 30 days at 90°F (32°C). Large tanks of styrene should be stored under a nitrogen blanket. **Engineering Controls:** Make sure all engineering systems (production, transportation) are of maximum explosion-proof design. Ground and bond all containers and pipelines, etc., used in shipping, transferring, reacting, production, and sampling operations to prevent static sparks. **Other:** Inhibited styrene can polymerize from frictional heat in a running centrifugal pump if the flow of the liquid is stopped.

Transportation Data (49 CFR 172.101-2)

DOT Shipping Name: Styrene Monomer, Inhibited

DOT Hazard Class: Flammable Liquid

ID No. UN2055

DOT Label: Flammable Liquid

DOT Packaging Exceptions: 49 CFR 173.118

IMO Shipping Name: Styrene Monomer, Inhibited

IMO Label: Flammable Liquid

IMO Hazard Class: 3.3

IMDG Packaging Group: II

References: 1, 38, 84-94, 100, 116, 117, 120, 122.

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Medical Review: MJ Hardies, MD

MATERIAL SAFETY DATA SHEET

GENIUM PUBLISHING CORPORATION

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MSDS # 355

PHENOL (Revision B)

Issued: September, 1980

Revised: September, 1995

From Genium's MSDS Collection, to be used as a reference.

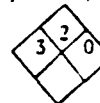
SECTION 1. MATERIAL IDENTIFICATION

MATERIAL NAME: PHENOL

OTHER DESIGNATIONS: Carboic Acid, Hydrobenzene, Oxybenzene, Phenic acid, Phenyl Hydrate, Phenyl hydroxide, Phenylic acid, Phenyl alcohol, CAS #000 108 952, C_6H_5OH

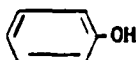
MANUFACTURER/SUPPLIER: Available from many suppliers, including:

Dow Chemical USA
2020 Dow Center
Midland MI 48640 (517) 636-1000



SECTION 2. INGREDIENTS AND HAZARDS

PHENOL



* Current OSHA PEL and ACGIH TLV/STEL (1984-85) (Skin) notation indicates a potential contribution to overall exposure via absorption through the skin.

NIOSH recommends a 10 hr. TWA of 20 mg/m^3 with a ceiling of 60 mg/m^3 for any 15 minute period.

% HAZARD DATA

ca 100
8 hr TWA: 5 ppm,
19 mg/m^3 (Skin)
STEL: 10 ppm, 38 mg/m^3 *
Human, Oral LDLo:
140 mg/kg
Rat, oral LDLo:
414 mg/kg
Rat, skin LD50:
669 mg/kg

SECTION 3. PHYSICAL DATA

Boiling Point @ 1 atm 359.4°F (181.9°C)

Vapor pressure @ 25°C 0.35

Vapor density (Air=1) 3.24

Solubility in water (% by wt.) ... 8.4 @ 20°C
(Sol. in all proportion @ temp. $>66^\circ\text{C}$)

APPEARANCE & ODOR: White crystalline solid with a characteristic sharp medicinal sweet, tangy odor which is detectable above 0.05 ppm. Phenol turns pink or red if it contains impurities or if it is exposed to heat or light.

Specific Gravity ($H_2O=1$):

Solid: 1.017 @ $25/4^\circ\text{C}$

Liquid: 1.0576 @ $41/4^\circ\text{C}$

Melting point 109.4°F (43°C)

Volatiles, % by vol @ 20°C .. ca 100

Evaporation rate (BuAc=1) ... <0.03

Viscosity, CPS, @ 80°C 1.51

Molecular weight 94.12

SECTION 4. FIRE AND EXPLOSION DATA

Lower Upper

Flash Point and Method

Autoignition Temp.

Flammability Limits in Air

175°F (79°C) C.C.

1319°F (715°C)

% by volume

1.5

8.6

EXTINGUISHING MEDIA: Carbon dioxide, dry chemical, or alcohol type foam. Do not use a solid stream of water since the stream will scatter and spread the fire. Use water spray to cool fire-exposed tanks/containers. Phenol presents a moderate fire hazard when exposed to heat, flame, or oxidizers. When heated, it emits toxic fumes and vapors which will form explosive mixtures with air. Solid phenol burns with difficulty, giving off a heavy smoke.

Firefighters should wear self-contained breathing apparatus and full protective clothing when fighting fires involving phenol. NOTE: Water containing phenol can cause severe chemical burns.

SECTION 5. REACTIVITY DATA

This material is stable at room temperature under normal handling and storage conditions. It does not undergo hazardous polymerization. Phenol is incompatible with strong oxidizing agents and halogens. Reaction with calcium hypochlorite is exothermic and produces toxic fumes which may ignite. Hot phenol is corrosive to many metals, including aluminum, lead, magnesium, and zinc. Reaction with these materials causes phenol to become discolored. Do not heat phenol above 122°F (90°C).

Thermal decomposition or burning produces oxides of carbon and water.

SECTION 6. HEALTH HAZARD INFORMATIONTLV 5 ppm or 19 mg/m³ (Skin)

Phenol is a general protoplasmic poison which is corrosive to body tissue. Poisoning can occur via skin absorption, vapor inhalation, or ingestion. Vapors of phenol are irritating to the eyes, nose, and throat. The liquid is rapidly absorbed through the skin. Contact with the skin causes a white wrinkled discoloration followed by a severe burn or systemic poisoning if not properly removed. Intense burning and pain from skin contact may be delayed. Absorption of phenol through skin may cause sudden collapse, or death. Symptoms develop rapidly. When ingested, phenol causes burning of the gastrointestinal tract, and blotches on the lips and in the mouth. Headache, nausea, dizziness, dyspnea, shock, convulsions, and death may follow exposures by any route. Chronic exposure to low concentrations of phenol may cause digestive disturbances, nervous disorders, skin eruptions, and death due to liver and kidney damage. The TLV is set to prevent systemic poisoning.

FIRST AID: **EYE CONTACT:** Immediately flush eyes, including under eyelids, with copious amounts of running water for at least 30 minutes. Get medical attention! (Inplant, community, paramedic). **SKIN CONTACT:** Immediately flush skin for at least 30 minutes while removing contaminated clothing and shoes. Get medical attention! **INHALATION:** Remove victim to fresh air. Restore and/or support breathing as necessary. Keep person warm and quiet. Transport to a medical facility. **INGESTION:** Give victim large quantities of milk or water as quickly as possible. Induce vomiting by touching back of throat with finger. Do not give fluids or induce vomiting if victim is unconscious or is having convulsions. Contact a physician or Poison Control Center and transport to a medical facility.

SECTION 7. SPILL, LEAK AND DISPOSAL PROCEDURES

Notify safety personnel of 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 clean-up. Close the leak immediately, if possible. Absorb small spills on paper, vermiculite or other absorbent and place in a closed metal container for disposal. Dike large spills and allow material to cool and solidify. Shovel solid into steel containers for disposal. Flush spill area thoroughly with water and collect flushings and wash water for disposal. Do not allow phenol to enter sewer, watersheds, or waterways! Notify proper authorities including the National Response Center (800-424-8802). Clean-up personnel must wear a self-contained breathing apparatus and full personal protective clothing and equipment. **DISPOSAL:** Burn contaminated waste in an approved incinerator. Phenol may be recovered by charcoal absorption, solvent extraction or steam stripping. A concentration of 1% by weight is required for economical recovery. Phenol is water soluble and is amenable to biological or chemical oxidation. Solutions can be chemically oxidized by chlorine, chlorine dioxide, or other oxidants. Phenol content of water supply not to exceed 0.001 mg/L. (DO NOT flush phenol down drains.) RCRA Hazardous Waste # U188 Reportable Spill Quantity ... 1000 lbs.

SECTION 8. SPECIAL PROTECTION INFORMATION

Provide general and local exhaust ventilation (explosion-proof) to meet TLV requirements. When phenol is heated, vapor inhalation can be a serious hazard without proper precaution. For emergency or nonroutine exposures where the TLV may be exceeded, use an appropriate NIOSH-approved full face respirator. Fume hoods should maintain a minimum face velocity of 100 fpm. All electrical service in use or storage areas should have an explosion-proof design.

DANGER! Avoid any contact with this material. Full protective equipment, including splash goggles, faceshield, impervious gloves, apron, boots, impervious shirt and trousers, hard hat with brim, acid suit and respirator should be available and worn as appropriate. Remove contaminated clothing immediately and do not reuse until it has been properly laundered.

Eyewash stations and safety showers should be readily available in use and handling areas.

Contact lenses pose a special hazard; soft lenses may absorb and all lenses concentrate irritants.

SECTION 9. SPECIAL PRECAUTIONS AND COMMENTS

Store in closed containers in a cool, dry, well-ventilated area away from heated surfaces, open flame and ignition sources. Outside or detached storage is preferred. Protect containers from physical damage. Phenol is a very dangerous compound. Do not breathe vapor or allow liquid to come in contact with the skin. Wear appropriate protective equipment and remove contaminated clothing immediately. Use extreme caution when transporting phenol to prevent leaks. Vent containers before heating and do not heat above 140°F (60°C). Do not eat or smoke in areas where this material is being used or handled. Do not allow employees who have diseases of the central nervous system, liver, kidney, or lungs to work in area of phenol exposure. Provide preplacement and periodic medical exams to employees working with phenol. Do not allow untrained workers to handle this material (see also ASTM D2286-Sampling and Handling Phenol).

ICC & DOT - CLASS B Poison.

LABEL: POISON

DATA SOURCE(S) CODE (See Glossary) 2-12, 15, 19, 23-24, 31, 34, 37, 38, 59, 79, R.

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APPROVALS

INDUST. HYGIENE/SAFETY

MEDICAL REVIEW:

J. C. Allen 11/85
J. W. 11-85
Dec 85

Material Safety Data Sheet

from Genium's Reference Collection
Genium Publishing Corporation
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Schenectady, NY 12303-1836 USA
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No. 385

ETHYL BENZENE

(Revision A)

Issued: August 1978

Revised: November 1988

SECTION 1. MATERIAL IDENTIFICATION

27

Material Name: ETHYL BENZENE

Description (Origin/Uses): Used as a solvent and as an intermediate in the production of styrene monomer.

Other Designations: Phenylethane; Ethylbenzol; $C_2H_5C_6H_5$; CAS No. 0100-41-4

Manufacturer: Contact your supplier or distributor. Consult the latest edition of the *Chemicalweek Buyers' Guide* (Genium ref. 73) for a list of suppliers.



NFPA

HMIS

H 2 R 1

F 3 I 3

R 0 S 2

PPG* K 4

*See sect. 8

SECTION 2. INGREDIENTS AND HAZARDS

%

EXPOSURE LIMITS

Ethyl Benzene, CAS No. 0100-41-4

Ca 100

OSHA PELs

8-Hr TWA: 100 ppm, 435 mg/m³

15- Min STEL: 125 ppm, 545 mg/m³

ACGIH TLVs, 1988-89

TLV-TWA: 100 ppm, 435 mg/m³

TLV-STEL: 125 ppm, 545 mg/m³

Toxicity Data*

Human, Inhalation, TC_{01} : 100 ppm (8 Hrs)

Rat, Oral, LD_{50} : 3500 mg/kg

*See NIOSH, RTECS (DA0700000), for additional data with references to reproductive, irritative, and mutagenic effects.

SECTION 3. PHYSICAL DATA

Boiling Point: 277°F (136°C)

Melting Point: -139°F (-95°C)

Vapor Pressure: 7.1 Torrs at 68°F (20°C)

Vapor Density (Air = 1): 3.7

% Volatile by Volume: Ca 100

Molecular Weight: 106 Grams/Mole

Solubility in Water (%): Slight

Specific Gravity ($H_2O = 1$): 0.86258 at 77°F (25°C)

Appearance and Odor: A clear, colorless, flammable liquid; characteristic aromatic hydrocarbon odor.

SECTION 4. FIRE AND EXPLOSION DATA

Flash Point and Method: 64°F (18°C) CC

Autoignition Temperature: 810°F (432.22°C)

LEL: 1% v/v

UEL: 6.7% v/v

Extinguishing Media: Use foam, dry chemical, or carbon dioxide to put out ethyl benzene fires. A water spray may be ineffective in extinguishing the fire, because it can scatter and spread the burning liquid. Use water spray to cool fire-exposed containers of ethyl benzene, to disperse ethyl benzene vapor, and to protect personnel attempting to stop an ethyl benzene leak. Unusual Fire or Explosion Hazards: This liquid can readily form explosive vapor-air mixtures, especially when heated. Ethyl benzene vapor is heavier than air and may travel a considerable distance to a low-lying source of ignition and flash back to its origin. 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

Stability/Polymerization: Ethyl benzene is stable in closed containers during routine operations. Hazardous polymerization cannot occur.

Chemical Incompatibilities: Hazardous chemical reactions can occur between ethyl benzene and strong oxidizing agents, acids, ammonia, and bases. Conditions to Avoid: Avoid any exposure to sources of ignition such as heat, sparks, open flame, and lighted tobacco products, etc., and to incompatible chemicals. Use caution when entering confined spaces, particularly low-lying areas where explosive concentrations of ethyl benzene vapor may be present. Provide good ventilation to such areas to prevent the concentration of this vapor. Hazardous Products of Decomposition: Thermal-oxidative degradation can include toxic gases such as carbon monoxide and/or aromatic hydrocarbon gases.

SECTION 6. HEALTH HAZARD INFORMATION

Carcinogenicity: Ethyl benzene is not listed as a carcinogen by the NTP, IARC, or OSHA.

Summary of Risks: Ethyl benzene vapor is severely irritating to the eyes and to the mucous membranes of the respiratory system. Sustained inhalation of excessive levels can cause depression of the central nervous system (CNS) characterized by dizziness, headache, narcosis, and coma. Skin contact with liquid ethyl benzene causes irritation; dermatitis and defatting can also develop. The acute oral toxicity of ethyl benzene is low; however, ingestion of it presents a serious aspiration hazard. Aspiring even a small amount into the lungs can result in extensive edema (lungs filled with fluid) and hemorrhaging of the lung tissue. No systemic effects are expected at the levels that produce pronounced, unignorable, disagreeable skin and eye irritation. The TLVs cited in section 2 are set to prevent this intolerable irritation. Medical Conditions Aggravated by Long-Term Exposure: None reported. Target Organs: Skin, eyes, respiratory system, and CNS. Primary Entry: Inhalation, skin contact. Acute Effects: Irritation of the skin, eyes, and respiratory system. Also, cardiac-rhythm disturbance due to sensitization; acute bronchitis, bronchospasm, pulmonary and laryngeal edema; euphoria; headache; giddiness; dizziness; and incoordination, as well as possible depression; confusion; and coma. Chronic Effects: None reported. First Aid: Eyes. Immediately

SECTION 6. HEALTH HAZARD INFORMATION, cont.

flush eyes, including under the eyelids, gently but thoroughly with flooding amounts of running water for at least 15 minutes. **Skin.** Rinse the affected area with plenty of water, then wash it with soap and water. **Inhalation.** Remove the exposed person to fresh air; restore and/or support his or her breathing as needed. Have qualified medical personnel administer oxygen as required. **Ingestion.** Unlikely. Should this type of exposure occur, the aspiration hazard must be considered. Do not induce vomiting unless directed to do so by a physician. To prevent aspiration by spontaneous vomiting, keep the victim's head low (between his or her knees). 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: Professional judgment is required as to whether or not to induce vomiting because of the possibility of aspiration. A gastric lavage may be administered, followed by saline catharsis, if this procedure is appropriate to the specific incident. Monitor cardiac and pulmonary functions.

SECTION 7. SPILL, LEAK, AND DISPOSAL PROCEDURES

Spill/Leak: Notify safety personnel, evacuate unnecessary personnel, eliminate all sources of ignition immediately, and provide adequate explosion-proof ventilation. Cleanup personnel need protection against skin or eye contact with this liquid as well as inhalation of its 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 Disposal:** Contact your supplier or a licensed contractor for detailed recommendations. Follow Federal, state, and local regulations.

OSHA Designations

Listed as an Air Contaminant (29 CFR 1910.1000 Subpart Z).

EPA Designations (40 CFR 302.4)

CERCLA Hazardous Substance, Reportable Quantity: 1000 lbs (454 kg), per the Clean Water Act (CWA), §§ 311 (b) (4) and 307 (a).

SECTION 8. SPECIAL PROTECTION INFORMATION

Goggles: Always wear protective eyeglasses or chemical safety goggles. Where splashing is possible, wear a full face shield. Follow OSHA eye- and face-protection regulations (29 CFR 1910.133). **Respirator:** Wear a NIOSH-approved respirator per Genium reference 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 (spills or cleaning reactor vessels and storage tanks), wear an SCBA. **Warning:** Air-purifying respirators will *not* protect workers in oxygen-deficient atmospheres. **Other:** Wear impervious gloves, boots, aprons, and gauntlets, etc., to prevent prolonged or repeated skin contact with this material. **Ventilation:** Install and operate general and local maximum, explosion-proof ventilation systems powerful enough to maintain airborne levels of this material below the OSHA PEL standard cited in section 2. Local exhaust ventilation is preferred because it prevents dispersion of the contaminant into the general work area by eliminating it at its source. Consult the latest edition of Genium reference 103 for detailed recommendations. **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. **Comments:** Practice good personal hygiene; always wash thoroughly after using this material and before eating, drinking, smoking, using the toilet, or applying cosmetics. Keep it off 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 ethyl benzene vapor.

SECTION 9. SPECIAL PRECAUTIONS AND COMMENTS

Storage/Segregation: Store ethyl benzene in closed containers in a cool, dry, well-ventilated area away from sources of ignition and strong oxidizers. Protect containers from physical damage. **Special Handling/Storage:** Outside, isolated, detached, or remote storage is recommended for large quantities of ethyl benzene. Isolate bulk storage areas from acute fire hazards. **Engineering Controls:** Make sure all engineering systems (production, transportation) are of maximum explosion-proof design. To prevent static sparks, electrically ground and bond all containers, pipelines, etc., used in shipping, transferring, reacting, production, and sampling operations. **Other:** Use safety cans for transferring small amounts of ethyl benzene.

