REVISED WORK PLAN
FOR OPERABLE UNIT 2 (OU-2)

BASF Rensselaer
Rensselaer, New York

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Prepared for:

BASF CORPORATION
3000 Continental Drive North
Mount Olive, New Jersey 07828

Prepared by:

ROUX ASSOCIATES, INC.
209 Shafter Street
Islandia, New York 11749

ROUX

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1.0 INTRODUCTION

This Work Plan provides the approach and methods that will be used to evaluate whether and to what extent constituents originating on the BASF Corporation (BASF) Main Plant located in Rensselaer, New York (Figure 1) have been transported off to surrounding properties. Based upon discussions with and correspondence from the New York State Department of Environmental Conservation (NYSDEC), BASF has directed Roux Associates, Inc. (Roux Associates) to prepare this Revision to the March 5, 2004 Revised Work Plan for Operable Unit 2 (OU-2).

The BASF property consists of an approximate 80-acre parcel of land that is separated into four areas that are commonly referred to as the: 1) Main Plant and Lagoon Area; 2) Closed Landfill; 3) Warehouse Building (Building 39); and 4) South 40 (Figure 2). Operable Unit 2 consists of areas located off BASF property where contaminants may have migrated.

BASF was initially requested to submit a work plan for the investigation of OU-2 on October 31, 2003, with additional detail regarding the scope of the work plan provided in a November 10, 2003 letter to BASF from the NYSDEC. In that letter, the NYSDEC made recommendations as to the areas of concern to be incorporated into the scope of work for the work plan. These areas included:

- All outfall locations, including the City of Rensselaer and Town of East Greenbush storm sewers, and industrial discharge points;
- Offsite migration of impacted groundwater northward beneath Riverside Avenue and northward from the Lagoon Area;
- A soil gas survey related to the off-site groundwater migration investigation; and
- An investigation of areas of possible airborne and particulate deposition, including soil sampling in residential areas to the east and northwest of the Main Plant.

BASF submitted an initial version of the requested work plan on December 10, 2003. NYSDEC provided comments on January 9, 2004. BASF met with the NYSDEC and the New York State Department of Health (NYSDOH) on February 19, 2004 to discuss BASF's approach to each of the requested components of the offsite investigation and received comments from the NYSDEC and NYSDOH on BASF's approach. A first Revised Work Plan was submitted to the NYSDEC

on March 5, 2004, which incorporated the January 9, 2004 comments from NYSDEC and the comments provided by NYSDEC and NYSDOH in the February 19, 2004 meeting, and addressed each of the four off-site areas identified by NYSDEC. This second Revised Work Plan was prepared to address comments provided by the NYSDEC to BASF in an April 9, 2004 letter.

The focus of this OU-2 Work Plan is to complete the investigation of any off-site transport of constituents that may have originated on the BASF Main Plant and Lagoon Area. As such, a key component of the Work Plan will be to differentiate those constituents that may be present as a result of activities on either the Main Plant or Lagoon Area from those that may be present as a result of off-site activities unrelated to BASF. These off-site activities include, among others, operations conducted at the Sterling Drug Site, located to the north of BASF (Figure 2).

BASF has used the information developed in the course of the Remedial Investigation (RI) as well as data obtained from the adjacent Sterling Drug Site to develop the scope of work presented in this Work Plan. These physical and chemical data support BASF's conclusion that there are three primary pathways by which constituents from the BASF Main Plant or Lagoon Area may have migrated off-site. Based on these data, the three primary pathways are:

- **Discharge of Constituents Present in Groundwater Flowing through Utility Bedding to Outfalls in the Hudson River**
  As per the November 10, 2003 letter, the investigation of this pathway will be focused on sediment at industrial and municipal outfall locations.

- **Groundwater and Organic Vapor Migration Via Sewer and/or Utility Bedding Located Beneath Riverside Avenue**
  Other possible pathways have already been investigated during the RI, and the potential for off-site migration via these pathways has been eliminated. Therefore, the primary focus of the requested off-site groundwater and soil gas investigation to the north and northwest of the Main Plant will be the sewer and utility bedding below the water table beneath Riverside Avenue.

- **Deposition of Airborne Constituents that May Have Been Emitted from the BASF Main Plant**
  BASF is proposing in this Work Plan the process by which a detailed soil sampling plan to assess the potential impact of this pathway will be developed in consultation with NYSDEC and NYSDOH. BASF is currently compiling and analyzing information regarding historical emissions from the Site and the local meteorology. After determining the types and quantities of constituents historically emitted at the facility and the local meteorology, the most likely locations for deposition to have occurred will be

identified, and a sampling plan will be prepared. The ultimate objective of this evaluation is to determine what, if any, risk is posed by impacts to soil in the neighborhood from historic airborne emissions.

1.1 Facility Background

This section presents a brief description of the results of the RI that indicated the need for further off-site investigation. A more complete description and a Site history are presented in the Remedial Investigation and Supplemental Remedial Investigation Report (Roux Associates, 2000).

1.1.1 Facility Description

The BASF Rensselaer facility is located in an industrial area of Rensselaer, Rensselaer County, New York. The BASF property consists of an approximate 80-acre parcel of land that is separated into four areas that are commonly referred to as the Main Plant and Lagoon Area, Closed Landfill, Warehouse Building (Building 39) and South 40 (Figure 2). Three of these areas are listed in the NYSDEC Registry of Inactive Hazardous Waste Disposal Sites. The Main Plant is listed in the New York State Registry of Inactive Hazardous Waste Disposal Sites as a Class 2 Site (Inactive Hazardous Waste Disposal Ste Code 442027) and subject to an Order on Consent (Index Number A4-0345-96-07).

The Main Plant was first developed in the 1880s, and functioned primarily as a production facility for colorants and dyes. BASF acquired the property in 1978. The Main Plant is currently inactive and contains 18 buildings that were production buildings, maintenance shops, laboratories, warehouses, and offices. Areas of the Main Plant that are not covered by asphalt or buildings are covered with gravel or grass.

The Main Plant is bordered on the north by the Sterling Drug Site 1 (Sterling Site [Inactive Hazardous Waste Disposal Site Code 442009]) – a chemical manufacturing plant that was formerly Sterling Drug, NYCOMED, Organichem, and is currently owned and operated by Albany Molecular – and residential areas north of the Sterling Site. Riverside Avenue borders the Main Plant to the west and south and separates the Main Plant from the Lagoon Area. The Closed Landfill (Inactive Hazardous Waste Disposal Site Code 442004) is located to the southeast of the Main Plant with the South 40 (Inactive Hazardous Waste Disposal Site

Code 442022) beyond. To the east of the Main Plant are several Amtrak rail spurs, New York State Route 9J and the elevated Port of Rensselaer Highway. The Hudson River is to the west of the Lagoon Area (Figure 2).

1.1.2 Surface Features

The Site topography is generally flat and gently slopes down to the west. No naturally occurring surface-water bodies exist within the Site. A majority of the Site is paved with asphalt (approximately 0.5 feet thick) or covered by a building. A large gravel parking lot covers the southwest corner of the Main Plant. In addition, there are several gravel areas located throughout the Main Plant including several former building footprints and a portion of the former railroad spur along the north edge of the property. Runoff from the Main Plant is directed to storm drains that discharge to the lagoons.

1.1.3 Site Geology

The evaluation of geologic conditions was based upon the information developed during drilling of the soil borings and monitoring well pilot boreholes for the Remedial Investigation (RI), Supplemental Remedial Investigation (SRI), and Additional Remedial Investigation Activities (Additional RI Activities). The Main Plant and Lagoon Area is predominately underlain by fill, consisting of sand with silt and clay. The fill is approximately five to ten-feet thick beneath the Main Plant and becomes slightly thicker adjacent to the Hudson River. In the Lagoon Area, the fill is underlain by alluvial deposits consisting of sand with gravel and some silt and clay. These alluvial deposits are approximately 18-feet thick adjacent to the Hudson River and pinch out along the eastern edge of the wastewater lagoons.

Underlying the fill (alluvial deposits in the Lagoon Area) are glacio-lacustrine deposits consisting of silt and clay ranging from less than nine feet thick beneath the eastern border of the Main Plant to approximately 55 feet thick beneath the Lagoon Area and the western portion of the Main Plant. The glacio-lacustrine deposits are underlain by a thin sand and gravel unit approximately 6.5 feet thick along the western boundary of the Main Plant. This unit is absent and presumably pinches out beneath the eastern boundary of the Main Plant. Shale bedrock is below the sand and gravel unit at a depth of 70.5 feet along the western boundary of the Main

Plant. The shale bedrock is located immediately below the silt and clay at a depth of 17 feet along the eastern boundary of the Main Plant.

1.1.4 Site Hydrogeology

The evaluation of hydrogeologic conditions was based upon a review of three synoptic rounds of water-level measurements collected during the RI, SRI, and Additional RI Activities. In general, the water table underlying the Main Plant, Lagoon Area, and Closed Landfill occurs within the upper fill deposits. Depth to water beneath the Main Plant ranged from approximately 0.5 feet below land surface to approximately 15 feet below land surface.

The general groundwater flow direction across the Main Plant is from east to west, towards the Hudson River, but this flow direction is not uniform and contains perturbations that are assumed to indicate the influence of subsurface conduits (e.g., sewers). As discussed in the Additional RI Activities, steep groundwater gradients are present at the north, west and south perimeters of the Main Plant at locations where either BASF sanitary sewers or City of Rensselaer storm sewers are present. Groundwater flow directions in these locations are towards the sewers, and it has been hypothesized that groundwater beneath the Main Plant discharges to the bedding of these utilities.

Groundwater level measurements from the adjacent Sterling Site show that a groundwater divide exists in across the center of the Sterling Site. South of the groundwater divide, groundwater flows to the south, towards the BASF sanitary sewer located between Sterling and BASF, and west, towards the City of Rensselaer storm sewer located beneath Riverside Avenue. North of the groundwater divide, groundwater flow is to the northwest, towards the residential area and the Hudson River. Based on these groundwater elevation data, it can be concluded that groundwater from both the BASF Main Plant and Sterling Site may discharge to the bedding of the BASF sanitary sewer and ultimately to the bedding of the City of Rensselaer storm water sewer. Since groundwater beneath the northern portion of the Sterling Site is known to contain constituents similar to those found in groundwater beneath the BASF Main Plant (see Section 2), constituents originating on the Sterling Site may also be migrating towards the residential area.

1.1.5 Previous Investigations

The following reports summarize previous investigations that were conducted at the Main Plant and Lagoon Area:

- "Wastewater Equalization Lagoon Reconstruction Study and Preliminary Design," March 1993, Clough, Harbour & Associates (1993).
- "BASF/Sterling Organics Wastewater Lagoons Baseline Assessment Rensselaer, New York," June 1994, Malcolm Pirnie, Inc (1994).
- "Remedial Investigation (RI) and Supplemental Remedial Investigation (SRI) Report, BASF Rensselaer, Rensselaer, New York," November 2000, Roux Associates, Inc (2000).
- "Additional Remedial Investigation Activities, BASF Rensselaer, Rensselaer, New York," August 3, 2001, Roux Associates, Inc (2001a).

Additional investigations have been performed in the Closed Landfill and South 40 under two separate Voluntary Cleanup Agreements with the NYSDEC. Investigations of these areas are described in the following reports:

- "Voluntary Cleanup Program Application, Closed Landfill" (Roux Associates, Inc. 2002a).
- "Site Investigation Report, Closed Landfill" (Roux Associates, Inc. 2002b).
- "Voluntary Cleanup Program Application, South 40 Parcel" (Roux Associates, Inc. 2001b).
- "Site Investigation Report, South 40 Parcel" (Roux Associates, Inc. 2001c).

1.2 Scope of Work

To accomplish the OU-2 Work Plan objectives, the following scope of work will be performed:

- Task 1: Historical Data Review
- Task 2: Airborne Emission Pathway Analysis
- Task 3: Utility Identification and Tracing
- Task 4: Installation of Sewer Bedding Sampling Points
- Task 5: Soil Gas Sampling
- Task 6: Water-Level Measurements and Groundwater Sampling

- Task 7: Hudson River Sediment Sampling at Sewer Outfalls
- Task 8: Report Preparation

This Work Plan provides the rationale for the proposed scope of work and describes the methodology by which the investigation will be implemented. The scope of work was developed based upon a review of data obtained during previous investigations of the Main Plant and Lagoon Area, and data obtained for the adjacent Sterling Site. These data are referenced and summarized but are not reproduced. The investigation will be conducted in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), the Superfund Amendments, and Reauthorization Act (SARA), and applicable United States Environmental Protection Agency (USEPA) guidance documents. Figures presenting the results of the Main Plant soil gas survey are presented as Appendix A. Tasks described in this Work Plan will be performed following the Site-specific Health and Safety Plan (HASP) presented as Appendix B. In addition, Roux Associates' Standard Operating Procedures (SOPs) for methods used to acquire and handle environmental samples and data and equipment calibration is included as Appendix C, the Statement of Qualifications for the data validator is presented as Appendix D and Rensselaer County Sewer District maps showing sewers located beneath Riverside Avenue are included as Appendix E.

2.0 WORK PLAN RATIONALE

The rationale behind the scope of work in this Work Plan was developed based on a review of soil, soil gas, groundwater quality, and groundwater flow data obtained during performance of the RI and Additional RI Activities, and data obtained by others working in the area near the Main Plant and Lagoon Area. The scope of work is based upon the previously referenced correspondence from the NYSDEC and subsequent discussions with the NYSDEC and NYSDOH.

Sediment Investigation at Sewer Outfalls

BASF has identified five sewer outfalls to the Hudson River in the vicinity of the Site:

- One 18-inch cast iron sewer in the northern part of the Lagoon Area, probably related to storm water;
- Two outfalls in the northern part of the Lagoon Area related to past operations at the plant;
- The Town of East Greenbush Storm Sewer; and
- The City of Rensselaer Storm Sewer.

The two outfalls related to past plant operations were both used before the lagoons went into operation and include an abandoned 30-inch tile sewer that was used before lagoon construction, and a 30-inch diameter cast iron temporary effluent line that was apparently used only during lagoon construction. The abandoned 30-inch tile sewer was also used by Sterling Drug, which was a prior owner of the site now occupied by Albany Molecular. BASF will attempt to locate the outfalls for these two 30-inch sewers using historical plant plans, and will obtain dredge samples of river sediment at these former outfalls. These samples will be analyzed for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs) and metals, and compared with the NYSDEC sediment criteria for non-polar organic compounds and metals as per the NYSDEC document titled "Technical Guidance for Screening Contaminated Sediments."

The Town of East Greenbush and City of Rensselaer storm sewers are not related to past plant operations. The bedding outside of these sewers was identified during the RI as a potential migration route for dissolved VOCs in groundwater – primarily chlorobenzene – and was evaluated using water-quality samples obtained from piezometers in the sewer bedding. To

evaluate the potential for the VOCs migrating along the sewer bedding to have impacted Hudson River sediments, BASF will obtain river sediment samples from where the sewer bedding reaches the river. These samples will be analyzed for VOCs only and compared with the NYSDEC sediment criteria for non-polar organic compounds.

Sources other than BASF may be responsible for or contribute to the presence of any constituents that may be found in sediment. Several metals and SVOCs are typically found in sediments as a result of urban discharges. The City of Rensselaer storm sewer originates east of the Main Plant, and may represent a conduit for constituents originating east of the Site to be transported to the Hudson River. Finally, as stated above, at least one of the outfalls was historically used by Sterling. Therefore, BASF is proposing to also collect sediment samples from the Hudson River up and down stream of the Site and to collect sediment samples from the City of Rensselaer and Town of Greenbush storm sewers east of the Site to evaluate the potential contribution of contaminants from other (i.e., non-BASF) sources.

Groundwater

The NYSDEC is recommending that contaminated groundwater migration be investigated northward beneath Riverside Avenue and northward from the Lagoon Area. As part of the investigation of this potential pathway, NYSDEC also requested that a soil gas investigation be performed in "appropriate" areas. The groundwater quality data obtained at the Site during the RI and the groundwater flow direction information from the Main Plant and Lagoon Area and Sterling Site have eliminated the potential for direct transport of constituents in groundwater in the saturated fill beneath the Main Plant and Lagoon Area to the neighborhood to the north. These data support the conclusion that the only remaining pathway for off-site transport of any constituents originating on the Main Plant or Lagoon Area is the utility bedding below the water table beneath Riverside Avenue. Therefore, this potential pathway will be the focus of the groundwater and soil gas investigation requested by NYSDEC.

There are several lines of evidence supporting a conclusion that the utilities beneath Riverside Avenue represent the only remaining pathway by which constituents could be transported offsite and should, therefore, be the primary focus of the investigation. These are:

- Water-level elevations from wells located in the northern portion of the Lagoon Area (LG-PZ-101 through LG-PZ-103, LG-PZ-10, LG-PZ-17 and LG-PZ-19) collected during the RI show that groundwater in this area flows to the west and south (i.e., away from both the Sterling Site and residential areas to the north [see Figure 3]), presumably into the sewer and utility bedding located in these locations. Groundwater flow beneath the southwestern portion of the Sterling Site is also to the south and southwest.

- Sterling Well ST-MW-8 (Figure 3), located approximately 600 feet north of the Lagoon Area and immediately west of Riverside Avenue, has not contained VOCs since 1984 or arsenic since 1994. These data, along with the groundwater flow data presented above, strongly support a conclusion that groundwater flow to the north of the Lagoon Area is not a transport pathway requiring additional investigation.

- Groundwater flow along the northern border of the Main Plant is to the north into sewer bedding and a perforated pipe (Figure 3) in an east-west trending trench along the border with the Sterling Site, while groundwater elevation data on the Sterling Site showed groundwater flow to the south, into the same sewer bedding. Additionally, groundwater samples collected from Sterling Well ST-MW-6A (Figure 3), located immediately to the north of the BASF-Sterling property line, did not contain constituents at levels that would support a conclusion that groundwater from the BASF Main Plant was flowing further north beneath the Sterling Site.

Based on these data, direct transport of constituents in groundwater in the saturated fill from BASF to the Sterling Site is not an off-site pathway of concern.

Therefore, the gravel bedding in the north-south trending sewers and utilities below the water table beneath Riverside Avenue is the only remaining potential pathway for northward migration of constituents in groundwater originating on the BASF Site. BASF will investigate this potential migration pathway by sampling groundwater in the utility bedding beneath Riverside Avenue to a point approximately 500 feet north of the Site. If the data collected during this phase of the investigation support a conclusion that constituents from the Main Plant have been transported beyond the northernmost sampling location, BASF will perform subsequent phases of investigation, as presented in Figure 4, "Groundwater and Soil Gas Decision Matrix," up to and including an investigation of the residential area to the north.

It is important to note that several of the constituents found in groundwater beneath the Main Plant (chlorobenzene, benzene and arsenic) are also found in groundwater beneath the Sterling Site. For example, elevated levels of both chlorobenzene and benzene have been found north of the groundwater divide at Sterling's northern property line. Sterling Well ST-MW-3 (Figure 5), located on the northern portion of the Sterling Site, contained 6 milligrams per liter (mg/L) and 30 mg/L of benzene and chlorobenzene, respectively, in 2000.

As discussed previously, groundwater beneath the southern portion of the Sterling Site (south of the groundwater divide) flows southerly, into the BASF sanitary sewer bedding and to the west, towards Riverside Avenue, whereas groundwater on the northern portion of the Sterling Site flows to the northwest (Figure 3). Therefore, as presented in Figure 4, a key decision point in this evaluation will be whether, and to what extent, any constituents that may be found within the utility bedding originated at the Main Plant, or whether they originated on the Sterling Site.

Therefore, BASF will collect groundwater-level measurements along the sewer line as well as groundwater and soil gas samples, and will include in the investigation portions of the sewer line along the entire western perimeter of the Site. BASF is proposing to conduct the investigation in phases to allow for evaluation of the data collected and interaction with NYSDEC and NYSDOH with regard to the extent and scope of the subsequent phases.

Soil Gas Survey

BASF will conduct a soil gas survey of the remaining VOC transport pathway (the Riverside Avenue utility beds) concurrent with the groundwater investigation. In addition to the groundwater flow and chemistry data discussed above, data obtained from the extensive, and sensitive, soil gas survey of the entire Main Plant conducted by BASF during the RI in April 1999 provides additional evidence supporting BASF's conclusion that the off-site groundwater investigation and soil gas survey should be focused on the utility bedding beneath Riverside Avenue.

During the RI, 134 GORE-SORBER® modules were placed in a relatively uniform pattern across the entire Main Plant, with 15 along the northern perimeter and five along the eastern perimeter. Another twelve modules were placed approximately 100 feet south of the northern perimeter.

Therefore, 32 sampling locations were either at or adjacent to the northern or eastern property perimeter, providing adequate placement and distribution to determine whether there was off-site transport of either soil gas or groundwater to the north or east. This investigation found only background levels of VOCs in soil gas around most of the perimeter of the Main Plant. These results were originally provided to NYSDEC in the RI, but are resubmitted in Appendix A.

The data from the original soil gas survey have proven to be very conservative (i.e., the results of the subsequent RI have confirmed that the GORE-SORBER® modules accurately identified areas of soil and groundwater contamination). Each significant soil gas detection was further investigated with both soil and groundwater sampling, and the results found that, while the GORE-SORBER® modules yielded several false positives, no false negatives were encountered. Results of soil and groundwater investigations conducted in the limited areas along the property perimeter where elevated GORE-SORBER® results were obtained were:

- Chloroform was detected at elevated levels at GORE-SORBER® location 306110 (Appendix A), but was not detected in either soil or groundwater samples obtained from MP-SB-103 and MP-MW-103 in the vicinity.

- 1,1,2,2-Tetrachloroethane was detected at elevated levels at GORE-SORBER® location 306110 (Appendix A), but was not detected in either soil or groundwater samples obtained from MP-SB-103 and MP-MW-103 in the vicinity.

- Trichloroethene was detected at elevated levels at GORE-SORBER® locations 306110 and 306109 (Appendix A), but was not detected in either soil or groundwater samples obtained from MP-SB-103 and MP-MW-103 in the vicinity.

- Vinyl chloride was detected at elevated levels at GORE-SORBER® location 306113 (Appendix A). Vinyl chloride was subsequently detected at a low concentration in the groundwater sample obtained from MP-MW-102 in the vicinity (17.4 µg/L).

- Tetrachloroethene was detected at elevated levels at GORE-SORBER® locations 306110 and 306109 (Appendix A), but was not detected in either soil or groundwater samples obtained from MP-SB-103 and MP-MW-103 in the vicinity. Tetrachloroethene was also detected at slightly elevated levels in GORE-SORBER® locations 306223 and 306225 along the western border of the Main Plant adjacent to Riverside Avenue. However, tetrachloroethene was not detected in soil or groundwater samples from the vicinity.

- 1,2-dichloroethane was detected at elevated levels at GORE-SORBER® locations 306113 (Appendix A), but was not detected in either soil or groundwater samples obtained from MP-SB-102 and MP-MW-102 in the vicinity.

The results of the initial soil gas survey and the subsequent soil and groundwater investigation in locations where elevated soil gas results were found along the northern and eastern perimeter demonstrate that there is no potential for off-site transport of vapors associated with contaminated soil or groundwater along the northern or eastern perimeters of the Main Plant.

BASF is proposing to conduct the sewer bedding soil gas investigation in phases, as summarized in the Groundwater and Soil Gas Decision Matrix (Figure 4) and Figure 6. The first phase of the soil gas investigation will extend along Riverside Avenue from the northern property line of the Main Plant to the corner of Riverside Avenue and Belmore Place, which are along the southern perimeter of the residential area. Samples will also be obtained along Rensselaer Avenue. If the results of this phase of the investigation shows that VOCs originating on the Main Plant are present, a second phase will extend to the residential area.

Airborne and Particulate Migration

The NYSDEC has requested that BASF perform sampling in residential areas surrounding the Site to determine whether deposition of airborne mists, vapors or particulates emitted from the Main Plant have impacted soil in the surrounding community. BASF is currently collecting and analyzing the information needed to develop a soil sampling program in consultation with the NYSDEC and NYSDOH by which any impacts from this pathway can be evaluated. This information includes historic emissions from the facility and local meteorology.

The initial task of identifying analytes of concern and potential/probable deposition areas is an extremely important component of this portion of the OU-2 investigation. Without this step, it will not be possible to select sampling locations or determine which constituents are most likely to have originated at the Main Plant. Importantly, it will also not be possible to select control, or background, sampling locations without completing this task.

BASF intends to present the information it is currently compiling to both the NYSDEC and NYSDOH and solicit each agency's opinions regarding the scope of the soil sample collection program. Critical issues that must be addressed include the number and locations of soil samples, the constituents that will be analyzed for and the methodology that will be used for sample collection. An important objective of the data evaluation component of the sampling

plan will be to determine, if possible, whether any constituents found in soil originated from BASF, local residential sources or other industrial sources.

Based on this analysis, BASF has developed a scope of work and initiated the tasks needed to collect the necessary data to determine the types and quantities of compounds that may have been emitted from the Main Plant, the locations where any deposition of these compounds may have occurred, and any background sampling locations that may be incorporated into a soil sampling plan. The scope of work will consist of:

1. Review records--including air permits, stack tests and engineering reports--to provide a historical analysis of emissions from the Site during BASF's term of operation and from other sources in the area.
2. Determine the climate history of the area, focusing on historical wind directions.
3. Perform air dispersion modeling, as needed, to determine the most likely areas of deposition.
4. Work with the NYSDEC and NYSDOH to develop a sampling plan, including locations, analytes, depth intervals and methodologies.
5. Perform sampling.
6. Analyze data, develop conclusions and prepare report for NYSDEC review.

3.0 SCOPE OF WORK

The scope of work will be performed according to the methods discussed in this section to accomplish the objectives of this OU-2 investigation based on the rationale provided in Section 2.

3.1 Task 1: Historical Data Review

This task will consist of several components. The first will involve collecting and reviewing information regarding air emissions from the Main Plant, which will be incorporated into the Airborne Emission Pathway Analysis (Task 2). The second component will include obtaining information from the adjacent Sterling Site to assist in the evaluation of potential contributions to any constituents found in the utility bedding beneath Riverside Avenue and potentially the adjacent residential area. It is BASF's understanding that NYSDEC will assist in this component of Task 1. The third component of Task 1 will be obtaining and reviewing emissions data from other potential sources of airborne contaminants in the vicinity of the BASF site.

BASF has directed Roux Associates to file a Freedom of Information Act (FOIA) request with the NYSDEC for information pertaining to the Sterling Site located north of the Main Plant. This facility borders the site and Riverside Avenue. However, there has been some difficulty in obtaining a complete set of files regarding the Sterling Site. A review of information describing historical releases of VOCs and arsenic from the Sterling Site and the potential for impacts to the utilities beneath Riverside Avenue and adjacent residential areas is an important component of the groundwater and soil gas evaluation. During the February 19, 2004 meeting, BASF requested from NYSDEC any assistance it can provide in obtaining information on the Sterling Site.

An analysis of historical air emissions from the Main Plant and meteorological data for the Rensselaer area will be performed. Roux Associates has already begun the process of obtaining the emission information for the Main Plant and will continue with this task. Meteorological data suitable for use with the selected air dispersion model (see Section 3.2) is also being obtained.

The final task of this data review will be collection and evaluation of air emissions data from the adjacent industrial sources. Roux Associates will be filing FOIA requests for these facilities in the near future.

3.2 Task 2: Airborne Emission Pathway Analysis

BASF will perform an analysis of potential air emission pathways to determine whether there could have been historical emissions of airborne mists, vapors or particulates from the Main Plant that could have impacted soil in the surrounding community, and where. The results of this analysis will be used to develop a scope of work for off-site sampling of surficial soil. The air emissions pathway analysis will consist of the following subtasks:

1. Review records – including air permits, stack tests and engineering reports – to provide a historical summary of emissions from the Site during BASF's term of operation.
2. Obtain and review historical meteorological data.
3. Perform appropriate air dispersion and/or deposition modeling as needed to identify potential off-site deposition and background sampling locations.
4. Utilize the results of the above three subtasks to develop an off-site sampling plan with input from the NYSDEC and the NYSDOH.

The extent and complexity of the air dispersion modeling subtask will be determined based on the results of the ongoing data collection and analysis effort. Upon completion of the air emissions pathway analysis, a work plan for off-site surface soil sampling will be developed with NYSDEC and NYSDOH input in accordance with the sampling approach shown in Figure 7. The Work Plan will include collecting surface soil samples from the residential areas and analyzing the samples for priority pollutants.

NYSDEC and NYSDOH have identified the potential for use of "sentinel" or "signature" compounds – compounds unique to BASF's operations – to be used in the off-site analysis to differentiate between constituents that may be found in off-site locations that originated from BASF and the same constituents that may have originated from other sources. BASF has interviewed former and current BASF chemists and reviewed historical information regarding products and formulations to assess whether any sentinel compounds can be identified. To date, no compound unique to the BASF manufacturing process has been identified.

3.3 Task 3: Utility Identification and Tracing

Roux Associates has reviewed Rensselaer County Sewer District records and met on March 11, 2004 with Rensselaer County Sewer District engineers. Based on maps provided by the Rensselaer County Sewer District (Appendix E), and a field reconnaissance, the Rensselaer Interceptor Sewer has been identified as the only utility below the water table trending north-south beneath Riverside Avenue. The gravel bedding of the Rensselaer Interceptor Sewer will be the focus of a revised scope of work for sewer bedding soil gas and groundwater sampling. The revised scope of work presented below was first presented to the NYSDEC in an April 6, 2004 letter.

3.4 Task 4: Installation of Sewer Bedding Sampling Points

Soil gas sampling points will be installed concurrent with, and immediately adjacent to, sewer bedding groundwater sampling points. Soil gas sampling points will include either a Soil Gas Sampler installed via Geoprobe® from land surface, or sampling ports installed through manhole sidewalls where available.

Soil Gas Sampler locations (OS-SG-101 and OS-SG-102 [Figure 6]) installed via Geoprobe® will consist of a Screen Point 15 Sampler (Figure 8). The Screen Point Sampler is threaded onto the leading end of a Geoprobe® rod and advanced with a Geoprobe® direct-push machine. The Screen Point Sampler will be advanced to a depth of approximately four feet. Once at the desired depth, extension rods are sent down the center of the Sampler until the leading rod contacts the bottom of the Sampler screen. The tool string is then retracted approximately 12 inches while the screen is held in place with the extension rods. This will expose approximately 12-inches of screen from approximately three to four feet below land surface in the unsaturated zone. An O-ring maintains a seal at the top of the screen.