Transportation Data (49 CFR 172.101-2)

DOT Shipping Name: Ethyl Benzene

DOT Hazard Class: Flammable Liquid

ID No. UN1175

DOT Label: Flammable Liquid

DOT Packaging Exceptions: 49 CFR 173.118

DOT Packaging Requirements: 49 CFR 173.119

IMO Shipping Name: Ethylbenzene

IMO Hazard Class: 3.2

IMO Label: Flammable Liquid

IMDG Packaging Group: II

References: 1, 26, 38, 84-94, 100, 116, 117, 120, 122.

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Industrial Hygiene Review: DJ Wilson, CIH

Medical Review: W Silverman, MD

Material Safety Data Sheet

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GENIUM PUBLISHING CORP.

No. 409

CRESOL
(Revision A)
Issued: December 1978
Revised: August 1988

SECTION 1. MATERIAL IDENTIFICATION

26

Material Name: CRESOL*

Description (Origin/Uses): 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 No. 1319-77-3

Manufacturer: Contact your supplier or distributor. Consult the latest edition of the *Chemicalweek Buyers' Guide* (Genium ref. 73) for a list of suppliers.

*See Genium Industrial MSDS 560 for data specific to *ortho*-cresol.

**Fire diamond for Cresol mixture Not Found.



*ortho***
NFPA



*meta and para***
NFPA

HMS

H 3 R 1

F 2 I 4

R 1 S 4

PPG* K 1

*See sect. 8

SECTION 2. INGREDIENTS AND HAZARDS

%

EXPOSURE LIMITS

Cresol, CAS No. 1319-77-3
ortho-Cresol, CAS No. 0095-48-7
meta-Cresol, CAS No. 0108-39-4
para-Cresol, CAS No. 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, or benzene are present in reportable quantities.

**This material can be absorbed through intact skin, which contributes to overall exposure.

***See NIOSH, RTECS (GO5950000, mixed cresol; GO6125000, *meta*; GO6300000, *ortho*; GO6475000, *para*), for additional data with references to reproductive, tumorigenic, mutagenic, and irritative effects.

OSHA PEL (Skin**)
8-Hr TWA: 5 ppm, 22 mg/m³ (All Isomers)

ACGIH TLV (Skin**), 1987-88
TLV-TWA: 5 ppm, 22 mg/m³

Toxicity Data***

Rat, Oral, LD₅₀: 1454 mg/kg
Mouse, Oral, LD₅₀: 760 mg/kg
Rabbit, Skin, LD₅₀: 2000 mg/kg

SECTION 3. PHYSICAL DATA

Boiling Point*

Specific Gravity ($\text{H}_2\text{O} = 1$): 1.1

Vapor Pressure*

Water Solubility (%): Slight

Molecular Weight: 108 Grams/Mole

pH: Acidic

Appearance and 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.

*Contact your supplier to determine the specific physical properties of the cresol product.

SECTION 4. FIRE AND EXPLOSION DATA

LOWER

UPPER

Flash Point and Method

Autoignition Temperature

Flammability Limits in Air

*

*

% by Volume

*

*

Extinguishing Media: *Contact your supplier for this data. 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.

SECTION 5. REACTIVITY DATA

Cresol is stable in closed containers at room temperature under normal storage and handling conditions. It cannot undergo hazardous polymerization.

Chemical Incompatibilities: This material 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 Products of Decomposition: Toxic gases such as carbon monoxide and heated cresol and/or cresol derivatives like phenol may be produced during fires.

SECTION 6. HEALTH HAZARD INFORMATION

Cresol is not listed as 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 Aggravated by Long-Term Exposure: Preexisting kidney or hepatic (liver) problems.

Primary Entry: Skin absorption/contact, inhalation. **Acute Effects:** Skin and eye burns, difficulty in breathing, and respiratory failure. **Chronic Effects:** 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.

FIRST AID: **Eyes.** 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.** 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 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 is responsive, give 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 7. SPILL, LEAK, AND DISPOSAL PROCEDURES

Spill/Leak: Notify safety personnel, provide ventilation, and eliminate all 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 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. 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 8. SPECIAL PROTECTION INFORMATION

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. **Warning:** Air-purifying respirators will *not* protect workers in oxygen-deficient atmospheres. **Other:** Wear impervious gloves, boots, aprons, gauntlets, etc., to prevent skin contact with cresol. **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. **Comments:** Practice good personal hygiene; always wash thoroughly after using this material. Keep it off 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.

SECTION 9. SPECIAL PRECAUTIONS AND COMMENTS

Storage/Segregation: Store cresol in a cool, dry, well-ventilated area away from incompatible chemicals (see sect. 5) and 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 Hazard Class: Corrosive Material

DOT Label: Corrosive

DOT ID No. UN2076

IMO Class: 6.1

IMO Label: Poison

References: 1, 2, 26, 38, 84-94, 100, 112, 113, 114.

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Material Safety Data Sheet

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No. 624

NAPHTHALENE

Issued: November 1987

SECTION 1. MATERIAL IDENTIFICATION

24

Material Name: NAPHTHALENE

Description (Origin/Uses): Used as a moth repellant and in many industrial processes.

Other Designations: Naphthalin; Naphthene; Tar Camphor; $C_{10}H_8$;
NIOSH RTECS No. Q10525000; 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 1
R 0 I 4
PPG* S 1
*See sect. 8 K 2



SECTION 2. INGREDIENTS AND HAZARDS

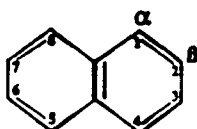
%

EXPOSURE LIMITS

Naphthalene, CAS No. 0091-20-3

ca 100

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

*Immediately dangerous to life and health

**See NIOSH RTECS for additional data with references to irritative, mutagenic, reproductive, and tumorigenic effects.

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 ($H_2O = 1$): 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 PH

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Approvals

Indust. Hygiene/Safety

Medical Review

Occupational Health Guideline for Cyanide

INTRODUCTION

This guideline is intended as a source of information for employees, employers, physicians, industrial hygienists, and other occupational health professionals who may have a need for such information. It does not attempt to present all data; rather, it presents pertinent information and data in summary form.

APPLICABILITY

The general guidelines contained in this document apply to all cyanides. Physical and chemical properties of two specific compounds are provided for illustrative purposes.

SUBSTANCE IDENTIFICATION

Potassium cyanide

- **Formula:** KCN
- **Synonyms:** None
- **Appearance and odor:** White solid with a faint almond odor.

Sodium cyanide

- **Formula:** NaCN
- **Synonyms:** None
- **Appearance and odor:** White solid with a faint almond odor.

PERMISSIBLE EXPOSURE LIMIT (PEL)

The current OSHA standard for cyanide is 5 milligrams of cyanide per cubic meter of air (mg/m^3) averaged over an eight-hour work shift. NIOSH has recommended that the permissible exposure limit be changed to a ceiling of 5 milligrams cyanide per cubic meter of air averaged over a 10-minute period. The NIOSH Criteria Document for Hydrogen Cyanide and Cyanide Salts should be consulted for more detailed information.

These recommendations reflect good industrial hygiene and medical surveillance practices and their implementation will assist in achieving an effective occupational health program. However, they may not be sufficient to achieve compliance with all requirements of OSHA regulations.

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service Centers for Disease Control
National Institute for Occupational Safety and Health

HEALTH HAZARD INFORMATION

• Routes of exposure

Cyanide can affect the body if it is inhaled, if it comes in contact with the eyes or skin, or if it is swallowed. Sufficient cyanide may be absorbed through the skin, especially if there are cuts to cause fatal poisoning.

• Effects of overexposure

1. Short-term Exposure: Inhalation or ingestion of cyanide salts may be rapidly fatal. Larger doses by inhalation or swallowing may cause the person to rapidly lose consciousness, stop breathing, and die. In some cases, there are convulsions. At lower levels of exposure, the earlier symptoms include weakness, headache, confusion, nausea, and vomiting. These symptoms may be followed by unconsciousness and death. Occasionally, convulsions occur. Milder forms of intoxication may result only in weakness, dizziness, headache, and nausea. The dust of cyanide salts is irritating to the eyes. In the presence of tears, it may cause the symptoms of poisoning described above. The dust of cyanide salts may produce irritation of the nose and skin. Strong solutions of cyanide salts are corrosive and may produce ulcers.

2. Long-term Exposure: Effects from chronic exposure to cyanide are non-specific and rare.

3. Reporting Signs and Symptoms: A physician should be contacted if anyone develops any signs or symptoms and suspects that they are caused by exposure to cyanide.

• Recommended medical surveillance

The following medical procedures should be made available to each employee who is exposed to cyanide at potentially hazardous levels:

1. Initial Medical Examination:

—A complete history and physical examination: The purpose is to detect pre-existing conditions that might place the exposed employee at increased risk, and to establish a baseline for future health monitoring. Persons with a history of fainting spells, such as occur in various types of cardiovascular and nervous disorders,

and those unusually susceptible to effects of anoxia or with anemia would be expected to be at increased risk from exposure. Examination of the cardiovascular, nervous, and upper respiratory systems, and thyroid should be stressed. The skin should be examined for evidence of chronic disorders.

—Skin disease: Cyanide is a defatting agent and can cause dermatitis on prolonged exposure. Persons with pre-existing skin disorders may be more susceptible to the effects of this agent.

—14" x 17" chest roentgenogram: Cyanide causes human lung damage. Surveillance of the lungs is indicated.

—FVC and FEV (1 sec): Cyanide is a respiratory irritant. Persons with impaired pulmonary function may be at increased risk from exposure. Periodic surveillance is indicated.

2. Periodic Medical Examination: The aforementioned medical examinations should be repeated on an annual basis.

3. First Aid Kits: First aid kits should be readily available in workplaces where there is a potential for the release of cyanide. These kits should contain a minimum of 48 ampules, each of 0.3 ml amyl nitrate, and complete instructions for use. In addition, 2 physician's kits should be immediately available to trained medical personnel. These kits should contain the above quantity of amyl nitrate as well as sterile sodium nitrite solution (3%) and sterile sodium thiosulfate solution (25%). All of the above drugs should be replaced at least biannually to ensure their potency.

• Summary of toxicology

The dust of cyanide salts, a source of cyanide ion, is an asphyxiant due to an inhibitory action on metabolic enzyme systems and can be rapidly fatal. Cyanide exerts this effect because it inactivates certain enzymes by forming very stable complexes with the metal in them. Cytochrome oxidase is probably the most important of these, since it occupies a fundamental position in the respiratory process and is involved in the ultimate electron transfer to molecular oxygen. Since cytochrome oxidase is present in practically all cells that function under aerobic conditions, and since the cyanide ion diffuses easily to all parts of the body, it is capable of suddenly bringing to a halt practically all cellular respiration. In the presence of even weak acids, hydrocyanic acid (HCN) gas is liberated from cyanide salts; a few inhalations of higher concentrations of HCN may be followed by almost instantaneous collapse and cessation of respiration; 270 ppm HCN is immediately fatal to humans, 181 ppm is fatal after 10 minutes, 135 ppm after 30 minutes, and 110 ppm may be fatal in 1 hour. The ingestion by humans of 50 to 100 mg of sodium or potassium cyanide may also be fatal. At lower levels of exposure to HCN, the earliest symptoms of intoxication may include weakness, headache, confusion, and occasionally nausea and vomiting; respiratory rate and depth is usually increased initially and at later stages becomes slow and gasping; if cyanosis is present,

it usually indicates that respiration has either ceased or has been very inadequate for a few minutes. Humans tolerate 45 to 54 ppm for ½ to 1 hour without immediate or delayed effects, while 18 to 36 ppm may result in some symptoms after an exposure of several hours. Sodium cyanide dust is irritating to the eyes; in the presence of tears it may liberate HCN, which can be absorbed and cause systemic intoxication. Skin contact with dust may be irritating; strong solutions on the skin produce ulcers which are slow in healing. Cyanide is one of the few toxic materials for which an antidote exists; it functions as follows: First, amyl nitrite (inhalation) and sodium nitrite (intravenously) are administered to form methemoglobin, which binds firmly with free cyanide ions. This traps any circulating cyanide ions. The formation of 10 to 20% methemoglobin usually does not involve appreciable risk, yet provides a large amount of cyanide-binding substance. Second, sodium thiosulfate is administered intravenously to increase the rate of conversion of cyanide to the less toxic thiocyanate. Methylene blue should not be administered, because it is a poor methemoglobin former and, moreover, promotes the conversion of methemoglobin back to hemoglobin.

CHEMICAL AND PHYSICAL PROPERTIES

• Physical data—Potassium cyanide

1. Molecular weight: 65.1
2. Boiling point (760 mm Hg): Data not available
3. Specific gravity (water = 1): 1.55
4. Vapor density (air = 1 at boiling point of potassium cyanide): Not applicable
5. Melting point: 635 C (1175 F)
6. Vapor pressure at 20 C (68 F): Essentially zero
7. Solubility in water, g/100 g water at 20 C (68 F): 71.6
8. Evaporation rate (butyl acetate = 1): Not applicable

• Physical data—Sodium cyanide

1. Molecular weight: 49
2. Boiling point (760 mm Hg): 1500 C (2732 F) (extrapolated)
3. Specific gravity (water = 1): 1.6
4. Vapor density (air = 1 at boiling point of sodium cyanide): Not applicable
5. Melting point: 560 C (1040 F)
6. Vapor pressure at 20 C (68 F): Essentially zero
7. Solubility in water, g/100 g water at 20 C (68 F): 58
8. Evaporation rate (butyl acetate = 1): Not applicable

• Reactivity

1. Conditions contributing to instability: None. Hazardous if kept in closed containers. It may form toxic concentrations of hydrogen cyanide gas when in prolonged contact with air in a closed area.
2. Incompatibilities: Contact with strong oxidizers such as nitrates and chlorates may cause fires and

explosions. Contact with acids and acid salts causes immediate formation of toxic and flammable hydrogen cyanide gas.

3. Hazardous decomposition products: Toxic gases and vapors (such as hydrogen cyanide and carbon monoxide) may be released when cyanide decomposes.

4. Special precautions: Cyanide may react with carbon dioxide in ordinary air to form toxic hydrogen cyanide gas.

- **Flammability**

- 1. Not combustible

- **Warning properties**

- 1. Odor Threshold: No quantitative information is available concerning the odor threshold of sodium or potassium cyanide. HCN, however, is evolved from these substances in the presence of moisture. The Manufacturing Chemists Association states that "although HCN has a characteristic odor, its toxic action at hazardous concentrations is so rapid that it is of no value as a warning property."

- 2. Eye Irritation Level: Cyanide (as CN) is not known to be an eye irritant. However, according to Grant, HCN can produce eye irritation after chronic exposures.

- 3. Evaluation of Warning Properties: Although cyanide (as CN) has a negligible vapor pressure, in the presence of moisture HCN can be given off. HCN does not have adequate warning properties.

MONITORING AND MEASUREMENT PROCEDURES

- **Eight-Hour Exposure Evaluation**

Measurements to determine employee exposure are best taken so that the average eight-hour exposure is based on a single eight-hour sample or on two four-hour samples. Several short-time interval samples (up to 30 minutes) may also be used to determine the average exposure level. Air samples should be taken in the employee's breathing zone (air that would most nearly represent that inhaled by the employee).

- **Ceiling Evaluation**

Measurements to determine employee ceiling exposure are best taken during periods of maximum expected airborne concentrations of cyanide. Each measurement should consist of a ten (10) minute sample or series of consecutive samples totalling ten (10) minutes in the employee's breathing zone (air that would most nearly represent that inhaled by the employee). A minimum of three (3) measurements should be taken on one work shift and the highest of all measurements taken is an estimate of the employee's exposure.

- **Method**

Sampling and analyses may be performed by collection of cyanide with a cellulose membrane filter and an impinger containing sodium hydroxide, followed by analysis by direct potentiometry. An analytical method for cyanide is in the *NIOSH Manual of Analytical Methods*, 2nd Ed., Vol. 3, 1977, available from the

RESPIRATORS

- Good industrial hygiene practices recommend that engineering controls be used to reduce environmental concentrations to the permissible exposure level. However, there are some exceptions where respirators may be used to control exposure. Respirators may be used when engineering and work practice controls are not technically feasible, when such controls are in the process of being installed, or when they fail and need to be supplemented. Respirators may also be used for operations which require entry into tanks or closed vessels, and in emergency situations. If the use of respirators is necessary, the only respirators permitted are those that have been approved by the Mine Safety and Health Administration (formerly Mining Enforcement and Safety Administration) or by the National Institute for Occupational Safety and Health.

- In addition to respirator selection, a complete respiratory protection program should be instituted which includes regular training, maintenance, inspection, cleaning, and evaluation.

PERSONAL PROTECTIVE EQUIPMENT

- Employees should be provided with and required to use impervious clothing, gloves, face shields (eight-inch minimum), and other appropriate protective clothing necessary to prevent any possibility of skin contact with cyanide or liquids containing cyanide.

- If employees' clothing has had any possibility of being contaminated with cyanide, employees should change into uncontaminated clothing before leaving the work premises.

- Clothing which has had any possibility of being contaminated with cyanide should be placed in closed containers for storage until it can be discarded or until provision is made for the removal of cyanide from the clothing. If the clothing is to be laundered or otherwise cleaned to remove the cyanide, the person performing the operation should be informed of cyanide's hazardous properties.

- Where there is any possibility of exposure of an employee's body to cyanide or liquids containing cyanide, facilities for quick drenching of the body should be provided within the immediate work area for emergency use.

- Non-impervious clothing which becomes contaminated with cyanide should be removed immediately and not reworn until the cyanide is removed from the clothing.

- Employees should be provided with and required to use dust- and splash-proof safety goggles where there is any possibility of cyanide or liquids containing cyanide contacting the eyes.

- Where there is any possibility that employees' eyes may be exposed to cyanide or liquids containing cyanide, an eye-wash fountain should be provided within the immediate work area for emergency use.

SANITATION

- Skin that becomes contaminated with cyanide should be immediately washed or showered with soap or mild detergent and water to remove any cyanide.
- Workers subject to skin contact with cyanide should wash with soap or mild detergent and water any areas of the body which may have contacted cyanide at the end of each work day.
- Eating and smoking should not be permitted in areas where cyanide or liquids containing cyanide are handled, processed, or stored.
- Employees who handle cyanide or liquids containing cyanide should wash their hands thoroughly with soap or mild detergent and water before eating, smoking, or using toilet facilities.