Well points/piezometers will be driven into the bedding adjacent to the soil gas sampling locations described above,. Each well point/piezometer will consist of a Geoprobe® pre-packed screen and Schedule 80 PVC riser pipe. Geoprobe® pre-packed screens are three-foot long sections of 1.4-inch outside diameter (0.75-inch inside diameter) Schedule 80 PVC with 0.01-inch slots encased inside a 1.5-inch diameter stainless steel wire mesh with 0.011-inch pore size. Enough lengths of pre-packed screen will be used to bring the well screen to a minimum of two

feet above the water table, with blank riser used to complete the piezometers to land surface. The road will be repaired in coordination with surface completion of the piezometers in flush-mount curb boxes.

Each piezometer will be allowed to set for a minimum of 24 hours prior to development. Development will begin with surging the screen zone with a surge block. Groundwater will then be evacuated from each piezometer using a peristaltic pump, vacuum pump, or polyethylene tubing with a bottom check valve. Field parameters including pH, temperature, specific conductance, and turbidity will be measured during development using a Horiba U-22 or equivalent. The Horiba U-22 requires a specific volume of water to measure parameters. Parameters will be measured as frequently as this volume is collected. Development will continue until three conditions are met: 1) a minimum of ten well volumes have been purged; 2) field parameters have stabilized to within 10 percent of the previous reading for three consecutive readings; and, 3) turbidity is less than 50 Nephelometric Turbidity Units (NTUs). If these conditions are not met within one hour, development will cease. All soil cuttings and development water will be containerized in labeled 55-gallon drums for characterization and disposal.

Soil gas sampling points installed in sewer manholes (LG-MH-4A-SG, OS-MH-3-SG, and OS-MH-2-SG) will contain a sampling port consisting of a one-inch diameter steel or PVC screen and pipe installed horizontally through a hole drilled through the manhole wall (Figure 8) approximately three to four feet below land surface. The screen and pipe will be driven up to one foot into the fill adjacent to the exterior of the manhole sidewall. The space between the pipe and manhole wall will be sealed with concrete. The end of the pipe extending into the manhole will have a sealed end and a small pipe nipple on the top of the pipe. A ¼-inch Teflon tube (approximate) will be connected to the pipe nipple and extended to the top of the manhole. When not in use the tube will be sealed with a plug.

Groundwater sampling ports installed in sewer manholes (LG-MH-4A-GW, OS-MH-3-GW and OS-MH-2-GW) will contain a sampling port consisting of a one-inch diameter steel or PVC screen and pipe installed horizontally through a hole drilled through the manhole wall approximately one to two feet above the elevation of the top of the sewer pipe, which is expected

to be below the water table. A PVC stopcock valve will be sealed in the hole, and a sampling/manometer tube will be attached to the valve. This method of sampling and measuring water levels has been employed successfully in sewer bedding sampling points LG-MH-5, LG-MH-6 and LG-MH-7, which were sampled during the RI. Reference elevations on the manometer tube and in the sewer (e.g., the invert elevation) will be surveyed vertically and horizontally relative to an existing Site benchmark.

The measuring point for each piezometer will be surveyed and referenced vertically and horizontally to an existing Site benchmark.

3.5 Task 5: Soil Gas Sampling

Soil gas sampling will be conducted immediately prior to groundwater sampling. At each sampling location, one end of a Teflon sampling tube will be connected to the tube rising from the soil gas sampling port (for manhole locations) or the Soil Gas Sampler installed via Geoprobe®. Tubing installed in the Soil Gas Sampler will be sealed from the atmosphere with a one-hole silicon rubber stopper inserted into the top of the Sampler sheath. The sampling tube will be connected to a 'T' connector. One end of the 'T' connector will lead to a vacuum pump and the other end of the 'T' connector will lead to a pre-evacuated 6 Liter Summa canister supplied by the laboratory. Valves will isolate both the pump and the Summa canister (Figure 8). Initially, the valve leading to the Summa canister will be closed, and the valve leading to the vacuum pump will be open. The Soil Gas Samplers will be purged of approximately five volumes of soil gas using the vacuum pump set at a rate equal to, or less than, 0.2 liters per minute. The manhole sampling ports will be purged of a volume approximately equal to one Summa canister volume (6 liters) at a rate not to exceed 0.2 liters per minute. Following purging, the valve leading to the pump will be closed, the pump will be turned off, and the valve leading to the Summa canister will be opened. The Summa canister will be filled at a rate not to exceed 0.2 liters per minute using a regulator. Once the Summa canister has been filled, the valve on the canister will be closed, and the canister disconnected from the sampling tubing.

Quality Assurance / Quality Control Samples

One duplicate soil gas sample will be obtained by filling a second Summa canister at a given sampling location immediately after the first canister is filled using the same methods described above.

One field blank will be obtained by filling a Summa canister from a zero air gas cylinder. All Summa canisters containing soil gas samples will be shipped to Accutest Laboratories of Dayton, New Jersey and analyzed for volatile organic compounds using USEPA Method TO-15.

The soil gas data recovered from the sewer bedding investigation will be evaluated and decisions made regarding the need for a second phase and third phase of investigation as per the attached decision matrix (Figure 4).

3.6 Task 6: Water Level Measurements and Groundwater Sampling

A round of water-level measurements will be obtained in all new sewer bedding sampling locations installed during Task 4, and the following existing sampling locations:

LG-MH-5	LG-MH-6	LG-MH-7	LG-MW-3
LG-PZ-101	LG-PZ-102	LG-PZ-103	LG-PZ-128
LG-PZ-129	MP-PP-1	MP-PP-2	MP-PZ-104
MP-PZ-105	MP-PZ-106	MP-PZ-107	ST-MW-3
ST-MW-7A	ST-MW-8	ST-MW-9	ST-MW-10
ST-OS-1A	ST-OS-3	ST-OS-5A	

Note that well designations commencing with 'ST' are Sterling Site wells. Sampling of these wells will be contingent upon obtaining access from the current owners of the Sterling Site.

Water-level measurements will be collected using an electronic water-level meter to the nearest 0.01 foot.

Groundwater sampling will occur approximately one week after installation and development of the new piezometers. Groundwater samples will be collected from the above locations and all new sewer bedding sampling locations. Each well or piezometer will be purged of three to five well volumes using a peristaltic pump. Manhole sampling ports will be purged of approximately one gallon of water prior to obtaining samples. All samples will be analyzed for Target Compound List (TCL) VOCs, TCL SVOCs, and filtered and unfiltered Target Analyte List (TAL) metals, including cyanide. Following collection, sample containers will be placed in a cooler at 4°C for transport to the laboratory. Filtered samples will be filtered in the field with a peristaltic pump and disposable 0.45 micron filters.

As discussed, the groundwater investigation and associated soil gas survey (see Task 6 below) will be performed in two phases, based on the Decision Matrix in Figure 4. The groundwater quality data recovered from Phase 1 of the sewer bedding investigation will be evaluated and decisions regarding the need for a second phase of investigation further north beneath residential areas.. If a second phase of investigation is deemed necessary, a groundwater and soil gas sampling plan for the residential areas will be developed with NYSDEC and NYSDOH input.

3.7 Task 7: Hudson River Sediment Sampling at Sewer Outfalls

A preliminary review of current and historical information has identified five potential Hudson River outfall locations (Plate 1):

- The City of Rensselaer storm sewer that discharges south of the Lagoon Area along the Port of Rensselaer bulkhead;
- The Town of East Greenbush storm sewer that discharges south of the southern end of the Lagoon Area;
- An abandoned BASF production sewer pipe that discharged along the bulkhead line adjacent to the north lagoon;
- An abandoned BASF production sewer pipe that was used temporarily during construction of the lagoons that discharged along the bulkhead line north of the north lagoon; and
- A former sewer pipe that discharged along the bulkhead line north of the north lagoon.

Two sediment sampling locations will be established in the vicinity of each of the five outfall locations described above (Plate 1). At each sampling location, sediment cores will be collected

using a vibracore system deployed from a boat. The core will be extended to a depth of one to two feet in the vicinity of active outfalls, and to a depth corresponding to the depth of the outfall location (if buried) for abandoned outfalls. Each sample will be characterized for lithology, homogenized and placed into sample containers. Sediment samples collected from the City of Rensselaer and Town of East Greenbush outfall locations will be analyzed for total organic carbon (TOC) and VOCs only, since these were the only constituents of concern identified during the RI that were migrating along the sewer bedding at these locations. All other samples will be analyzed for TOC, TCL VOCs, TCL SVOCs, and TAL metals.

In accordance with NYSDEC DER-10 "Technical Guidance for Site Investigation and Remediation," a minimum of five locations is required to statistically establish background sediment concentrations. Typically, background samples would be collected at upstream or cross-stream locations. However, the Hudson River in the vicinity of the Site is tidally-influenced. For at least a portion of the tidal cycle, flow velocities are to the north ("upstream"). Therefore, to establish the limits for transport of potentially impacted sediments and assess the general quality of river sediments, eight background locations will be sampled:

- three sediment samples will be collected from upstream (i.e., north) locations;
- two sediment samples will be collected from side-stream (i.e., west) locations; and
- three sediment samples will be collected from downstream (i.e., south) locations.

The exact background locations will be established based on a review of Hudson River current, bathymetry and off-site (i.e., non-BASF related) industrial outfall data. Background sediment samples will be collected with a vibracore. Each sample will be characterized for lithology, homogenized and placed into sample containers. All samples will be analyzed for TCL VOCs, TCL SVOCs, TAL metals, and TOC.

In addition to sediment samples collected from the Hudson River, an attempt will be made to collect sludge/sediment grab-samples from the Town of East Greenbush and City of Rensselaer storm sewers that run along the southern border of the Site and the Closed Landfill. The City of Rensselaer storm sewer will be sampled at three locations: 1) where the sewer first enters the Site from the northeast; 2) south of the Closed Landfill; and 3) at the manhole closest to the

Hudson River. The Town of East Greenbush storm sewer will be sampled at two locations: 1) at the southeast corner of the Closed Landfill; and 2) at the manhole closest to the Hudson River. Each sample will be analyzed for VOCs, SVOCs, and metals. The data from the sediment sampling will be compared to criteria in the NYSDEC document titled "Technical Guidance for Screening Contaminated Sediments."

3.8 Task 8: Report Preparation

As discussed above, the final report for this investigation may include several components, depending upon the results of the investigation. If the initial phase of investigation concludes that there is either no off-site transport of Site-related constituents or that any off-site transport has been adequately characterized, a report will be prepared to summarize the results of the OU-2 investigation. The report will include the following:

- Summary of historical data review;
- Discussion of investigation activities;
- Presentation of analytical results for all media sampled;
- Discussion of the nature and extent of any contaminants identified;
- Comparison of the analytical results to background concentrations;
- Conclusions and recommendations drawn from the interpretation of the data; and
- Supporting data including any analytical data packages and soil boring logs.

If additional phases of investigation are necessary, BASF will discuss with NYSDEC the benefits of providing interim reports and/or additional sampling plans.

4.0 SCHEDULE

The following schedule was based on the assumption that BASF will receive NYSDEC approval of this Work Plan within four weeks of submittal:

- Completion of Phase 1, of the off-site sewer bedding groundwater and soil gas investigation by the end of the Second Quarter of 2004;
- If performed, completion of Phase 2 of the off-site sewer bedding groundwater and soil gas investigation by the end of the Third Quarter of 2004;
- Completion of the Hudson River sediment investigation by the end of the Second Quarter of 2004;
- Submittal of a work plan for sampling of off-site surficial soil based on the results of the Air Emission Pathway Analysis by the end of the Third Quarter 2004; and
- Completion of the off-site surficial soil sampling by the end of the Fourth Quarter 2004.

5.0 QUALITY ASSURANCE

Quality control procedures including chain of custody procedures, duplicate samples, matrix spike and spike duplicate samples, trip blanks, and field blanks will be conducted to provide a quantitative basis for validating the analytical data. A summary of quality assurance sampling is presented in Table 1.

Roux Associates' SOPs for methods used to acquire and handle environmental samples and data and equipment calibration are included as Appendix C.

5.1 Field Duplicates

Field duplicates will be collected at a rate of five percent -- one per 20 field samples collected for each media and analysis, or a minimum of one per sampling event. The field duplicate will be collected at the same time as the parent sample.

5.2 Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicates (MSD) are analyzed by the laboratory to provide a quantitative measure of the laboratory's precision and accuracy. MS and MSD pairs will be collected at a rate of five percent – one per 20 field samples collected for each media and analysis, or a minimum of one per sampling event. The MS and MSD will each be a separate group of sample containers collected at the same time as the parent sample is collected.

5.3 Trip Blanks

Trip blanks will remain in the shipping cooler from when it leaves the laboratory until it returns to the laboratory. In addition, the trip blanks will accompany the sample containers at all times. One trip blank will be returned to the laboratory with any cooler containing aqueous samples for VOC analysis.

5.4 Field Blanks

New, clean, and dedicated sampling equipment will be used to collect all soil and groundwater samples. Field blanks will be collected at a rate of one per day for each media and analysis collected to assess the quality of decontamination, the sample containers, and ambient conditions. Field blanks will be collected by passing deionized, analyte-free water supplied by

the laboratory over the sampling device (i.e., acetate sleeve or stainless steel bailer) and into a sampling container. Water used to fill a specific sampling container will be transferred from an identical sampling container.

5.5 Data Validation

The laboratory will provide a NYSDEC Analytical Services Protocol (ASP) Category B deliverable package and develop a case narrative describing how closely the data meet the quality objectives as described by the NYSDEC ASP. In addition, a Data Usability Summary Report (DUSR) will be prepared by Data Validation Services of North Creek, New York, a third party data validation subcontractor. A copy of Data Validation Services' statement of qualifications is attached as Appendix D. The case narrative and the DUSR will be submitted to the NYSDEC.

5.6 Decontamination

All non-disposable sampling equipment (i.e., Geoprobe rods, Eckman dredge) will be decontaminated through the following steps:

- fresh water rinse;
- scrubbing with non-phosphorus detergent wash; and
- fresh water rinse.

5.7 Project Organization and Responsibility

The following section describes Roux Associates' proposed project organizational structure. A brief discussion of project personnel and general responsibilities are presented below.

BASF Corporate Representative – J. Douglas Reid-Green, Senior Environmental Specialist

Mr. Reid-Green will serve as BASF's representative and Project Manager during the implementation of this Work Plan. Mr. Reid-Green will direct the efforts of Roux Associates, and serve as a primary point of contact for the NYSDEC and NYSDOH.

Project Principal – Nathan Epler, Ph.D., Principal Hydrogeologist

Dr. Epler will serve as the Project Principal. Dr. Epler will be responsible for overall project direction and maintaining appropriate management controls at all responsibility levels.

Project Manager – Michael Roux, Senior Hydrogeologist

Mr. Roux will serve as Project Manager. Mr. Roux will be in charge of day-to-day performance of field activities, data collection, evaluation and summarization, and will be responsible for implementation of the project scope of work.

Field Manager – Christopher Battista, Project Environmental Scientist

Mr. Battista will be in charge of implementation of field tasks associated with the implementation of this Work Plan. Mr. Battista will serve as the project field health and safety coordinator.

Corporate Health and Safety Officer – Stephen Bates, Ph.D., CIH, CET, CMC

Dr. Bates will be responsible for overall management of health and safety-related issues during implementation of the Work Plan scope of work.

Respectfully submitted,

ROUX ASSOCIATES, INC.

Michael Roux
Senior Hydrogeologist

Nathan Epler, Ph.D.
Principal Hydrogeologist

6.0 REFERENCES

Clough, Harbour & Associates, 1993. Wastewater Equalization Lagoon Reconstruction Study and Preliminary Design.

Dames and Moore, 1987. Final Report, Remedial Actions, Rensselaer Plant – Site 1.

Malcolm Pirnie, Inc., 1994. BASF/Sterling Organics Wastewater Lagoons Baseline Assessment.

Malcolm Pirnie, Inc., 1998. Sampling and Analytical Plan, BASF Manufacturing Plant, Rensselaer, New York.

Roux Associates, Inc., 2000. Remedial Investigation and Supplemental Remedial Investigation Report.

Roux Associates, Inc., 2001a. Additional Remedial Investigation Activities.

Roux Associates, Inc. 2002a. Voluntary Cleanup Program Application, Closed Landfill.

Roux Associates, Inc. 2002b. Site Investigation Report, Closed Landfill.

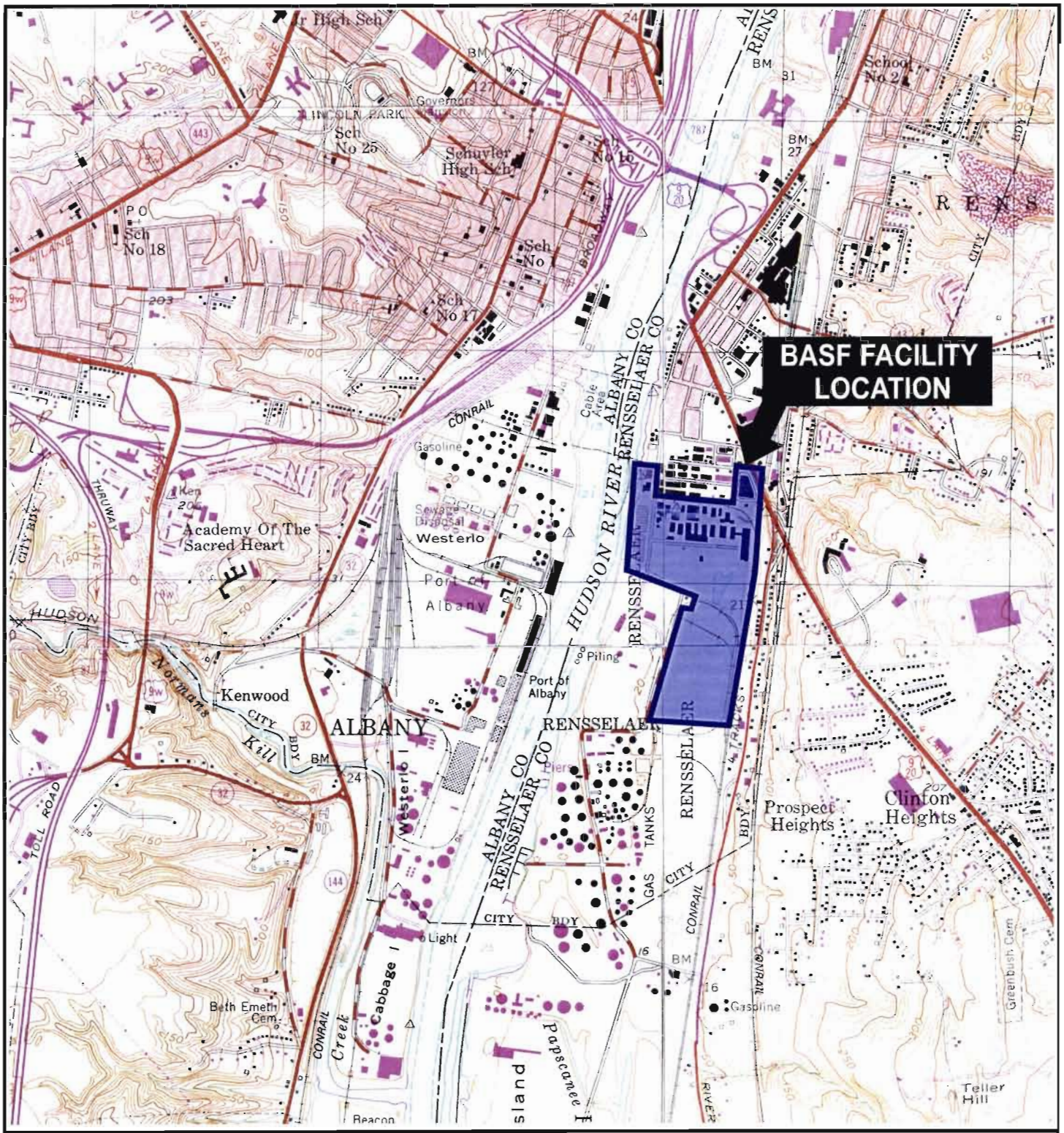
Roux Associates, Inc. 2001b. Voluntary Cleanup Program Application, South 40 Parcel.

Roux Associates, Inc. 2001c. Site Investigation Report, South 40 Parcel.

Table 1. Analytical Methods and Quality Assurance Indicators, BASF Corporation, Rensselaer, New York

Sample Type	Sample Matrix	Sample Frequency	Analytical Parameters / Methods	Sample Container / Preservation	Holding Time
Grab	Sediment	Approximately 23 Samples	TCL VOCs +LS / USEPA 8260B TCL SVOCs +LS / USEPA 8270C TAL metals / USEPA 6010B Mercury / USEPA 7470A TOC USEPA 9060	(1) 2-oz septum glass jar / ice (1) 9-oz glass jar / ice (1) 9-oz glass jar / ice (1) 2-oz septum glass jar / ice	14 days 14 days 6 months 28 days 14 days
Grab	Groundwater	Approximately 28 Samples	TCL VOCs +LS / USEPA 8260B TCL SVOCs +LS / USEPA 8270C TAL metals / USEPA 6010B Mercury / USEPA 7471A	(3)-40 mL. glass vials / HCl and ice (2)-1 L amber glass bottle / ice (1) -500 mL plastic bottle / HNO3 and ice	14 days 14 days 6 months 28 days
Grab	Soil Gas	Approximately 5 Samples	TCL VOCs + LS / USEPA TO-15	(1)- 1 L Summa Canister	30 days
QA/QC	Trip Blank	1 per delivery group maximum 1 per 20 samples (groundwater only)	TCL VOCs +LS / USEPA 8260B	(3)-40 mL. glass vials / HCl and ice	14 days
QA/QC	Field Duplicate	1 per 20 grab samples (soil, soil gas and groundwater)	TCL VOCs +LS / USEPA 8260B (soil) TCL SVOCs +LS / USEPA 8270C (soil) TAL metals / USEPA 6010B (soil) Mercury / USEPA 7470A (soil) TCL VOCs +LS / USEPA 8260B (water) TCL SVOCs +LS / USEPA 8270C (water) TAL metals / USEPA 6010B (water) Mercury / USEPA 7471A (water) TCL VOCs + LS / USEPA TO-15 (soil gas)	(1) 2-oz septum glass jar / ice (1) 9-oz glass jar / ice (1) 9-oz glass jar / ice (3)-40 mL. glass vials / HCl and ice (2)-1 L amber glass bottle / ice (1) -500 mL plastic bottle / HNO3 and ice (1)- 1 L Summa Canister	14 days 14 days 6 months 28 days 14 days 14 days 6 months 28 days 30 days
QA/QC	Matrix Spike and Duplicate Pair	1 per 20 grab samples (soil and groundwater)	TCL VOCs +LS / USEPA 8260B (soil) TCL SVOCs +LS / USEPA 8270C (soil) TAL metals / USEPA 6010B (soil) Mercury / USEPA 7470A (soil) TCL VOCs +LS / USEPA 8260B (water) TCL SVOCs +LS / USEPA 8270C (water) TAL metals / USEPA 6010B (water) Mercury / USEPA 7471A (water)	(1) 2-oz septum glass jar / ice (1) 9-oz glass jar / ice (1) 9-oz glass jar / ice (3)-40 mL. glass vials / HCl and ice (2)-1 L amber glass bottle / ice (1) -500 mL plastic bottle / HNO3 and ice	14 days 14 days 6 months 28 days 14 days 14 days 6 months 28 days
QA/QC	Field Blank	1 per day for parameters collected that day (soil and groundwater) 1 for soil gas	TCL VOCs +LS / USEPA 8260B TCL SVOCs +LS / USEPA 8270C TAL metals / USEPA 6010B Mercury / USEPA 7471A TCL VOCs + LS / USEPA TO-15 (soil gas)	(3)-40 mL. glass vials / HCl and ice (2)-1 L amber glass bottle / ice (1) -500 mL plastic bottle / HNO3 and ice (1)- 1 L Summa Canister	14 days 14 days 6 months 28 days 30 days

NOTES:
HCl - Hydrochloric acid
HNO3 - Nitric acid
L- Liter
LS - Library search
mL - Milliliter
oz - Ounce
QA/QC - Quality assurance/quality control
SVOCs - Semivolatile organic compounds
TAL - Target Analyte List



QUADRANGLE LOCATION

SOURCE:
USGS; 1980. Albany, New York;
USGS; 1980. Troy South, New York
USGS; 1980. Delmar, New York
USGS; 1980. East Greenbush, New York
7.5 Minute Topographic Quadrangles

N

0 2000'

Title:

SITE LOCATION MAP

RENSSELAER, NEW YORK FACILITY

Prepared for:
BASF CORPORATION
MOUNT OLIVE, NEW JERSEY

ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.		Date: 09DEC03	FIGURE
Prepared by: G.M.		Scale: AS SHOWN	1
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File No.: BF1134802.CDR		Project No.: 25111Y24	

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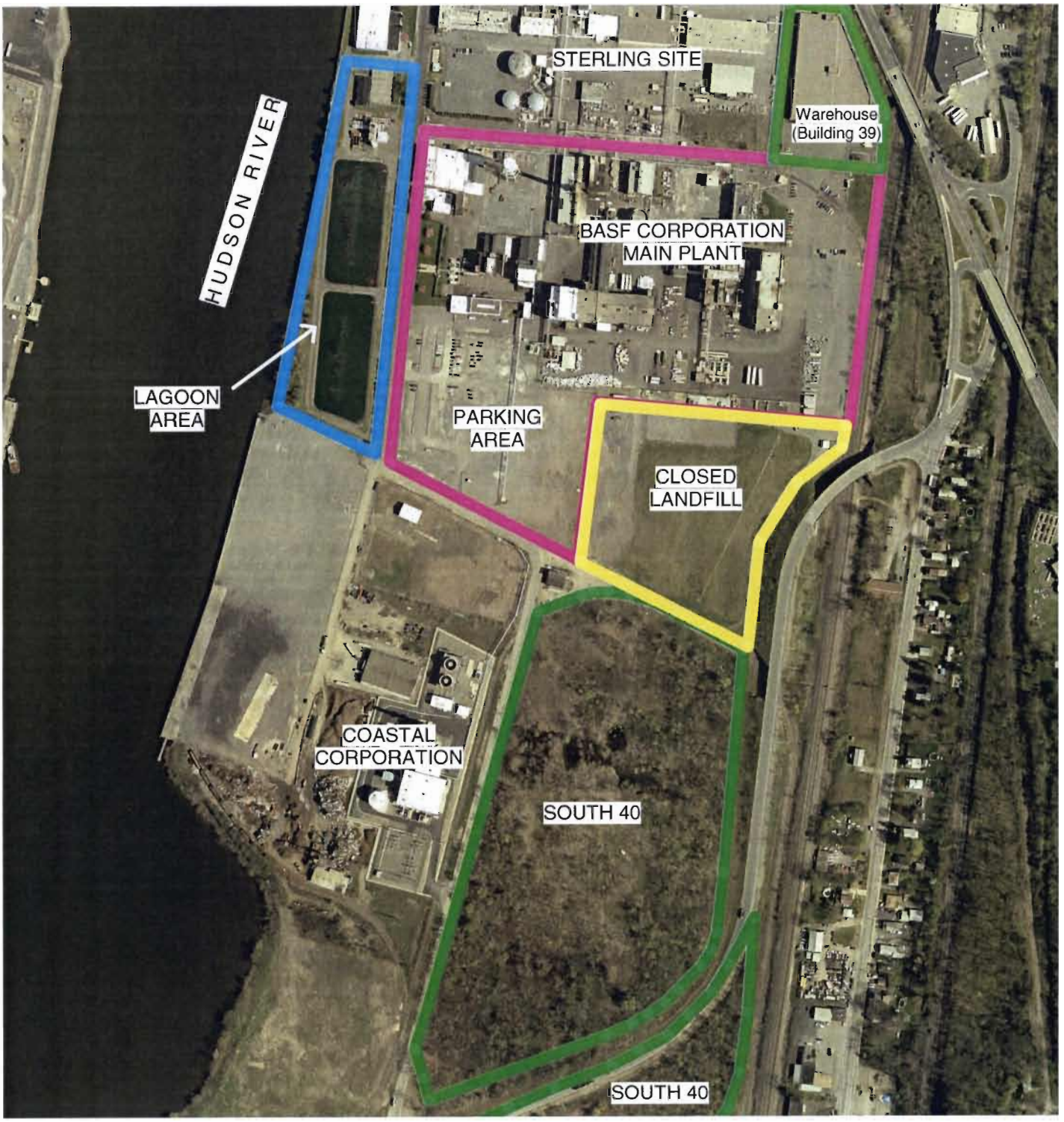

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AERIAL PHOTOGRAPH DATE : SPRING 2001

Title:

SITE AREAS

RENSSELAER, NEW YORK FACILITY

Prepared For.