COMMON OPERATIONS AND CONTROLS

The following list includes some common operations in which exposure to cyanide may occur and control methods which may be effective in each case:

Operation	Controls
Use as fumigants and pesticides in greenhouses, ships, mills, and warehouses; use of cyanogen chloride as a warning agent in fumigant gases	Local exhaust ventilation; general dilution ventilation; personal protective equipment
Use in metal treatment in nitriding, tempering, and case hardening steel; coloring of metals by chemical or electrolytic process; cleaning and coating metals; welding and cutting of heat-resistant metals; liberation during ore extraction and metal purification	Process enclosure; local exhaust ventilation; general dilution ventilation; personal protective equipment

Operation

Use of calcium cyanamid in fertilizer on soil; during chemical synthesis for manufacture of intermediates in pharmaceuticals, dyes, vitamins, plastics, and sequestering agents; preparation of nitriles, carbamides, cyano fatty acids, and inorganic cyanides

Use in cellulose technology; paper manufacture; in dyeing; as cement stabilizers; use in photography as fixatives, and in blueprinting and process engraving; liberation in blast furnace gases or in handling of illuminating gas

Controls

Process enclosure; local exhaust ventilation; general dilution ventilation; personal protective equipment

Process enclosure; local exhaust ventilation; general dilution ventilation; personal protective equipment

EMERGENCY FIRST AID PROCEDURES

In the event of an emergency, institute first aid procedures and send for first aid or medical assistance.

• Eye Exposure

If cyanide gets into the eyes, wash eyes immediately with large amounts of water, lifting the lower and upper lids occasionally. Get medical attention immediately. Contact lenses should not be worn when working with cyanides.

• Skin Exposure

If cyanide gets on the skin, immediately wash the contaminated skin using soap or mild detergent and water. If cyanide penetrates through the clothing, remove the clothing immediately and wash the skin using soap or mild detergent and water. Get medical attention immediately.

• Breathing

If a person breathes in large amounts of cyanide, move the exposed person to fresh air at once. If breathing has stopped, perform artificial respiration. Keep the affected person warm and at rest. Get medical attention as soon as possible.

• Swallowing

When cyanide has been swallowed and the person is conscious, give the person large quantities of water immediately. After the water has been swallowed, try to get the person to vomit by having him touch the back of his throat with his finger. Do not make an unconscious person vomit. Get medical attention immediately.

- **Rescue**

Move the affected person from the hazardous exposure. If the exposed person has been overcome, notify someone else and put into effect the established emergency rescue procedures. Do not become a casualty. Understand the facility's emergency rescue procedures and know the locations of rescue equipment before the need arises.

SPILL AND DISPOSAL PROCEDURES

- Persons not wearing protective equipment and clothing should be restricted from areas of spills until cleanup has been completed.

- If cyanide is spilled, the following steps should be taken:

1. Ventilate area of spill.

2. Collect spilled material in the most convenient and safe manner for reclamation, or for treatment in a cyanide disposal system.

- Waste disposal method:

After treatment as in above, cyanide may be disposed of in a secured sanitary landfill.

REFERENCES

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RESPIRATORY PROTECTION FOR CYANIDE

Condition

Minimum Respiratory Protection* Required Above 5 mg/m³

Particulate Concentration

50 mg/m³ or less

Any supplied-air respirator.

Any self-contained breathing apparatus.

Greater than 50 mg/m³ or
entry and escape from
unknown concentrations

Self-contained breathing apparatus with a full facepiece operated in pressure-demand or other positive pressure mode.

A combination respirator which includes a Type C supplied-air respirator with a full facepiece operated in pressure-demand or other positive pressure or continuous-flow mode and an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.

Fire Fighting

Self-contained breathing apparatus with a full facepiece operated in pressure-demand or other positive pressure mode.

Escape

Any gas mask providing protection against hydrogen cyanide and particulates.

Any escape self-contained breathing apparatus.

Only NIOSH-approved or MSHA-approved equipment should be used.

EXHIBIT E-3

SAMPLE MEDICAL DATA SHEET

CONFIDENTIAL

THE FOLLOWING INFORMATION IS REQUESTED TO DETERMINE YOUR
CURRENT MEDICAL STATUS

Date

1. Name (Last, First, Middle Initial)			3. Social Security Number		
2. Employee Address (Number & Street)		City - State		Zip Code	
4. Telephone Number					
5. Sex* <input type="checkbox"/> M <input type="checkbox"/> F	6. Birth Date*	7. Name and Address of Person to Notify in an Emergency			8. Telephone Number
9. Personal Physician		Address		Telephone Number	11. Type of Examination <input type="checkbox"/> Pre-Placement <input type="checkbox"/> Periodic <input type="checkbox"/> Other (Specify)
10. Which Division or Facility		Position		12. I.D. or Clock No.	
13. Work Location					
14. Please Check if You Have Been Immunized For:					15. Are You:
<input type="checkbox"/> Tetanus		<input type="checkbox"/> Smallpox		<input type="checkbox"/> Right Handed	
<input type="checkbox"/> Don't Know		<input type="checkbox"/> Don't Know		<input type="checkbox"/> Left Handed	
<input type="checkbox"/> Polio		<input type="checkbox"/> Others		<input type="checkbox"/> Ambidextrous	
<input type="checkbox"/> Don't Know		<input type="checkbox"/> Don't Know		<input type="checkbox"/> Don't Know	
LAST DATE		LAST DATE		LAST DATE	

16. Family History*				CHECK EACH BOX (If answer is yes, state blood relationship)		
RELATION	AGE	STATE OF HEALTH	IF DEAD, CAUSE AND AGE	YES	NO	RELATION
Father						Cancer
Mother						Diabetes
Spouse						Stomach Trouble
Grandparents						Kidney Trouble
						Heart Trouble
						Tuberculosis
						Mental Disorder
Brothers						Convulsions
						Anemia
Sisters						Allergies
						Other
Children						

17. Personal History*

DO YOU HAVE, OR HAVE YOU EVER HAD ANY OF THE FOLLOWING: (Check Each Box)

	YES	NO		YES	NO		YES	NO
Anemia			Female Disorders			Malaise		
Asthma			Foot Trouble			Nervous Breakdown		
Cancer, Cyst, Tumor or Growth			Frequent Indigestion or Heartburn			Nervous Trouble of Any Sort		
Chest Pain or Shortness of Breath			Frequent or Painful Urination			Numbness, Weakness		
Chills, Fever, Night Sweats			Frequent Trouble Sleeping			Palitation or Pounding Heart		
Chronic Cough or Colds			Gall Bladder Trouble			Prostate Trouble		
Convulsions, Fits,			Goiter or Thyroid Problem			Reaction from Medicines		
or Failing Sickness			Hayfever or Allergies			Recent Gain or Loss of Weight		
Coughing Up, Spitting, or			Headaches, Frequent or Severe			Rheumatism or Arthritis		
Vomiting Blood			Heart Trouble			Scarlet Fever or Rheumatic Fever		
Exhaustion or Excessive Worry			Hemorrhoids or Rectal Trouble			Skin Rash or Hives		
Diabetes, or Sugar in Urine			Hernia or Rupture			Stomach Trouble, Ulcers		
Dizziness			High Blood Pressure			Swelling of Ankles or Feet		
Ear, Nose, or Throat Trouble			Jaundice or Hepatitis			Swollen or Painful Joints		
Epilepsy			Kidney Trouble or Blood in Urine			Tuberculosis or Pleurisy		
Eye Trouble			Liver Trouble			Vascular Veins		
Fainting			"Locked" Knee or "Trick Joint"			Veneral Disease		
Fatigue, Chronic or Frequent			Loss of Appetite, Chronic			Other		

18. Injuries: Please Check Any Injuries You Have Had

- | | | | |
|---|---------------------------------------|--|--|
| <input type="checkbox"/> Fractures/Broken Bones | <input type="checkbox"/> Severe Cuts | <input type="checkbox"/> Loss of Consciousness | <input type="checkbox"/> Back Injury |
| <input type="checkbox"/> Severe Burns | <input type="checkbox"/> Dislocations | <input type="checkbox"/> Low Back Pain | <input type="checkbox"/> Loss of Arm, Leg, Finger, Toe |
| <input type="checkbox"/> Other Injury | <input type="checkbox"/> None | | |

19. Check Yes or No. If Yes, Give Details in Blank Area.

	YES	NO
a. Any Time Loss From Work Past Two Years Due to Illness.		
b. Any Brace or Support Worn		
c. Discharged or Disqualified From Armed Services for Any Reason.		
d. Military Service - Dates and Locations.		
e. Applied for, or Received Workmen's Compensation.		
f. Been Exposed to Work With Dusts, Radiation, Excessive Noise, Chemicals.		
g. Have You Been Unable to Hold a Job Because of:		
1. Sensitivity to Chemicals, Dust, Sunlight, etc.		
2. Inability to Perform Certain Motions.		
3. Inability to Assume Certain Positions.		
4. Other Medical Reasons.		
h. Been a Patient in a Hospital or Sanitarium.		
i. Had Surgery Recommended or Performed Date and Type.		
j. Are You Taking Medicines Now.		
k. Have You Been Turned Down on a Physical Examination or Been Informed of Any Abnormal Findings From a Physical Examination.		
l. Do You Smoke - If Yes, Quantity Per Day.		
m. Do You Use Alcoholic Beverages - If Yes, Quantity Per Day.		
n. Have You Lived or Travelled Outside the Continental U.S.A.		
o. Allergies.		

EXHIBIT E-4

ACCIDENT REPORT FORM

ACCIDENT REPORT

Report No. _____

STATE: _____ PROJECT NO.: _____

Location: _____

Date of Report: _____ Preparer's Name: _____

Name and Address of Injured: _____ SSN: _____ Age: _____

Sex: _____

Years of Service: _____ Time on Present Job: _____ Title/Classification: _____

Division/Department: _____ Date of Accident: _____ Time: _____

Accident Category: _____ Motor Vehicle _____ Property Damage _____ Fire

_____ Chemical Exposure _____ Near Miss _____ Other

Severity of Injury or Illness: _____ Non-disabling _____ Disabling

_____ Medical Treatment _____ Fatality

Amount of Damage: \$ _____ Property Damaged: _____

Estimated Number of Days Away from Job: _____

Nature of Injury or Illness: _____

CLASSIFICATION OF INJURY:

_____ Fractures
_____ Dislocations
_____ Sprains
_____ Abrasions
_____ Lacerations
_____ Punctures
_____ Bites

_____ Heat Burns
_____ Chemical Burns
_____ Radiation Burns
_____ Bruises
_____ Blisters
_____ Toxic Respiratory
Exposure
_____ Toxic Ingestion

_____ Cold Exposure
_____ Frostbite
_____ Heat Stroke
_____ Heat Exhaustion
_____ Concussion
_____ Faint/Dizziness
_____ Toxic
Respiratory
Allergy
_____ Dermal Allergy

Part of Body Affected: _____

Degree of Disability: _____

Date Medical Care was Received: _____

Where Medical Care was Received: _____

Address (if off-site): _____

ACCIDENT LOCATION: _____

Was weather a factor: _____

Unsafe act by injured and/or others contributing to the accident (Be specific, must be answered):

Personal factors (Improper attitude, lack of knowledge of skill, slow reaction, fatigue):

Level of personal protection equipment required in Site Safety Plan: _____

Modifications: _____

Was injured using required equipment: _____

If not, how did actual equipment use differ from plan: _____

Detailed narrative description (How did accident occur, why; objects, equipment, tools used, circumstance assigned duties) (Be specific):

(Use back of sheet, as required)

Witnesses to accident: _____

Signature of Preparer _____

Signature of Site Leader _____

EXHIBIT E-5

OSHA FORM 200

Bureau of Labor Statistics
Log and Summary of Occupational
Injuries and Illnesses

U.S. Department of Labor



NOTE: This form is required by Public Law 91-596 and must be kept in the establishment for 3 years. Failure to maintain and post can result in the issuance of citations and assessment of penalties. (See posting requirements on the other side of form.)

RECORDABLE CASES: You are required to record information about every occupational death, every nonfatal occupational illness, and those nonfatal occupational injuries which involve one or more of the following: loss of consciousness, restriction of work or motion, transfer to another job, or medical treatment (other than first aid). (See definitions on the other side of form.)

Company Name _____ For Calendar Year 19 _____ Page _____ of _____

Establishment Name _____

Establishment Address _____

Form Approved
OMB No. 1220-0029
See OMB Disclosure
Statement on reverse

Case or File Number	Date of Injury or Onset of Illness	Employee's Name	Occupation	Department	Description of Injury or Illness	Extent of and Outcome of INJURY						Type, Extent of, and Outcome of ILLNESS												
						Fatalities		Nonfatal Injuries				Fatalities		Nonfatal Illnesses										
						Injury Related	Nonfatal Injuries	Injury Without Lost Workdays	Injury With Lost Workdays	Injury Without Lost Workdays	Injury With Lost Workdays	Type of Illness	Injury Without Lost Workdays	Injury With Lost Workdays	Injury Without Lost Workdays	Injury With Lost Workdays	Injury Without Lost Workdays	Injury With Lost Workdays						
(A)	(B)	(C)	(D)	(E)	(F)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)						
TOTALS																								

INJURIES

ILLNESS

OMB DISCLOSURE STATEMENT

We estimate that it will take from 4 minutes to 30 minutes to complete a line entry on this form, including time for reviewing instructions; searching, gathering and maintaining the data needed; and completing and reviewing the entry. If you have any comments regarding this estimate or any other aspect of this recordkeeping system, send them to the Bureau of Labor Statistics, Division of Management Systems (1220-0029), Washington, D.C. 20212 and to the Office of Management and Budget, Paperwork Reduction Project (1220-0029), Washington, D.C. 20503.

Instructions for OSHA No. 200

I. Log and Summary of Occupational Injuries and Illnesses

Each employer who is subject to the recordkeeping requirements of the Occupational Safety and Health Act of 1970 must maintain for each establishment a log of all recordable occupational injuries and illnesses. This form (OSHA No. 200) may be used for that purpose. A substitute for the OSHA No. 200 is acceptable if it is as detailed, easily readable, and understandable as the OSHA No. 200.

Enter each recordable case on the log within six (6) workdays after learning of its occurrence. Although other records must be maintained at the establishment to which they refer, it is possible to prepare and maintain the log at another location, using data processing equipment if desired. If the log is prepared elsewhere, a copy updated to within 45 calendar days must be present at all times in the establishment.

Logs must be maintained and retained for five (5) years following the end of the calendar year to which they relate. Logs must be available (normally at the establishment) for inspection and copying by representatives of the Department of Labor, or the Department of Health and Human Services, or States accorded jurisdiction under the Act. Access to the log is also provided to employees, former employees and their representatives.

II. Changes in Extent of or Outcome of Injury or Illness

If, during the 5 year period the log must be retained, there is a change in an extent and outcome of an injury or illness which affects entries in columns 1, 2, 6, 8, 9, or 13, the first entry should be lined out and a new entry made. For example, if an injured employee at first required only medical treatment but later lost workdays away from work, the check in column 6 should be lined out, and checks entered in columns 2 and 3 and the number of lost workdays entered in column 4.

In another example, if an employee with an occupational illness lost workdays, returned to work, and then died of the illness, any entries in columns 9 through 12 should be lined out and the date of death entered in column 8.

The entire entry for an injury or illness should be lined out if later found to be nonrecordable. For example, an injury which is later determined not to be work related, or which was initially thought to involve medical treatment but later was determined to have involved only first aid.

III. Posting Requirements

A copy of the totals and information following the bold line of the last page for the year must be posted at each establishment in the place or places where notices to employees are customarily posted. This copy must be posted no later than **February 1** and must remain in place until **March 1**.

Even though there were no injuries or illnesses during the year, zeros must be entered on the totals line, and the form posted.

The person responsible for the **annual summary totals** shall certify that the totals are true and complete by signing at the bottom of the form.

IV. Instructions for Completing Log and Summary of Occupational Injuries and Illnesses

Column A - CASE OR FILE NUMBER. Self explanatory.

Column B - DATE OF INJURY OR ONSET OF ILLNESS.

For occupational injuries, enter the date of the work accident which resulted in injury. For occupational illnesses, enter the date of initial diagnosis of illness, or, if absence from work occurred before diagnosis, enter the first day of the absence attributable to the illness which was later diagnosed or recognized.

Columns C through F - Self-explanatory

Columns 1 and 8 - INJURY OR ILLNESS-RELATED DEATHS.

Self-explanatory.

Columns 2 and 9 - INJURIES OR ILLNESSES WITH LOST WORKDAYS.

Self-explanatory.

Any injury which involves days away from work, or days of restricted work activity, or both must be recorded since it always involves one or more of the criteria for recordability.

Columns 3 and 10 - INJURIES OR ILLNESSES INVOLVING DAYS AWAY FROM WORK.

Self-explanatory.

Columns 4 and 11 - LOST WORKDAYS - DAYS AWAY FROM WORK.

Enter the number of workdays (consecutive or not) on which the employee would have worked but could not because of occupational injury or illness. The number of lost workdays should not include the day of injury or onset of illness or any days on which the employee would not have worked even though able to work.

NOTE: For employees not having a regularly scheduled shift, such as certain truck drivers, construction workers, farm labor, casual labor, part-time employees, etc., it may be necessary to estimate the number of lost workdays. Estimates of lost workdays shall be based on prior work history of the employee AND days worked by employees, not ill or injured, working in the department and/or occupation of the ill or injured employee.

Columns 5 and 12 - LOST WORKDAYS - DAYS OF RESTRICTED WORK ACTIVITY.

Enter the number of workdays (consecutive or not) on which because of injury or illness

- (1) the employee was assigned to another job on a temporary basis, or
- (2) the employee worked at a permanent job less than full time, or
- (3) the employee worked at a permanently assigned job but could not perform all duties normally connected with it.

The number of lost workdays should not include the day of injury or onset of illness or any days on which the employee would not have worked even though able to work.

Columns 6 and 13 - INJURIES OR ILLNESSES WITHOUT LOST WORKDAYS.

Self explanatory.

Columns 7a through 7g - TYPE OF ILLNESS.

Enter a check in only one column for each illness.

TERMINATION OR PERMANENT TRANSFER—Place an asterisk to the right of the entry in columns 7a through 7g (type of illness) which represented a termination of employment or permanent transfer.

V. Totals

Add number of entries in columns 1 and 8.

Add number of checks in columns 2, 3, 6, 7, 9, 10, and 13.

Add number of days in columns 4, 5, 11, and 12.

Yearly totals for each column (1-13) are required for posting. Running or page totals may be generated at the discretion of the employer.

If an employee's loss of workdays is continuing at the time the totals are summarized, estimate the number of future workdays the employee will lose and add that estimate to the workdays already lost and include this figure in the annual totals. No further entries are to be made with respect to such cases in the next year's log.

VI. Definitions

OCCUPATIONAL INJURY is any injury such as a cut, fracture, sprain, amputation, etc., which results from a work accident or from an exposure involving a single incident in the work environment.

NOTE: Conditions resulting from animal bites, such as insect or snake bites or from one time exposure to chemicals, are considered to be injuries.

OCCUPATIONAL ILLNESS of an employee is any abnormal condition or disorder, other than one resulting from an occupational injury, caused by exposure to environmental factors associated with employment. It includes acute and chronic illnesses or diseases which may be caused by inhalation, absorption, ingestion, or direct contact.

The following listing gives the categories of occupational illnesses and disorders that will be utilized for the purpose of classifying recordable illnesses. For purposes of information, examples of each category are given. These are typical examples, however, and are not to be considered the complete listing of the types of illnesses and disorders that are to be counted under each category.

7a. Occupational Skin Diseases or Disorders

Examples: Contact dermatitis, eczema, or rash caused by primary irritants and sensitizers or poisonous plants, oil acne, chrome ulcers, chemical burns or inflammations, etc.

7b. Dust Diseases of the Lungs (Pneumoconiosis)

Examples: Silicosis, asbestosis and other asbestos related diseases, coal worker's pneumoconiosis, byssinosis, siderosis, and other pneumoconiosis.

7c. Respiratory Conditions Due to Toxic Agents

Examples: Pneumonitis, pharyngitis, rhinitis or acute congestion due to chemicals, dusts, gases, or fumes, farmer's lung, etc.

7d. Poisoning (Systemic Effect of Toxic Materials)

Examples: Poisoning by lead, mercury, cadmium, arsenic, or other metals; poisoning by carbon monoxide, hydrogen sulfide, or other gases; poisoning by benzol, carbon tetrachloride, or other organic solvents; poisoning by insecticide sprays such as parathion, lead arsenate, poisoning by other chemicals such as formaldehyde, plastics, and resins, etc.

7e. Disorders Due to Physical Agents (Other than Toxic Material)

Examples: Heatstroke, sunstroke, heat exhaustion, and other effects of environmental heat; freezing, frostbite, and effects of exposure to low temperatures; carbon disease, effects of ionizing radiation (isotopes, X-rays, radium); effects of nonionizing radiation (welding flash, ultraviolet rays, microwaves, sunburn), etc.

7f. Disorders Associated With Repeated Trauma

Examples: Noise-induced hearing loss, synovitis, tenosynovitis, or bursitis; Raynaud's phenomena, and other conditions due to repeated motion, vibration, or pressure.

7g. All Other Occupational Illnesses

Examples: Anthrax, brucellosis, infectious hepatitis, malignant and benign tumors, food poisoning, histoplasmosis, coccidioidomycosis, etc.

MEDICAL TREATMENT includes treatment (other than first aid) administered by a physician or by registered professional personnel under the standing orders of a physician. Medical treatment does NOT include first aid treatment (one-time treatment and subsequent observation of minor scratches, cuts, burns, splinters, and so forth, which do not ordinarily require medical care) even though provided by a physician or registered professional personnel.

ESTABLISHMENT—A single physical location where business is conducted or where services or industrial operations are performed (for example, a factory, mill, store, hotel, restaurant, movie theater, farm, ranch, bank, sales office, warehouse, or central administrative office). Where distinctly separate activities are performed at a single physical location, such as construction activities operated from the same physical location as a lumber yard, each activity shall be treated as a separate establishment.

For firms engaged in activities which may be physically dispersed, such as agriculture, construction, transportation, communications, and electric, gas, and sanitary services, records may be maintained at a place to which employees report each day.

Records for personnel who do not primarily report or work at a single establishment, such as traveling salesmen, technicians, engineers, etc., shall be maintained at the location from which they are paid or the base from which personnel operate to carry out their activities.

WORK ENVIRONMENT is comprised of the physical location, equipment, materials processed or used, and the kinds of operations performed in the course of an employee's work, whether on or off the employer's premises.

EXHIBIT E-6

FIRST REPORT OF INJURY FORM

1. INSURER FILE NUMBER/LARS Log Case		WORKERS' COMPENSATION COMMISSION OF CONNECTICUT EMPLOYER'S FIRST REPORT OF OCCUPATIONAL INJURY OR DISEASE (Please type or print in ink)		4. WCC FILE NUMBER	
2. EMPLOYER FILE NUMBER:				5. REASON FOR REPORT CHECK ALL THAT APPLY	
3. EMPLOYER'S CONNECTICUT REGISTRATION NUMBER (CRNT):				LOST TIME — ONE OR MORE DAYS <input type="checkbox"/> MEDICAL/HEALTH CARE <input type="checkbox"/> OCCUPATIONAL DISEASE (Note item 41 below) <input type="checkbox"/> CORRECT PRIOR REPORT <input type="checkbox"/>	
EMPLOYER INFORMATION			EMPLOYEE INFORMATION		
6. EMPLOYER NAME:		12. LAST NAME:		13. SOCIAL SECURITY NUMBER:	
7. EMPLOYER MAILING ADDRESS AND PHONE, including home		14. ADDRESS — NUMBER AND STREET:			
8. LOCATION IF DIFFERENT FROM MAILING ADDRESS:		15. CITY:		STATE:	ZIP:
9. NATURE OF BUSINESS:		16. HOME PHONE:		17. DATE OF BIRTH:	18. AGE:
				19. SEX: MALE <input type="checkbox"/> FEMALE <input type="checkbox"/>	
10. NAME OF WC INSURER:		20. OCCUPATION:			
		21. DEPARTMENT:			
11. POLICY NUMBER:		22. DATE OF HIRE:		23. DATE CURRENT DUTIES BEGAN:	
POLICY PERIOD:		24. WEEKLY WAGE AT TIME OF INJURY:			
INJURY OR EXPOSURE INFORMATION					
25. DATE AND TIME OF INJURY:		26. DID INJURY OR EXPOSURE OCCUR ON EMPLOYER'S PREMISES SHOWN ABOVE? YES <input type="checkbox"/> NO <input type="checkbox"/>		27. IF NO, PLACE WHERE INJURY OR EXPOSURE OCCURRED, INCLUDING TOWN:	
28. DESCRIBE THE EVENTS WHICH RESULTED IN THE INJURY OR DISEASE. (GIVE FULL DETAILS ON ALL FACTORS THAT LED OR CONTRIBUTED TO THE INJURY OR THE ONSET OF DISEASE.)					N P S T A
29. NAME THE OBJECT, SUBSTANCE, OR EXPOSURE WHICH DIRECTLY BROUGHT ABOUT THE INJURY OR DISEASE.					
30. DESCRIBE THE INJURY OR DISEASE AND INDICATE PART OF BODY AFFECTED.					
31. PHYSICIAN (NAME AND ADDRESS):		32. FIRST AID		33. HOSPITAL (NAME AND ADDRESS):	
		HOSPITAL			
		EMERGENCY ROOM			
		OUT-PATIENT			
34. DATE EMPLOYER NOTIFIED:		35. TIME EMPLOYEE'S WORKDAY BEGAN:		36. DID EMPLOYEE LOSE ONE OR MORE DAYS WORK? YES <input type="checkbox"/> NO <input type="checkbox"/>	
				IF NO, SKIP BOXES 36, 39, 40, AND 41.	
37. EXTENT OF ACCIDENT/HEALTH AND LIFE INSURANCE COVERAGE FOR EMPLOYEE:					
38. DATE INCAPACITY BEGAN:		39. HAS EMPLOYEE RETURNED TO WORK? YES <input type="checkbox"/> NO <input type="checkbox"/>		40. DID EMPLOYEE DIE? YES <input type="checkbox"/> NO <input type="checkbox"/>	
		IF YES, GIVE DATE:		IF YES, GIVE DATE:	
				41. FOR OCCUPATIONAL DISEASE DATE OF LAST EXPOSURE: DATE OF DIAGNOSIS AS OCCUPATIONALLY RELATED:	
PREPARER INFORMATION					
42. PREPARER'S NAME AND TITLE (TYPE OR PRINT):		43. SIGNATURE (FORM MUST BE SIGNED)			44. DATE:

EXHIBIT E-7

RECORD OF SAFETY MEETINGS


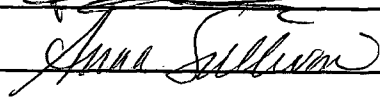
SAFETY MEETING RECORD

Safety Meeting Date/Time: 11/1/90 10:00 a.m.

Given By: Dennis Unites

Topics Discussed: Routes to hospitals for each site, sampling protocol,
decontamination measures, and level of protection.

Present at Safety Meeting (signature):

- | | |
|---|-----------|
| 1. <u></u> | 11. _____ |
| 2. <u></u> | 12. _____ |
| 3. _____ | 13. _____ |
| 4. _____ | 14. _____ |
| 5. _____ | 15. _____ |
| 6. _____ | 16. _____ |
| 7. _____ | 17. _____ |
| 8. _____ | 18. _____ |
| 9. _____ | 19. _____ |
| 10. _____ | 20. _____ |

QUALITY ASSURANCE PROJECT PLAN

This section presents those elements of project control which are necessary to ensure quality of the overall preliminary investigation at the NYSEG MGP Sites and outlines the procedures and guidelines Atlantic will follow to ensure the reliable collection and handling of sampling and analysis data. This basic elements normally included in an EPA Quality Assurance Plan and/or Quality Assurance Project Management Plan are addressed in this section.

Brief Description of Field Activities

The field investigation program will consist of the following subtasks:

- Topographic and Property Survey
- Surface Soil Sampling
- Surface Water Sampling
- Sediment Sampling
- Air Sampling

Each of these subtasks is discussed in detail in Section 2.0 of this Work Plan.

Field Procedures

Atlantic Environmental Services has developed a number of technical procedures which have been applied to site investigations including work performed at CERCLA sites. A list of relevant Atlantic procedures for the NYSEG MGP Sites field investigation are as follows.

<u>Procedure Number</u>	<u>Procedure Title</u>
1020	Field Procedures for Collection of Surface Soil Samples
1022	Field Procedures for Collection of Surface Water and Sediment Samples for Hazardous Waste Determination

1040NY	Sample Preservation for Solid and Liquid Matrices for Work Conducted in New York State
1041	Sample Chain-of-Custody Procedure
1042	Shipping Procedures for Environmental Field Samples
1051	Operation and Calibration of the HNu Systems Photoionizer Model PI-101
1060	Cleaning Procedure for Sampling Devices Used in Environmental Site Investigations

Each of these listed Atlantic Technical Procedures are presented in Appendix F.

Project Organization and Responsibility

Atlantic will perform the quality assurance elements described in this section in accordance with EPA guidance to assure consistency throughout the program. Specific personnel have been identified who are responsible for implementing the quality control aspects of the project. Primary responsibility rests with the Project Manager.

The following is a list of personnel responsible for various aspects of the project.

<u>Function</u>	<u>Person Responsible</u>
Sample Collection	Anna Sullivan (Atlantic)
QA/QC Coordinator	Robert Breeding (Atlantic)
Data Quality Review	Robert Breeding (Atlantic)
Data Processing QA	James Gould (Atlantic)
Sample QA	Anna Sullivan (Atlantic)
Lab Analysis	John Flaherty (Wadsworth)
Lab QA	Renee Gigliotti (Wadsworth)
Overall Project Coordination	Dennis Unites (Atlantic)

The Project Manager, Dennis Unites, P.G., will assume prime responsibility for technical, financial and scheduling matters. He will be Atlantic's principal point of contact with NYSEG and the DEC. James Gould, P.E., will be the Senior Technical Review for the project, responsible for overall technical content of

Atlantic's work. Robert Breeding will coordinate the overall project QA/QC program. Anna Sullivan will oversee all aspects of the field investigation.

Quality Assurance and Quality Control

This section describes the QA/QC requirements for the field activities.

Field Instrument Calibration and Preventative Maintenance

Atlantic procedure 1051 (HNu P1-101/Organic Vapor Meter) describes calibration and maintenance procedures for HNu P1-101.

A master calibration/maintenance file will be maintained which will include the following information:

- device/instrument serial and/or I.D. number;
- frequency of calibration;
- date of calibration;
- results of calibration;
- name of person performing the calibration; and
- identification of calibration gas.

QA/QC Sample Collection and Frequency

Trip Blanks

A trip blank is an aliquot of deionized organic-free water that is sealed in a sample bottle prior to initiation of field work. Glass vials (40 ml) will be used for VOA Trip Blanks. These sealed bottles are subsequently placed within a cooler and accompany field personnel during the sampling activities. For each day of aqueous sampling, a trip blank will also be sent for analysis. In this manner, any possible cross-contamination occurring among samples during shipment can be assessed. A trip blank will be taken for each day of aqueous volatile organics sampling.

Field Blanks

A field blank is an aliquot of deionized, organic free water which has been used to rinse the field sampling equipment after decontamination. A field blank will be taken for each media sampled (i.e., for each type of equipment used) at a frequency of one field blank per day per media. In this manner, any possible cross-contamination occurring among samples due to the repeated use of the same sampling equipment can be assessed.

Replicate Samples

Replicate samples will be analyzed to check laboratory reproducibility of analytical data from two aliquots of a sample taken at one location. Approximately ten percent of the total number of aqueous samples will be replicated in order to evaluate the precision of the methods used.

Sample Identification System

Each sample will be designated by alphanumeric code which will identify the project site, sample type, sampling location, sample depth, and addition designation if needed. Replicates will not be specifically identified as such in the sample number, but will have a different (sequential) number which will be noted in the sample logbook.

The sample code will use the following format: Lockport-CGLS

- Date of Sampling
- Sample Type: SS (surface soil), SW (surface water), SE (sediment), A (air)
- Sample Number

Where: CGLS-111290-SS3

Indicates: CGLS - Lockport State Road Site
111290 - November 12, 1990
SS - Surface Soil
3 - Sample Number 3

Sample Holding Times

Sample holding times are specified in Atlantic Procedure No. 1040NY.

Sampling Packaging and Shipping

Samples should be packaged and shipped according to Atlantic Procedure No. 1042. When sample shipments are to be sent, the receiving laboratory will be telephoned on that day or the following morning, and notified of the shipment date, airbill number, and number and type of samples being shipped. All samples will be shipped in the afternoon (the end) of each day to ensure that samples will be shipped within twenty-four (24) hours of sampling. Samples will be labeled as per 40 CFR 261.4, "Research Samples" or "Environmental Samples".

Sample and Field Activity Documentation

Custody of samples must be maintained and documented at all times. Chain-of-custody begins with the collection of the samples in the field. Procedures are detailed in Atlantic Procedure No. 1041.

A bound/weatherproof master sample log shall be maintained by the field team. The Field Operations Leader, or designee, shall record information related to sampling or field activities. The information will include sample number, sample time, shipping information, sample location, sample description, sample method used, weather conditions, field measurements, sampler's name, unusual events, etc.

A site logbook will be maintained by the Field Operations Leader or designee. The book will contain a summary of the day's activities, including site visitors, daily telephone contacts, and decision points.

QA Objectives for Precision, Accuracy and Completeness

Environmental measurements have inherent limitations arising from equipment problems, procedural deviations, and changes in ambient conditions. Most

environmental measurements are analyses made for extremely low concentrations of constituents and are subject to chemical interferences, instrument limitation and uncertainties that affect the accuracy of the determination. It is essential to minimize these factors so that the measurements accurately reflect the character of the sample collected.

All data gathered during the course of the NYSEG MGP Site study by Atlantic or processed by the laboratory will meet objectives of accuracy, precision, completeness, representativeness, and comparability, as referenced in Stanley and Verner (1983). These characteristics are defined below:

- Accuracy - the degree of agreement of a measurement, X, with an accepted reference or true value, T, usually expressed as the difference between the two values, $X-T$, or the difference as a percentage of the reference or true value, $100 (X-T)/T$. Accuracy is a measure of the bias in a system.
- Precision - a measure of mutual agreement among individual measurements of the same property, usually under prescribed similar conditions. Precision is best expressed in terms of the standard deviation. Various measures of precision exist depending upon the "prescribed similar conditions".
- Completeness - a measure of the amount of valid data obtained from a measurement system compared to the amount that was expected to be obtained under correct normal conditions.
- Representativeness - expresses the degree to which data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition.
- Comparability - expresses the confidence with which one data set can be compared to another.

ATLANTIC PROCEDURE NO. 1020

FIELD PROCEDURES FOR COLLECTION OF SURFACE SOIL SAMPLES

Prepared By: John A. Ripp Principal
JOHN A. RIPP TITLE

Reviewed By: Edmund J. Burke QA Manager
EDMUND J. BURKE, P.E. TITLE

Approved By: Paul Burgess Chief Engineer
PAUL BURGESS, P.E. TITLE

REVISIONS

NO.	DATE	PREPARED BY	REVIEWED BY	APPROVED BY
1.				
2.				
3.				
4.				

ATLANTIC ENVIRONMENTAL SERVICES, INC.
COLCHESTER, CONNECTICUT

Procedure No. 1020
Revision No. 1
Date April 21, 1989
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SECTION 1.0: PURPOSE

To insure a standard procedure for collection of surface soil samples for the identification of chemical parameters.

SECTION 2.0: SCOPE

The following procedure describes the logistics, chain-of-events, collection techniques and documentation requirements for collecting surface soil samples designated for chemical analysis.

SECTION 3.0: RESPONSIBILITY

Project Manager - First

Field Chemist, Geologist or Engineer - Second

SECTION 4.0: SUPPORTING PROCEDURES

Atlantic Procedure No. 1041 Sample Chain-of-Custody Procedure

SECTION 5.0: REQUIRED FORMS

Field Notebook No. 351, published by J.L. Darling Corp., Tacoma, Washington

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SECTION 6.0: PROCEDURE

6.1 Selection of Sampling Locations

The selection of sampling locations in and around a project site will be based on a review of existing site data, the site topography and surface features, results of preliminary site surveys using portable geophysical and air monitoring equipment and the initial estimates as to the extent of and migration pathways of the waste present. At the start of the investigation, a number of surface soil samples are usually allocated. Only after initial field reconnaissance are the final locations selected. At a minimum, the following should be included as sampling points:

- o Upgradient soil surfaces to determine background levels.
- o Soil surfaces within the immediate area of contamination.
- o Downgradient soil surfaces to determine any spread of contamination resulting from storm water runoff.