BASF CORPORATION
MOUNT OLIVE, NEW JERSEY

ROUX ASSOCIATES INC
Environmental Consulting & Management

Compiled by: N.E.	Date: 12/9/03	FIGURE
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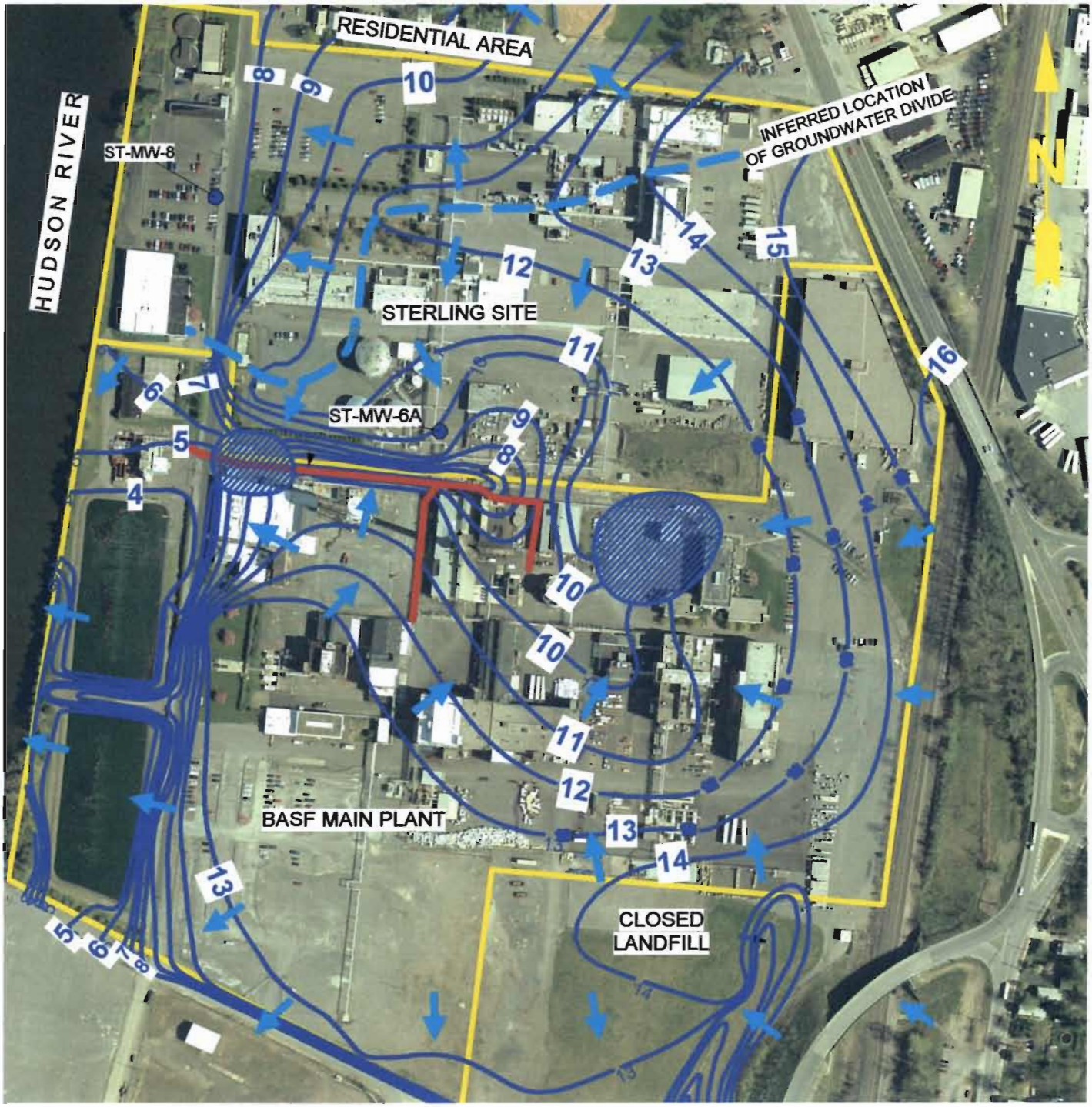
File No. BF1134804.WOR	Project: BF25 1111Y24	



12 WATER-LEVEL ELEVATION IN FEET RELATIVE TO MEAN SEA LEVEL

INFERRED DIRECTION OF GROUNDWATER FLOW

PERFORATED PIPE

AREA WHERE SATURATED FILL IS NOT PRESENT

Notes:

1- BASF groundwater levels measured during Additional RI Activities (April 2001)
2- Sterling Site groundwater levels based on November 2000 SAIC map.
3- Aerial photograph date Spring 2001

Title:

GROUNDWATER ELEVATIONS BASF AND STERLING SITES

REVISED OU-2 WORK PLAN
BASF RENSSELAER FACILITY

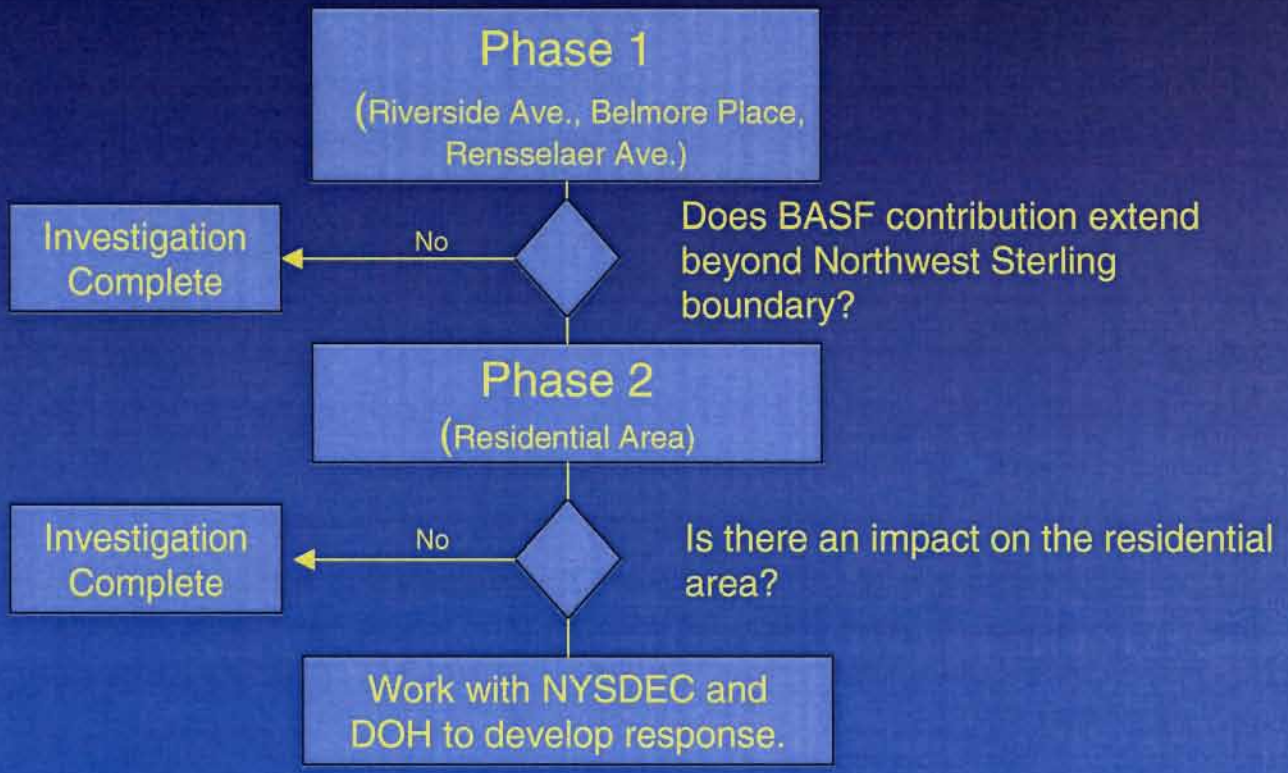
Prepared For:

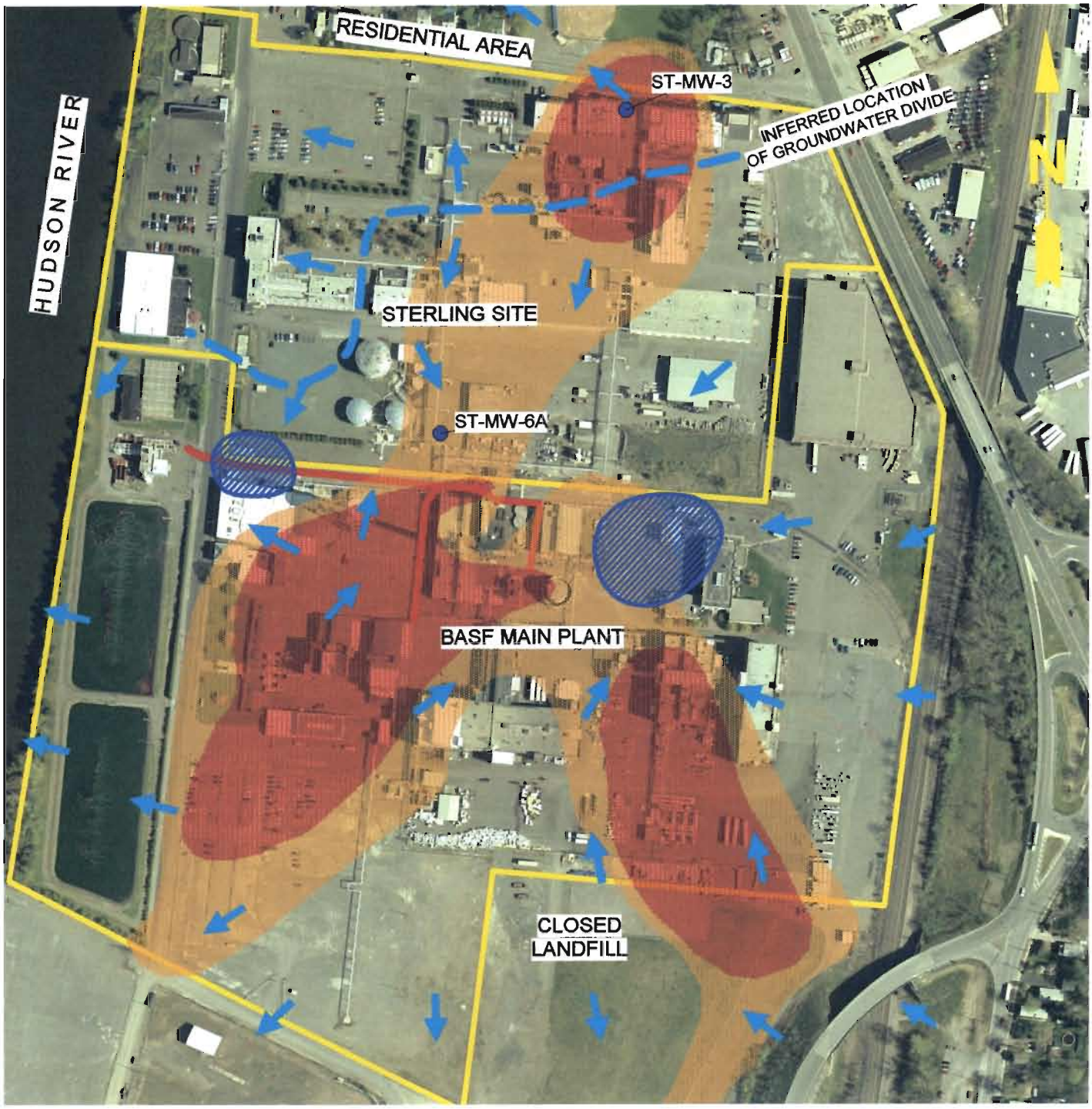
BASF CORPORATION
MOUNT OLIVE, NEW JERSEY

ROUX ASSOCIATES INC
Environmental Consulting & Management

Compiled by: N.E.	Date: 2/24/04	FIGURE 3
Prepared by: NE	Scale: 1" = 300'	
Project Mgr: N.E.	Office: NY	
File No: BF1134807.WOR	Project: BF25111Y24	

Figure 4. Ground Water and Soil Gas Decision Matrix





INFERRED DIRECTION OF GROUNDWATER FLOW

AREA WHERE SATURATED FILL IS NOT PRESENT

PERFORATED PIPE

TOTAL VOCS > 10 µg/L

TOTAL VOCS > 1,000 µg/L

Notes:

1- BASF VOC data obtained during Additional RI Activities (April 2001)
2- Sterling Site VOC data based on November 2000 sampling round.
3- Aerial photograph date Spring 2001

VOCs - volatile organic compounds
µg/L - micrograms per liter

Title:

VOCs IN GROUNDWATER BASF AND STERLING SITES

REVISED OU-2 WORK PLAN
BASF RENSSELAER FACILITY

Prepared For:

BASF CORPORATION
MOUNT OLIVE, NEW JERSEY

ROUX ASSOCIATES INC
Environmental Consulting & Management

Compiled by: N.E.	Date: 2/24/04	FIGURE
Prepared by: NE	Scale: 1" = 300'	5
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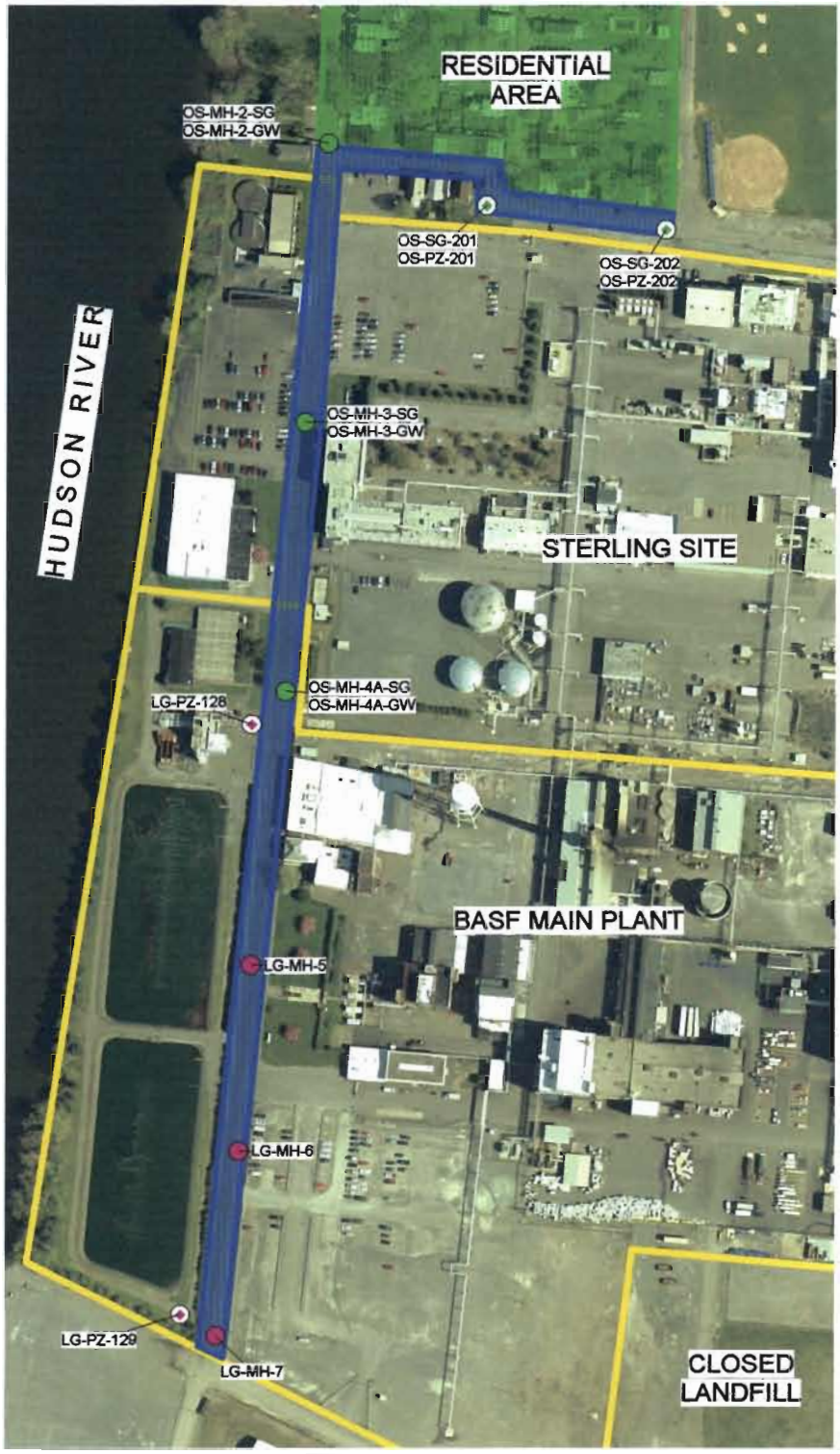
File No: BF1134808.WOR	Project: BF25111Y24	



SEWER BEDDING INVESTIGATION PHASE 1

SEWER BEDDING INVESTIGATION PHASE 2

LG-MH-7 — LOCATION AND DESIGNATION OF EXISTING MANHOLE SEWER BEDDING GROUNDWATER SAMPLING PORT

LG-PZ-128 — LOCATION AND DESIGNATION OF PROPOSED SEWER BEDDING GROUNDWATER SAMPLING PIEZOMETER

OS-MH-3-GW / OS-MH-3-SG — LOCATION AND DESIGNATION OF PROPOSED MANHOLE SEWER BEDDING SOIL GAS AND GROUNDWATER SAMPLING PORTS

OS-PZ-201 / OS-SG-201 — LOCATION AND DESIGNATION OF PROPOSED SOIL GAS SAMPLER (GEOPROBE) AND GROUNDWATER SAMPLING PIEZOMETER

PREFIX EXPLANATION:
LG - LAGOON AREA
OS - OFFSITE

AERIAL PHOTOGRAPH DATE : SPRING 2001

Title:

PROPOSED SEWER BEDDING SAMPLING LOCATIONS

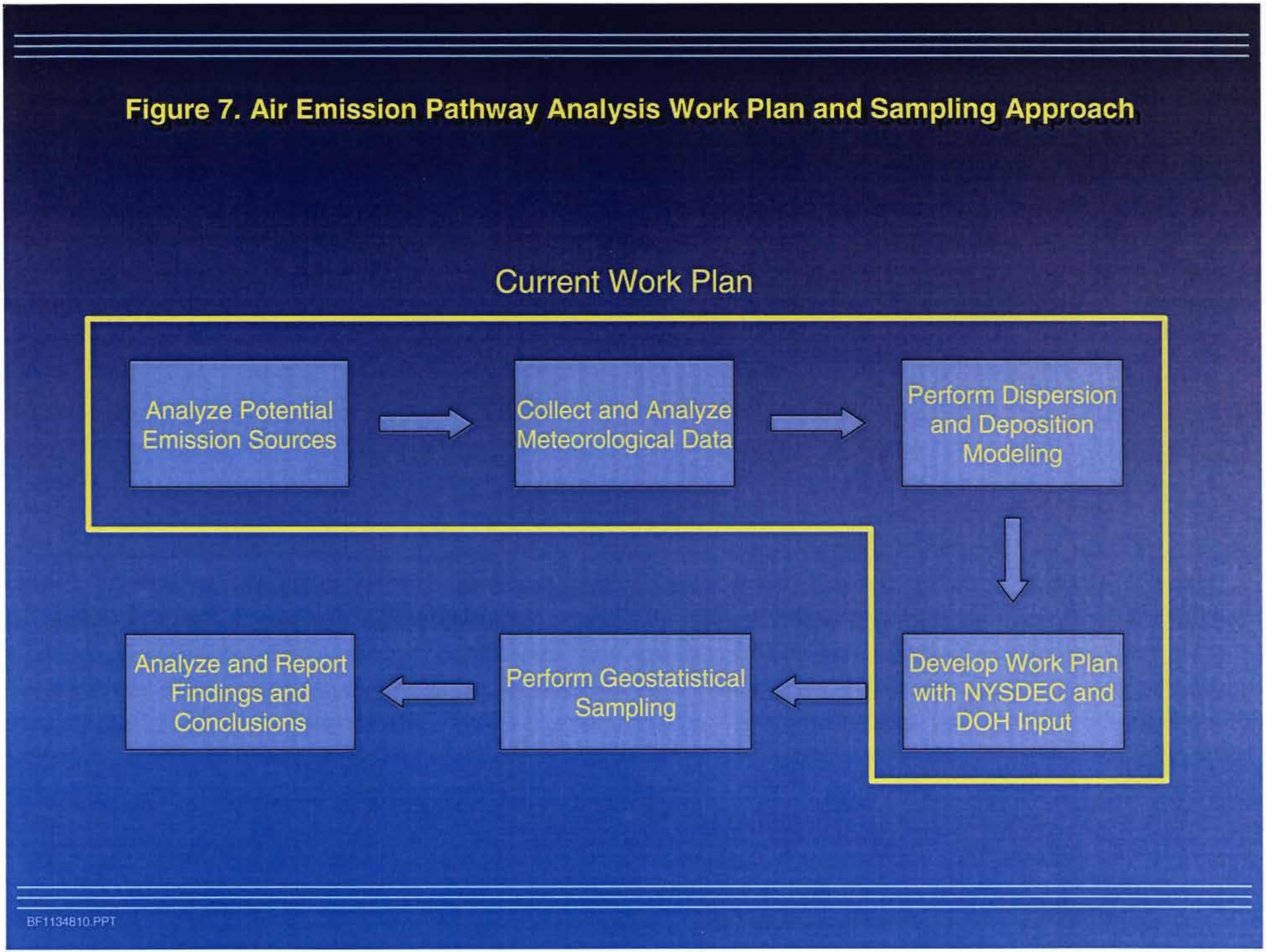
REVISED OU-2 WORK PLAN
BASF RENSSELAER FACILITY

Prepared For:
BASF CORPORATION
MOUNT OLIVE, NEW JERSEY

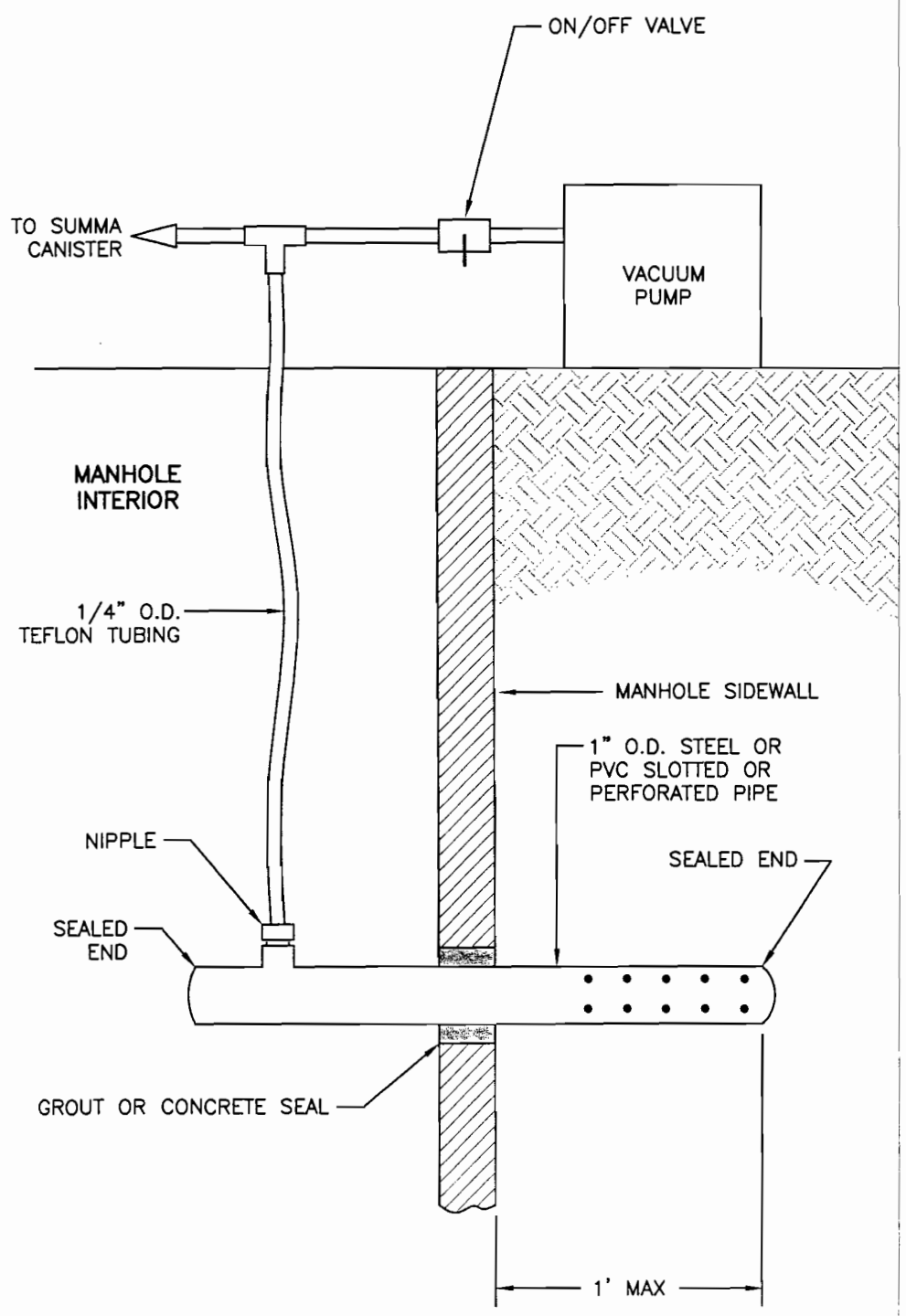
ROUX ASSOCIATES INC
Environmental Consulting & Management

Compiled by: N.E.	Date: 3/31/04	FIGURE	
Prepared by: NE	Scale: 1" = 300'	6	
Project Mgr: N.E.	Office: NY		
File No: BF1134813.WOR	Project: BF25111Y24		

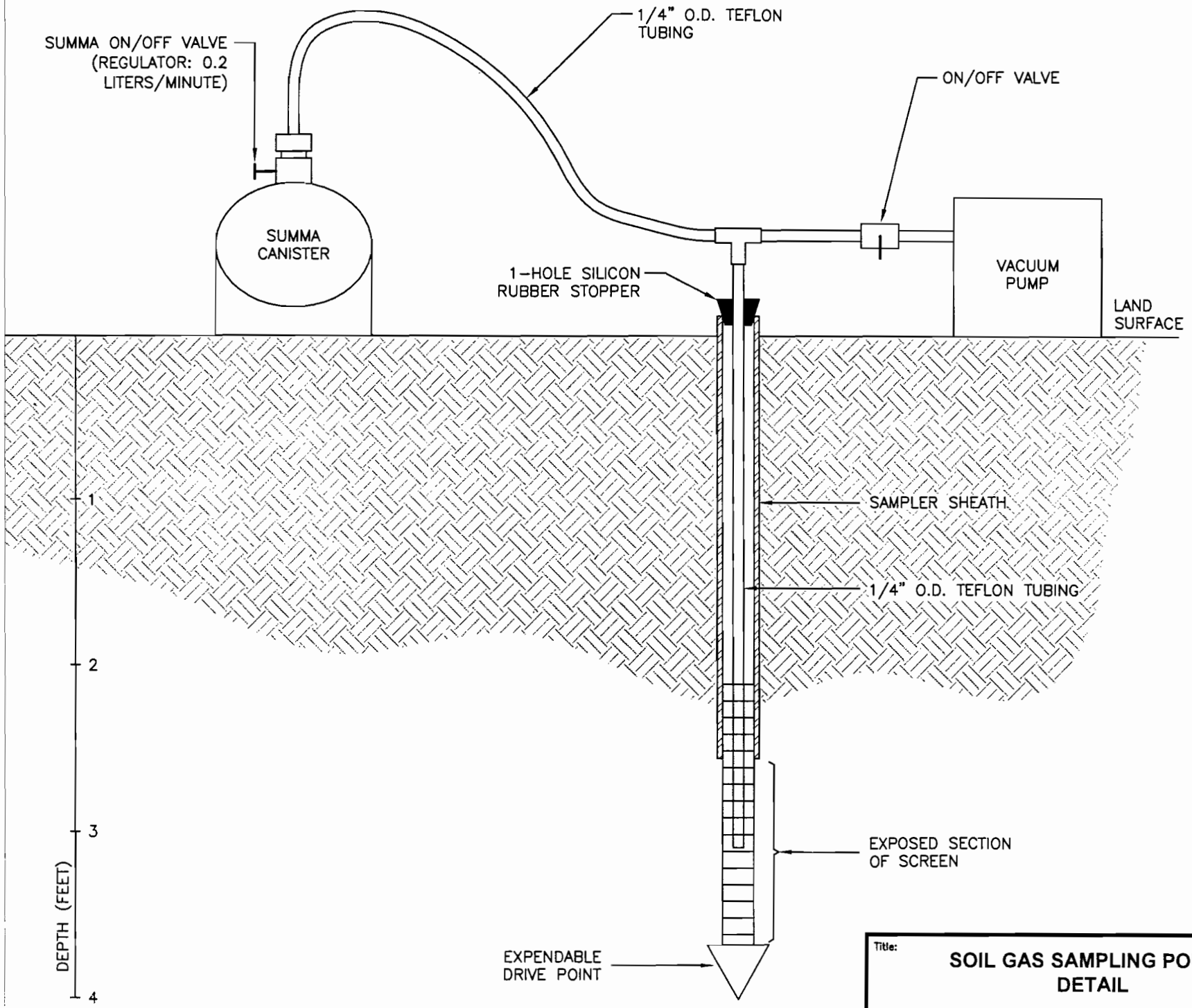
Figure 7. Air Emission Pathway Analysis Work Plan and Sampling Approach



SEWER MANHOLE SOIL GAS SAMPLING PORT DETAIL



SOIL GAS SAMPLER DETAIL (INSTALLED VIA GEOPROBE®)



Title: **SOIL GAS SAMPLING POINTS DETAIL**

ADDENDUM #1 OU-2 WORKPLAN, RENSSELAER, NY

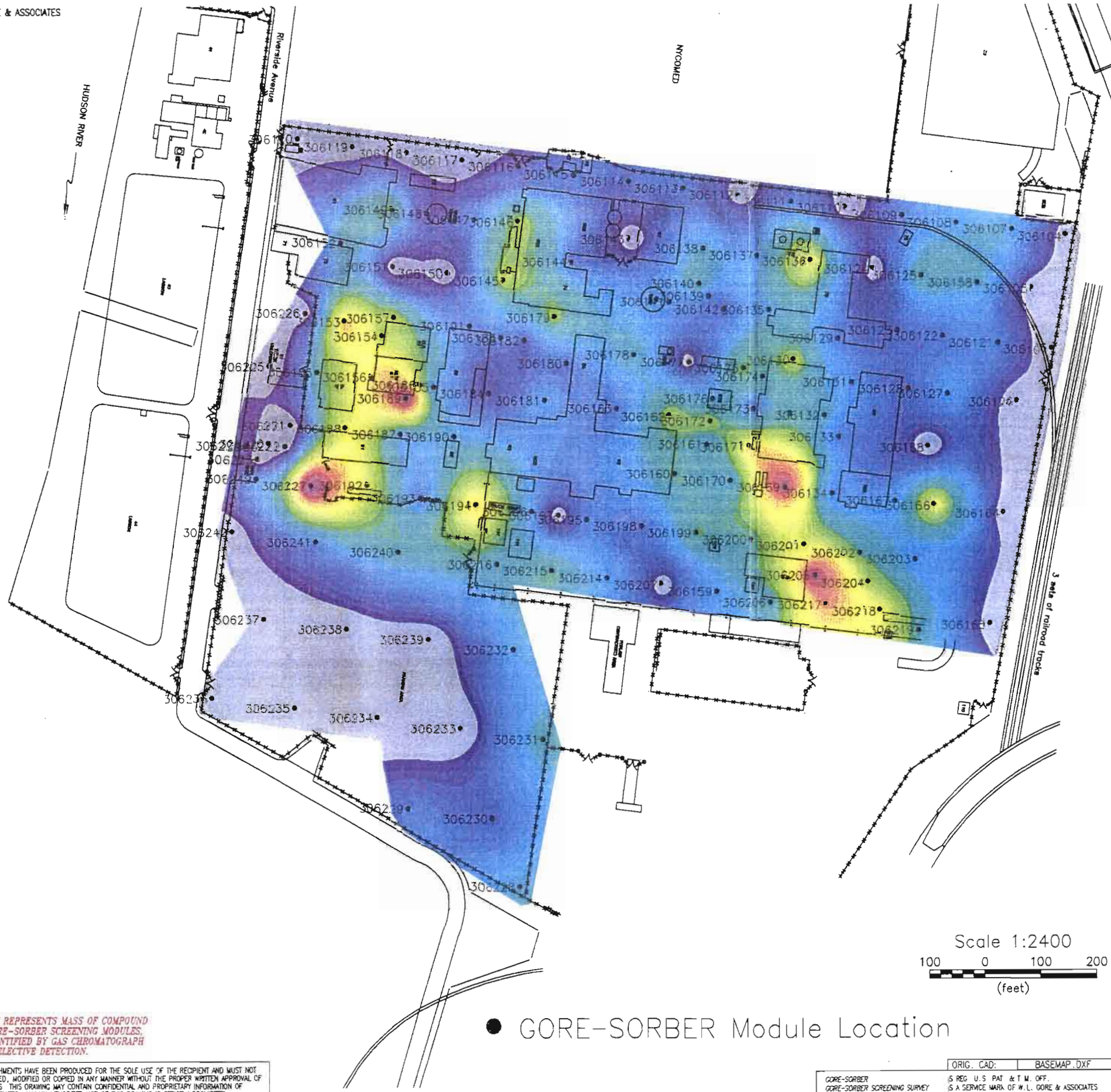
Prepared For: BASF CORPORATION

ROUX ASSOCIATES, INC. Environmental Consulting & Management	Compiled by: N.E.	Date: 21APR04	FIGURE 8
	Prepared by: G.M.	Scale: AS SHOWN	
	Project Mgr: N.E.	Office: NY	
	File No: BF1134811	Project: 25111Y24	

N:\PROJECTS\BF251Y\BF11Y\348\BF1134811.DWG

APPENDIX A

Soil Gas Survey Results



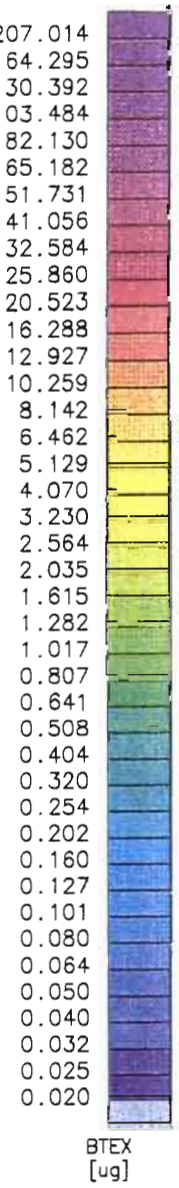


Figure 2

NOTE: CONTOUR PLOT REPRESENTS MASS OF COMPOUND DESORBED FROM GORE-SORBER SCREENING MODULES, IDENTIFIED AND QUANTIFIED BY GAS CHROMATOGRAPH MASS SELECTIVE DETECTION.

ORIG. CAD: BASEMAP.DXF

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GORE-SORBER SCREENING SURVEY

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(410) 392-3300

ALBANY AREA, RENSSELAER, NY

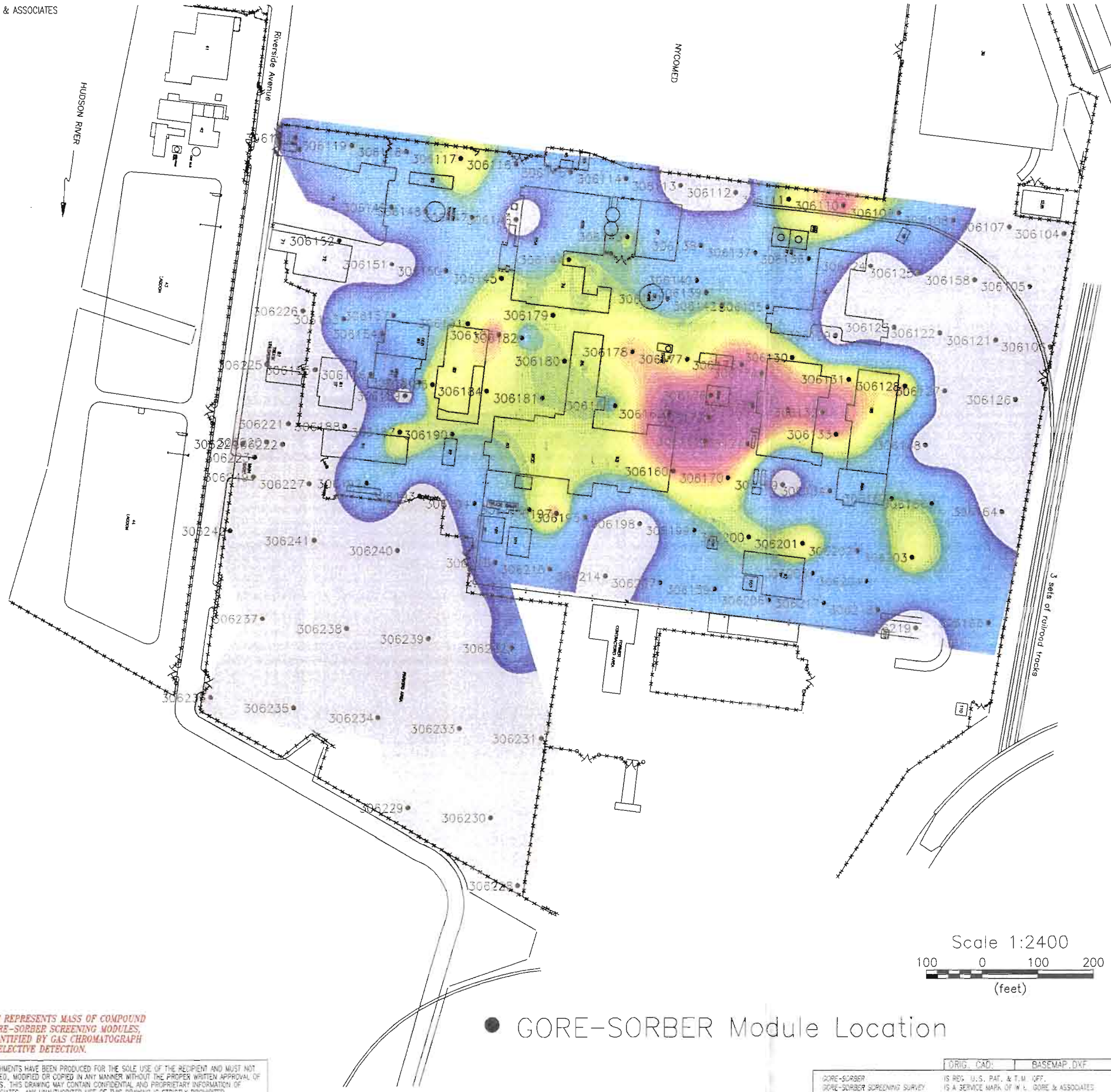
BTEX

ROUX ASSOCIATES, INC., ISLANDIA, NY

REV. #:

REV DATE:

DATE DRAWN	12 MAY, 1999	GRID FILE	BT01.GRD
DRAWN BY	JL/JH	PLOT FILE	BTC.PLT
DATE GRIDDED	13 MAY, 1999	PROJECT NUMBER	10091051
GRIDDED BY	JL/JH	SITE CODE:	ARW



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W. L. GORE & ASSOCIATES, INC.
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ELKTON, MD 21921
(410) 392-7600

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ROUX ASSOCIATES, INC., ISLANDIA, NY

REV. #:
REV. DATE:

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DRAWN BY:	JL/JH	PLOT FILE:	CF0.PLT
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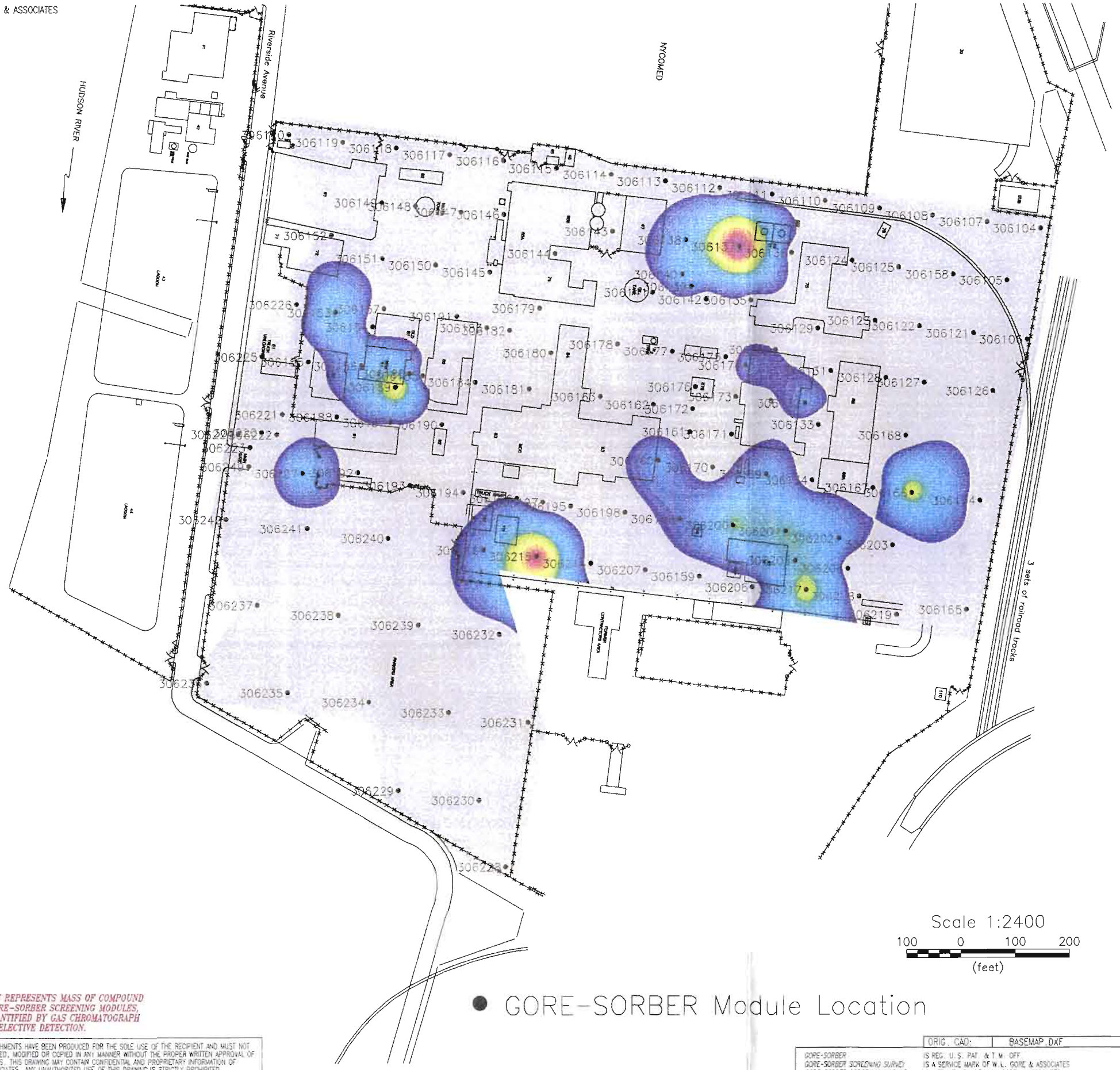

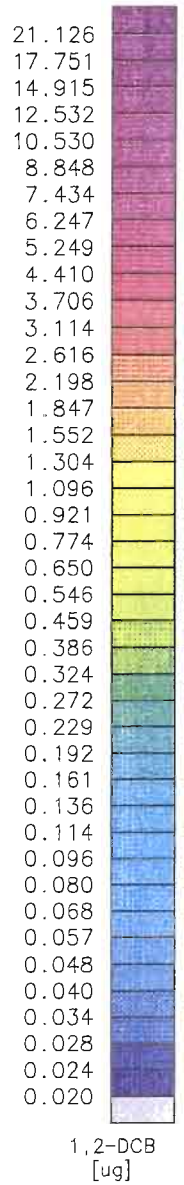

Scale 1:2400

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(feet)

● GORE-SORBER Module Location

NOTE: CONTOUR PLOT REPRESENTS MASS OF COMPOUND DESORBED FROM GORE-SORBER SCREENING MODULES, IDENTIFIED AND QUANTIFIED BY GAS CHROMATOGRAPH MASS SELECTIVE DETECTION.

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REV DATE:

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DATE GRIDDED:	13 MAY, 1999	PROJECT NUMBER	10091051
GRIDDED BY:	JL/JH	SITE CODE:	AYW

Scale 1:2400

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(feet)

● GORE-SORBER Module Location

NOTE: CONTOUR PLOT REPRESENTS MASS OF COMPOUND DESORBED FROM GORE-SORBER SCREENING MODULES, IDENTIFIED AND QUANTIFIED BY GAS CHROMATOGRAPH MASS SELECTIVE DETECTION.

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REV. #:

REV. DATE

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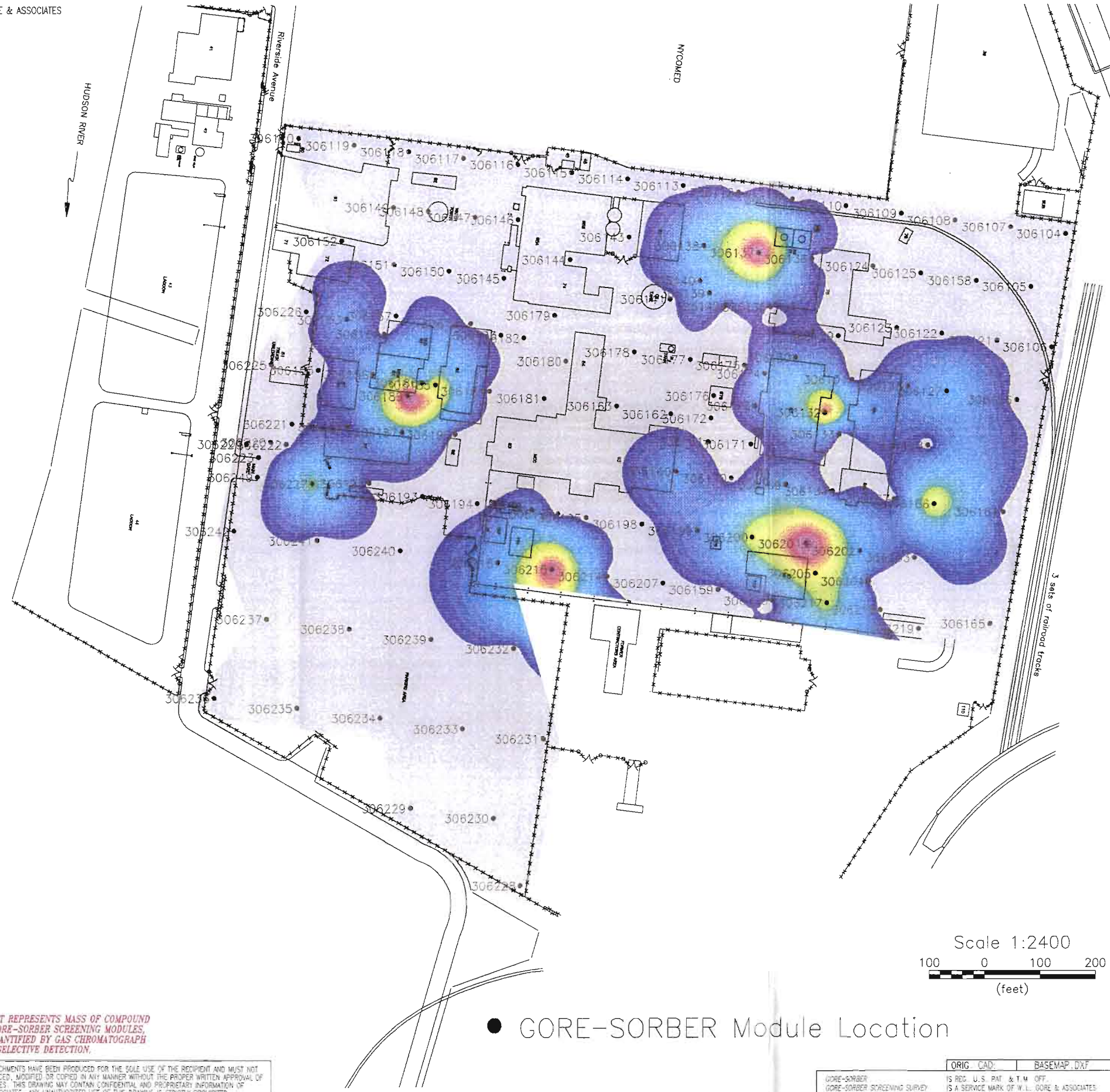
GRIDDED BY:	JL/JH	SITE CODE:	AYW



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REV. DATE:

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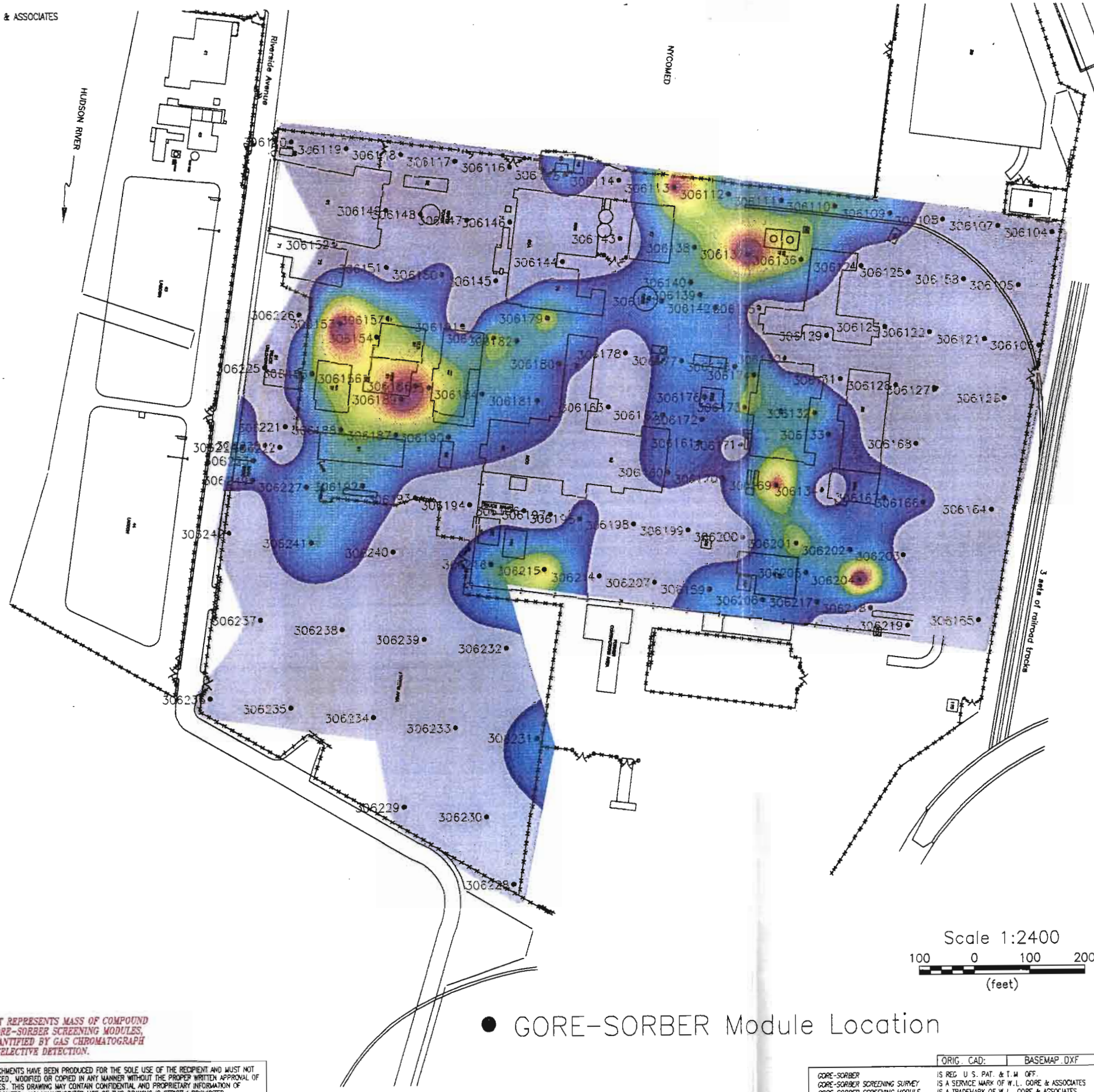

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0.229
0.193
0.162
0.136
0.114
0.096
0.080
0.068
0.057
0.048
0.040

1,2-DCA
[ug]

Scale 1:2400

100 0 100 200
(feet)

● GORE-SORBER Module Location

Figure 8

NOTE: CONTOUR PLOT REPRESENTS MASS OF COMPOUND DESORBED FROM GORE-SORBER SCREENING MODULES, IDENTIFIED AND QUANTIFIED BY GAS CHROMATOGRAPH MASS SELECTIVE DETECTION.

ORIG. CAD:	BASEMAP.DXF

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REV. #:
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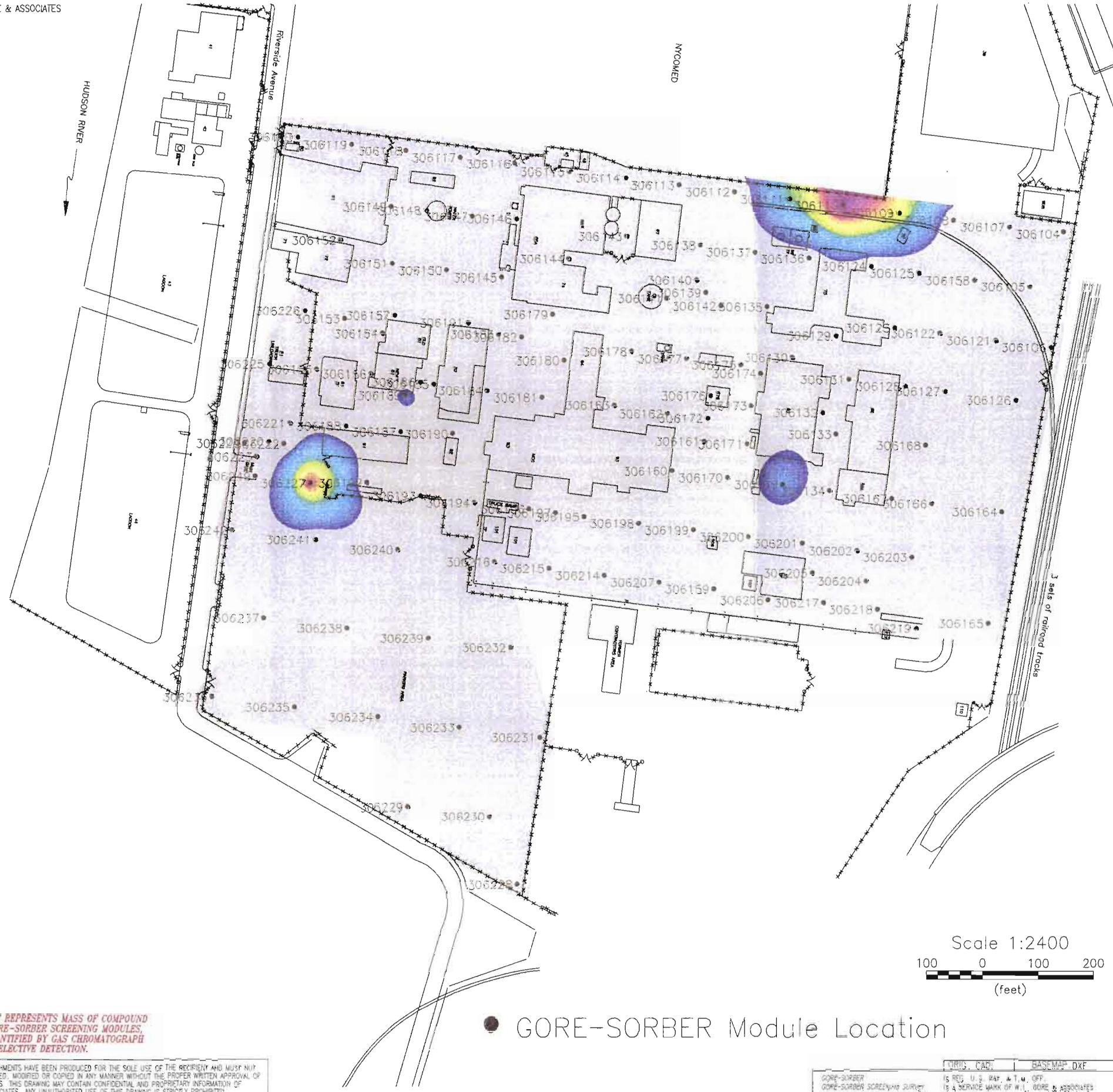

NOTE: CONTOUR PLOT REPRESENTS MASS OF COMPOUND DESORBED FROM GORE-SORBER SCREENING MODULES, IDENTIFIED AND QUANTIFIED BY GAS CHROMATOGRAPH MASS SELECTIVE DETECTION.

DWG. CAP:	BASEMAP.DXF		
GORE-SORBER GORE-SORBER SCREENING SURVEY GORE-SORBER SCREENING MODULE	IS REG. U.S. PAT. & T.M. OFF. IS A SERVICE MARK OF W.L. GORE & ASSOCIATES IS A TRADEMARK OF W.L. GORE & ASSOCIATES		

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REV. DATE:

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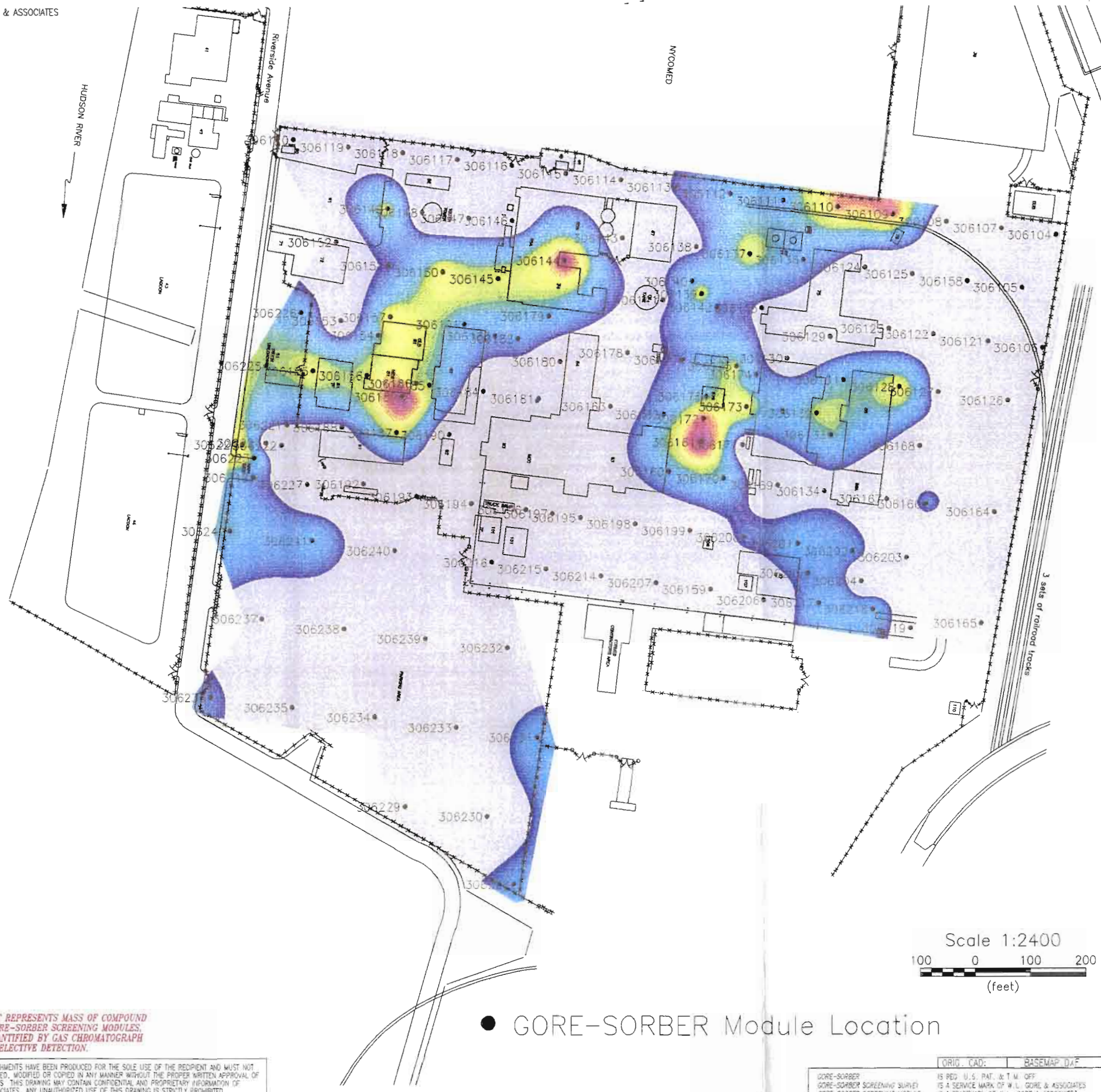

NOTE: CONTOUR PLOT REPRESENTS MASS OF COMPOUND DESORBED FROM GORE-SORBER SCREENING MODULES, IDENTIFIED AND QUANTIFIED BY GAS CHROMATOGRAPH MASS SELECTIVE DETECTION.