Sampling locations may be selected in the following areas at the site:

- o Areas where chemicals may have been stored, handled or disposed.
- o Areas where motor vehicles hauling chemicals may have traveled on the site.
- o Areas where water may have ponded during storm events.

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6.2 Equipment List

The following is to be considered a minimum listing of required field equipment for collecting soil samples. Other tools required for accessing soils beneath paved area, etc. should be included when necessary.

- o Boots, latex gloves, chemical resistant gloves, appropriate level of protection.
- o Sample container - 1 each 1 liter glass jar with a teflon lined cap.
- o Teflon coated or stainless steel sample spoons.
- o Wooden stakes and spray paint (highly visible)
- o Field notebook
- o Sample bottle labels
- o Chain-of-custody forms

6.3 Order of Samples

Surface soil samples should be taken in all locations prior to all other site sampling events. This is to prevent the possibility of cross-contamination between sampling points by site personnel or equipment (backhoe, drill rigs, equipment vehicles, etc. . .). For consistency with other sampling programs, the upgradient samples should be collected first.

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6.4 Location and Collection of Samples

Surface soils, depending upon the contaminants of interest, can be either individual or composite samples. Composites represent samples taken from a number of individual locations which are equally blended to form a sample representing a larger area. Certain state agencies are discouraging the use of composite samples when looking for aromatic volatile and halogenated volatile organic compounds because of dilution and the difficulty of forming a "true" composite. Therefore prior to sampling, the use of composites should be checked with the agency which will have final approval of actions regarding a site in which surface soil samples are used in developing certain actions regarding clean up.

If statistical techniques are to be employed in collecting surface soil samples using a random grid, the procedure provided in Chapter 5 of Methods of Soil Analysis, Part I by C.A. Black et al, American Society of Agronomy, Academic Press, N.Y. 1965 and Section I of EPA-SW 846 Test Methods for Evaluating Solid Waste. Physical Chemical/Methods are suggested protocols.

Once the general locations have been chosen, sampling can begin. Normally a sample representing the top 3 to 6 inches of soil is taken. Samples are collected using a dedicated, precleaned stainless steel or Teflon spoon and immediately stored in the glass jar. Organic debris (ie.

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Date April 21, 1989
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leaves, twigs, bark) along with large pieces of gravel should be avoided. The sample should be representative of the area soil; it is best represented by the finer grains of the topsoil. The jars must be filled completely so as to avoid creating a head space where volatiles may escape. After each jar is filled the threads should be wiped clean so that the cap can be threaded on without creating an air gap.

Latex or rubber gloves should be worn to protect the sampling person and to avoid cross contamination through handling.

All filled jars must be labelled with the following as a minimum:

- o project number
- o sampling time and date
- o sample number
- o analysis
- o collector's initials

The sample chain-of-custody form is then immediately filled out and kept with the sample. The sample is then stored in a refrigerated container until delivery to the analytical lab.

The location, depth of sample, sample type, time of sample, and other associated data (ie. organic vapor readings, color of the ground, odors, texture, etc.) will be documented in the field notebook when the sample is taken. If sampling is performed under a paved area or in fill, a description of these unique areas will also be included.

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6.5 Sample Verification

After each sample of soil is taken, an indicator should be used to mark the location in the event it will be surveyed at a later time. Once all the surface soil samples are collected, the sample numbers and locations should be reviewed before leaving the site or progressing to other tasks in a program. All used sampling devices will be kept together, separate from clean tools, so that they can be cleaned according to appropriate decontamination and cleaning procedure. In no event will a used sampling device be used for two or more samples without full cleaning between samples.

ATLANTIC PROCEDURE NO. 1022

FIELD PROCEDURES FOR COLLECTION OF SURFACE WATER AND SEDIMENT SAMPLES FOR HAZARDOUS WASTE DETERMINATION

Prepared By: John A. Ripp Principal
JOHN A. RIPP TITLE

Reviewed By: Edmund J. Burke A.A. Manager
EDMUND J. BURKE, P.E. TITLE

Approved By: Paul Burgess Chief Engineer
PAUL BURGESS, P.E. TITLE

REVISIONS

NO.	DATE	PREPARED BY	REVIEWED BY	APPROVED BY
1.				
2.				
3.				
4.				

ATLANTIC ENVIRONMENTAL SERVICES, INC.
COLCHESTER, CONNECTICUT

Procedure No. 1022
Revision No. _____
Date July 1, 1986
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1.0 PURPOSE

To insure a standard procedure for collection of surface water (streams, ponds, lakes, impoundments) and sediments for the identification of chemical composition.

2.0 SCOPE

The following procedure describes the logistics, chain-of-events, collection techniques and documentation requirements for collecting surface water and sediment samples designated for chemical analysis.

3.0 RESPONSIBILITY

Project Manager - First

Field Supervisor - Second

Field Sampling Technicians - Third

4.0 SUPPORTING PROCEDURES

Atlantic Procedure No. 1060 Decontamination Procedure for Sampling Devices

Atlantic Procedure No. 1041 Sample Chain-of-Custody Procedure.

5.0 REQUIRED FORMS

Field Notebook No. 351, published by J.L. Darling Corp.,

Tacoma, Washington

6.0 PROCEDURE

6.1 Selection of Sampling Locations

The selection of sampling locations in and around an project site will be based on a review of existing site data, the site topography and surface features, results of preliminary site surveys using portable geophysical and air monitoring equipment and the initial estimates as to the extent of the waste. At the start of the investigation, a number of surface water and sediment samples are usually allocated. Only after initial field reconnaissance are the final locations selected. At a minimum the following should be included as sampling points.

- o Upstream and upgradient of the waste site to determine background levels of pollutants.
- o In leachate, runoff or intermittent flow paths passing through or from the site.
- o In downgradient streams, swales, runoff channels or sewers draining the site to determine limits of surficial deposition.

6.2 Equipment List

The following lists are examples of equipment to be used for sampling. Site specific checklists of equipment should be designed based on the characteristics of each sample and location.

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6.2.1 Surface Water Sampling

- o Boots, latex gloves, chemical resistant gloves, appropriate level of protection.
- o Sample containers (depending on sample requirements of the analytical laboratory) may include for each location:
 - 4 each 1 liter glass jars with teflon lined caps.
 - 8 each 40 ml. glass vials with teflon lined septas.
 - 1 each 500 ml. plastic containers for metals analysis.
 - 1 each 500 ml. plastic containers for mercury analysis.
- o Wooden stakes and spray paint.
- o Stainless steel Kemmerer bottle, Van Dorn bottle or sterile glass samplers (if required)
- o Remote samplers
- o Field Notebook
- o Sample bottle labels
- o Chain-of-custody forms

6.2.2 Sediment Sampling

- o Boots, latex gloves, chemical resistant gloves, appropriate level of protection.
- o Dedicated stainless steel spoons (tablespoon size)
- o Dedicated teflon spoons (if required)
- o Sample containers for each sample
 - 1 each 1 liter glass jars with teflon lined caps
- o Wooden stakes and spray paint.

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- o Field Notebook
- o Sample bottle labels
- o Chain-of-custody forms

6.3 Order of Samples

If both stream sediment and water samples are to be collected concurrently, the water samples should be taken first in order to avoid introducing pollutants in the water column from sediment collection activities.

In flowing streams or runoff channels samples should be collected from the furthest downstream point first. The remaining samples will be taken progressing upstream.

6.4 Sample Collection

6.4.1 Surface Water Samples

Surface water samples are collected in a manner to be representative of the water column from which the samples are taken. A two man team is required for the collection as a safety precaution. The person collecting the samples in most cases will have entered the water body. For flowing streams this will necessitate the donning of boots or waders and wearing latex inner gloves and chemical resistant outer gloves. All samples in flowing water bodies will be taken facing upstream. Samples taken from small lakes or ponds should be taken from a

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small boat using a Kemmerer or teflon lined Van Dorn bottle. Samples taken from standing puddles, pools, drainage ditches should be taken without disturbing the sediments. This may be accomplished by the use of a remote sampler, e.g. a sample bottle held on along pole with a gimbaled yoke.

For pre-preserved sample containers the following procedure will be followed:

- o Prior to collecting any water samples place a waterproof sample label on each container which specifies the following:

Sample number
Date
Time
Analysis
Preservative
Project number
Initials of the collector

Fill in the information with a waterproof ink pen. This will prevent difficulty in filling out the labels on a wet jar after it is filled.

- o Face upstream, wearing gloves, take a 1 liter glass container with no preservative and submerge it closed to mid-depth.
- o Open the jar with the mouth facing upstream; fill it and; close it while submerged.
- o Take the filled jar and use it to fill the 40 ml. vials making sure no air is trapped in the vials.

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- o Repeat steps 1 and 2 with the same container and fill those containers having preservative avoiding any overflow since this will dilute the preservative.
- o Repeat steps 1 and 2 with the same container and fill the remaining sample containers. The last container filled, will be the original container used to fill the other jars.
- o If dissolved metals analysis are required, an extra bottle (no preservative) will be filled and the metals container (pre-preserved with nitric acid) will remain empty. Only after the water sample is field filtered will it be poured into the pre-preserved metals container.
- o Place all sample containers into a sample shipping container, cool with ice packs and fill in the chain-of-custody form.
- o Detail in the field notebook the following:
 - sample identification number
 - location of the sample (sketch of the sample point)
 - time and date sample was taken
 - personnel performing the task
 - visual or sensory description of the sample
(color, odor, turbidity, etc.)
 - weather conditions during sampling
 - runoff conditions
 - other pertinent observations

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- o Place a wooden stake at the edge of the stream or near the sample point with sample number on it. The stake may be located by survey for inclusion on a site map.

Note:

- o It is understood that all sample containers and collection devices will be cleaned prior to field use following the appropriate cleaning procedures depending on the type of analysis to be performed.
- o If sampling devices are to be dedicated to a particular sample location, they will be placed in a plastic bag after its use and marked or tagged "DEDICATED TO PROJECT NO. _____ SAMPLE LOCATION NO. _____".

6.4.2 Sediment Samples

Stream sediment samples are collected in a manner to be representative of deposits of sediment carried off of a site. Again the use of protective boots, and gloves will be necessary. All priority pollutant and organic analysis of sediments can be performed on a 1 liter sample. The following procedure will be followed:

- o Select a sample location that is representative of sediment depositional areas. This might mean a sandbar in the middle of a stream, the inside corner of a stream bed in a meander, or a deep pool where water velocities are reduced.

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- o Place a waterproof sample label on the glass container which specifies the following:

Sample number
Date
Time
Preservative
Project number
Initials of the collector

Fill in the information with a waterproof ink pen prior to collecting the sample.

- o Use either a pre-cleaned dedicated stainless steel spoon or teflon coated spoon, that will fit inside the sample jar, to collect a sample.
- o All samples should be taken within the top 3 inches of the stream bed. Remove any vegetation debris (leaves, roots, bark) along with any large stones from the sample so that only the finer soil material is collected.
- o Fill out the chain-of-custody form and place the sediment sample into the shipping container. Cool as required.
- o Detail in the field notebook the following:
 - sample identification number
 - location of the sample (sketch of the sample point)
 - time and date sample was taken
 - personnel performing the task

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- visual or sensory description of the sample
 - brief sediment descriptions (color, texture, appearance)
 - weather conditions during sampling
 - runoff or flow conditions
 - other pertinent observations
- o Place a wooden stake at the edge of the stream or near the sample point with the sample number on it. This stake will be located by survey for including on a site map.

6.4.3 General Site Rules

Surface water and sediment samples, depending on the particular site, can be collected from a variety of locations. Instead of having a procedure for each type of location, the following general rules should be used for any site.

- o The sample must be representative of the water body or sediments deposited in an area.
- o Avoidance of cross contamination between sampling points can be accomplished by the use of dedicated sampling devices.
- o Care must be taken to not disturb the sample location conditions or chemistry, e.g. facing upstream in a river, collecting sediments from areas not stepped on by the collectors.

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- o In lakes or ponds, samples of the water column, at a minimum, will be a composite of surface, mid-depth and bottom (1 foot above floor) samples. Sediments need only be sampled by grab method.
- o Only pre-cleaned sampling devices and sample containers are to be used.
- o Proper field documentation and chain-of-custody procedures must be followed.

ATLANTIC PROCEDURE NO. 1040-NY

SAMPLE PRESERVATION FOR
SOLID AND LIQUID MATRICES FOR PROGRAMS
CONDUCTED IN NEW YORK STATE

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ATLANTIC ENVIRONMENTAL SERVICES, INC.
COLCHESTER, CONNECTICUT

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SECTION 1.0: PURPOSE

To insure a standard procedure for preservation of solid and liquid samples collected at a site for hazardous waste determination.

SECTION 2.0: SCOPE

The following procedure is established to provide a set of standards which follow recommended NYSDEC preservation techniques and holding times for various analytical groups as per the NYSDEC Analytical Services Protocol (ASP) published in 1989.

SECTION 3.0: RESPONSIBILITY

Project Manager - First

Field Operations Manager - Second

Field Staff - Third

SECTION 4.0: SUPPORTING PROCEDURES

Atlantic Procedure No. 1020 Field Procedures for Collection of Surface Soil Samples

Atlantic Procedure No. 1021 Field Procedures for Collection of Subsurface Soils

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Atlantic Procedure No. 1022 Field Procedures for Collection of Surface
Water and Sediment Samples for Hazardous Waste Determination

Atlantic Procedure No. 1023 Field Procedures for Collection of Groundwater
Samples for Hazardous Waste Determination

Atlantic Procedure No. 1042 Shipping Procedure for Environmental Field
Samples

SECTION 5.0: REQUIRED FORMS

1. Field Notebook No. 351. Published by the J.L. Darling Corp., Tacoma,
Washington
2. Master Sample Log

SECTION 6.0: PROCEDURE

6.1 General Procedure

All sample preservations will be performed in the field as soon after sample collection as possible. In many instances sample containers supplied by the analytical laboratory will be pre-preserved so that no additional preservations will be required. In the event preservations are required, Atlantic personnel will use the following format:

1. For those water samples requiring target compound list (TCL),
the procedures in Table 6-1 will be followed.

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2. All glass or plastic containers must be cleaned prior to sampling according to appropriate cleaning procedures. In no case will sample containers be rinsed with a sample before the actual sample is containerized.
3. In no case shall methylene chloride or acetone be used as a cleaning agent in any glassware or field equipment used on a site investigation. Methylene chloride and acetone are listed wastes and if used, cleaning may cause errors in evaluating field data.
4. All soils samples collected for TCL analysis be placed in a one liter glass jar with teflon lined cap. This jar also must be cleaned prior to sampling according to appropriate cleaning procedure. To avoid losing volatile organics to the head space within a jar, all soil jars will be filled completely. Care must be taken to avoid getting soil on the threads of a sample jar. This can cause a faulty seal.
5. All samples will be held in insulated shipping containers and kept cool to a temperature of 4°C until they are delivered to the analytical laboratory.

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6. When samples are preserved in the field, the type of preservation will be listed on the label along with all other appropriate label information. Also the details of each sample will be logged in the Master Sample Log, maintained at the field office.
7. If Atlantic personnel plan to perform field preservations the analytical laboratory must be consulted to verify those particular procedures to be followed. In some instances different laboratories may require more sample volume than those listed or wish no preservative be used.
8. Table 6-1 is taken directly from the NYSDEC ASP. Soils rarely require preservation and the laboratory should always be consulted before collecting soil samples. Occasionally the NYSDEC may update the holding times and this can be found by calling the NYSDEC headquarters in Albany, New York.
9. All field preservations should be performed using proper safety precautions especially when handling acids and caustics. A reference for proper chemical handling techniques is found in Basic Laboratory Skills for Water and Wastewater Analysis by

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Douglas W. Clark, New Mexico Water Resources Research Institute,
Report No. 125, 1980. Also latex or chemical resistant gloves
should be worn during all field preservations. Proper
ventilation is necessary when performing preservations in
enclosed areas.

6.2 Sample Preservation and Holding Time Requirements

Table 6-1 provides a schedule for sampling, preservation, and
holding times for samples being analyzed for convention parameters and
target compound list (TCL) parameters.

The laboratory shall adhere to the preservation procedures and
holding times listed in Table 6-1 below unless specifically directed
otherwise by the Bureau of Technical Services and Research. All holding
times are from Verified Time of Sample Receipt (VISR) at the laboratory.

The laboratory shall provide all necessary preservatives to
properly stabilize the samples. The laboratory must adhere to all
analytical holding times. Failure to do so will result in the imposition
of any contract specified penalties.