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REV. #:
REV. DATE:

DATE DRAWN	12 MAY, 1999	GRID FILE	PCE1.GRD
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ORIG. CAD: BASEMAP.DXF

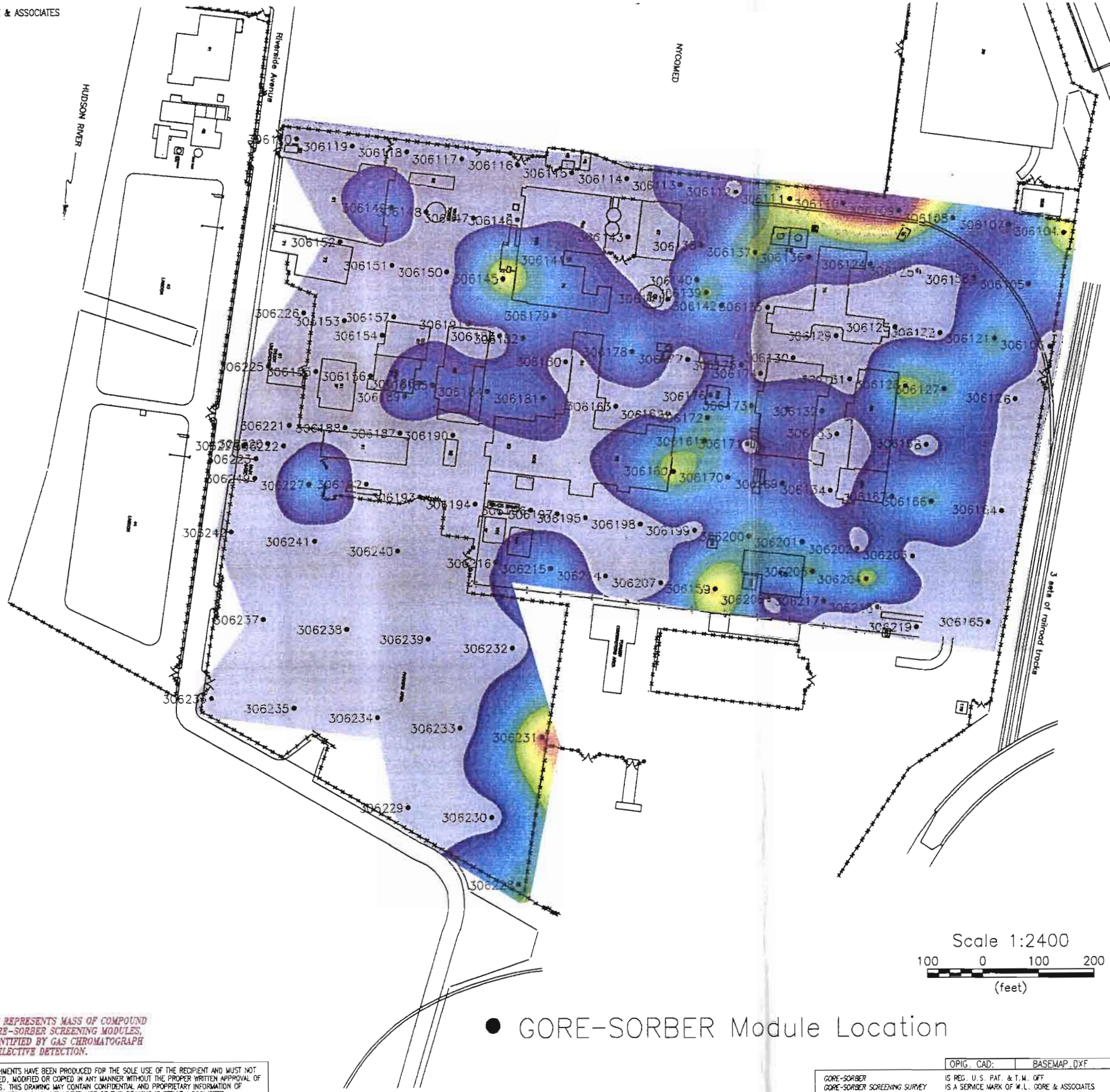

Figure 11

NOTE: CONTOUR PLOT REPRESENTS MASS OF COMPOUND DESORBED FROM GORE-SORBER SCREENING MODULES, IDENTIFIED AND QUANTIFIED BY GAS CHROMATOGRAPH MASS SELECTIVE DETECTION.

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REV #:

REV DATE:

DATE DRAWN:	12 MAr, 1999	GRID FILE	TED1 GRD
DRAWN BY:	JL/JH	PLOT FILE:	TEC.PLT
DATE GRIDDED:	13 MAr, 1999	PROJECT NUMBER	10091051
GRIDDED BY:	JL/JH	SITE CODE:	AYW

Figure 12

NOTE: CONTOUR PLOT REPRESENTS MASS OF COMPOUND DESORBED FROM GORE-SORBER SCREENING MODULES, IDENTIFIED AND QUANTIFIED BY GAS CHROMATOGRAPH MASS SELECTIVE DETECTION.

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REV DATE:

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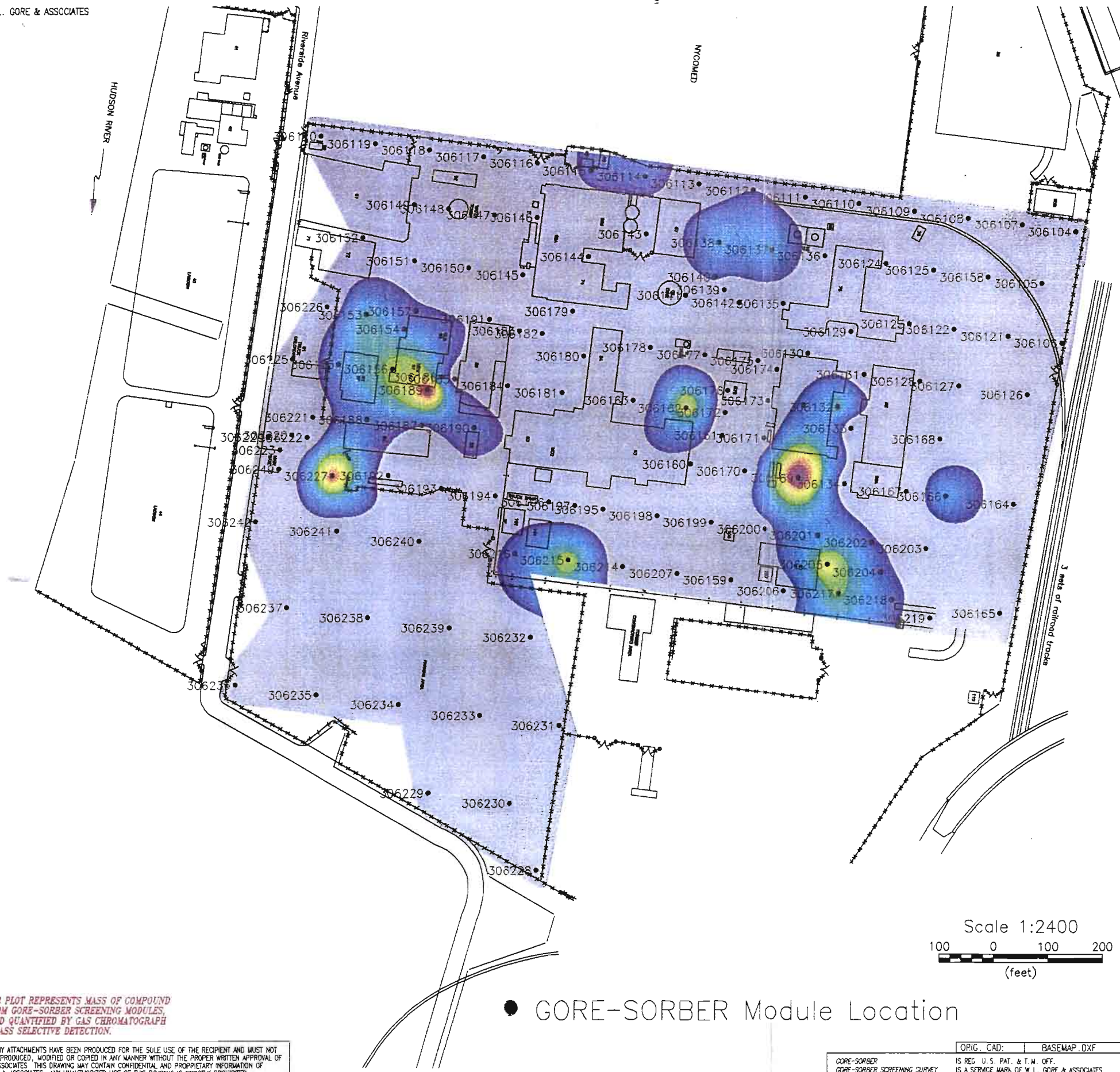

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0.137
0.112
0.091
0.074
0.060
0.049
0.040

ClBenzene
[ug]

Figure 3

NOTE: CONTOUR PLOT REPRESENTS MASS OF COMPOUND DESORBED FROM GORE-SORBER SCREENING MODULES, IDENTIFIED AND QUANTIFIED BY GAS CHROMATOGRAPH MASS SELECTIVE DETECTION.

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ALBANY AREA, RENSSELAER, NY

CHLOROBENZENE

ROUX ASSOCIATES, INC., ISLANDIA, NY

REV. #:
REV DATE:

DATE DRAWN	12 MAY 1999	GRID FILE	CB01 GRD
DRAWN BY:	JL/JH	PLOT FILE	CBC PLT
DATE GRIDDED:	13 MAY, 1999	PROJECT NUMBER	10091051
GRIDDED BY:	JL/JH	SITE CODE:	AtW

APPENDIX B

Health and Safety Plan

HEALTH AND SAFETY PLAN

BASF Rensselaer
36 Riverside Avenue
Rensselaer, New York 12144

March 5, 2004

Prepared for:

BASF CORPORATION
3000 Continental Drive North
Mount Olive, New Jersey 07828

Prepared by:

ROUX ASSOCIATES, INC.
209 Shafter Street
Islandia, New York 11749

ROUX

TABLE OF CONTENTS

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(Continued)

TABLES

FIGURES

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(Continued)

APPENDICES

1.0 INTRODUCTION

On behalf of BASF Corporation (BASF), Roux Associates, Inc. (Roux Associates) has prepared this site-specific Health and Safety Plan (HASP) in accordance with the Occupational Safety and Health Administration's (OSHA's) Hazardous Waste Operation and Emergency Response Standard (29 CFR 1910.120 and 1926.65) and other OSHA requirements for job safety and health protection, and our Standard Operating Procedures (SOPs). In addition, various guidance documents were also consulted in preparing this HASP including the National Institute for Occupational Safety and Health's (NIOSH's) Occupation Safety, Health Guidance Manual for Hazardous Waste Site Activities, and the OSHA Job Safety and Health Protection Poster (Appendix A). This HASP addresses the work associated with piezometer installation, groundwater sampling, and sediment sampling adjacent to the BASF facility located in Rensselaer, New York (Site) and will be implemented by the designated Site Health and Safety Officer (SHSO) during Site work. The HASP attempts to identify all potential hazards at the Site; however, Site conditions are dynamic and new hazards may appear constantly. Personnel must remain alert to existing and potential hazards as Site conditions change and protect themselves accordingly.

Compliance with this HASP is required for Roux Associates personnel who enter this Site. Assistance in implementing this HASP can be obtained from the Roux Associates Office Health and Safety Manager (OHSM). The content of this HASP may undergo revision based upon additional information made available. Any changes proposed must be reviewed and approved by the Roux Associates OHSM or his designee. Key Roux Associates personnel involved with this project include the following.

Responsibility	Name	Telephone Number
Project Principal	Nathan Epler, Ph.D.	(631) 232-2600
Project Manager	Michael Roux	(631) 232-2600
Office Health and Safety Manager	Stephen Bates, Ph.D.	(631) 232-2600
Site Health and Safety Officer	Christopher Battista	(631) 232-2600 (office) (516) 250-0382 (cellular)

1.1 Scope of Work

The scope of work will include the following task:

- Piezometer Installation;
- Groundwater Sampling; and
- Sediment Sampling.

1.2 Emergency Contacts

Type	Name	Telephone Numbers
Police	Rensselaer Police	911
Fire Department	Rensselaer Police (dispatches)	911
Hospital (see Figure 1)	Albany Medical Center	(518) 262-3125
Poison Control Center	Poison Control Center	(800) 222-1222
Emergency Response	Rensselaer Police (dispatches)	911
Ambulance	Rensselaer Police (dispatches)	911
Police Non-Emergency	Rensselaer Police	(518) 462-7451
Fire Department Non-Emergency	Rensselaer Pumper #2	(518) 465-3243

Environmental Emergency (e.g., release or spill)

Contact	Name	Telephone Numbers
Project Principal	Nathan Epler, Ph.D.	(631) 232-2600
Project Manager	Michael Roux	(631) 232-2600
Office Health and Safety Manager	Stephen Bates, Ph.D.	(631) 232-2600
Site Health and Safety Officer	Christopher Battista	(631) 232-2600 (office) (516) 250-0382 (cellular)
National Response Center		(800) 424-8802
BASF Site Contact	Wayne St. Clair	(518) 465-6534

Note: Roux Associates personnel will be equipped with a mobile telephone.
(Additional emergency information is provided in Section 13.0).

2.0 HEALTH AND SAFETY PERSONNEL RESPONSIBILITIES

2.1 Office Health and Safety Manager

The Office Health and Safety Manager (OHSM) serves in assuring that the policies and procedures of the HASP are implemented by the SHSO. The OHSM provides guidance regarding the appropriate monitoring and safety equipment and other resources necessary in implementing the HASP.

2.2 Site Health and Safety Officer

The Site Health and Safety Officer (SHSO) will be onsite during oversight activities and intrusive field operations. The SHSO is responsible for health and safety activities and has the authority to make related decisions. The determination of hazard levels will be made by the SHSO. The SHSO has stop-work authorization, which he or she will execute upon determination of an imminent safety hazard, emergency situation, or other potentially dangerous situation, such as detrimental weather conditions. Authorization to proceed with work will be issued by the OHSM in consultation with the Project Principal (PP) or his/her designee, e.g., Project Manager (PM). The SHSO or PP will contact emergency facilities and personnel when appropriate. Alternate SHSOs may be designated by the SHSO, if required, but must be pre-qualified and approved by the OHSM.

2.3 Project Principal

The Project Principal is responsible for defining the overall project objectives (field and office related activities) determining chain-of-command, evaluating program outcome and serves as final technical review of deliverables. For Roux Associates, the Project Principal is ultimately responsible for overall Site activities including health and safety issues. The day-to-day management of health and safety issues is the responsibility of the Project Manager. The SHSO, OHSM, Project Manager, and Project Principal shall consult and make an agreeable determination should Site information or unforeseen circumstances indicate a change in field procedures may be warranted. Changes to the HASP must be made by formal addendum and be approved by the Project Principal, Project Manager, OHSM and SHSO.

2.4 Project Manager

The Project Manager is responsible for day-to-day activities associated with his/her project including health and safety. Because there may be more than one Project Manager for a site (for example, a Remedial Project Manager and a Site Investigation Project Manager), each Project Manager must ensure that the HASP addresses the hazards associated with each phase of the project and is appropriate for the current specified scope of work. The PM ensures that all Roux Associates personnel designated to work onsite are qualified according to applicable Environmental Protection Agency (EPA), OSHA and New York State requirements. The PM is responsible for ensuring that a duplicate office copy of this HASP is placed in the central project files. The PM is also responsible for ensuring that all required signatures are in place prior to implementing field work.

2.5 Field Crew Personnel

All field crew personnel are responsible for reporting unsafe or hazardous conditions to SHSO. All field personnel (including the above listed personnel) are responsible for understanding and complying with this HASP.

3.0 SITE HISTORY AND PHYSICAL DESCRIPTION

The BASF Rensselaer facility is located in an industrial area of Rensselaer, Rensselaer County, New York. The facility consists of an approximately 80-acre parcel of land that is separated into three areas commonly referred to as the Main Plant (including the wastewater treatment lagoons), Capped Landfill, and South 40. Each one of these three areas is listed separately in the NYSDEC Registry of Inactive Hazardous Waste Disposal Sites. The Site currently contains 18 buildings that include production buildings, maintenance shops, laboratories, warehouses, and above ground storage tank farms; however, the Site is no longer active. The Site is bordered on the north by the chemical plant Organichem (formerly Nycomed and formerly Sterling Organics); on the southwest by a Coastal power plant; on the southeast by the South 40 parcel; on the east by railroad tracks and an elevated highway; and, on the west by the Hudson River.

1881 marks the first reported use of the Site that is currently the BASF Rensselaer manufacturing plant. Twelve different independent companies or divisions have occupied the Site since then. The Site formerly contained the first continually-operated synthetic dyestuffs manufacturing plant in the United States. BASF acquired the manufacturing plant from GAF Corporation in 1978. In January 2001, decommissioning of the plant began in preparation for demolition of all buildings. This included ceasing all operations and the cleaning and removal of production equipment.

4.0 WASTE DESCRIPTION AND CHARACTERIZATION

Wastes may be encountered or generated during Site activities. Based on Roux Associates Scope of Work, these wastes are anticipated to be characterized as follows:

- Waste Types

Liquid	☒	Solid	☐	Gas	☐
Sludge	☐	Semi-Solid	☒	Other (describe)	

- Waste Characteristics

Corrosive	☐	Toxic	☒	Flammable	☐
Volatile	☒	Carcinogen	☒	Radioactive	☐
Reactive	☐	Other (describe) _____			

For purposes of this HASP, toxic chemicals are those materials as defined by OSHA in Appendix A of 29 CFR 1910.1200. In general, toxicity is defined by OSHA on the basis of median lethal dose (LD50) or median lethal concentration (LC50) based upon the effects of the chemical in laboratory studies. A chemical is considered a carcinogen, as defined by Appendix A of OSHA in 29 CFR 1910.1200, if "(a) It has been evaluated by the International Agency for Research on Cancer (IARC), and found to be a carcinogen or potential carcinogen; or (b) It is listed as a carcinogen or a potential carcinogen in the Annual Report on Carcinogens published by the National Toxicology Program (NTP) (latest edition); or (c) It is regulated by OSHA as a carcinogen."

- Waste Containment

Pond	☐	Process Vessel	☐	Tank	☐
Lagoon	☐	Piping	☐	Lab	☐
Lake	☐	Drum	☒	Other	☐
Tank Car	☐	Soil Stockpile	☐	Describe: _____	

5.0 HAZARD ASSESSMENT

Chemical Hazards

The toxicological, physical, and chemical properties of compounds of concern with respect to the New York State Ambient Water Quality Standards are presented in Table 1. The compounds listed in Table 1 may pose a potential exposure hazard through ingestion, inhalation, injection or skin absorption, or a combination of these routes. These exposures will be minimized through the use of personal protective equipment (PPE), designated action levels based upon onsite air monitoring, and the assignment of experienced field personnel.

Chemical inhalation hazards will be monitored with the following instrument:

- photoionization detector (PID).

Action levels for level of protection upgrades are discussed in Section 7.2.1.

Ambient Air Hazards

Potential exposure to impacted airborne particulates, and to organic vapors. All personnel will remain up-wind as the task allows.

Heat/Cold Stress and Sun Exposure

Heat and cold stress are potential hazards associated with seasonal temperatures in Rensselaer, New York. Heat stress and cold stress symptoms, prevention, and treatment are described in Appendix B. Protection against sun exposure by wearing a sunscreen, hat, and long-sleeved shirts must be implemented when warranted.

Noise

Noise, associated with close proximity to operating heavy equipment, power tools, pumps, and generators. Personnel with 8-hour time weighted average (TWA) exposures exceeding 85dBA must be included in a hearing conservation program in accordance with 29 CFR 1910.95. High noise operations will be evaluated by the SHSO. Noise exposure will be controlled through the use of hearing protection such as ear plugs or ear muffs or by maintaining set-backs from high noise equipment as warranted.

General Safety Hazards

- Heavy equipment and motor vehicle traffic. Workers shall wear fluorescent vests furnished with reflective strips at all times while working near motor vehicle traffic.
- Slip, trip, fall hazards associated with uneven terrain, obstacles and slippery or icy surfaces. General housekeeping will be performed to reduce slip, trip and fall hazards.
- Sharp edges, broken glass, exposed nails, rusty metal.
- Pinch points.
- Overhead hazards (wear hard hats as applicable).
- Flying objects (i.e., rocks, debris) and airborne particulate hazards. Wear safety glasses, goggles, or face shields when appropriate.

Electrical Hazards

- Portable pumps, generators, and other power tools require proper grounding and/or a ground fault circuit interrupter (GFCI) before operation. Personnel should never attempt to move an operating pump or generator.
- Overhead and underground utility line.

Biological Hazards

Biological hazards include the possibility of snake bites, potentially rabid stray or wild animal bites, ticks or other insect bites and bee and wasp stings. Ticks may carry lyme disease and/or rocky mountain spotted fever. Personnel shall examine themselves for ticks. Insecticides containing DEET may be an effective tick repellent. Personnel allergic to bee and/or wasp stings shall notify the SHSO of their condition and have medicine or antidotes to treat allergic reactions as prescribed by their personal physician available.

Other biological hazards include poison ivy, poison oak and poison sumac. If exposed to these plants, wash skin thoroughly with soap and water.

6.0 TRAINING REQUIREMENTS

6.1 Basic Training

Site personnel who will perform work in areas where there exists the potential for toxic exposure will be health and safety trained prior to performing work onsite per OSHA 29 CFR 1910.120(e). Training records will be maintained by the onsite SHSO and as described in Section 6.2.

6.2 Site-Specific Training

Training will be provided by the SHSO and Field Team Leader (FTL) that will specifically address the activities, procedures, monitoring, and equipment for the site operations to site personnel and visitors. The training will include site and facility layout, hazards, emergency services at the site, and will detail provisions contained within this HASP. This training will also allow field workers to clarify anything they do not understand and to reinforce their responsibilities regarding safety and operations for their particular activity. Site-specific training will be documented as part of the project records. There are no facility Health and Safety requirements currently in place. However, any facility Health and Safety requirements implemented in the future will be followed.

6.3 Safety Briefings

Project personnel will be given briefings by the FTL or SHSO on an as-needed basis to further assist them in conducting their activities safely. Safety briefings will be provided when new operations are to be conducted, changes in work practices must be implemented due to new information made available, and before work is begun at each project site. Records of safety briefings will be part of the project records.

6.4 Record Keeping Requirements

Record keeping requirements mandated by OSHA 29 CFR 1910.120 will be strictly followed. Specifically, all personnel training records, incident reports (Appendix C), and medical examination records will be maintained by Roux Associates for a period of at least 30 years after the employment termination date of each employee. The SHSO will maintain a daily written log of health and safety monitoring activities and monitoring results will become part of the project records.

7.0 ZONES, PROTECTION AND COMMUNICATIONS

7.1 Site Zones

The Scope of Work will be performed in level "D" Personal Pro Equipment, upgrading to Level C protection is not anticipated on this project. However, should the level of protection worn by field personnel be upgraded to level C, Roux Associates will employ a three-zone approach to site operations to control the potential spread of contamination. Level D operation will not generally require segregated zones. The three zones to be employed when Level C is in use include:

- The Exclusion Zone;
- The Contamination Reduction Zone; and
- The Support Zone.

7.1.1 Exclusion Zone

The area(s) which contain or are suspected to contain hazardous materials will be considered the Exclusion Zone. This zone will be clearly delineated by a "Hotline." The "Hotline" is a length of colored flag tape completely surrounding the Exclusion Zone. The SHSO may establish more than one restricted area within the Exclusion Zone when different levels of protection may be used or various hazards exist. Personnel are not allowed in the Exclusion Zone without the following:

- a buddy;
- appropriate personal protective equipment;
- medical authorization; and
- training certification.

For purposes of this project, if Level C protection is required on this project, the Exclusion Zone's Hotline will include, at a minimum, a 30-foot radius around all areas that contain or are suspected to contain hazardous materials. This area will be determined by the SHSO.

7.1.2 Contamination Reduction Zone

The Contamination Reduction Zone (CRZ) is established between the Exclusion Zone and the Support Zone. The CRZ will contain the Contamination Reduction Corridor (CRC) and will provide for full personnel and portable equipment decontamination. The CRZ is used for general site entry and egress in addition to access for heavy equipment for investigation activities. The CRZ will also contain safety and emergency equipment (see Section 7.2.3). No personnel are allowed in the Contamination Reduction Zone without:

- a buddy;
- the proper personal protective equipment;
- medical authorization; and
- training certification.

For purposes of this project, if Level C protection is required on this project, the CRZ will include a 20 foot radius area outside of the Exclusion Zone.

7.1.3 Support Zone

The Support Zone is considered the uncontaminated area and will be separated from the CRZ by the "Contamination Control Line." The "Contamination Control Line" will be a different colored flag tape than the "Hotline." The Support Zone will contain the support facility which will provide for team communications and emergency response. At least one person will remain in the Support Zone at all times during operations downrange to facilitate communications and emergency response. Appropriate sanitary facilities and safety and support equipment will be located in this zone. The majority of site operations will be controlled from this location as well as site access of authorized persons. The support facility will be located upwind of site operations, if possible and may be used as a potential evacuation point. No potentially contaminated personnel or materials are allowed in this zone except appropriately packaged/ decontaminated and labeled samples and drummed wastes.

For purposes of this project, the Support Zone will include all areas outside of the CRZ.

7.2 Personal Protection

This section describes personal protective equipment (PPE) and safety equipment to be used onsite.

7.2.1 General

Appropriate PPE shall be worn by site personnel when there is a potential exposure to chemical hazards or physical hazards (e.g., falling objects, flying particles, sharp edges, electricity, noise) and as otherwise directed by the SHSO. The level of personal protection, type and kind of equipment selected depends on the hazardous conditions and in some cases cost, availability, compatibility with other equipment, and performance. An accurate assessment of all these factors must be made before work can be safely carried out.

Roux Associates maintains a comprehensive written PPE program that addresses proper PPE selection, use, maintenance, storage, fit and inspection. PPE to be used at the site will meet the appropriate American National Standards Institute (ANSI) standards and the following OSHA (General Industry) standards for PPE.

- head protection – 29 CFR 1910.135;
- eye and face protection – 29 CFR 1910.133;
- respiratory protection – 29 CFR 1910.134;
- hand protection – 29 CFR 1910.138;
- foot protection – 29 CFR 1910.136; and
- protective clothing – 1910.132, 1910.120.

The level of protection to be worn by field personnel will be defined and controlled by the SHSO in conjunction with the Project Principal or his/her designee. Where more than one hazard area is indicated, further definition will be provided by review of site hazards, conditions, and operational requirements and by monitoring at the particular operation being conducted. Any upgrades or downgrades must be immediately communicated to the Project Principal or his/her

designee. The anticipated PPE level of protection for Site tasks are listed below.

Task	Level of Protection
Collection of Groundwater Samples	Level D

Respiratory protection may be upgraded or downgraded by the SHSO in conjunction with the Project Principal on the basis of action levels presented below:

Action Levels for Respiratory Protection (Total Organic Vapors)	
Total Organic Vapors in Breathing Zone (ppm)[1]	**Action**
≤5	No Action
>5 - <25	Level C or Cease Work Until Level Drops
≥25	Cease Field Operations

[1] Based on relative response (sensitivity of PID to total organic vapors).

If the PID measurements are above five ppm but below 25 ppm and above background for five minutes in the breathing zone, employee protection will be upgraded to Level C with the use of a full-face respirator or work will cease until the relative measurements of VOCs are below 5 ppm.

If PID measurements exceed 25 ppm above background for five minutes in the breathing zone, work activities will cease until airborne vapor levels can be reduced to less than 25 ppm and are quantified or the SHSO determines alternate methods to be followed in order to proceed.

7.2.2 PPE Level Descriptions

The type of respiratory protection and clothing to be worn in each level of protection indicated above includes the following:

- Level D
  - Full-length pants and short-sleeved shirt at a minimum. Long-sleeved shirt or coveralls as required.
  - Boots/shoes - chemical resistant with steel toes and shanks

- Safety glasses
- Hard hat (as required)
- Chemical-resistant or cut-resistant gloves – depending on task
- Hearing protection (as required)
- Fluorescent Traffic Safety Vest w/ Reflective Strips (as required)

• Level C

- Full-face, air-purifying, HEPA cartridge-equipped respirator (MSHA/NIOSH specifically approved for protection from organic vapors and particulates per OSHA 1910.1028)
- Chemical-resistant clothing (coverall; hooded, two-piece chemical splash suit; chemical-resistant hood and apron; disposable chemical-resistant coveralls)
- Gloves (outer), chemical-resistant - latex
- Gloves (inner), chemical-resistant - nitrile
- Boots (inner), chemical-resistant, steel toe and shank
- Boots (outer), chemical-resistant (disposable)
- Hard hat
- Hearing protection (as required)

7.2.3 Safety Equipment

Basic emergency and first-aid equipment will be available at the work site, as appropriate. This may include HASP-specified communications, first-aid kit, emergency eyewash or emergency shower or drench system, fire extinguisher, and other safety-related equipment. Other safety equipment will be located at the area of specific operations, e.g., drilling and sampling, as appropriate. Traffic cones or barricades, and traffic vests will be used when work is required in high traffic areas.

7.3 Communications

Telephones - for communication with emergency support services/facilities. Roux Associates personnel will be equipped with a cellular telephone.

8.0 MONITORING PROCEDURES FOR SITE OPERATIONS

8.1 Monitoring During Site Operations

Air monitoring may be performed to verify that the proper level of equipment is used and to determine if increased protection or work stoppage is required. The following equipment may be used by Roux Associates onsite to monitor conditions:

- photoionization detector (PID).

Section 7.2.1 lists the acceptable ranges for each piece of monitoring equipment above and the action levels for changes in respiratory protection. Monitoring equipment will be calibrated in accordance with the owner's manual.

8.2 Personnel Monitoring Procedures

Personal breathing zone samples, 8-hour, time-weighted average (TWA) sampling, may be conducted if sustained operations in Level C are required. The personal breathing zone samples will be collected according to NIOSH analytical methods and analyzed by an AIHA-certified laboratory.

8.3 Medical Surveillance Requirements

Medical surveillance specifies any special medical monitoring and examination requirements as well as stipulates that all Roux Associates, Inc. personnel and subcontractors are required to pass the medical surveillance examination or equivalent for hazardous waste work required by 29 CFR 1910.120. As a minimum, the examination will include:

- complete medical and work histories;
- urinalysis;
- physical exam;
- vision and hearing exam;
- blood chemistry;
- pulmonary function test; and
- audiometry.

The examination will be annual, at a minimum, and upon termination of employment with the company. Additional medical testing may be required by the OHSM in consultation with the company physician and the SHSO if an overt exposure or accident occurs, or if other Site conditions warrant further medical surveillance.

9.0 SAFETY CONSIDERATIONS FOR SITE OPERATIONS

General

Field activities will be performed under the level of personal protection described in Section 7.0. In this section, non-monitoring safety-related procedures are described.

9.1 Site Walk-Throughs

As a full investigation of the Site has already been performed, Site walks will not encounter unknown situations. However, site walks still present the potential for dangerous situations based on the hazard assessment presented in Section 5.0. The SHSO must inform all personnel performing a Site walk of the hazards associated with the Site, describe the Site layout, and identify areas of particular hazard, if any.

9.2 Heavy Equipment and Drill Rig Safety

The SHSO will be present onsite during invasive operations such as drilling, and will provide health and safety monitoring to ensure that appropriate levels of protection and safety procedures are followed by Roux Associates personnel. The proximity of chemical, water, sewer and electrical lines will be identified by a utility mark-out service before any subsurface activity or sampling is attempted. The SHSO and Project Manager shall confirm that the utility mark-out service has been notified at least 72 hours prior to earth disturbing activities.

Hazardous waste sites use all of the mechanical equipment used on any major construction site. Typical machinery to be found includes pumps, compressors, generators, portable lighting systems, pneumatic tools (drum openers), hydraulic drum crushers, pug mills, fork lifts, trucks, dozers, backhoes, and drill rigs. The equipment poses a serious hazard if not operated properly or if personnel near machinery cannot be seen by operators.

Drilling crews are confronted with all of these heavy equipment hazards. They must be responsible for good housekeeping around the rig because of the rods, auger sections, rope, and hand tools used for the operation. Maintenance is a constant requirement. Overhead and buried utilities require special precautions because of electrical and natural gas hazards. Electrical storms may seek out a standing derrick. The hoist or cathead rope poses specific hazards; always

use clean, dry, sound rope. Keep hands away from the test hammer. Hearing loss, while not an immediate danger, is considerable over time. Use hearing protection.

Proper containment and disposal practices will be followed in regard to the potential amount of waste generated during operations. The location of safety equipment and evacuation procedures will be established prior to initiation of operations according to this HASP. The use of hard hats, eye protection, ear protection, and steel-toed boots will be required during heavy equipment operations. Contaminated equipment will be placed on liner material when not in use, or when awaiting and during decontamination. Communications with the Support Zone will be regularly maintained.

9.3 Groundwater Sampling

Personnel must wear prescribed clothing, especially eye protection and chemical resistant gloves when purging, sampling, or filtering groundwater samples. Sample bottles may be bagged prior to sampling to ease decontamination procedures. The sampling team must be aware of emergency evacuation procedures described in this HASP and the location of emergency equipment, including spill containment materials, prior to sampling. Contamination avoidance will be practiced at all times. In some situations, additional monitoring by the SHSO may be needed to confirm or establish the proper level of protection before the sampling team can proceed.

9.4 Sample Handling

Personnel responsible for the handling of samples will wear the level of protection described in Section 7.2. Samples will be identified as to their hazard and packaged to prevent spillage or breakage. Any unusual sample conditions will be noted. Lab personnel will be advised of sample hazard level and the potential contaminants present. This can be accomplished by a phone call to the lab coordinator and/or inclusion of a written statement with the samples. It may be necessary for the SHSO to review safety procedures in handling site samples to assist or assure that these practices are appropriate for the type of suspected contaminants in the sample.

9.5 Waste Disposal

Waste disposal operations will be monitored by the SHSO and performed under the appropriate level of personal protection described in Section 7.2. Personnel will wear the prescribed clothing, especially eye protection and chemical resistant gloves, when handling or drumming waste materials. Contamination avoidance will be practiced at all times. Additional information on disposal procedures is described in Section 11.0.

9.6 Heavy Equipment Decontamination

If steam cleaner or pressure washer is used to decontaminate the drill rig and associated drilling equipment, personnel will exercise caution during use. The high pressure steam can cause severe burns. Protective gloves, face shields, hard hats, steel-toed boots, and Tyvek suits or rain gear must be worn when using steam cleaners.

9.7 Confined Space Entry

The scope of work does not require Roux Associates personnel to enter confined space for this project. Any changes to the field activities that may necessitate confined space entry will be reported to the Project Principal and OHSM. No Roux Associates personnel are permitted to make a permit required confined space entry. A permit required confined space is defined as any space, depression, or enclosure that has limited opening for entry and egress, may have limited ventilation, may contain or produce life-threatening atmospheres due to oxygen deficiency, the presence of toxic, flammable, or corrosive contaminants, and which is not intended for continuous occupancy.

Examples of confined spaces prohibited from entry may include, but are not limited to, storage tanks, ventilation and exhaust ducts, stacks, pits, basements, silos, vats, vaults, pipes and any topped open space four or more feet deep and not adequately ventilated.

9.8 Control of Hazardous Energy (LockOut/Tagout)

Hazardous energy at the site will be controlled through the use of a lockout/tagout procedure developed in accordance with OSHA's lockout/tagout standard (29 CFR 1910.147). The purpose of lockout/tagout procedures is to minimize exposures to hazards from the unexpected energizing, startup or release of residual or stored energy from equipment, machinery or

processes. Lockout/tagout procedures will be followed during the installation, servicing and maintenance of machines or equipment that involve hazardous energy sources. Hazardous energy sources include any electrical, mechanical, hydraulic, pneumatic, chemical, thermal or other energy source that is capable of causing injury to personnel.

Lockout/tagout procedures require the placement of a lock and/or tag on an energy isolating device (a device that physically prevents the transmission or release of energy such as manually operated electrical circuit breakers, disconnect switches, valves and selector switches). After the energy isolation device is placed in the "off" or "safe" position, the lockout/tagout is placed on the energy isolation device to secure it in the "off" or "safe" position. This ensures that the equipment, machinery or process is not capable of being operated while, installation, servicing or maintenance is taking place.

If it is determined that lockout/tagout procedures are required for any aspect of site work, the following generic lockout/tagout procedures will be implemented. Note, these procedures will be tailored to the specific application of a lockout/tagout if there is a need for same. Presently, there are no known situations that would require the application of lockout/tagout procedures at this site.

1. Affected personnel and authorized personnel will receive lockout/tagout orientation training to become familiar with procedures to control hazardous energy. Affected personnel is defined as personnel whose job requires that they operate or use equipment, machinery or processes on which servicing or maintenance is being performed under lockout/tagout, or whose job requires them to work in an area in which such servicing or maintenance is being performed. Authorized personnel is defined as a qualified person to whom authority and responsibility to perform a specific lockout and/or tagout assignment has been given by the employer.

2. Before proceeding with the installation, maintenance or servicing of any equipment, machinery or process at the site for which lockout/tagout procedures apply, a survey will be made to locate and identify associated energy isolation devices.

3. Once the survey is complete, the authorized personnel will notify all affected personnel, including the FTL and SHSO that a shutdown of the equipment or machine will occur.

4. Following notification, the equipment or machine, if operating, will be shut down by normal stopping procedure (i.e., depress stop button, open toggle switch, turn light switch off, etc.).

5. Once turned off, the energy isolating device (i.e., circuit breaker, disconnect switch, valve, etc.) will be operated in such a manner that the machine or equipment will be isolated from the energy source (electrical, mechanical, hydraulic, pneumatic, chemical, thermal, etc.).

6. The energy isolating device is then "locked out" by applying the lockout, padlock and tag to the device. In some cases, a chain must be used (in combination with a padlock) to sufficiently "lockout" a device (i.e., steam valve, hydraulic valve, etc.).

7. The tag will be filled out by the authorized personnel indicating the personnel's name and the date and time of the lockout.

8. Once the energy isolating device has been locked out and tagged, all potentially hazardous sources or residual energy will be purged or dissipated (i.e., grounding, bleeding, venting, lowering, etc.).

9. After ensuring that no personnel are exposed, the authorized personnel will operate the normal operating controls to make certain the equipment will not restart. There operating controls must be returned to the "off" or "neutral" position after the test.

10. Use a volt meter to make sure that work is not energized, if applicable.

11. Attach a "ground stick" of sufficient size to handle any possible fault current to all three phases of the source, if applicable.

12. Maintenance or servicing of the machine or equipment can now be performed.

13. When the maintenance and/or service is completed, the work area is to be inspected to ensure that all affected personnel are safely positioned and/or removed. In addition, remove all nonessential items from the equipment.

14. The lockout, padlock, and tag shall then be removed from the energy isolating device by the authorized personnel who applied the lockout devices.

15. Each and every personnel involved with the service or maintenance of the locked out equipment will place their assigned padlock to each and every lockout device and/or chain in such manner that if every other padlock were removed, the personnel would still have a padlock assuring that each and every source of energy is still "locked out". No personnel may affix the personal lockout/tagout device of another personnel.

16. If work on a piece of equipment of machinery that is locked out carries over to the next shift, the authorized personnel may remove their lockout device, provided that the next authorized personnel applies their lockout device at the same time the previous authorized personnel removes their lock device.

9.9 Hazard Communication

Personnel working at this Site have the right to know about the chemical hazards associated with hazardous materials used and stored onsite. This information will be readily available to all Site workers as required by OSHA's Hazard Communication Standard (29 CFR 1910.1200). This information will be communicated to personnel through the maintenance of a chemical inventory system, chemical labeling, material safety data sheets (MSDSs), hazard communication training, and a written hazard communication program.

Chemicals imported to the Site will bear the original Department of Transportation (DOT) required labeling on the chemical's container. In addition, a new label will be affixed to the original containers, if necessary, and to a new container to which the chemical is dispensed providing the chemical name and specific hazard warnings (e.g., flammability, health, reactivity). Hazard warnings will follow either the National Fire Protection Association (NFPA) format or the Hazardous Material Information System (HMIS) format. Both systems are easy to use and rely on numerically ranking hazards on a 0 to 4 scale. Most chemicals used onsite, which are subject to the Hazard Communication Standard are related to sampling activities. These chemicals may include hexane, methanol, acetone and nitric acid.

9.10 Vehicular Traffic Safety Procedures

A vehicular traffic area is any area where a vehicle may legally travel including, but not limited to, a roadway, roadway shoulder, and driveway or parking area. Vehicular traffic along Riverside Avenue varies from light and infrequent to very heavy. Traffic consists of car and large-commercial truck traffic typically moving at speeds of 25 to 30 miles per hour (mph) and frequently at speeds approaching 40 mph. Note that the local speed limit on all roads adjacent to the Site is 30 mph. Vehicle speed in work areas within parking lots is typically low but may be hazardous due to vision limitations caused by miscellaneous obstructions. The following procedures shall be followed to mitigate vehicular traffic hazards posed at the work areas at the Site during any activities within a roadway, roadway shoulder or any active parking area unless the area is secured (fenced and gated without any vehicle movement potential).

- Double parking shall not be permitted.
- All workers shall wear hardhats and reflective orange vests.

- Workers shall use caution when crossing any road.
- Workers should take care to avoid sudden movements across the road.
- Workers shall position vehicles and equipment to minimize exposure to traffic and to facilitate safe access and egress from vehicles while loading and unloading equipment and/or materials.
- Traffic cones shall be deployed around work areas while workers are present.
- Traffic cones shall be placed at strategic locations to warn approaching traffic.
- All vehicles shall be parked as close to the work area as possible to use the vehicle as a barrier against oncoming traffic.
- When performing activities on a roadway or on the shoulder of any roadway, a minimum of two people must be present. One person will serve as a "traffic watchman" whose sole responsibility is to monitor vehicular traffic conditions and alert worker(s) of potential traffic hazards. The "traffic watchman" must be alert at all times and focused on traffic conditions. At no time should the "traffic watchman" engage in activities other than monitoring traffic conditions.
- Project Staff shall require that all project subcontractors conform to the same guidelines.
- If a specific task is required to be performed in high volume traffic areas or areas with unpredictable traffic patterns, a traffic watchman or police detail should be utilized. The need for a traffic watchman or police detail should be discussed with the Project Manager and client prior to deployment.
- Notify the local police of the work location, dates of work and the anticipated work times when work is to be conducted in a public roadway.
- Additional requirements of local transportation, highway, public safety, and police departments must also be followed when work is performed in a public roadway.

9.11 Working Over or Near Water

The following section describes the hazards associated with working over or near water and the prevention measures that should be taken.

9.11.1 Hazards

Hazards associated with working around water include drowning, frostbite, hypothermia, and injury from falling into the water.

9.11.2 Prevention

When working over or near water where there is potential for drowning, engineering controls such as the installation of guardrails or other personal protective equipment shall be used to prevent falling into the water. In addition, floatation devices must be worn and other lifesaving devices must be available. Guardrails shall be provided for deck openings, elevated surfaces, and similar locations where persons may slip or fall from them. Any obstruction in a passageway that restricts normal passage shall be posted with warning signs or distinctively marked. Employees shall not be permitted to pass fore and aft, over or around the deck loads unless there is a safe passage. Decks and other working surfaces will be maintained in a safe condition and adequate safe walkways will be maintained for passage around the deck.

9.12 Working In or Near Sediments

When working in or near sediments there is a potential for suffocation. All personnel working in sediments must wear a floatation device and be connected to shore with a retrieval line. At least one person must be on shore while work is being performed in sediments.

9.13 Heat Stress

Heat stress is a significant potential hazard and can be associated with heavy physical activity and/or the use of personal protective equipment in hot weather environments.

Heat cramps are brought on by prolonged exposure to heat. As an individual sweats, water and salts are lost by the body resulting in painful muscle cramps. The signs and symptoms of heat stress are as follows:

- severe muscle cramps, usually in the legs and abdomen;
- exhaustion, often to the point of collapse; and
- dizziness or periods of faintness.

First aid treatment includes shade, rest and fluid replacement. Normally, the individual should recover within one-half hour. If the individual is not better within 30 minutes and the body temperature has not decreased, the individual should be transported to a hospital for medical attention.

Heat exhaustion may occur in a healthy individual who has been exposed to excessive heat while working or exercising. The circulatory system of the individual fails as blood collects near the skin in an effort to rid the body of excess heat. The signs and symptoms of heat exhaustion are as follows:

- rapid and shallow breathing;
- weak pulse;
- cold and clammy skin with heavy perspiration;
- skin appears pale;
- fatigue and weakness;
- dizziness; and
- elevated body temperature.

First aid treatment includes cooling the victim, elevating the feet, and replacing fluids. If the individual is not better within 30 minutes and the body temperature has not decreased, the individual should be transported to the hospital for medical attention.

Heat stroke occurs when an individual is exposed to excessive heat and stops sweating. This condition is classified as a **MEDICAL EMERGENCY** requiring immediate cooling of the victim and transport to a medical facility. The signs and symptoms of heat stroke are as follows:

- dry, hot red skin;
- body temperature approaching or above 105 degrees F;
- large (dilated) pupils; and
- loss of consciousness - the individual may go into a coma.

First aid treatment requires immediate cooling and transportation to a medical facility. Heat stress is a significant hazard if any type of protective equipment (semipermeable or impermeable) that prevents evaporative cooling is worn in hot weather environments.

9.14 Cold Stress

Cold stress is a danger at low temperatures and when the wind-chill factor is low. Prevention of cold-related illnesses is a function of whole body protection. Adequate insulating clothing must be used when the air temperature is below 40°F. A work/rest regimen will be initiated when ambient temperatures and protective clothing cause a stressful situation. In addition, reduced work periods followed by rest in a warm area may be necessary in extreme conditions. The signs and symptoms of cold stress include the following:

- severe shivering;
- abnormal behavior;
- slowing;
- weakness;
- stumbling or repeated falling;
- inability to walk;
- collapse; and/or
- unconsciousness.

First aid requires removing the victim from the cold environment and seeking medical attention immediately. Also, prevent further body heat loss by covering the victim lightly with blankets. Do not cover the victim's face. If the victim is still conscious, administer hot drinks and encourage activity such as walking, wrapped in a blanket.

9.15 Manhole Cover Lifting

Any task that requires the removal of a manhole cover or catch basin cover will be monitored by the SHSO and performed under the appropriate level of personal protection described in Section 7.2. A mechanical manhole cover lifter is the preferred tool to remove a manhole cover. If unavailable, pry bars and manhole cover hooks can be used to loosen and remove a manhole or catch basin cover from the frame. Proper lifting technique should be used when using a manhole cover hook to prevent back injury.

Proper lifting technique begins with determining how heavy the cover is before attempting to lift or move it. In addition, think about how far the cover needs to be moved and where it is going to end up. Look for obstructions before lifting the object. If the cover appears to be is too heavy for your ability, don't try to lift it alone; find help.

The correct technique for lifting a heavy load includes:

- use both hands on the pry bar or manhole cover hook to lift or slide the cover;
- stand directly in front of the load, with feet about shoulder width apart;
- keep one foot in front of the other for balance;
- bend the knees and tighten the stomach muscles;
- lift with the legs, until they are straightened (leg muscles are stronger than back muscles);
- avoid jerky movements;
- keep the natural curve in the spine (don't bend at the waist); and
- turn by pivoting on the toes and moving the feet, do not twist at the stomach.

Before lifting a cover, move any objects away from the area that may be damaged by the cover if it should fall. Stay aware of the cover and your feet at all times.

Any work being performed in a vehicular traffic area should be performed following the safety considerations presented in section 9.10. Any open manhole or catch basin that is left unattended for any period of time should be protected with a manhole guard or safety cones. Manholes and catch basins are not permitted to remain uncovered when the personnel performing the task are not on site (i.e., lunch or at end of the day).

9.16 Additional Safe Work Practices

Refer to the SHSO for specific concerns on each individual site task. The safety rules listed below must be strictly followed:

- Use the buddy system when required.
- Practice contamination avoidance, both on and offsite.
- Plan activities ahead of time.

- Do not climb over/under obstacles.
- Be alert to your own physical condition.
- Watch your co-workers for signs of fatigue, exposure, heat or cold stress, etc.
- Report all accidents, no matter how minor, immediately to the SHSO.
- Do not eat, drink, chew gum, apply cosmetics, or use tobacco products while working onsite (except in the support zone).
- Be aware of traffic, heavy equipment, and other obstacles around you.
- Do not work onsite while under the influence of drugs or alcohol, including prescription drugs that may cause drowsiness.
- Copies of this HASP shall be readily accessible at all times.
- Note wind direction. Personnel shall remain upwind wherever possible during onsite activities.
- **READ AND SIGN YOUR HEALTH AND SAFETY PLAN BEFORE ENGAGING IN SITE ACTIVITIES.**

A work/rest regimen will be initiated when ambient temperatures and protective clothing cause a stressful situation. Work will not be conducted without adequate light or without supervision. Safety briefings may be held prior to beginning each task.

10.0 DECONTAMINATION PROCEDURES

10.1 Contamination Prevention

One of the most important aspects of decontamination is contamination prevention. Contamination prevention practices will minimize worker exposure and ensure valid sample results by precluding cross contamination. Procedures for contamination prevention include the following:

- For Personnel
  - do not walk through areas of obvious or known contamination;
  - do not handle or touch contaminated materials directly;
  - make sure all personal protective equipment (PPE) has no cuts or tears prior to donning;
  - fasten all closures on suits, covering with tape, if necessary;
  - take particular care to protect any skin injuries;
  - stay upwind of airborne contaminants; and
  - do not carry cigarettes, gum, etc. into contaminated areas.
- Sampling/Monitoring
  - when required by the SHSO, cover instruments with clear plastic, leaving opening for sampling and exhaust ports; and
  - bag sample containers prior to the placement of sample material.
- Heavy Equipment
  - care should be taken to limit the amount of contamination that comes in contact with heavy equipment;
  - if contaminated tools are to be placed on non-contaminated equipment for transport to the decontamination pad, plastic should be used to keep the equipment clean; and
  - drill cuttings (i.e., soil) should be contained and kept out of the way of workers.

10.2 Decontamination

All personnel and equipment exiting an Exclusion Zone will be thoroughly decontaminated. Safety briefings will explain the decontamination procedures for personnel and portable

equipment for the various levels of protection indicated in Section 7.2. Heavy equipment will be decontaminated with a steam cleaner. Rinseates will be collected, handled, and/or drummed as potentially hazardous waste. Additional information on disposal procedures is presented in Section 11.0.

Equipment Decontamination

Non-disposable sampling equipment will be decontaminated through the following steps, if necessary:

- fresh water rinse;
- non-phosphorus detergent wash; and
- fresh water rinse.

11.0 DISPOSAL PROCEDURES

Discarded materials, waste materials, or other objects will be handled in such a way as to preclude the potential for spreading contamination, creating a sanitary hazard, or causing litter to be left onsite. Potentially contaminated materials as determined by the SHSO, e.g., soil, clothing, gloves, etc., will be bagged or drummed, as necessary, and segregated for disposal. Contaminated materials will be disposed in accordance with appropriate regulations. Non-contaminated materials will be collected and bagged for appropriate disposal as normal domestic waste. Waste disposal operations conducted by Roux Associates will be monitored by the SHSO and carried out under the appropriate level of personal protection described in Section 7.2.

12.0 EMERGENCY PLAN

As a result of the hazards onsite and the conditions under which operations are conducted, the possibility of an emergency exists. An emergency plan is required by OSHA 29 CFR 1910.120 to be available for use and is included below. A copy of this plan will be posted in the Support Zone at each work site. Figure 1 includes directions and a map to Albany Medical Center.

12.1 Site Emergency Coordinator(s)

The Site Emergency Coordinator(s) are the Field Team Leader and the Site Health and Safety Officer. The Site Emergency Coordinator(s) will contact the local fire, police, and other emergency units prior to beginning work onsite. In these contacts, the Site Emergency Coordinator(s) will inform the emergency units about the nature and duration of work expected on the site and the type of contaminants and possible health or safety effects of emergencies involving these contaminants. Also at this time, the coordinators and the emergency response units will make arrangements to handle any emergencies that might occur.

The Site Emergency Coordinator(s) will implement the emergency plan whenever conditions at the site warrant such action. The coordinator(s) will be responsible for assuring the evacuation, emergency treatment, emergency transport of site personnel as necessary, and notification of emergency response units, and the appropriate management staff.

Emergency Site Control

In the event of an emergency, the Site Emergency Coordinator(s) will discourage any unauthorized personnel from entering the Site. If necessary, the Site Emergency Coordinator(s) will contact the proper authorities.

12.2 Evacuation

In the event of an emergency situation, such as fire, explosion, significant release of particulates, etc., an air horn, automobile horn, or other appropriate device will be sounded by the SHSO or field crew personnel for approximately ten seconds indicating the initiation of evacuation procedures. All persons in both the restricted and non-restricted areas will evacuate and assemble near the Support Zone or other safe area as identified by the Site Emergency Coordinator(s). The Site Emergency Coordinator(s) will have authority to initiate proper action

if outside services are required. Under no circumstances will incoming personnel or visitors be allowed to proceed into the area once the emergency signal has been sounded. The SHSO must see that access for emergency equipment is provided and that all combustion apparatus has been shutdown once the alarm has been sounded. Once the safety of all personnel is established, the fire department and other emergency response groups will be notified by telephone of the emergency. Then, other personnel listed in Section 12.4 will be notified.

12.3 Potential or Actual Fire or Explosion

If the potential for a fire exists or if an actual fire or explosion occurs, the following procedures will be implemented:

- immediately evacuate the site as described above (Section 12.2); and
- notify fire, security, and police departments.

12.4 Environmental Incident (Release or Spread of Contamination)

If possible, the spread of contamination will be controlled or stopped. The Site Emergency Coordinator(s) will instruct a person onsite to immediately contact police and fire authorities to inform them of the possible or immediate need for nearby evacuation. If a significant release has occurred, the National Response Center and other appropriate groups will be contacted. Those groups will alert National or Regional Response Teams as necessary. Following these emergency calls, the remaining personnel listed in the table below will be notified, as necessary.

Responsibility	Contact	Telephone
Fire Department	Rensselaer Police (dispatches)	911
Police Department	Rensselaer Police	911
Ambulance	Rensselaer Police (dispatches)	911
Hospital (see Figure 1)	Albany Medical Center	(518) 262-3125
National Response Center (Release or Spill)		800-424-8802
Chemical Transport Emergency Center (CHEMTREC)		800-424-9300
Site Health and Safety Officer	Christopher Battista	(631) 232-2600 (office) (516) 250-0382 (cellular)
Project Manager	Michael Roux	(631) 232-2600

Responsibility	Contact	Telephone
Project Principal	Nathan Epler, Ph.D.	(631) 232-2600
Site Contact	Wayne St. Clair	(518) 465-6534
Office Health and Safety Manager	Stephen Bates, Ph.D.	(631) 232-2600

12.5 Personal Injury

If onsite personnel require emergency medical treatment, the following steps will be taken:

1. Notify the Fire Department or Ambulance service and request an ambulance or transport the victim to the hospital, as appropriate.

2. Decontaminate to the extent possible prior to administration of first aid or movement to emergency facilities.

3. First aid will be provided by emergency medical services (EMS) or by onsite personnel trained in first aid, CPR, and bloodborne pathogens, if available.

4. The OHSM will supply medical data sheets on the victim (if a Roux Associates, Inc. employee) to appropriate medical personnel.

12.6 Overt Personnel Exposure

If an overt exposure to toxic materials occurs, the exposed person will be treated onsite as follows:

Skin Contact:	Remove contaminated clothing. Wash immediately with water. Use soap if available. Contact EMS, if necessary.
Inhalation:	Remove from contaminated atmosphere. Contact EMS, if necessary. Transport to hospital.
Ingestion:	Never induce vomiting on an unconscious person. Also, never induce vomiting when acids, alkalis, or petroleum products are suspected. Contact the poison control center. Contact EMS, if necessary.
Puncture Wound or Laceration:	Decontaminate and transport to emergency medical facility or contact EMS. Do not contact blood or bodily fluids. The OHSM will provide medical data sheets to medical personnel as requested.

12.7 Adverse Weather Conditions

In the event of adverse weather conditions, the SHSO will determine if work can continue without risking the health and safety of onsite workers. Some of the items to be considered prior to determining if work should continue are the following:

- heavy rainfall;
- potential for heat stress (see Appendix B);
- potential for cold stress and cold-related injuries (see Appendix B);
- limited visibility;
- potential for electrical storms;
- potential for malfunction of H&S monitoring equipment or gear;
- potential for accidents;
- unsafe driving and working conditions due to snow or ice; and
- high wind.

13.0 FIELD TEAM REVIEW

Each Roux Associates field member shall sign this section after site-specific training is completed and before being permitted to work onsite.

I have read and understand this Site-Specific Health and Safety Plan. I will comply with the provision contained herein. I have been provided with an opportunity to have questions and concerns addressed by the Project Manager.

Site/Project: BASF Rensselaer Facility/Groundwater sampling
Rensselaer, New York

Name Printed	Signature	Date

14.0 APPROVALS

The Approval Page must be attached and signed by the SHSO, OHSM, Project Manager and Project Principal.

By their signature, the undersigned certify that this HASP is approved and will be utilized by Roux Associates, Inc. personnel at the BASF Rensselaer Facility located in Rensselaer, New York.