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TABLE 6-1

REQUIRED CONTAINERS, PRESERVATIVES, AND
HOLDING TIMES

PARAMETER NAME	CONTAINER(1)	PRESERVATIVE(2),(3)	MAXIMUM HOLDING TIME(4)
AQUEOUS SAMPLES			
Bacteriological Tests:			
Total Coliform	Sterilized P,G	Cool, 4°C, 0.008% Na ₂ S ₂ O ₅ (5)	6 hours
Fecal Coliform	Sterilized P,G	Cool, 4°C, 0.008% Na ₂ S ₂ O ₅ (5)	6 hours
Fecal Streptococci	Sterilized P,G	Cool, 4°C, 0.008% Na ₂ S ₂ O ₅ (5)	6 hours
Inorganic and Conventional Tests:			
Acidity	P,G	Cool, 4°C	12 days
Alkalinity	P,G	Cool, 4°C	12 days
Ammonia	P,G	Cool, 4°C H ₂ SO ₄ to pH<2	26 days
BOD ₅	P,G	Cool, 4°C	24 hours
BOD ₂₀	P,G	Cool, 4°C	24 hours
Bromide	P,G	Cool, 4°C	26 days
CBOD ₅	P,G	Cool, 4°C	24 hours
COD	P,G	Cool, 4°C H ₂ SO ₄ to pH<2	26 days
Chloride	P,G	Cool, 4°C	26 days
Color	P,G	Cool, 4°C	24 hours
Cyanide, Total	P,G	Cool, 4°C NaOH to pH>12	12 days

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TABLE 6-1 (CONTINUED)

REQUIRED CONTAINERS, PRESERVATIVES, AND
HOLDING TIMES

PARAMETER NAME	CONTAINER(1)	PRESERVATIVE(2),(3)	MAXIMUM HOLDING TIME(4)
AQUEOUS SAMPLES (continued)			
Cyanide, Amenable to Chlorination	P,G	Cool, 4°C NaOH to pH>12, 0.6 g ascorbic acid(5)	12 days(6)
Fluoride	P only	Cool, 4°C	26 days
Hardness	P,G	HNO ₃ to pH<2	6 months
Kjeldahl Nitrogen	P,G	Cool, 4°C H ₂ SO ₄ to pH<2	26 days
Organic Nitrogen	P,G	Cool, 4°C H ₂ SO ₄ to pH<2	26 days
Metals(7), except Chromium+6 and Mercury	P,G	HNO ₃ to pH<2	6 months
Chromium+6	P,G	Cool, 4°C	24 hours
Mercury	P,G	HNO ₃ to pH<2	26 days
Nitrate + Nitrite	P,G	Cool, 4°C H ₂ SO ₄ to pH<2	26 days
Nitrate	P,G	Cool, 4°C	24 hours
Nitrite	P,G	Cool, 4°C	24 hours
Oil and Grease	G only	Cool, 4°C H ₂ SO ₄ to pH<2	26 days
Total Organic Carbon	P,G	Cool, 4°C H ₂ SO ₄ to pH<2	26 days
Orthophosphate	P,G	Cool, 4°C	24 hours
Total Phenols	G only	Cool, 4°C H ₂ SO ₄ to pH<2	26 days

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TABLE 6-1 (CONTINUED)

REQUIRED CONTAINERS, PRESERVATIVES, AND
HOLDING TIMES

PARAMETER NAME	CONTAINER(1)	PRESERVATIVE(2),(3)	MAXIMUM HOLDING TIME(4)
AQUEOUS SAMPLES (continued)			
Phosphorous, Total	P,G	Cool, 4°C H ₂ SO ₄ to pH<2	26 days
Residue, Total	P,G	Cool, 4°C	5 days
Residue, Filterable	P,G	Cool, 4°C	24 hours
Residue, Non-Filterable	P,G	Cool, 4°C	5 days
Residue, Settleable	P,G	Cool, 4°C	24 hours
Residue, Volatile	P,G	Cool, 4°C	5 days
Silica	P only	Cool, 4°C	26 days
Specific Conductance	P,G	Cool, 4°C	26 days
Sulfate	P,G	Cool, 4°C	26 days
Sulfide	P,G	Cool, 4°C, add zinc acetate plus NaOH to pH>9	5 days
Surfactants (MBAS)	P,G	Cool, 4°C	24 hours
Turbidity	P,G	Cool, 4°C	24 hours
Organic Tests(8):			
Purgeable Halocarbons	G, teflon lined septa	Cool, 4°C	7 days
Purgeable Aromatics	G, teflon lined septa	Cool, 4°C	7 days
Acrolein and Acrylonitrile	G, teflon lined septa	Cool, 4°C, 0.008% Na ₂ S ₂ O ₅ (5) adjust to pH 4-5(9)	7 days

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TABLE 6-1 (CONTINUED)

REQUIRED CONTAINERS, PRESERVATIVES, AND
HOLDING TIMES

PARAMETER NAME	CONTAINER(1)	PRESERVATIVE(2),(3)	MAXIMUM HOLDING TIME(4)
AQUEOUS SAMPLES (continued)			
Phenolics(10)	G, teflon lined septa	Cool, 4°C, 0.008% Na ₂ S ₂ O ₈ (5)	5 days after VTSR until extraction; 40 days for analysis(12)
Benzidines(10,11)	G, teflon lined septa	Cool, 4°C 0.008% Na ₂ S ₂ O ₈ (5)	5 days after VTSR until extraction(12)
Phthalate esters(10)	G, teflon lined septa	Cool, 4°C	5 days after VTSR until extraction; 40 days for analysis(12)
Nitrosamines(10,14)	G, teflon lined septa	Cool, 4°C 0.008% Na ₂ S ₂ O ₈ (5) Store in dark	5 days after VTSR until extraction; 40 days for analysis(12)
PCBs(10)	G, teflon lined septa	Cool, 4°C	5 days after VTSR until extraction; 40 days for analysis(12)
Nitroaromatics and Isophorone(10)	G, teflon lined septa	Cool, 4°C 0.008% Na ₂ S ₂ O ₈ (5) Store in dark	5 days after VTSR until extraction; 40 days for analysis(12)

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TABLE 6-1 (CONTINUED)

REQUIRED CONTAINERS, PRESERVATIVES, AND
HOLDING TIMES

PARAMETER NAME	CONTAINER(1)	PRESERVATIVE(2),(3)	MAXIMUM HOLDING TIME(4)
AQUEOUS SAMPLES (continued)			
Polynuclear Aromatic Hydrocarbons(10)	G, teflon lined septa	Cool, 4°C 0.008% Na ₂ S ₂ O ₃ (5) Store in dark	5 days after VTSR until extraction; 40 days for analysis(12)
Haloethers(10)	G, teflon lined septa	Cool, 4°C 0.008% Na ₂ S ₂ O ₃ (5)	5 days after VTSR until extraction; 40 days for analysis(12)
Chlorinated Hydrocarbons(10)	G, teflon lined septa	Cool, 4°C 0.008% Na ₂ S ₂ O ₃ (5)	5 days after VTSR until extraction; 40 days for analysis(12)
Chlorinated Dioxins and Furans(10)	G, teflon lined septa	Cool, 4°C 0.008% Na ₂ S ₂ O ₃ (5)	5 days after VTSR until extraction; 40 days for analysis(12)
Pesticides(10)	G, teflon lined septa	Cool, 4°C Adjust pH to 5-9(14)	5 days after VTSR until extraction; 40 days for analysis(12)
Radiological Tests:			
Alpha, beta and Radium	P,G	HNO ₃ to pH<2	6 months

SOIL/SEDIMENT/SOLID SAMPLES

The same containers and holding times as listed for aqueous samples are to be used for soil/sediment/solid samples. Preservation for all analyses is limited to cooling to 4 C.

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Footnotes for Table 6-1

1. Polyethylene (P) or Glass (G).
2. Sample preservation should be performed immediately upon collection. For composite chemical samples each aliquot should be preserved at the time of collection. When use of an automated sampler makes it impossible to preserve each aliquot, then chemical samples may be preserved by maintaining at 4°C until compositing and sample splitting is completed.
3. When any samples is to be shipped by common carrier or sent through the United States Mails, it must comply with the Department of Transportation Hazardous Materials Regulations (49 CFR Part 172). The person offering such material for transportation is responsible for ensuring such compliance. For preservation requirements of Table 6-1, the Office of Hazardous Materials, Materials Transportation Bureau, Department of Transportation has determined that the Hazardous Materials Regulations do not apply to the following materials: Hydrochloric Acid (HCL) in water solutions at concentrations of 0.04% by weight or less (pH about 1.96 or greater); Nitric Acid (HNO₃) in water solutions at concentrations

of 0.15% by weight or less (pH about 1.62 or greater); Sulfuric Acid (H_2SO_4) in water solutions at concentrations of 0.35% by weight or less (pH about 1.15 or greater); and Sodium Hydroxide (NaOH) in water solutions at concentrations of 0.080% by weight or less (pH about 12.30 or less).

4. Samples should be analyzed as soon as possible after collection. The times listed are the maximum times that samples may be held before analysis and still be considered valid. Samples may be held for longer periods only if the monitoring laboratory has data on file to show that specific types of samples under study are stable for the longer time, and has received written permission prior to analysis from the Regional Administrator under 40 CFR Part 136.3(e) AND from the Bureau of Technical Services and Research. Some samples may not be stable for the maximum time period given in the table. A monitoring laboratory is obligated to hold the sample for a shorter time if knowledge exists to show that this is necessary to maintain sample stability.
5. Should only be used in the presence of residual chlorine.

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6. Maximum holding time is 24 hours when sulfide is present.
Optionally all samples may be tested with lead acetate paper before pH adjustments in order to determine if sulfide is present. If sulfide is present, it can be removed by addition of cadmium nitrate powder until a negative spot test is obtained. The sample is filtered and then NaOH is added to pH 12.
7. Samples should be filtered immediately onsite before adding preservative for dissolved metals.
8. Guidance applies to samples to be analyzed by GC, LC or GC/MS for specific compounds.
9. The pH adjustment is not required if acrolein will not be measured. Samples for acrolein receiving no pH adjustment must be analyzed within 3 days of sampling.
10. When the extractable analytes of concern fall within a single chemical category, the specified preservative and maximum holding times should be observed for optimum safeguard of sample integrity. When the analytes of concern fall within two or more chemical categories, the sample may be preserved by cooling to

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4°C, reducing residual chlorine with 0.008% sodium thiosulfate, storing in the dark, and adjusting the pH to 6-9; samples preserved in this manner may be held for five days before extraction and for 40 days after extraction. Exceptions to this optional preservation and holding time procedure are noted in footnote 5 (re the requirement for thiosulfate reduction of residual chlorine), and footnotes 12, 13 (re the analysis of benzidine).

11. If 1,2-diphenylhydrazine is likely to be present, adjust the pH of the sample to 4.0 ± 0.2 to prevent rearrangement of benzidine.
12. This does not supercede the contract requirement of a 30 day reporting time.
13. Extracts may be stored up to 7 days before analysis if storage is conducted under an inert (oxidant-free) atmosphere.
14. For the analysis of diphenylnitrosamine, add 0.008% sodium thiosulfate and adjust the pH to 7-10 with NaOH within 24 hours of sampling.

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15. The pH adjustment may be preformed upon receipt in the laboratory and may be omitted if the samples are extracted with 72 hours of collection. For the analysis of aldrin, add 0.008% sodium thiosulfate.

ATLANTIC PROCEDURE NO. 1041

SAMPLE CHAIN-OF-CUSTODY PROCEDURE

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SECTION 1.0: PURPOSE

To provide the project manager with a record of the custody of any environmental field sample from time of collection to final analysis. Once a sample has been submitted to the laboratory, internal laboratory chain-of-custody will take over in the form of "Request for Analysis" forms, analytical notebooks, and "Reports of Analysis" forms.

SECTION 2.0: SCOPE

This procedure details how a sample is traced through the Chain-of-Custody-Form.

SECTION 3.0: RESPONSIBILITY

Project Manager - First
Field Supervisor - Second
Field Technician - Third

SECTION 4.0: SUPPORTING PROCEDURES

None

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SECTION 5.0: REQUIRED FORMS

Atlantic Chain-of-Custody Form No. 1041

SECTION 6.0: PROCEDURE

This procedure describes the use of a Chain-of-Custody Form to accompany all sample containers from the time of collection to submission to the analytical laboratory.

For sampling programs where a large number of samples are to collected or where various laboratories will be receiving the samples, a Chain-of-Custody Form is to accompany each group of samples (see attached form). This form presents general sample information in tabular form listing sample number, date and time of sampling, whether the sample was a composite or grab and information regarding the number of containers, size of container and preservative used for each. If for instance a sample consisted of two 40 ml. vials with no preservation and one 500 ml vial preserved with nitric acid, the number of containers box would designate three while the first diagonal box would list 40 ml vial/PRSV.-NONE and the box beneath listing two and the second diagonal box listing 500 ml glass jar/PRSV.-HNO₃ and the box beneath listing one.

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The bottom of the form is the chain-of-custody with dates and times of transfer indicated with the appropriate signatures. The sample collector is always the first signature while the analytical laboratory is the final. Theoretically all individuals handling the samples between collection and laboratory should sign the form. However if a common carrier (ie. Federal Express, Purolator) are used for shipping only one signature is required.

This form can be used as a legal document to guarantee samples were not mishandled and that they were delivered to the laboratory within the time frame necessary to start analysis.

On occasion, the analytical laboratory will provide their own Chain-of-Custody form. Usually the same information is included but in a different format from the Atlantic form. Chain-of-Custody forms from the analytical laboratories are acceptable documentation.

Since these forms are basically sample transmittal documents a copy of the form should remain with the sampling personnel. Upon completion of the analysis the laboratory will provide a complete set of all Chain-of-Custody forms for inclusion with analytical reports.

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ATLANTIC PROCEDURE NO. 1042

SHIPPING PROCEDURES FOR ENVIRONMENTAL FIELD SAMPLES

Prepared By: John A. Ripp Principal
JOHN A. RIPP TITLE

Reviewed By: Edmund J. Burke Q.A. Manager
EDMUND J. BURKE, P.E. TITLE

Approved By: Paul Burgess Chief Engineer
PAUL BURGESS, P.E. TITLE

REVISIONS

NO.	DATE	PREPARED BY	REVIEWED BY	APPROVED BY
1.				
2.				
3.				
4.				

ATLANTIC ENVIRONMENTAL SERVICES, INC.
COLCHESTER, CONNECTICUT

Procedure No. 1042
Revision No. _____
Date July 1, 1986
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SECTION 1.0: PURPOSE

To insure a standard procedure for shipment of water, soil and other environmental samples that are controlled by chain-of-custody and strict analytical starting times.

SECTION 2.0: SCOPE

The following procedure is established to avoid mishandling, delays and mislabeling of samples normally collected and shipped from a field site to a designated analytical laboratory.

SECTION 3.0: RESPONSIBILITY

Project Manager - First

Field Supervisor - Second

Field Technicians - Third

SECTION 4.0: SUPPORTING PROCEDURES

Atlantic Procedure No. 1040 Sample Preservation for Solid and Liquid Matrices

Atlantic Procedure No. 1041 Sample Chain-Of-Custody Procedure

SECTION 5.0: REQUIRED FORMS

Receipt of Airweigh Bill or Weighbill Forms

Chain-of-Custody Form Standard Form No. 1041

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SECTION 6.0: PROCEDURE

6.1 Prior to mobilization to a field site, the field operations manager or his designee will select a shipper based on proximity to the site and ability to ship overnight.

6.2 Upon selection of a shipper the following information will be gathered before any samples are shipped. This can be done over the phone or by correspondence.

1. Location of the shipping depot or local pickup office in case samples are to be delivered directly to the depot by the field team.
2. Name and phone number of a contact at the shipper.
3. Rates of shipping per package size and weight
4. Special instructions as to container sizes and weights.
5. A set of weighbills for the field team.
6. A copy of the shipper's brochure which will provide information on the format for the various types of weigh bills.
7. Times for calling in a pickup from the job site and normal pickup times.

6.3 The Atlantic field manager will give the shipper a street address where samples can be picked up by the courier near the job site.

6.4 Once all samples have been collected, preserved and containerized for shipment, the field supervisor will call the shipper to arrange for pick up.

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- 6.5 All samples, unless so designated for ground transportation, will be shipped by air express for overnight delivery. This is the standard method since samples collected for Method 625 organics have only a 72-hour holding time between collection and the start of analysis.
- 6.6 The following steps will be followed in the field to prepare the sample shipping containers for pick up.
1. A standard chain-of-custody form will be filled-out, signed by the courier as a custodian, and placed inside each shipping container before final sealing.
 2. The Atlantic field supervisor or his designee will insure that all weighbills have been filled-in properly for air express. If the contract laboratory is within ground transportation distance for overnight delivery, then the weighbills should reflect guaranteed overnight delivery.
 3. A copy of all weighbills must be kept by the field supervisor and the weighbill number associated with each group of samples logged into the Master Sample Log. The name of courier must be written in this log also in case there is a problem in tracing samples.
 4. If possible, to save shipping fees, the sample shipping containers can be strapped together.

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5. An estimated time of delivery for the samples will be logged in the Master Sample Log, (e.g., ETA 12 noon 3/14/83).
- 6.7 Once the samples have been shipped, the field supervisor will call the analytical laboratory and provide a listing of samples to be delivered, the shipping company's name, and the weighbill numbers. As soon as the samples are delivered, the contract laboratory will inform Atlantic of their arrival and report, any damage associated with the samples or whether any sample containers are missing.

ATLANTIC PROCEDURE NO. 1051

OPERATION AND CALIBRATION OF THE HNu SYSTEMS PHOTOIONIZER MODEL PI-101

Prepared By: John A. Ripp Principal
JOHN A. RIPP TITLE

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EDMUND J. BURKE, P.E. TITLE

Approved By: Paul Burgess Chief Engineer
PAUL BURGESS, P.E. TITLE

REVISIONS

NO.	DATE	PREPARED BY	REVIEWED BY	APPROVED BY
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ATLANTIC ENVIRONMENTAL SERVICES, INC.
COLCHESTER, CONNECTICUT

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SECTION 1.0: PURPOSE

To insure a standard procedure for the calibration and operation of the HNu Systems Photoionizer Model PI-101.

SECTION 2.0: SCOPE

The following procedure details those steps necessary for the collection and operation in the survey mode of the HNu Photoionizer. A listing of calibration data needed for proper documentation is supplied at the end of this procedure.

SECTION 3.0: RESPONSIBILITY

Project Manager - First

Field Operations Manager - Second

Field Staff - Third

SECTION 4.0: SUPPORTING PROCEDURES

None

SECTION 5.0: REQUIRED FORMS

Field Notebook No. 351, published by J.L. Darling Corp., Tacoma, Washington (or equivalent), or a conventional paper, bound laboratory notebook (Nalge 6301 or equivalent).

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SECTION 6.0: PROCEDURE

6.1 General Description

The HNu Photoionizer is a survey tool for determining general levels of organic vapors in air. The instrument is comprised of a readout module which contains all controls and the battery power supply and a photoionizer probe which contains the photo-cell. The readout module also contains terminals for connection to a recorder. This module is carried by a strap held across the shoulder while the probe is held by hand.

6.2 Instrument Startup

First connect the probe unit to the readout module by attaching and turning the connector terminal. Note this fitting is "keyed" and must be attached in only one orientation.

Second turn the main switch to battery. The needle should deflect to the upper end of the green scale. If it doesn't deflect into the green area or is at the low end of the scale, the instrument needs to be charged. A battery charger is located in the instrument cover and it plugs into the side of the readout module. For a full day's operation the battery should be charged overnight.