Site Health and Safety Officer	Date
Office Health and Safety Manager	Date
Project Manager	Date
Project Principal	Date

Table 1. Toxicological, Physical, and Chemical Properties of Compounds Potentially Present at the Site

Compound	CAS #	TLV	IDLH	PEL	Routes of Exposure	Toxic Properties	Target Organs	Physical/Chemical Properties
Arsenic (As)	7440-38-2	0.01 mg/m^3	(ND)	10 $\mu g/^{m3}$	Dermal; inhalation; ingestion	Sensory irritant Lung & Skin Cancer Aplastic anemia Numbness	skin eyes lungs blood peripheral nervous system	Silver gray - tin white BP: sublimes
Benzene	71-43-2	1.6 mg/m^3 0.5 ppm	Ca (ND)	1 ppm	Dermal; inhalation ingestion	CNS depression Hematopoietic depression Dermatitis	CNS blood skin eyes resp system bone marrow	Liquid (solid below 42°F BP: 80.093°C flammable LEL: 1.4% UEL: 8.0%
Cadmium (Dust)	7440-43-9	0.01 mg/m^3	9 mg/m^3	0.005 mg/m^3	Inhalation; ingestion	Sensory irritant Lung injury Kidney disease Cancer	skin eyes kidneys bone	Silver-white/blue tinged BP: 1409°F Noncombustible
Chromium (VI)	7440-47-3	0.05 mg/m^3	(ND)	None	Dermal; inhalation; ingestion	Nasal and lung tumors Sensory irritant	lungs eyes skin	Red, rhombic crystals
Copper (dusts and mists as Cu)	7440-50-8	1 mg/m^3	100 mg/m^3	1 mg/m^3	Dermal; inhalation; ingestion	Sensory irritant GI irritation CNS depressant	skin eyes GI tract CNS	Reddish metal BP: 4730°F Powdered form may ignite
1,2-Dichloroethane (Ethylene dichloride)	107-06-2	40 mg/m^3 10 ppm	Ca (ND)	4.0 mg/m^3 1 ppm	Dermal; ingestion; inhalation	CNS depressant Liver neurosis Kidney damage Dermatitis	CNS liver kidneys skin	Colorless liquid BP: 83.5° LEL: 6.2% UEL: 15.9%

Table 1. Toxicological, Physical, and Chemical Properties of Compounds Potentially Present at the Site

Compound	CAS #	TLV	IDLH	PEL	Routes of Exposure	Toxic Properties	Target Organs	Physical/Chemical Properties
Ethylbenzene	100-41-4	434 mg/m^3 100 ppm	800 ppm (10% LEL)	435 mg/m^3 100 ppm	Dermal; inhalation; ingestion	Sensory irritant CNS depressant Narcosis Hematological disorders	eyes skin CNS respiratory system blood	Liquid aromatic odor BP: 277°F Fl.P: 59°F LEL: 1.2% UEL: 7.0%
Lead (as Pb)	7439-92-1	0.05 mg/m^3	100 mg/m^3	<0.1 mg/m^3	Dermal; inhalation ingestion	Abdominal pain CNS depressant Anemia Nephropathy Reproductive effects	GI tract CNS blood kidneys	Metal - soft gray BP: 3164°F
Mercury vapor	7439-97-6	0.05 (skin)	28 mg/m^3	0.05 (skin)	Dermal; inhalation; ingestion	Tremor Insomnia Chest pain GI disturbance Eye irritant Skin irritant	skin resp system CNS kidneys eyes	Silver, white, odorless liquid BP = 674°F
Nickel	7440-02-0	1.5 mg/m^3	Ca 10 mg/m^3	0.015 mg/m^3	Dermal; inhalation; ingestion	Pulmonary fibrosis Lung cancer Sinus cancer Sensory irritant GI irritation	lungs skin eyes GI tract	Silver-white metal BP: 2730°
Toluene	108-88-3	188 mg/m^3 50 ppm	500 ppm	200 ppm	Dermal; inhalation; ingestion	CNS depression Liver damage Kidney damage Defatting of skin	CNS liver kidney skin	Liquid benzene odor BP: 110.4°C flammable LEL: 1.2% UEL: 7.1%

Table 1. Toxicological, Physical, and Chemical Properties of Compounds Potentially Present at the Site

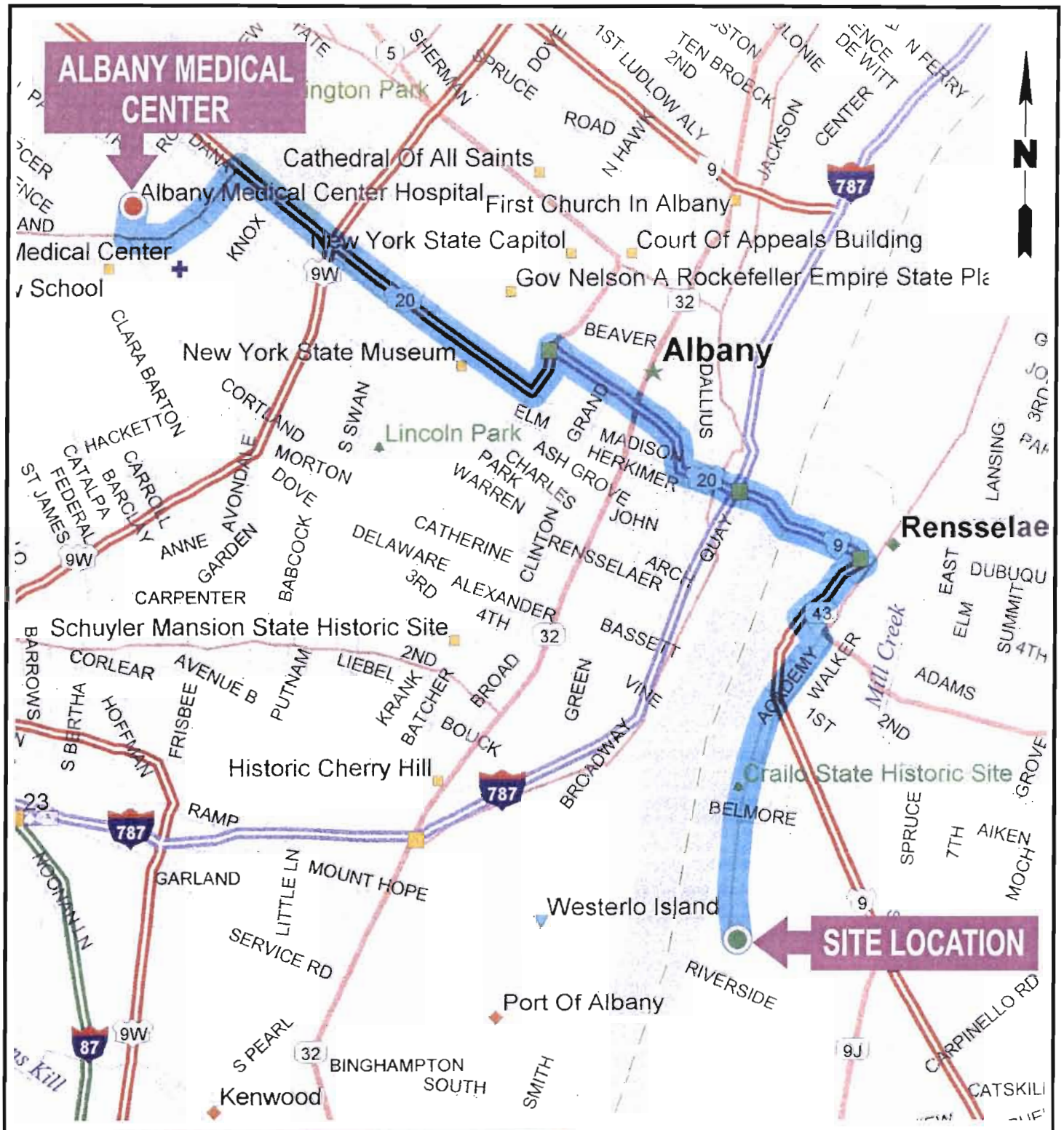
Compound	CAS #	TLV	IDLH	PEL	Routes of Exposure	Toxic Properties	Target Organs	Physical/Chemical Properties
Xylene(s)	1330-20-7	434 mg/m^3 100 ppm	900 ppm	435 mg/m^3 100 ppm	Dermal; inhalation; ingestion	Sensory irritant Blood dyscrasia Bronchitis CNS depression	CNS eyes skin GI tract blood liver kidneys	Liquid Aromatic odor BP: 138.5° flammable LEL: 1.1% UEL: 7.0%
Zinc Oxide (dust)	7440-66-6	10 mg/m^3	None	10 5 resp.	Dermal; inhalation; ingestion	Skin irritant Cough	skin lungs	Bluish-white metallic element BP: 908°

Notes:

Ca – Carcinogen
TLV – Threshold Limit Value (ACGIH)
IDLH – Immediately Dangerous to Life and Health (OSHA)
PEL – Permissive Exposure Level (OSHA)
PPM – Parts per million
mg/m^3 – milligrams per cubic meter
Fl. Pt. – Flash point
LEL – Lower Explosive Level
UEL – Upper Explosive Level
BP – Boiling Point
NA – Not Available
ND – Not Determined

References:

Guide to Occupational Exposure Values, 2000. American Conference of Governmental Industrial Hygienists.
Hawley's Condensed Chemical Dictionary, Sax, N. Van Nostrand and Reinhold Company, 11th Edition, 1987.
Occupational Safety and Health Administration, 1993. General Industry Air Contaminant Standard (2a CFR 1910.1000).
Proctor, N.H., J.P. Hughes and M.L. Fischman, 1989. Chemical Hazards of the Workplace. Van Nostrand Reinhold. New York.
Sax, N.I. and R.J. Lewis, 1989. Dangerous Properties of Industrial Materials. 7th Edition. Van Nostrand Reinhold. New York.
U.S. Department of Health and Human Services, 1997. NIOSH Pocket Guide to Chemical Hazards.



DIRECTIONS TO HOSPITAL

1. EXIT FACILITY AND HEAD NORTH ON RIVERSIDE AVENUE.
2. TURN LEFT ONTO ROUTE 20 AND CROSS DUNN MEMORIAL BRIDGE. STAY ON ROUTE 20.
3. TURN LEFT ONTO NEW SCOTLAND AVENUE. FOLLOW SIGNS TO EMERGENCY ROOM.

Title:

HOSPITAL ROUTE MAP

ALBANY MEDICAL CENTER
43 SCOTLAND AVENUE
ALBANY, NEW YORK

Prepared for:

BASF CORPORATION

ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.		Date: 10DEC03	FIGURE
Prepared by: B.H.C.		Scale: UNKNOWN	1
Project Mgr.: M.R.		Office: NY	
File No.: BF1134805.CDR		Project No.: 25111Y24	

PROJECTS\BF251Y\BF11Y348\BF1134805.CDR

APPENDIX A

OSHA Poster

You Have a Right to a Safe and Healthful Workplace.

IT'S THE LAW!

- You have the right to notify your employer or OSHA about workplace hazards. You may ask OSHA to keep your name confidential.
- You have the right to request an OSHA inspection if you believe that there are unsafe and unhealthful conditions in your workplace. You or your representative may participate in the inspection.
- You can file a complaint with OSHA within 30 days of discrimination by your employer for making safety and health complaints or for exercising your rights under the *OSH Act.*
- You have a right to see OSHA citations issued to your employer. Your employer must post the citations at or near the place of the alleged violation.
- Your employer must correct workplace hazards by the date indicated on the citation and must certify that these hazards have been reduced or eliminated.
- You have the right to copies of your medical records or records of your exposure to toxic and harmful substances or conditions.
- Your employer must post this notice in your workplace.

The *Occupational Safety and Health Act of 1970 (OSH Act)*, P.L. 91-596, assures safe and healthful working conditions for working men and women throughout the Nation. The Occupational Safety and Health Administration, in the U.S. Department of Labor, has the primary responsibility for administering the *OSH Act.* The rights listed here may vary depending on the particular circumstances. To file a complaint, report an emergency, or seek OSHA advice, assistance, or products, call 1-800-321-OSHA or your nearest OSHA office: • Atlanta (404) 562-2300 • Boston (617) 565-9860 • Chicago (312) 353-2220 • Dallas (214) 767-4731 • Denver (303) 844-1600 • Kansas City (816) 426-5861 • New York (212) 337-2378 • Philadelphia (215) 861-4900 • San Francisco (415) 975-4310 • Seattle (206) 553-5930. Teletypewriter (TTY) number is 1-877-889-5627. To file a complaint online or obtain more information on OSHA federal and state programs, visit OSHA's website at **www.osha.gov**. If your workplace is in a state operating under an OSHA-approved plan, your employer must post the required state equivalent of this poster.

1-800-321-OSHA

www.osha.gov

U.S. Department of Labor • Occupational Safety and Health Administration • OSHA 3165

APPENDIX B

Temperature Hazards

Heat Stress

Heat stress is a significant potential hazard and can be associated with heavy physical activity and/or the use of personal protective equipment (PPE) in hot weather environments.

Heat cramps are brought on by prolonged exposure to heat. As an individual sweats, water and salts are lost by the body resulting in painful muscle cramps. The signs and symptoms of heat cramps are as follows:

- severe muscle cramps, usually in the legs and abdomen;
- exhaustion, often to the point of collapse; and
- dizziness or periods of faintness.

First aid treatment includes moving to a shaded area, rest, and fluid intake. Normally, the individual should recover within one-half hour. If the individual has not recovered within 30 minutes and the temperature has not decreased, the individual should be transported to a hospital for medical attention.

Heat exhaustion may occur in a healthy individual who has been exposed to excessive heat. The circulatory system of the individual fails as blood collects near the skin in an effort to rid the body of excess heat. The signs and symptoms of heat exhaustion are as follows:

- rapid and shallow breathing;
- weak pulse;
- cold and clammy skin with heavy perspiration;
- skin appears pale;
- fatigue and weakness;
- dizziness; and
- elevated body temperature.

First aid treatment includes cooling the victim, elevating the feet, and replacing fluids and electrolytes. If the individual has not recovered within 30 minutes and the temperature has not decreased, the individual should be transported to the hospital for medical attention.

Heat stroke occurs when an individual is exposed to excessive heat and stops sweating. This condition is classified as a **MEDICAL EMERGENCY**, requiring immediate cooling of the victim and transport to a medical facility. The signs and symptoms of heat stroke are as follows:

- dry, hot, red skin;
- body temperature approaching or above 105°F;
- large (dilated) pupils; and
- loss of consciousness - the individual may go into a coma.

First aid treatment requires immediate cooling and transportation to a medical facility.

Heat stress (heat cramps, heat exhaustion, and heat stroke) is a significant hazard if any type of protective equipment (semi-permeable or impermeable) which prevents evaporative cooling is worn in hot weather environments. Local weather conditions may require restricted work schedules in order to adequately protect personnel. The use of work/rest cycles (including working in the cooler periods of the day or evening) and training on the signs and symptoms of heat stress should help prevent heat-related illnesses from occurring. Work/rest cycles will depend on the work load required to perform each task, type of protective equipment, temperature, and humidity. In general, when the temperature exceeds 88°F, a 15 minute rest cycle will be initiated once every two hours. In addition, potable water and fluids containing electrolytes (e.g., Gatorade) will be available to replace lost body fluids.

Cold Stress

Cold stress is a danger at low temperatures and when the wind-chill factor is low. Prevention of cold-related illnesses is a function of whole-body protection. Adequate insulating clothing must be used when the air temperature is below 40°F. In addition, reduced work periods followed by rest in a warm area may be necessary in extreme conditions. Training on the signs and symptoms of cold stress should prevent cold-related illnesses from occurring. The signs and symptoms of cold stress include the following:

- severe shivering;
- abnormal behavior;

- slowing of body movement;
- weakness;
- stumbling or repeated falling;
- inability to walk;
- collapse; and/or
- unconsciousness.

First aid requires removing the victim from the cold environment and seeking medical attention immediately. Also, prevent further body heat loss by covering the victim lightly with blankets. Do not cover the victim's face. If the victim is still conscious, administer hot drinks, and encourage activity, such as walking wrapped in a blanket.

APPENDIX C

Incident Reports

INCIDENT REPORT

Site _____

Site Location _____

Report Prepared By _____
Name Printed Title

Incident Category (Check all that apply)

_____ Injury	_____ Illness	_____ Property Damage
_____ Near Miss	_____ On-Site Equipment	_____ Chemical Exposure
_____ Motor Vehicle	_____ Fire	_____ Electrical
_____ Mechanical	_____ Other	

Date and Time of Incident _____

Name of Persons Injured (see end of report for details)

_____

_____

_____

Narrative Report of Incident

(Provide sufficient detail so that the reader may fully understand the actions leading to or contributing to the incident, the incident occurrence, and actions following the incident. Append additional sheets of paper, if necessary.)

_____

_____

_____

_____

_____

Witnesses to Incident

1. Name _____
   Company _____
   Address _____
   Telephone No. _____

2. Name _____
   Company _____
   Address _____
   Telephone No. _____

Property Damage

Brief Description of Property Damage _____

_____

_____

_____

Estimate of Damage _____

Incident Location

_____

_____

Incident Analysis
(Causative agent most directly related to accident (object, substance, material, machinery, equipment, conditions.)

_____

_____

Was weather a factor? _____

Unsafe mechanical/physical/environmental condition at time of incident (be specific, must be answered):

_____

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

_____

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

_____

On-Site Incidents

Level of personal protection equipment required in Site Safety Plan:

_____

_____

_____

Modifications:

_____

_____

Was injured using required equipment?

_____

Project #: _____
Project Name: _____
Location: _____
Date: _____

INCIDENT REPORT

Incident Follow-Up

Date of Incident:

Brief Description of Incident:

Outcome of Incident:

Physician's Recommendations:

Date Injured Returned to Work:

APPENDIX C

Standard Operating Procedures

Date: May 5, 2000

1.0 PURPOSE

The purpose of this standard operating procedure (SOP) is to explain the quality control (QC) measures taken to ensure the integrity of the samples collected and to establish the guidelines for the collection of QC samples. The objective of the QC program is to ensure that water-quality data of known and reliable quality are developed.

Because valid water-chemistry data are integral to a hydrogeologic investigation that characterizes water-quality conditions, the data will be confirmed by QC samples. Without checks on the sampling and analytical procedures, the potential exists for contradictory or incorrect results. The acceptance of water-quality data by regulatory agencies and in litigation-support investigations depends heavily on the proper QC program to justify the results presented. The QC sampling requirements must be determined by the project manager and be clearly defined in the work plan. If data validation (for in-house purposes or for compliance with the United States Environmental Protection Agency [USEPA] regulations) is stipulated as part of the hydrogeologic investigation, QC sampling must be conducted.

2.0 QUALITY CONTROL SAMPLES

2.1 Samples taken for analysis of compounds require the use of quality control samples to monitor sampling activities and laboratory performance. Types of quality control samples may include replicate and/or replicate split, trip blank, field equipment blank, matrix spike and matrix spike duplicate, and fortification. A discussion pertaining to each quality control sample follows:

a. Replicate and Replicate Split - Replicate sample analysis is done to check on the reproducibility of results either within a laboratory or between laboratories. A replicate sample is called a split sample when it is collected with or turned over to a second party (e.g., regulatory agency, consulting firm) for an independent analysis. Replicate samples are aliquots (equal portions) from a sample in a common container.

To collect a replicate sample, water from the bailer or pump will be distributed first to fill one container and then to fill the second container. Adequate water should be available to fill the bottles completely before they are capped. If the water is insufficient to fill all the bottles at once, then incrementally fill each bottle with water from two or more bailer volumes or pump cycles.

For some test substances, water may have to be accumulated in a common container and then decanted slowly into the sample bottles. The work plan should be checked for a description of how replicate samples are to be collected. Additionally, in the case of wells that recover slowly and produce insufficient water to fill all the replicate sample containers, the

containers should be filled incrementally and kept on ice in the cooler in between filling periods.

b. Trip Blank - A trip blank sample is a sample bottle that is filled with "clean" (e.g., distilled/deionized) water in the laboratory, and travels unopened with the sample bottles. (The USEPA now uses the phrase "demonstrated analyte free water.") It is opened in the laboratory and analyzed along with the field samples for the constituent(s) of interest to detect if contamination has occurred during field handling, shipment, or in the laboratory. Trip blanks are primarily used to check for "artificial" contamination of the sample caused by airborne volatile organic compounds (VOCs) but may also be used to check for "artificial" contamination of the sample by a test substance or other analyte(s). One trip blank per cooler containing VOC samples, or test substance of other analyte(s) of interest would accompany each day's samples.

c. Field Equipment Blank - A field equipment blank (field blank) sample is collected to check on the sampling procedures implemented in the field. A field blank is made with "clean" (e.g., distilled/deionized/demonstrated analyte free) water by exposing it to sampling processes (i.e., the clean water must pass through the actual sampling equipment). For example, if samples are being collected with a bailer, the field blank would be made by pouring the clean water into a bailer which has been decontaminated and is ready for sampling, and then pouring from the bailer into the sample containers. If a metals equipment blank is to be made, and the water was filtered, then the sample must be filtered (i.e., exposed to the sampling process). One equipment blank would be incorporated into the sampling program for each day's collection of samples and analyzed for the identical suite of constituents as the sample. In some situations one equipment blank will be required for each type of sampling procedure (e.g., split-spoon, bailer, hand auger).

A special type of field blank may be needed where ambient air quality may be poor. This field blank sample would be taken to determine if airborne contaminants will interfere with constituent identification or quantification. This field blank sample is a sample bottle that is filled and sealed with "clean" (e.g., distilled/deionized/demonstrated analyte free) water in the analytical laboratory, and travels unopened with the sample bottles. It is opened in the field and exposed to the air at a location(s) to check for potential atmospheric interference(s). The field blank is resealed and shipped to the contract laboratory for analysis.

d. Matrix Spike and Matrix Spike Duplicate - Spikes of compounds (e.g., standard compound, test substance, etc.) may be added to samples in the laboratory to determine if the ground-water matrix is interfering with constituent identification or quantification, as well as a check for systematic errors and lack of sensitivity of analytical equipment. Samples

for spikes are collected in the identical manner as for standard analysis, and shipped to the laboratory for spiking. Matrix spike duplicate sample collection, and laboratory spiking and analysis is done to check on the reproducibility of matrix spike results.

e. Fortification - A fortification, which is performed in the field, is used to check on the laboratory's ability to recover the test substance (analyte) added as well as its stability between fortification and analysis.

A field fortification (spike) is prepared by filling the container(s) with field or distilled/deionized/demonstrated analyte free water (as specified by the laboratory) to a predetermined volume (as specified by the laboratory) and adding the spike (supplied by the laboratory). The predetermined volume of water is measured with a clean (decontaminated) graduated cylinder. Field spikes will be prepared following the collection, labeling, and sealing of nonspiked samples in a separate cooler. The spike is kept at a safe distance from the sampling point (e.g., in the hotel room).

2.2 The work plan must be referred to for details regarding the type of QC samples to be collected and the QC sample collection method.

3.0 PROCEDURE

3.1 Implement QC sampling as outlined above, depending on the type of QC sample(s) specified in the work plan.

3.2 Ensure unbiased handling and analysis of replicate and blank QC samples by concealing their identity by means of coding so that the analytical laboratory cannot determine which samples are included for QC purposes. Attempt to use a code that will not cause confusion if additional samples are collected or additional monitoring wells are installed. For example, if there are three existing monitoring wells (MW-1, 2 and 3), do not label the QC blank MW-4. If an additional monitoring well were installed, confusion could result.

3.3 Label matrix spike and field fortification (spike) QC samples so that the analytical laboratory knows which samples are to be spiked in the laboratory and which samples were fortified (spiked) in the field, respectively. In certain situations, the field fortification will be "blind" or undisclosed to the laboratory to independently verify their analytical ability.

3.4 Verify that each sample is placed in an individual "zip-lock" bag, wrapped with "bubble wrap," and placed in its appropriate container (holder) in the cooler, and that the cooler has sufficient ice (wet ice or blue packs) to preserve the samples for transportation to the analytical laboratory. Consult the site work plan to determine if a particular ice is specified as the preservative for transportation (e.g., the USEPA prefers the use of wet ice because they claim that blue ice will not hold the samples at 4° Centigrade/Celsius).

3.5 Document the QC samples on the appropriate field form and in the field notebook. On the chain-of-custody form, replicate and blank QC samples will be labeled using the codes (Number 3.2, above), and matrix spike and field fortification QC samples will be identified as such (Number 3.3, above).

3.6 Follow standard shipping procedures for samples (i.e., retain one copy of the chain-of-custody form, secure the cooler with sufficient packing tape and a custody seal, forward the samples via overnight [express] mail or hand deliver to the designated analytical laboratory preferably within 24 hours but no later than 48 hours after sampling). However, check the site work plan for information on the analyte(s), as some have to be analyzed immediately (e.g., CN).

END OF PROCEDURE

Date: May 5, 2000

1.0 PURPOSE

The purpose of this standard operating procedure (SOP) is to provide procedures and standards for record keeping and maintenance, for all field activities conducted by Roux Associates, Inc. (Roux Associates).

Strict quality assurance/quality control (QA/QC) is necessary to properly and accurately document and preserve all project-related information. Quality assurance is implemented to corroborate that quality control procedures are followed. Quality control provides a means to monitor investigation activities (e.g., sampling and laboratory performance) as a check on the quality of the data.

Valid data and information are integral to all aspects of Roux Associates' field activities. These aspects include, but are not necessarily limited to, activities that involve: drilling; sediment, sludge, and soil sampling (lithologic, and soil-quality and analysis); well construction and development; aquifer testing and analysis; water-quality sampling and analysis (surface water and ground water); free-product sampling and analysis; air-quality sampling and analysis; geophysical testing; demolition activities; waste removal operations; engineering installations; etc. The data will be confirmed by QA/QC methods established and set forth in the work plan/scope of work. Without checks on the field and analytical procedures, the potential exists for contradictory results, and associated incomplete or incorrect results from the interpretation of potentially questionable data.

Documentation will be entered in the field notebook and must be transcribed with extreme care, in a clear and concise manner, as the information recorded will become part of the permanent legal record. Because field notes are the legal record of site activities, they must be taken in a standard and consistent manner. If abbreviations are used, then they must first be spelled out for clarity (i.e., to avoid ambiguity and misunderstanding). All entries must be dated and initialed, and the time (military time) of the entry included. Field notebooks and forms must be assigned to an individual project and properly identified (i.e., client name, project number, location and name of site, individual recording information, dates, times, etc.). Change of possession of field notebooks or forms must be documented with the date and time, and initialed by both individuals. Following each day's entries, the field notebook or form must be photocopied in the event that the original documentation is lost or stolen. All field notebooks must have the company name and address legibly printed in indelible ink along with the message "If found, then please forward to Roux Associates, Inc. at the above address - REWARD OFFERED."

Information must be recorded while onsite because it may be difficult to recall details at a later date. Furthermore, information must be documented immediately as it provides unbiased information which will be used for writing the report when the field activities are completed. Project-related documentation is an irreplaceable, important record for other individuals who may become involved in the project, and provides the project

manager with a complete history of project-related activities. Written information must be accompanied by maps, sketches, and photographs where appropriate, especially if these supplemental sources of information assist in the documentation process. A new page must be used in the field notebook for each new day's entries (i.e., unused portions of a previous page must have an "X" placed through it). The end of the day's records must be initialed and dated.

As part of record keeping and QA/QC activities, state and federal regulatory agencies should be contacted to check if special or different protocols are required and/or if particular or unconventional methods are required for the given field activity. Thus, the record keeping and QA/QC activities implemented by Roux Associates are based on technically sound standard practices and incorporate Roux Associates own, extensive experience in conducting hydrogeologic field activities.

2.0 MATERIALS

In order to track investigation activities, specific materials are required. These materials include the following:

a. A bound, waterproof field notebook.

b. Appropriate Roux Associates' forms (e.g., daily log, geologic log, monitoring well construction log, well sampling data form, location sketch, chain of custody, telephone conversation record, meeting notes, etc.).

c. Appropriate labels (e.g., sample, Roux Associates' Custody Seal, etc.)

d. Work plan/scope of work.

e. Health and safety plan (HASP).

f. Appropriate Roux Associates' SOPs.

g. Black pens, and indelible markers.

h. Camera and film.

3.0 DOCUMENTATION

3.1 Before the Roux Associates personnel leave the field, they must ensure that their field notes include comprehensive descriptions of the hydrogeologic conditions, and all investigation-related activities and results (onsite and offsite). This will safeguard against the inability to reconstruct and comprehend all aspects of the field investigation after its completion, and will serve to facilitate the writing of an accurate report. Properly documented information provides the QA/QC tracking (back-up) required for all Roux Associates' projects. General types of information that must be recorded (where pertinent to the investigation being conducted) include, but may not necessarily be limited to, the following:

a. List of Roux Associates personnel on site.

b. Name, date, and time of arrival on site by Roux Associates personnel, including temporary departures from, and returns to, the site during the work day.

c. Client and project number.

d. Name and location of study area.

e. Date and time of arrival on site by non-Roux Associates personnel (names and affiliation) and equipment (e.g., subcontractors and facility personnel, and drilling equipment, respectively, etc.), including temporary departures from, and returns to, the site during the work day, and departure at the end of the work day.

f. List of non-Roux Associates personnel on site.

g. Weather conditions at the beginning of the day as well as any changes in weather that occur during the working day.

h. Health and safety procedures including level of protection, monitoring of vital signs, frequency of air monitoring, and any change (i.e., downgrade or upgrade) in the level of protection for Roux Associates and other on-site personnel (e.g., subcontractors, facility personnel, etc.).

i. Health and safety procedures not in compliance with the HASP (for all on-site personnel).

j. Site reconnaissance information (e.g., topographic features, geologic features, surface-water bodies, seeps, areas of apparent contamination, facility/plant structures, etc.).

k. Air monitoring results (i.e., photoionization detector [PID], etc. measurements).

l. Task designation and work progress.

m. Work-related and site-related discussions with subcontractors, regulatory agency personnel, plant personnel, the general public, and Roux Associates personnel.

n. Delays, unusual situations, problems and accidents.

o. Field work not conducted in accordance with the work plan/scope of work, and rationale and justification for any change(s) in field procedures including discussions with personnel regarding the change(s) and who authorized the change(s).

p. QA/QC procedures not conducted in accordance with the QA/QC procedures established in the work plan/scope of work and rationale and justification for any change(s) in QA/QC procedures including discussions with personnel regarding the change(s) and who authorized the change(s).

q. Equipment and instrument problems.

r. Decontamination and calibration procedures.

s. Activities in and around the site and work area by any and all on-site personnel which may impact field activities.

t. Sketches, maps, and/or photographs (with dates and times) of the site, structures, equipment, etc. that would facilitate explanations of site conditions.

u. Contamination evidenced as a result of work-related activities (e.g., visible contaminants [sheen] in drilling fluids or on drilling equipment; sheen on, or staining of, sediments; color of, or separate [nonaqueous] phase on, water from borehole or well; vapors or odors emanating from a borehole or well; etc.); make all observations as objectively as possible (e.g., grey-blue, oil-like sheen; black and orange, rust-like stain; fuel-like odor; etc.) and avoid using nontechnical or negative-sounding terms (e.g., slimy, goopy, foul-smelling).

v. Date and time of final departure from the site of all personnel at the end of the work day.

3.2 In addition to the general types of information that must be recorded (as presented in Section 3.1), task-specific information must also be properly documented. Task-specific information which is required is provided in each respective task-oriented SOP, and the documentation procedures outlined in each SOP must be followed.

END OF PROCEDURE

Date: May 5, 2000

1.0 PURPOSE

The purpose of this standard operating procedure (SOP) is to establish guidelines for sample handling which will allow consistent and accurate results. Valid chemistry data are integral to investigations that characterize media-quality conditions. Thus, this SOP is designed to ensure that once samples are collected, they are preserved, packed and delivered in a manner which will maintain sample integrity to as great an extent as possible. The procedures outlined are applicable to most sampling events and any required modifications must be clearly described in the work plan.

2.0 CONSIDERATIONS

Sample containers, sampling equipment decontamination, quality assurance/quality control (QA/QC), sample preservation, and sample handling are all components of this SOP.

2.1 Sample Containers

Prior to collection of a sample, considerations must be given to the type of container that will be used to store and transport the sample. The type and number of containers selected is usually based on factors such as sample matrix, potential contaminants to be encountered, analytical methods requested, and the laboratory's internal quality assurance requirements. In most cases, the overriding considerations will be the analytical methodology, or the state or federal regulatory requirements because these regulations generally encompass the other factors. The sample container selected is usually based on some combination of the following criteria:

a. Reactivity of Container Material with Sample

Choosing the proper composition of sample containers will help to ensure that the chemical and physical integrity of the sample is maintained. For sampling potentially hazardous material, glass is the recommended container type because it is chemically inert to most substances. Plastic containers are not recommended for most hazardous wastes because the potential exists for contaminants to adsorb to the surface of the plastic or for the plasticizer to leach into the sample.

In some instances, however, the sample characteristics or analytes of interest may dictate that plastic containers be used instead of glass. Because some metals species will adhere to the sides of the glass containers in an aqueous matrix, plastic bottles (e.g., nalgene) must be used for samples collected for metals analysis. A separate, plastic container should accompany glass containers if metals analysis is to be performed along with other analyses. Likewise, other sample characteristics may dictate that glass cannot be used. For example, in the

case of a strong alkali waste or hydrofluoric solution, plastic containers may be more suitable because glass containers may be etched by these compounds and create adsorptive sites on the container's surface.

b. Volume of the Container

The volume of sample to be collected will be dictated by the analysis being performed and the sample matrix. The laboratory must supply bottles of sufficient volume to perform the required analysis. In most cases, the methodology dictates the volume of sample material required to complete the analysis. However, individual laboratories may provide larger volume containers for various analytes to ensure sufficient quantities for duplicates or other QC checks.

To facilitate transfer of the sample from the sampler into the container and to minimize spillage and sample disturbance, wide-mouth containers are recommended. Aqueous volatile organic samples must be placed into 40-milliliter (ml) glass vials with polytetrafluoroethylene (PTFE) (e.g., TeflonTM) septums. Non-aqueous volatile organic samples should be collected in the same type of vials or in 4-ounce (oz) wide-mouth jars provided by the laboratory. These jars should have PTFE-lined screw caps.

c. Color of Container

Whenever possible, amber glass containers should be used to prevent photodegradation of the sample, except when samples are being collected for metals analysis. If amber containers are not available, then containers holding samples should be protected from light (i.e., place in cooler with ice immediately after filling).

d. Container Closures

Container closures must screw on and off the containers and form a leak-proof seal. Container caps must not be removed until the container is ready to be filled with the sample, and the container cap must be replaced (securely) immediately after filling it. Closures should be constructed of a material which is inert with respect to the sampled material, such as PTFE (e.g., TeflonTM). Alternately, the closure may be separated from the sample by a closure liner that is inert to the sample material such as PTFE sheeting. If soil or sediment samples are being collected, the threads of the container must be wiped clean with a dedicated paper towel or cloth so the cap can be threaded properly.

e. Decontamination of Sample Containers

Sample containers must be laboratory cleaned by the laboratory performing the analysis. The cleaning procedure is dictated by the specific analysis to be performed on the sample. Sample containers must be

carefully examined to ensure that all containers appear clean. Do not mistake the preservative as unwanted residue. The bottles should not be field cleaned. If there is any question regarding the integrity of the bottle, then the laboratory must be contacted immediately and the bottle(s) replaced.

f. Sample Bottle Storage and Transport

No matter where the sample bottles are, whether at the laboratory waiting to be packed for shipment or in the field waiting to be filled with sample, care must be taken to avoid contamination. Sample shuttles or coolers, and sample bottles must be stored and transported in clean environments. Sample bottles and clean sampling equipment must never be stored near solvents, gasoline, or other equipment that is a potential source of cross-contamination. When under chain of custody, sample bottles must be secured in locked vehicles, and custody sealed in shuttles or in the presence of authorized personnel. Information which documents that proper storage and transport procedures have been followed must be included in the field notebook and on appropriate field forms.