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Third turn on the main switch to any range (ie. 0-2,000 ppm, 0-200 ppm or 0-20 ppm). Look into the probe through the sample tube and observe the violet light of the photo cell. If the light is not on, check the following:

1. Make sure the probe is attached properly to the readout module.
2. An etch mark should be scribed on the probe where it can be unscrewed to replace the photo cell. This mark shows the exact position that the top of the probe takes so that the air inlet ports are lined up. If not lined up, unscrew the probe and assemble it properly.
3. Check the photo cell lamp and replace it if necessary.

Once the battery and photo cell are operating, perform a calibration.

6.3 Calibration

The PI 101 Analyzer is designed for trace gas analysis in ambient air and is calibrated at HNU with certified standards of benzene, vinyl chloride and isobutylene.

Some general points to consider when calibrating the PI 101 are that the analyzer is designed for operation at ambient conditions and therefore the gas standards used for calibration should be delivered to

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the analyzer at ambient temperatures and pressure and at the proper flow rates. The PI 101 is a non-destructive analyzer; calibrations using toxic or hazardous gases must be done in a well ventilated area.

The frequency of calibration should be twice daily as a minimum. The instrument should be calibrated at the beginning of the day (or when the instrument is first turned on) and at the end of the day (or when use of the instrument is completed). If the instrument is turned off during the day for any significant length of time, it should be calibrated when turned on. An accurate and reliable method of calibration check is to use analyzed gas cylinders of "hydrocarbon-free" air and isobutylene (prepared by HNu).

- Step 1. Zero set - Turn the function switch to STANDBY. In this position the lamp is OFF and no signal is generated. Set the zero point with the ZERO set control. The zero can also be set with the function switch on the XI position and using a "Hydrocarbon-free" air. In this case "negative" readings are possible if the analyzer measures a cleaner sample when in service.
- Step 2. 0-20 or 0-200 range - For calibrating on the 0-20 or 0-200 range only one gas standard is required. Turn the function switch to the range position and note the meter reading. Adjust the SPAN control setting as required to read the ppm concentration of the standard. Recheck the zero setting (Step 1). If readjustment is needed, repeat Step 2. This gives a two-point calibration; zero and the gas standard point.

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6.4 Documentation

In the field notebook, or in the bound laboratory notebook, at the start of the project (or if there is a change in instruments), record the following:

1. Site name
2. Instrument model and serial number S/N
3. Types of calibration gases
4. Note the size of the photo cell lamp used in the particular probe. This is useful to know which organic compounds the HNu is sensitive toward.

In the field notebook, or in the bound laboratory notebook, at the start of each calibration, record the following:

1. Date
2. Time
3. Name of person performing the calibration
4. Span setting before beginning calibration
5. That the instrument was zeroed, and whether the instrument was on standby or if "hydrocarbon-free" air was used.
6. The new span setting, if necessary, to calibrate instrument reading
7. Repeat Step 5 if span was adjusted during Step 6
8. Note that the second calibration reading was correct

NEW YORK STATE DEPARTMENT OF HEALTH

DAVID AXELROD, M.D. COMMISSIONER



Expires 12:01 AM April 1, 1991
ISSUED September 28, 1990

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

INTERIM

(Issued in accordance with the Laws of New York State)

pursuant to Section 502 of the Public Health Law

Laboratory ID. Number 11182

Director: Mr. John Flaherty

Laboratory Name: Wadsworth Alert Lab - PA
Number & Street: 450 William Pitt Way
City, State, Zip : Pittsburgh PA 15230
VALID AT THIS ADDRESS ONLY

is hereby APPROVED as an Environmental Laboratory for the category

ENVIRONMENTAL ANALYSES/SOLID AND HAZARDOUS WASTE

All approved subcategories and/or analytes are listed below:

Characteristic Testing :

Corrosivity
Ignitability
Toxicity

Halocethers (ALL)

Nitroaromatics Isophorone (ALL)

Phthalate Esters (ALL)

Purgeable Aromatics (ALL)

Miscellaneous :

Cyanide, Total
Hydrogen Ion (pH)
Sulfide (as S)

Metals 1 (ALL)

Polynuclear Aromatic Hydrocarbons (ALL)

Priority Pollutant Phenols (ALL)

Purgeable Halocarbons (ALL)

Acrolein and Acrylonitrile (ALL)

Chlorophenoxy Acid Pesticides (ALL)

Chlorinated Hydrocarbon Pesticides (ALL)

Chlorinated Hydrocarbons (ALL)

Metals 11 (ALL)

Polychlorinated Biphenyls (ALL)

Herbert W. Dickerman, M.D., Ph.D.

Director

Wadsworth Center for Laboratories and Research

NEW YORK STATE DEPARTMENT OF HEALTH

DAVID AXELROD, M.D. COMMISSIONER



Expires 12:01 AM April 1, 1991
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Director: Mr. John H. Flaherty

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is hereby APPROVED as an Environmental Laboratory for the category

NON-POTABLE WATER

All approved subcategories and analytes are listed on the attached addendum

A handwritten signature in black ink, reading "Herbert W. Dickerman".

Herbert W. Dickerman, M.D., Ph.D.

Director

Wadsworth Center for Laboratories and Research

The following list correlates Atlantic Environmental Services, Inc. sample identification number with NYSEG's Manufactured Gas Plant Sampling Identification Protocol.

SAMPLE IDENTIFICATION

<u>Atlantic Codes</u>	<u>NYSEG Codes</u>
CGLS-SW1	LSCUSS9001G
CGLS-SW2	LSCISS9002G
CGLS-SW3	LSCDSS9003G
CGLS-SE1	LSRUSM9001G
CGLS-SE2	LSRISM9002G
CGLS-SE3	LSRD SM9003G
CGLS-SS1	LSRISF9001L
CGLS-SS2	LSRISF9002L
CGLS-SS3	LSRISF9003L
CGLS-SS4	LSRISF9004L
CGLS-SS5	LSRISF9005G

ANALYTICAL RESULTS - STATE ROAD SITE, LOCKPORT, NEW YORK
NOVEMBER 2, 14 AND 15, 1990

	SURFACE WATER					SEDIMENT			SURFACE SOIL				
	CGLS-SW1	CGLS-SW2	CGLS-SW3	FIELD BLANK	TRIP BLANK	CGLS-SE1	CGLS-SE2	CGLS-SE3	CGLS-SS1	CGLS-SS2	CGLS-SS3	CGLS-SS4	CGLS-SS5
VOLATILE ORGANICS (CAS NOS)													
Acetone (67-64-1)	<0.5	<0.5	<0.5	--	<0.5	120	300	<23	<60	<68	<58	71	<74
Benzene (71-43-2)	<0.5	<0.5	<0.5	--	<0.5	<9.6	<10	<7.7	<6	<6.8	<5.8	<6.4	<7.4
Bromobenzene (108-86-1)	<0.5	<0.5	<0.5	--	<0.5	<9.6	<10	<7.7	<6	<6.8	<5.8	<6.4	<7.4
Bromodichloromethane (THM) (75-27-4)	<0.5	<0.5	<0.5	--	<0.5	<9.6	<10	<7.7	<6	<6.8	<5.8	<6.4	<7.4
Bromoform (THM) (75-25-2)	<0.5	<0.5	<0.5	--	<0.5	<9.6	<10	<7.7	<6	<6.8	<5.8	<6.4	<7.4
Bromomethane (74-95-3)	<0.5	<0.5	<0.5	--	<0.5	<19	<20	<15	<12	<14	<12	<13	<15
2-Butanone (78-93-3)	--	--	--	--	--	<96	<100	<23	<60	<68	<58	<64	<74
Carbon disulfide (75-15-0)	--	--	--	--	--	<9.6	<10	<7.7	<6	<6.8	<5.8	<6.4	<7.4
Carbon tetrachloride (56-23-5)	<0.5	<0.5	<0.5	--	<0.5	<9.6	<10	<7.7	<6	<6.8	<5.8	<6.4	<7.4
Chlorobenzene (108-90-7)	<0.5	<0.5	<0.5	--	<0.5	<9.6	<10	<7.7	<6	<6.8	<5.8	<6.4	<7.4
Chlorodibromomethane (THM)	<0.5	<0.5	<0.5	--	<0.5	<9.6	<10	<7.7	<6	<6.8	<5.8	<6.4	<7.4
Chloroethane (75-00-3)	<0.5	<0.5	<0.5	--	<0.5	<19	<20	<15	<12	<14	<12	<13	<15
Chloroform (67-66-3)	<0.5	<0.5	<0.5	--	<0.5	<9.6	<10	<7.7	<6	<6.8	<5.8	<6.4	<7.4
Chloromethane (74-87-3)	<0.5	<0.5	<0.5	--	<0.5	<19	<20	<15	<12	<14	<12	<13	<15
o-Chlorotoluene (95-49-8)	<0.5	<0.5	<0.5	--	<0.5	<9.6	<10	<7.7	<6	<6.8	<5.8	<6.4	<7.4
p-Chlorotoluene (106-43-4)	<0.5	<0.5	<0.5	--	<0.5	<9.6	<10	<7.7	<6	<6.8	<5.8	<6.4	<7.4
Dibromochloromethane (124-48-1)	--	--	--	--	--	<9.6	<10	<7.7	<6	<6.8	<5.8	<6.4	<7.4
1,2-Dibromo-3-Chloropropane (DBCP) (96-12-8)	<0.5	<0.5	<0.5	--	<0.5	<9.6	<10	<7.7	<6	<6.8	<5.8	<6.4	<7.4
Dibromomethane (75-95-3)	<0.5	<0.5	<0.5	--	<0.5	<9.6	<10	<7.7	<6	<6.8	<5.8	<6.4	<7.4
p-Dichlorobenzene (106-46-7)	<0.5	<0.5	<0.5	--	<0.5	<9.6	<10	<7.7	<6	<6.8	<5.8	<6.4	<7.4
m-Dichlorobenzene (541-73-1)	<0.5	<0.5	<0.5	--	<0.5	<9.6	<10	<7.7	<6	<6.8	<5.8	<6.4	<7.4
o-Dichlorobenzene (95-50-1)	<0.5	<0.5	<0.5	--	<0.5	<9.6	<10	<7.7	<6	<6.8	<5.8	<6.4	<7.4
1,1-Dichloroethane (75-34-3)	--	--	--	--	--	<9.6	<10	<7.7	<6	<6.8	<5.8	<6.4	<7.4
1,2-Dichloroethane (107-06-2)	--	--	--	--	--	<9.6	<10	<7.7	<6	<6.8	<5.8	<6.4	<7.4
1,1-Dichloroethene (75-34-3)	<0.5	<0.5	<0.5	--	<0.5	<9.6	<10	<7.7	<6	<6.8	<5.8	<6.4	<7.4
1,2-Dichloroethene (Total) (540-59-0)	<0.5	<0.5	<0.5	--	<0.5	<9.6	<10	<7.7	<6	<6.8	<5.8	<6.4	<7.4
1,1-Dichloroethylene (75-35-4)	<0.5	<0.5	<0.5	--	<0.5	<9.6	<10	<7.7	<6	<6.8	<5.8	<6.4	<7.4
cis-1,2-Dichloroethylene	<0.5	<0.5	<0.5	--	<0.5	<9.6	<10	<7.7	<6	<6.8	<5.8	<6.4	<7.4
trans-1,2-Dichloroethylene	<0.5	<0.5	<0.5	--	<0.5	<9.6	<10	<7.7	<6	<6.8	<5.8	<6.4	<7.4
1,2-Dichloropropane (78-87-5)	<0.5	<0.5	<0.5	--	<0.5	<9.6	<10	<7.7	<6	<6.8	<5.8	<6.4	<7.4
1,3-Dichloropropane	<0.5	<0.5	<0.5	--	<0.5	<9.6	<10	<7.7	<6	<6.8	<5.8	<6.4	<7.4
2,2-Dichloropropane	<0.5	<0.5	<0.5	--	<0.5	<9.6	<10	<7.7	<6	<6.8	<5.8	<6.4	<7.4
1,1-Dichloropropene	<0.5	<0.5	<0.5	--	<0.5	<9.6	<10	<7.7	<6	<6.8	<5.8	<6.4	<7.4
1,3-Dichloropropene	<0.6	<0.5	<0.5	--	<0.5	<9.6	<10	<7.7	<6	<6.8	<5.8	<6.4	<7.4
cis-1,3-Dichloropropene	--	--	--	--	--	<9.6	<10	<7.7	<6	<6.8	<5.8	<6.4	<7.4
trans-1,3-Dichloropropene	--	--	--	--	--	<9.6	<10	<7.7	<6	<6.8	<5.8	<6.4	<7.4
Ethylbenzene (100-41-4)	<0.5	<0.5	<0.5	--	<0.5	<9.6	<10	<7.7	<6	<6.8	<5.8	<6.4	<7.4
Ethylene dibromide (EDB) (106-93-4)	<0.5	<0.5	<0.5	--	<0.5	<9.6	<10	<7.7	<6	<6.8	<5.8	<6.4	<7.4

ANALYTICAL RESULTS - STATE ROAD SITE, LOCKPORT, NEW YORK
NOVEMBER 2, 14 AND 15, 1990

	SURFACE WATER					SEDIMENT			SURFACE SOIL				
	CGLS-SW1	CGLS-SW2	CGLS-SW3	FIELD BLANK	TRIP BLANK	CGLS-SE1	CGLS-SE2	CGLS-SE3	CGLS-SS1	CGLS-SS2	CGLS-SS3	CGLS-SS4	CGLS-SS5
2-Hexanone (591-78-6)	—	—	—	—	—	<96	<100	<23	<60	<68	<58	<64	<74
Methylene chloride (75-09-2)	<0.5	<0.5	<0.5	—	0.25	<19	<20	<15	<12	<14	<12	<13	<15
4-Methyl-2-pentanone (108-10-1)	—	—	—	—	—	<96	<100	<23	<60	<68	<58	<64	<74
Styrene (100-42-5)	<0.5	<0.5	<0.5	—	<0.5	<9.6	<10	<7.7	<6	<6.8	<5.8	<6.4	<7.4
1,1,1,2-Tetrachloroethane (79-34-5)	<0.5	<0.5	<0.5	—	<0.5	<9.6	<10	<7.7	<6	<6.8	<5.8	<6.4	<7.4
1,1,2,2-Tetrachloroethane (79-34-5)	—	—	—	—	—	<9.6	<10	<7.7	<6	<6.8	<5.8	<6.4	<7.4
Tetrachloroethene (127-18-4)	—	—	—	—	—	<9.6	<10	<7.7	<6	<6.8	<5.8	<6.4	43
Tetrachloroethylene (127-18-4)	<0.5	<0.5	<0.5	—	<0.5	<9.6	<10	<7.7	<6	<6.8	<5.8	<6.4	<7.4
Toluene (108-88-3)	<0.5	<0.5	<0.5	—	1	<9.6	<10	<7.7	<6	<6.8	<5.8	<6.4	<7.4
1,1,1-Trichloroethane (71-55-6)	<0.5	<0.5	<0.5	—	<0.5	<9.6	<10	<7.7	<6	<6.8	<5.8	<6.4	16
1,1,2-Trichloroethane (79-00-5)	<0.5	<0.5	<0.5	—	<5	<9.6	<10	<7.7	<6	<6.8	<5.8	<6.4	<7.4
Trichloroethene (79-01-6)	—	—	—	—	—	<9.6	<10	<7.7	<6	<6.8	<5.8	<6.4	16
Trichloroethylene (79-01-6)	<0.5	<0.5	<0.5	—	<0.5	<9.6	<10	<7.7	<6	<6.8	<5.8	<6.4	<7.4
1,2,3-Trichloropropane	<0.5	<0.5	<0.5	—	<0.5	<9.6	<10	<7.7	<6	<6.8	<5.8	<6.4	<7.4
Vinyl acetate (108-05-4)	—	—	—	—	—	<96	<100	<23	<60	<68	<58	<64	<74
Vinyl chloride (75-01-4)	<0.5	<0.5	<0.5	—	<0.5	<19	<20	<15	<12	<14	<12	<13	<15
Total xylenes (1330-20-7)	<0.5	<0.5	<0.5	—	<0.5	<9.6	<10	<7.7	<6	<6.8	<5.8	<6.4	<7.4
SEMI-VOLATILE ORGANICS													
Acenaphthene (83-32-9)	<10	<10	<10	<10	—	<6300	<6600	<5100	<4000	<4500	<3900	<4200	<4900
Acenaphthylene (83-32-9)	<10	<10	<10	<10	—	<6300	<6600	<5100	<4000	<4500	<3900	<4200	<4900
Anthracene (120-12-7)	<10	<10	<10	<10	—	<6300	<6600	<5100	<4000	<4500	<3900	<4200	14000
Benzidine (92-87-5)	<50	<50	<50	<50	—	<6300	<6600	<5100	<4000	<4500	<3900	<4200	<4900
Benzo(a)anthracene	<10	<10	<10	<10	—	<6300	<6600	<5100	<4000	<4500	2500J	<4200	15000
Benzo(b)fluoranthene (205-99-2)	<10	<10	<10	<10	—	<6300	<6600	<5100	<4000	<4500	<3900	<4200	<4900
Benzo(k)fluoranthene (207-08-9)	<10	<10	<10	<10	—	<6300	<6600	<5100	<4000	<4500	3200J	3900J	43000
Benzo(ghi)perylene	<10	<10	<10	<10	—	<6300	<6600	<5100	<4000	<4500	<3900	<4200	8900
Benzo(a)pyrene (50-32-8)	<10	<10	<10	<10	—	<6300	<6600	<5100	<4000	<4500	<3900	<4200	18000
Benzyl alcohol (100-51-6)	<10	<10	<10	<10	—	<6300	<6600	<5100	<4000	<4500	<3900	<4200	<4900
Bis(2-chloroethoxy)methane	<10	<10	<10	<10	—	<6300	<6600	<5100	<4000	<4500	<3900	<4200	<4900
Bis(2-chloroethyl)ether (111-44-4)	<10	<10	<10	<10	—	<6300	<6600	<5100	<4000	<4500	<3900	<4200	<4900
Bis(2-chloroisopropyl)ether	<10	<10	<10	<10	—	<6300	<6600	<5100	<4000	<4500	<3900	<4200	<4900
Bis(2-Ethylhexyl)phthalate (117-81-7)	<10	<10	<10	<10	—	<6300	<6600	<5100	<4000	<4500	<3900	<4200	<4900
4-Bromophenyl phenyl ether	<10	<10	<10	<10	—	<6300	<6600	<5100	<4000	<4500	<3900	<4200	<4900
Butyl benzyl phthalate (85-68-7)	<10	<10	<10	<10	—	<6300	<6600	<5100	<4000	<4500	<3900	<4200	<4900
4-Chloroaniline (106-47-8)	<10	<10	<10	<10	—	<6300	<6600	<5100	<4000	<4500	<3900	<4200	<4900
2-Chloronaphthalene (91-58-7)	<10	<10	<10	<10	—	<6300	<6600	<5100	<4000	<4500	<3900	<4200	<4900
4-Chlorophenyl phenyl ether	<10	<10	<10	<10	—	<6300	<6600	<5100	<4000	<4500	<3900	<4200	<4900
Chrysene (218-01-9)	<10	<10	<10	<10	—	<6300	<6600	<5100	<4000	<4500	<3900	3300J	25000
Dibenzo(a,h)anthracene (53-70-3)	<10	<10	<10	<10	—	<6300	<6600	<5100	<4000	<4500	<3900	<4200	<4900

ANALYTICAL RESULTS - STATE ROAD SITE, LOCKPORT, NEW YORK
NOVEMBER 2, 14 AND 15, 1990

	SURFACE WATER					SEDIMENT			SURFACE SOIL				
	CGLS-SW1	CGLS-SW2	CGLS-SW3	FIELD BLANK	TRIP BLANK	CGLS-SE1	CGLS-SE2	CGLS-SE3	CGLS-SS1	CGLS-SS2	CGLS-SS3	CGLS-SS4	CGLS-SS5
Dibenzofuran	<10	<10	<10	<10	—	<6300	<6600	<5100	<4000	<4500	<3900	<4200	<4900
Di-n-butyl phthalate (84-74-2)	<10	<10	<10	<10	—	<6300	<6600	<5100	<4000	<4500	<3900	<4200	<4900
1,2-Dichlorobenzene (95-50-1)	<10	<10	<10	<10	—	<6300	<6600	<5100	<4000	<4500	<3900	<4200	<4900
1,3-Dichlorobenzene (541-73-1)	<10	<10	<10	<10	—	<6300	<6600	<5100	<4000	<4500	<3900	<4200	<4900
1,4-Dichlorobenzene (106-46-7)	<10	<10	<10	<10	—	<6300	<6600	<5100	<4000	<4500	<3900	<4200	<4900
3,3'-Dichlorobenzidine (91-94-1)	<50	<50	<50	<50	—	<31000	<32000	<25000	<19000	<22000	<19000	<21000	<24000
Diethyl phthalate (84-66-2)	<10	<10	<10	<10	—	<6300	<6600	<5100	<4000	<4500	<3900	<4200	<4900
Dimethyl phthalate (131-11-3)	<10	<10	<10	<10	—	<6300	<6600	<5100	<4000	<4500	<3900	<4200	<4900
2,4-Dinitrotoluene	<10	<10	<10	<10	—	<6300	<6600	<5100	<4000	<4500	<3900	<4200	<4900
2,6-Dinitrotoluene (606-20-2)	<10	<10	<10	<10	—	<6300	<6600	<5100	<4000	<4500	<3900	<4200	<4900
Di-n-octyl phthalate (117-84-0)	<10	<10	<10	<10	—	<6300	<6600	<5100	<4000	<4500	<3900	<4200	<4900
Fluoranthene (206-44-0)	<10	<10	<10	<10	—	<6300	<6600	<5100	<4000	<4500	4100	3600J	16000
Fluorene (86-73-7)	<10	<10	<10	<10	—	<6300	<6600	<5100	<4000	<4500	<3900	<4200	<4900
Hexachlorobenzene (118-74-1)	<10	<10	<10	<10	—	<6300	<6600	<5100	<4000	<4500	<3900	<4200	<4900
Hexachlorobutadiene (87-68-3)	<10	<10	<10	<10	—	<6300	<6600	<5100	<4000	<4500	<3900	<4200	<4900
Hexachlorocyclopentadiene (77-47-4)	<10	<10	<10	<10	—	<6300	<6600	<5100	<4000	<4500	<3900	<4200	<4900
Hexachloroethane (67-72-1)	<10	<10	<10	<10	—	<6300	<6600	<5100	<4000	<4500	<3900	<4200	<4900
Indeno(1,2,3-cd)pyrene (193-39-5)	<10	<10	<10	<10	—	<6300	<6600	<5100	<4000	<4500	<3900	<4200	8500
Isophorone (78-59-1)	<10	<10	<10	<10	—	<6300	<6600	<5100	<4000	<4500	<3900	<4200	<4900
2-Methylnaphthalene	—	—	—	—	—	<6300	<6600	<5100	<4000	<4500	<3900	<4200	<4900
Naphthalene (91-20-3)	<10	<10	<10	<10	—	<6300	<6600	<5100	<4000	<4500	<3900	<4200	<4900
Nitrobenzene (98-95-3)	<10	<10	<10	<10	—	<6300	<6600	<5100	<4000	<4500	<3900	<4200	<4900
2-Nitroaniline (88-74-4)	—	—	—	—	—	<31000	<32000	<25000	<19000	<22000	<19000	<21000	<24000
3-Nitroaniline (99-09-2)	—	—	—	—	—	<6300	<6600	<5100	<4000	<4500	<3900	<4200	<4900
4-Nitroaniline (100-01-6)	—	—	—	—	—	<6300	<6600	<5100	<4000	<4500	<3900	<4200	<4900
N-Nitrosodimethylamine (86-30-6)	<10	<10	<10	<10	—	<6300	<6600	<5100	<4000	<4500	<3900	<4200	<4900
N-Nitrosodiphenylamine (85-01-8)	<10	<10	<10	<10	—	<6300	<6600	<5100	<4000	<4500	<3900	<4200	<4900
N-Nitrosodi-n-propylamine	<10	<10	<10	<10	—	<6300	<6600	<5100	<4000	<4500	<3900	<4200	<4900
Phenanthrene (85-01-8)	<10	<10	<10	<10	—	<6300	<6600	<5100	<4000	<4500	2200J	1800J	<4900
Pyrene (129-00-0)	<10	<10	<10	<10	—	<6300	<6600	<5100	<4000	<4500	4600	6000	21000
1,2,4-Trichlorobenzene (120-82-1)	<10	<10	<10	<10	—	<6300	<6600	<5100	<4000	<4500	<3900	<4200	<4900
Benzoic Acid (65-85-0)	—	—	—	—	—	<31000	<32000	<25000	<19000	<22000	<19000	<21000	<24000
4-Chloro-3-methylphenol (59-50-7)	<10	<10	<10	<10	—	<6300	<6600	<5100	<4000	<4500	<3900	<4200	<4900
2-Chlorophenol (95-57-8)	<10	<10	<10	<10	—	<6300	<6600	<5100	<4000	<4500	<3900	<4200	<4900
2,4-Dichlorophenol (120-83-2)	<10	<10	<10	<10	—	<6300	<6600	<5100	<4000	<4500	<3900	<4200	<4900
2,4-Dimethylphenol	<10	<10	<10	<10	—	<6300	<6600	<5100	<4000	<4500	<3900	<4200	<4900
2,4-Dinitrophenol (51-28-5)	<50	<50	<50	<50	—	<31000	<32000	<25000	<19000	<22000	<19000	<21000	<24000
2-Methyl-4,6-dinitrophenol (534-52-1)	<50	<50	<50	<50	—	<31000	<32000	<25000	<19000	<22000	<19000	<21000	<24000
2-Methylphenol (95-48-7)	—	—	—	—	—	<6300	<6600	<5100	<4000	<4500	<3900	<4200	<4900

ANALYTICAL RESULTS - STATE ROAD SITE, LOCKPORT, NEW YORK
NOVEMBER 2, 14 AND 15, 1990

	SURFACE WATER					SEDIMENT			SURFACE SOIL				
	CGLS- SW1	CGLS- SW2	CGLS- SW3	FIELD BLANK	TRIP BLANK	CGLS- SE1	CGLS- SE2	CGLS- SE3	CGLS- SS1	CGLS- SS2	CGLS- SS3	CGLS- SS4	CGLS- SS5
4-Methylphenol (106-44-5)	—	—	—	—	—	<6300	<6600	<5100	<4000	<4500	<3900	<4200	<4900
2-Nitrophenol (88-75-5)	<10	<10	<10	<10	—	<6300	<6600	<5100	<4000	<4500	<3900	<4200	<4900
4-Nitrophenol (100-02-7)	<10	<10	<10	<10	—	<31000	<32000	<25000	<19000	<22000	<19000	<21000	<24000
Pentachlorophenol (87-86-5)	<10	<10	<10	<10	—	<31000	<32000	<25000	<19000	<22000	<19000	<21000	<24000
Phenol (108-95-2)	<10	<10	<10	<10	—	<6300	<6600	<5100	<4000	<4500	<3900	<4200	<4900
2,4,5-Trichlorophenol (95-95-4)	—	—	—	—	—	<6300	<6600	<5100	<4000	<4500	<3900	<4200	<4900
2,4,6-Trichlorophenol (88-06-2)	<10	<10	<10	<10	—	<6300	<6600	<5100	<4000	<4500	<3900	<4200	<4900
METALS													
Silver (7440-22-4)	<10	<10	<10	—	—	<1.9	<2	<1.5	<1.2	<1.3	<1.1	<1.3	<1.5
Aluminum (7429-90-5)	380	<200	<200	—	—	14000	12000	11000	5900	5900	7600	7400	5400
Arsenic (7440-38-2)	<10	<10	<10	—	—	3.1	3.9	3.3	5.8	4.5	5.5	6.7	11
Barium (7440-39-3)	<200	<200	<200	—	—	88	90	100	130	70	80	78	120
Beryllium (7440-41-7)	<5	<5	<5	—	—	1.2	1.2	0.92	<0.76	0.73	0.69	0.96	0.78
Calcium (7440-70-2)	56000	57000	52000	—	—	31000	36000	31000	82000	34000	50000	27000	8900
Cadmium (7440-43-9)	<5	<5	<5	—	—	<1	<0.99	<0.76	<0.76	<0.67	<0.58	<0.64	<0.73
Cobalt (7440-48-4)	<50	<50	<50	—	—	10	11	<7.6	66	<6.7	<5.8	<6.4	<7.3
Chromium (7440-47-3)	<5	7.2	<5	—	—	26	28	41	12	17	11	16	21
Copper (7440-50-8)	<25	<25	<25	—	—	39	44	44	46	34	25	34	120
Iron (7439-89-6)	300	200	170	—	—	23000	26000	22000	11000	15000	15000	23000	26000
Mercury (7439-97-6)	<0.2	<0.2	<0.2	—	—	<0.19	<0.2	0.19	0.14	0.41	<0.12	0.24	1.1
Potassium (7440-09-7)	<5000	<5000	<5000	—	—	2100	1900	1400	6800	860	1100	1100	2100
Magnesium (7439-95-4)	12000	12000	11000	—	—	11000	12000	12000	42000	9700	20000	7900	3100
Manganese (7439-96-5)	36	40	21	—	—	540	550	510	780	450	840	800	370
Sodium	15000	15000	15000	—	—	<970	<990	<760	<600	<670	<580	<640	<730
Nickel (7440-02-0)	<40	<40	<40	—	—	29	36	35	68	43	16	39	<5.8
Lead (7439-92-1)	<3	<3	<3	—	—	31	46	76	100	190	100	140	180
Antimony (7440-36-0)	—	<60	<60	—	—	<12	<12	<9.2	<7.2	<8	<7	<7.7	<8.8
Selenium (7782-49-2)	—	41	<5	—	—	<4.6	<4.8	<3.8	<3	<3.2	<2.9	<3.2	<7.1
Thallium (7440-28-0)	—	<10	<10	—	—	<1.8	<1.9	<1.5	<1.2	<1.3	<1.2	<1.3	<2.8
Vanadium (7440-62-2)	—	<50	<50	—	—	21	20	17	<6	<6.7	16	17	16
Zinc (7440-66-6)	—	<20	30	—	—	190	290	310	120	130	120	140	240
CYANIDE	<0.01	<0.01	<0.01	—	—	<0.94	<0.96	<0.72	<0.57	<0.67	<0.5	<0.63	3800

All concentrations in ppb. Cyanide concentrations in ppm.

< None detected, lower detectable limit.

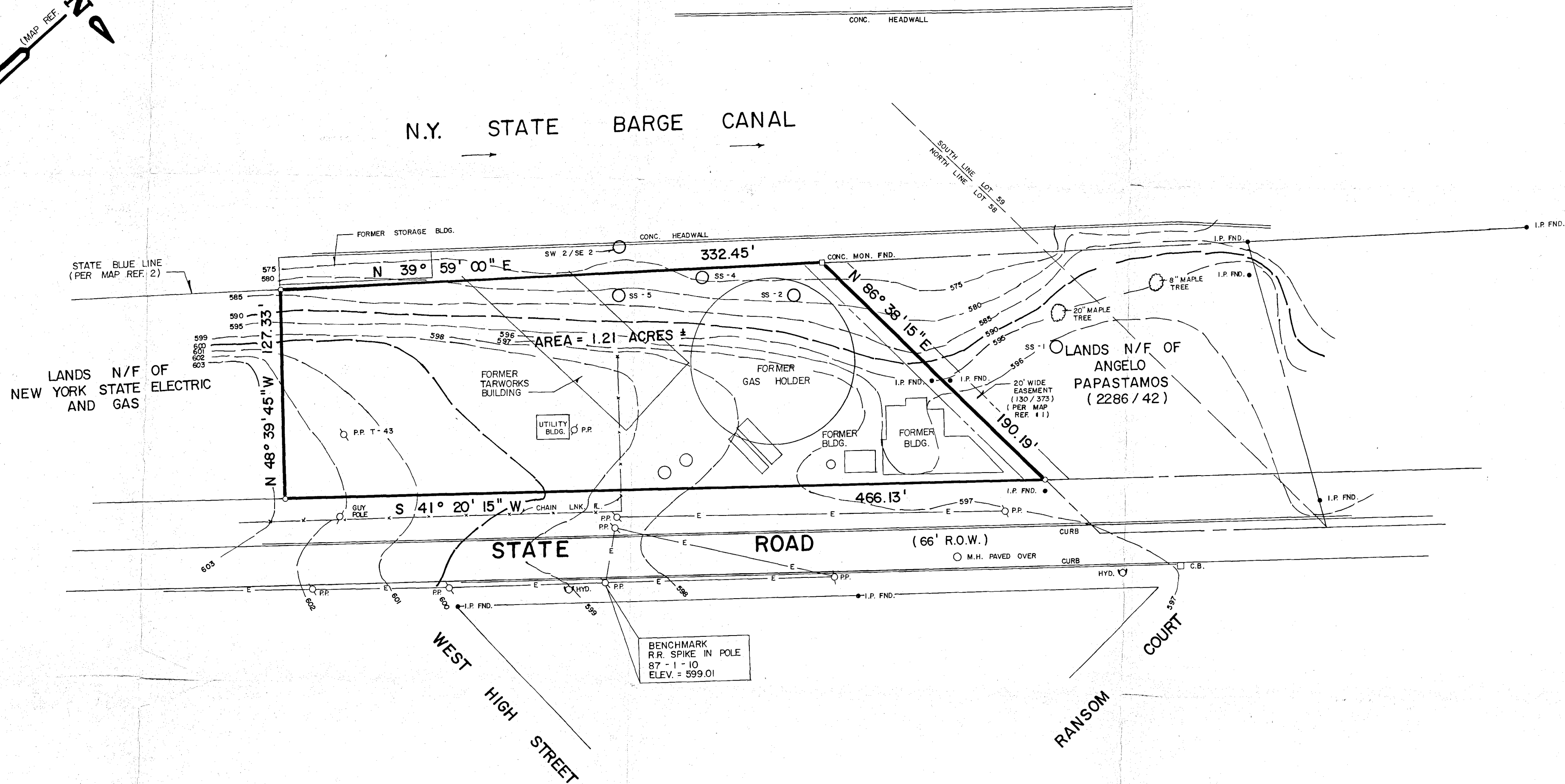
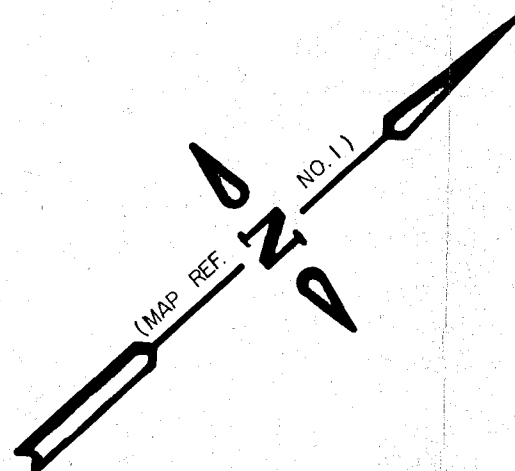
— Not analyzed.

J - Detected, but below quantification limit; estimated value.

Shaded areas indicate detected concentrations.

Laboratory: Wadsworth/Alert Laboratories, Inc.


Sample locations shown on Figure 5.



MAP REFERENCES:

- 1) Survey of Part of Lots 58 & 59, TWP-14, R-7 City of Lockport, dated November 30, 1961, prepared by John E. McIntosh Land Surveyor.
- 2) Sketch of Lockport Gas Holder Site - State Road, City of Lockport.

NOTE:

- 1) Elevations as shown are National Geodetic Vertical Datum of 1929.
- 2)  Denotes approximate location of former structures on site as scaled from various maps.

This survey has been prepared without benefit of Abstract of Title and is subject to a statement of fact Abstract of Title may reveal.

UNAUTHORIZED ADDITIONS OR ALTERATIONS TO THIS MAP IS A VIOLATION OF ARTICLE 145, SECTION 7209, SUB-PARAGRAPH 2 OF NEW YORK STATE EDUCATION LAW.

BOUNDARY & TOPOGRAPHIC SURVEY FOR LOCKPORT, N.Y. MGP SITE

CITY OF LOCKPORT NIAGARA CO. N.Y.

SCALE: 1" = 50' JANUARY 17, 1991

S.Y. KIM LAND SURVEYOR P.C. JOB NO. 5N - 212 - 90