2.2 Decontamination of Sampling Equipment

Proper decontamination of all re-usable sampling equipment is critical for all sampling episodes. The SOP for Decontamination of Field Equipment and SOPs for method-specific or instrument-specific tasks must also be referred to for guidance for decontamination of various types of equipment.

2.3 Quality Assurance/Quality Control Samples

QA/QC samples are intended to provide control over the proper collection and tracking of environmental measurements, and subsequent review, interpretation and validation of generated analytical data. The SOPs for Collection of Quality Control Samples, for Evaluation and Validation of Data, and for Field Record Keeping and Quality Assurance/Quality Control must be referred to for detailed guidance regarding these respective procedures. SOPs for method-specific or instrument-specific tasks must also be referred to for guidance for QA/QC procedures.

2.4 Sample Preservation Requirements

Certain analytical methodologies for specific analytes require chemical additives in order to stabilize and maintain sample integrity. Generally, this is accomplished under the following two scenarios:

a. Sample bottles are preserved at the laboratory prior to shipment into the field.

b. Preservatives are added in the field immediately after the samples are collected.

Many laboratories provide pre-preserved bottles as a matter of convenience and to help ensure that samples will be preserved immediately upon collection. A problem associated with this method arises if not enough sample could be collected, resulting in too much preservative in the sample. More commonly encountered problems with this method include the possibility of insufficient preservative provided to achieve the desired pH level or the need for additional preservation due to chemical reactions caused by the addition of sample liquids to pre-preserved bottles. The use of pre-preserved bottles is acceptable; however, field sampling teams must always be prepared to add additional preservatives to samples if the aforementioned situations occur. Furthermore, care must be exercised not to overfill sample bottles containing preservatives to prevent the sample and preservative from spilling and therefore diluting the preservative (i.e., not having enough preservative for the volume of sample).

When samples are preserved after collection, special care must be taken. The transportation and handling of concentrated acids in the field requires additional preparation and adherence to appropriate preservation procedures. All preservation acids used in the field should be trace-metal or higher-grade.

2.5 Sample Handling

After the proper sample bottles have been received under chain-of-custody, properly decontaminated equipment has been used to collect the sample, and appropriate preservatives have been added to maintain sample integrity, the final step for the field personnel is checking the sample bottles prior to proper packing and delivery of the samples to the laboratory.

All samples should be organized and the labels checked for accuracy. The caps should be checked for tightness and any 40-ml volatile organic compound (VOC) bottles must be checked for bubbles. Each sample bottle must be placed in an individual "zip-lock" bag to protect the label, and placed on ice. The bottles must be carefully packed to prevent breakage during transport. When several bottles have been collected for an individual sample, they should not be placed adjacent to each other in the cooler to prevent possible breakage of all bottles for a given sample. If there are any samples which are known or suspected to be highly contaminated, these should be placed in an individual cooler under separate chain-of-custody to prevent possible cross contamination. Sufficient ice (wet or blue packs) should be placed in the cooler to maintain the temperature at 4 degrees Celsius (°C) until delivery at the laboratory. Consult the work plan to determine if a particular ice is specified as the preservation for transportation (e.g., the United States Environmental Protection Agency does not like the use of blue packs because they claim that the samples will not hold at 4°C). If additional coolers are required, then they should be purchased. The chain-of-custody form should be properly completed, placed in a "zip-lock" bag, and placed in the cooler. One copy must be maintained for the project files. The cooler should be sealed with packing tape and a custody seal. The custody seal number should be noted in the field book. Samples collected from Monday through Friday will be delivered to the laboratory within 24 hours of collection. If Saturday delivery is

not available, samples collected on Friday must be delivered by Monday morning. Check the work plan to determine if certain analytes require a shorter delivery time. If overnight mail is utilized, then the shipping bill must be maintained for the files and the laboratory must be called the following day to confirm receipt.

3.0 EQUIPMENT AND MATERIALS

3.1 General equipment and materials may include, but not necessarily be limited to, the following:

a. Sample bottles of proper size and type with labels.

b. Cooler with ice (wet or blue pack).

c. Field notebook, appropriate field form(s), chain-of-custody form(s), custody seals.

d. Black pen and indelible marker.

e. Packing tape, "bubble wrap", and "zip-lock" bags.

f. Overnight (express) mail forms and laboratory address.

g. Health and safety plan (HASP).

h. Work plan/scope of work.

i. Pertinent SOPs for specified tasks and their respective equipment and materials.

3.2 Preservatives for specific samples/analytes as specified by the laboratory. Preservatives must be stored in secure, spillproof glass containers with their content, concentration, and date of preparation and expiration clearly labeled.

3.3 Miscellaneous equipment and materials including, but not necessarily limited to, the following:

a. Graduated pipettes.

b. Pipette bulbs.

c. Litmus paper.

d. Glass stirring rods.

e. Protective goggles.

f. Disposable gloves.

g. Lab apron.

h. First aid kit.

i. Portable eye wash station.

j. Water supply for immediate flushing of spillage, if appropriate.

k. Shovel and container for immediate containerization of spillage-impacted soils, if appropriate.

4.0 PROCEDURE

4.1 Examine all bottles and verify that they are clean and of the proper type, number, and volume for the sampling to be conducted.

4.2 Label bottles carefully and clearly with project name and number, site location, sample identification, date, time, and the sampler's initials using an indelible marker.

4.3 Collect samples in the proper manner (refer to specific sampling SOPs).

4.4 Conduct preservation activities as required after each sample has been collected. Field preservation must be done immediately and must not be done later than 30 minutes after sample collection.

4.5 Conduct QC sampling, as required.

4.6 Seal each container carefully and place in an individual "zip lock" bag.

4.7 Organize and carefully pack all samples in the cooler immediately after collection (e.g., bubble wrap). Insulate samples so that breakage will not occur.

4.8 Complete and place the chain-of-custody form in the cooler after all samples have been collected. Maintain one copy for the project file. If the cooler is to be transferred several times prior to shipment or delivery to the laboratory, it may be easier to tape the chain-of-custody to the exterior of the sealed cooler. When exceptionally hazardous samples are known or suspected to be present, this should be identified on the chain-of-custody as a courtesy to the laboratory personnel.

4.9 Add additional ice as necessary to ensure that it will last until receipt by the laboratory.

4.10 Seal the cooler with packing tape and a custody seal. Record the number of the custody seal in the field notebook and on the field form. If there are any exceptionally hazardous samples, then shipping regulations should be examined to ensure that the sample containers and coolers are in compliance and properly labeled.

4.11 Samples collected from Monday through Friday will be delivered to the laboratory within 24 hours of collection. If Saturday delivery is not available,

samples collected on Friday must be delivered by Monday morning. Check the work plan to determine if certain analytes require a shorter delivery time.

4.12 Maintain the shipping bill for the project files if overnight mail is utilized and call the laboratory the following day to confirm receipt.

END OF PROCEDURE

Date: May 5, 2000

1.0 PURPOSE

The purpose for this standard operating procedure (SOP) is to establish the guidelines for purging a well prior to the collection of a ground-water sample. Purging (evacuating) a well involves the removal of the standing column of water in the well to allow "fresh" (representative) formation water to enter the well. Two conventionally used methods for well purging include: 1) discharge of a specified number of casing volumes of water (which is more commonly used); and 2) pumping until specific indicator parameters (e.g., specific conductance, pH, temperature) stabilize. Wells must be purged prior to sampling to ensure the collection of representative formation ground water for water-quality analysis.

For accepted, existing sampling and analysis programs, the same purging method will be used each time to maintain consistency. For new sampling and analysis programs, the basis for the purging technique(s) will be site-specific field conditions, client input, the experience of Roux Associates, Inc. and regulatory agency(ies) guidelines (e.g., some states permit purging a low-yield well to dryness while others insist that some water remains in the well).

2.0 EQUIPMENT AND MATERIALS

2.1 The following equipment may be needed to purge a monitoring well before sampling:

a. Bailers.

b. Centrifugal pumps.

c. Electrical submersible pumps.

d. Peristaltic pumps.

e. Positive gas-displacement devices.

f. Bladder pumps.

g. Hand-operated diaphragm or bilge pump(s).

h. Teflon™ tape, electrical tape.

i. Tape measure (stainless steel, steel, fiberglass) with 0.01-foot measurement increments and chalk (e.g., blue carpenter's) or m-scope.

j. Appropriate discharge hose and valves.

k. Appropriate discharge tubing (e.g., polypropylene) if using a peristaltic pump.

l. Appropriate compressed gas if using bladder-type or gas-displacement device.

m. Extension cord(s) or portable generator (and fuel) if using an electric submersible pump.

n. Non-absorbent cord (e.g., polypropylene, etc.), cotton (absorbent) cord.

o. Tripod(s).

p. Water Well Handbook.

q. Explosimeter.

r. Flow meter.

2.2 Bailers or centrifugal pumps are recommended for shallow, small diameter monitoring wells. For deep wells, or large diameter wells, a submersible pump is recommended.

3.0 DECONTAMINATION

Each piece of equipment that is used to evacuate wells (e.g., bailers, pumps, hoses) will be decontaminated thoroughly prior to the introduction of the equipment into the well and prior to leaving the site. Additionally, disposable items (e.g., cord, tubing) will be changed between each well purged and discarded in an appropriate manner.

4.0 PROCEDURE

4.1 The depth to water (DTW) is measured and subtracted from the sounded (total) depth of the well to calculate the length of the column of standing water in the well (in feet).

4.2 The volume of the standing water in the well is calculated by multiplying the length of standing water by a coefficient which equates the diameter of the well to gallons per linear foot. (Refer to the attached table from the Water Well Handbook for the coefficient or use the following equation [V=(7.48 gal/ft3)(r2h), where V is volume of water in gallons, r is the radius of the well casing in feet, and h is the height of the water column in the well in feet].)

4.3 If purging is performed by evacuating a specified number of casing volumes, then three to five volumes are purged (typical regulatory agency requirement).

4.4 If wells are screened in low permeability formations, then the well may go dry prior to removing the specified volume of water. If the recovery rate is fairly rapid and time allows, then remove more than one casing volume; otherwise, the

evacuation of one casing volume may suffice. (Refer to the site sampling and analysis plan [SAP] for details of purging a low-yield well.)

4.5 Evacuation will occur from the top of the water column in the well to ensure that "fresh" formation water enters the bottom of the well through the screen, moves up as standing water is removed from the top, and all standing water is removed (i.e., only representative formation water is in the well).

4.6 The volume of water purged from the well must be measured and can be calculated directly by discharging into containers of known volume or can be calculated by multiplying rate of flow by time.

4.7 If a submersible or centrifugal pump is used, then the intake is set just below the dynamic (pumping) water level in the well. The rate of flow in gallons per minute (gpm) can be measured using a calibrated bucket (e.g., 5-gallon) if the rate is relatively low, or a 55-gallon drum if the rate is relatively high, and a watch capable of measuring time in second intervals. A precalibrated flow meter may also be used if available.

4.8 After the specified number of casing volumes have been evacuated from the well, the pump intake is lifted slowly until it breaks suction to confirm that any standing water above the intake has been purged.

4.9 If a bailer is used, then the bailer is lowered only deep enough to remove water from the top of the water column and a 5-gallon bucket is used to measure the volume of water evacuated.

4.10 If purging is not executed by evacuating a specified number of well volumes, then purging is performed by pumping or bailing the well until specific indicator parameters (e.g., specific conductance, pH, temperature) stabilize. The volume of water removed is documented on an appropriate field form or in the field notebook.

4.11 Water purged from the well will be disposed of in accordance with the appropriate method outlined in the site SAP.

4.12 If historic site data indicate that explosive gases could be present and accumulate in the well, then an explosimeter will be used to check vapor concentrations in wells at the site prior to beginning the purging procedure. Vapor concentrations in a well that exceed the 25 percent lower explosive limit (LEL) will require specific precautionary measures to allow purging the well without danger of explosion or fire (e.g., use of cotton cord for bailers or lowering pumping devices, non-electric powered pumps). These conditions will be addressed in the site health and safety plan (HASP) and/or SAP.

END OF PROCEDURE

Date: May 5, 2000

1.0 PURPOSE

The purpose of this standard operating procedure (SOP) is to establish guidelines for the sampling of ground-water monitoring wells for dissolved constituents. As part of the SOP for the sampling of ground-water monitoring wells, sample collection equipment and devices must be considered, and equipment decontamination and pre-sampling procedures (e.g., measuring water levels, sounding wells, and purging wells) must be implemented. Sampling objectives must be firmly established in the work plan before considering the above.

Valid water-chemistry data are integral to a hydrogeologic investigation that characterizes ground-water quality conditions. Water-quality data are used to evaluate both current and historic aquifer chemistry conditions, as well as to estimate future conditions (e.g., trends, migration pathways). Water-quality data can be used to construct ground-water quality maps to illustrate chemical conditions within the flow system, to generate water-quality plots to depict conditions with time and trends, and to perform statistical analyses to quantify data variability, trends, and cleanup levels.

2.0 EQUIPMENT AND MATERIALS

2.1 In order to sample ground water from monitoring wells, specific equipment and materials are required. The equipment and materials list may include, but not necessarily be limited to, the following:

a. Bailers (Teflon™ or stainless steel).

b. Pumps (centrifugal, peristaltic, bladder, electric submersible, bilge, hand-operated diaphragm, etc.).

c. Gas-displacement device(s).

d. Air-lift device(s).

e. Teflon™ tape, electrical tape.

f. Appropriate discharge hose.

g. Appropriate discharge tubing (e.g., polypropylene, teflon, etc.) if using a peristaltic pump.

h. Appropriate compressed gas if using bladder-type or gas-displacement device.

i. Portable generator and gasoline or alternate power supply if using an electric submersible pump.

j. Non-absorbent cord (e.g., polypropylene, etc.).

k. Plastic sheeting.

l. Tape measure (stainless steel, steel, fiberglass) with 0.01-foot measurement increments and chalk (blue carpenter's).

m. Electronic water-level indicators (e.g., m-scope, etc.) or electric water-level/product level indicators.

n. Non-phosphate, laboratory-grade detergent.

o. Distilled/Deionized water.

p. Potable water.

q. Paper towels, clean rags.

r. Roux Associates' field forms (e.g., daily log, well inspection checklist, sampling, etc.) and field notebook.

s. Well location and site map.

t. Well keys.

u. Stop watch, digital watch with second increments, or watch with a second hand.

v. Water Well Handbook.

w. Calculator.

x. Black pen and water-proof marker.

y. Tools (e.g., pipe wrenches, screwdrivers, hammer, pliers, flashlight, pen knife, etc.).

z. Appropriate health and safety equipment, as specified in the site health and safety plan (HASP).

aa. pH meter(s) and buffers.

bb. Conductivity meter(s) and standards.

cc. Thermometer(s).

dd. Extra batteries (meters, thermometers, flashlight).

ee. Filtration apparatus, filters, pre-filters.

ff. Plasticware (e.g., premeasured buckets, beakers, flasks, funnels).

gg. Disposable gloves.

hh. Water jugs.

ii. Laboratory-supplied sample containers with labels.

jj. Cooler(s).

kk. Ice (wet, blue packs).

ll. Masking, duct, and packing tape.

mm. Chain-of-custody form(s) and custody seal(s).

nn. Site sampling and analysis plan (SAP).

oo. Site health and safety plan (HASP).

pp. Packing material (e.g., bubble wrap)

qq. "Zip-lock" plastic bags.

rr. Overnight (express) mail forms.

3.0 DECONTAMINATION

3.1 Make sure all equipment is decontaminated and cleaned before use (refer to the SOP for Decontamination of Field Equipment for detailed decontamination methods, summaries for bailers and pumps are provided below). Use new, clean materials when decontamination is not appropriate (e.g., non-absorbent cord, disposable gloves). Document, and initial and date the decontamination procedures on the appropriate field form and in the field notebook.

a. Decontaminate a bailer by: 1) wearing disposable gloves, 2) disassembling (if appropriate) and scrubbing in a non-phosphate, laboratory-grade detergent and distilled/deionized water solution, and 3) rinsing first with potable water and then distilled/deionized water.

b. Decontaminate a pump by: 1) wearing disposable gloves, 2) flushing the pump and discharge hose (if not disposable) first with a non-phosphate, laboratory-grade detergent and potable water solution in an appropriate container (clean bucket, garbage can, or 55-gallon drum) and then with

distilled/deionized water or potable water, and 3) wiping pump-related equipment (e.g., electrical lines, cables, discharge hose) first with a clean cloth and detergent solution and then rinsing or wiping with a clean cloth and distilled/deionized water or potable water.

3.2 Note that the decontamination procedures for bailers and pumps are the minimum that must be performed. Check the work plan to determine if chemicals specified by individual state regulatory agencies must also be used for decontamination procedures (e.g., hexane, nitric acid, acetone, isopropanol, etc.).

4.0 CALIBRATION OF FIELD ANALYSIS EQUIPMENT

Calibrate field analysis equipment before use (e.g., thermometers, pH and conductivity meters, etc.). Refer to the specific SOP for field analysis for each respective piece of equipment. Document, and initial and date the calibration procedures on the appropriate field form, in the field notebook, and in the calibration log book.

5.0 PROCEDURE

5.1 Document, and initial and date well identification, pre-sampling information, and problems encountered on the appropriate field form and in the field notebook as needed.

5.2 Inspect the protective casing of the well and the well casing, and note any items of concern such as a missing lock, or bent or damaged casing(s).

5.3 Place plastic sheeting around the well to protect sampling equipment from potential cross contamination.

5.4 Remove the well cap or plug and, if necessary, clean the top of the well off with a clean rag. Place the cap or plug on the plastic sheeting. If the well is not vented, allow several minutes for the water level in the well to equilibrate. If fumes or gases are present, then diagnose these with the proper safety equipment. Never inhale the vapors.

5.5 Measure the depth to water (DTW) from the measuring point (MP) on the well using a steel tape and chalk or an electronic sounding device (m-scope). Refer to the specific SOPs for details regarding the use of a steel tape or a m-scope for measuring water levels. Calculate the water-level elevation. Document, and initial and date the information on the appropriate field form and in the field notebook.

5.6 Measuring the total depth of the well from the MP with a weighted steel tape. Calculate and record the volume of standing water in the well casing on the appropriate field form and in the field notebook.

5.7 Decontaminate the equipment used to measure the water level and sound the well with a non-phosphate, laboratory-grade detergent solution followed by a distilled/deionized water rinse.

5.8 Purge the well prior to sampling (refer to the SOP for Purging a Well). The well should be pumped or bailed to remove the volume of water specified in the work plan. Usually three to five casing volumes are removed if the recharge rate is adequate to accomplish this within a reasonable amount of time.

If the formation cannot produce enough water to sustain purging, then one of two options must be followed. These include: 1) pumping or bailing the well dry, or 2) pumping or bailing the well to "near-dry" conditions (i.e., leaving some water in the well). The option employed must be specified in the work plan and be in accordance with regulatory requirements.

If the well is purged dry, then all the standing water has been removed and upon recovery the well is ready for sampling. However, depending on the rate of recovery and the time needed to complete the sampling round, one of the following procedures may have to be implemented: 1) the well may have to be sampled over a period of more than one day; 2) the well may not yield enough water to collect a complete suite of samples and only select (most important) samples will be collected; or 3) the well may not recover which will preclude sampling. Regardless of the option that must be followed, the sampling procedure must be fully documented. When preparing to conduct a sampling round, review drilling, development and previous sampling information (if available) to identify low-yielding wells in order to purge them first, and potentially allow time for the well to recover for sampling.

5.9 Record the physical appearance of the water (i.e., color, turbidity, odor, etc.) on the appropriate field form and in the field notebook, as it is purged. Note any changes that occur during purging.

5.10 If a bailer is used to collect the sample, then:

a. Flush the decontaminated bailer three times with distilled/deionized water.

b. Tie the non-absorbent cord (polypropylene) to the bailer with a secure knot and then tie the free end of the bailer cord to the protective casing or, if possible, some nearby structure to prevent losing the bailer and cord down the well.

c. Lower the bailer slowly down the well and into the water column to minimize disturbance of the water surface. If a bottom-filling bailer is used, then do not submerge the top of the bailer; however, if a top-filling bailer is used, then submerge the bailer several feet below the water surface.

d. Remove and properly discard one bailer volume from the well to rinse the bailer with well water before sampling. Again, lower the bailer slowly down the well to the appropriate depth depending on the bailer type (as discussed above in 5.11 c). When removing the bailer from the well, do not allow the bailer cord to rest on the ground but coil it on the protective plastic sheeting placed around the well. Certain regulatory agencies require that the first bailer volume collected be utilized for the samples.

5.11 If a pump is used to collect the sample, then use the same pump used to purge the well and, if need be, reduce the discharge rate to facilitate filling sample containers and to avoid problems that can occur while filling sample containers (as listed in Number 5.14, below). Alternately, the purge pump may be removed and a thoroughly decontaminated bailer can be used to collect the sample.

5.12 Remove each appropriate container's cap only when ready to fill each with the water sample, and then replace and secure the cap immediately.

5.13 Fill each appropriate, pre-labeled sample container carefully and cautiously to prevent: 1) agitating or creating turbulence; 2) breaking the container; 3) entry of, or contact with, any other medium; and 4) spilling/splashing the sample and exposing the sampling team to contaminated water. Immediately place the filled sample container in a ice-filled (wet ice or blue pack) cooler for storage. If wet ice is used it is recommended that it be repackaged in zip-lock bags to help keep the cooler dry and the sample labels secure. Check the work plan as to whether wet ice or blue packs are specified for cooling the samples because certain regulatory agencies may specify the use of one and not the other.

5.14 "Top-off" containers for volatile organic compounds (VOCs) and tightly seal with Teflon™-lined septums held in place by open-top screw caps to prevent volatilization. Ensure that there are no bubbles by turning the container upside down and tapping it gently.

5.15 Filter water samples (Procedure 4.6) collected for dissolved metals analysis prior to preservation to remove the suspended sediment from the sample. If water samples are to be collected for total metals analysis, then collect a second set of samples without field filtering.

In the event that the regulatory agency(ies) want unfiltered samples for metals analysis, a second set of filtered samples should also be collected. Because unfiltered samples are indications of total metals (dissolved and suspended) they are not representative of aquifer conditions because ground water does not transport sediment (except in some rare cases). Thus, the results for dissolved metals in ground water should be based on filtered samples even if both filtered and unfiltered sets are presented in a report.

5.16 Add any necessary preservative(s) to the appropriate container(s) prior to, or after (preferred), the collection of the sample, unless the appropriate preservative(s) have already been added by the laboratory before shipment.

5.17 Collect quality control (QC) samples as required in the work plan to monitor sampling and laboratory performance. Refer to the SOP for Collection of Quality Control Samples.

5.18 Conduct field analyses after sample collection is complete by measuring and recording the temperature, conductivity, pH, etc. (as called for in the work plan). Note and record the "final" physical appearance of the water (after purging and sampling) on an appropriate field form and in the field notebook.

5.19 Wipe the well cap with a clean rag, replace the well cap and protective cover (if present). Lock the protective cover.

5.20 Verify that each sample is placed in an individual "zip-lock" bag, wrapped with "bubble wrap," placed in the cooler, and that the cooler has sufficient ice (wet ice or blue packs) to preserve the samples for transportation to the analytical laboratory.

5.21 Decontaminate bailers, hoses, and pumps as discussed in the decontamination SOP. Wrap decontaminated equipment with a suitable material (e.g., clean plastic bag or aluminum foil). Discard cords, rags, gloves, etc. in a manner consistent with site conditions.

5.22 Complete all necessary field forms, field notebook entries, and the chain-of-custody forms. Retain one copy of each chain-of-custody form. Secure the cooler with sufficient packing tape and a custody seal.

5.23 Samples collected from Monday through Friday will be delivered within 24 hours of collection. If Saturday delivery is not available, samples collected on Friday must be delivered by Monday morning. Consult the work plan to determine if any of the analytes require a shorter delivery time.

END OF PROCUDURE

APPENDIX D

Data Validator's Statement of Qualifications

JUDY V. HARRY
P. O. Box 208
120 Cobble Creek Rd.
North Creek, NY 12853

Occupation: Data Validator/Environmental Technical Consultant

Years Experience: 27

Education: B.S., Chemistry, Magna cum laude, 1976, Phi Beta Kappa

Certifications: New York State Woman-Owned Business Enterprise (WBE)

Relevant Work History:

Data Validation Services: September 1989 - present

Sole proprietor of Data Validation Services, providing consultation/validation services to various regulatory and commercial clients.

These services include the review of analytical laboratory data for compliance with respect to specific protocols, accuracy and defensibility of data, verification of reported values, and evaluation of quality parameters for analytical usability of results. Approved by USEPA, NYSDEC, NJDEP, and NYCDEP as a data validator for projects, including USEPA Superfund and lead sites, and those contracted through the NYSDEC Division of Hazardous Waste Remediation, Division of Solid Waste, and Division of Water Quality.

Performed validation for compliance with protocols including USEPA OLM, USEPA OLC, USEPA ILM, USEPA DFLM, USEPA SOW3/90, USEPA SOW 7/87 CLP, USEPA SOW 2/88 CLP, USEPA SW846, RCRA, AFCEE, NYS 6 NYCRR Part 360, 40 CFR, air analysis methods, 1989/1991/1995 NYSDEC ASPs, and 1987 NYSDEC CLP. Performed validation according to the USEPA National and Regional SOPs and Functional Guidelines, AFCEE requirements, NYSDEC Validation Scope of Work, and NJDEP Division of Hazardous Site Mitigation/ Publicly Funded Site Remediation SOPs.

Performed validation for USEPA Superfund Sites including Salem Acres, York Oil, Port Washington L-4 Landfill, Bridgeport Rental and Oil Services, MMR/ OTIS AFB, and Peter Cooper site; and for USEPA lead sites including SJ&J Piconne, Maska, Bowe System, and Syossett Landfill, involving CLP, RAS, and SAS protocols.

Contracted for NYSDEC Superfund Standby Contracts with LMS Engineers, Camp Dresser & McKee, Malcolm-Pirnie, Ecology & Environment, and EC Jordan, involving samples collected at NYS Superfund Sites and analyzed under the NYSDEC ASP.

Validated data for NYSDEC Phase II remedial investigations, RI/FS projects, and PRP over-site projects for hazardous waste sites. Was the primary contractor for Lawler, Matusky & Skelly Engineers during fifth and sixth round Phase II investigation, reviewing results for TCL/ TAL analyses performed according to EPA CLP and 1989 NYSDEC ASP. Provided data validation for NYSDEC Phase II investigations for Gibbs & Hill, Inc, reviewing results from TCL/TAL analyses performed in accordance with the 1989 NYSDEC ASP.

Performed validation services for clients conducting RI/FS activities involving samples of many matrices, including waste, air, sludges, leachates, solids/sediments, aqueous, and biota; clients have included Arcadis Geraghty & Miller, Barton & Loguidice, Bergmann Associates, Blasland, Bouck & Lee, Camp Dresser & McKee, C&S Consulting Engineers, Clough Harbour & Associates, Columbia Analytical Services, C.T. Male, Dames & Moore, Day Engineering, EA Engineering, Ecology & Environment, EC Jordan, Environmental Chemical Corporation, EHRT, ENSR Consulting, ERM-Northeast, Fagan Engineers, Fanning Phillips & Molnar, FluorDaniel GTI, Foster Wheeler Environmental Corp, Frontier Technical, Galson Consultants, Geomatrix Consultants, GZA Environmental, Handex of N, H2M Group, IT Corp, JTM Associates, Leader Environmental, Lockwood, Kessler & Bartlett, LMS Engineers, Malcolm-Pirnie, Metcalf & Eddy, O'Brien & Gere Engineers, Parsons Engineering-Science, Plumley Engineering, Prescott Environmental, P. W. Grosser, Rizzo Associates, Roux Associates, Sear Brown Group, SECOR, Shaw Environmental, ThermoRemediation Inc., TRC Environmental, Turnkey Environmental Restoration, TVGA Engineering, URS Consultants, Wehran Emcon, Weston, YEC, and private industries.

Validator for investigations at the Knolls Atomic Power Laboratory site. Validator for NYSDEC and NJDEP sites for samples analyzed according to EPA CLP SOPs, with validation performed according to NJDEP validation procedures. Validator for numerous landfill site investigations for TCL/TAL and NYS 6 NYCRR Part 360 analytes.

Provided consultation services to laboratories regarding analytical procedures and protocol interpretation, and to law firms for litigation support.

Provided services to firms involving audits of environmental analytical laboratories to determine analytical capability, particularly for compliance with NYSDEC ASP and AFCEE requirements.

Guest speaker on a panel discussing Data Review/Compliance and Usability, for an analysts workshop for the New York Association of Approved Environmental Laboratories, 1993.

Adirondack Environmental Services: June 1987 - August 1989

Senior mass spectroscopist for AES. Responsible for GC/MS analyses of environmental samples by USEPA and NYSDEC protocols; development of the GC/MS laboratory, initiating the instrumental and computer operations from the point of installation; and for implementing the procedures and methodologies for Contract Laboratory Protocol.

CompuChem Laboratories: May 1982 - January 1987

Managed a GC/MS production laboratory; developed, implemented, and supervised QA/QC criteria at three different levels of review; and was responsible for the development and production of the analysis of environmental and clinical samples. Directed a staff of 23 technical and clerical personnel, and managed the extraction and GC/MS labs and data review operations.

Research Triangle Institute: December 1979 - May 1982

Worked as an analytical research chemist responsible for development of analytical methods for the EPA Federal Register at RTI. This involved analysis of biological and environmental samples for priority pollutants, primarily relating to wastewaters and to human sampling studies. Method development included modification and interfacing of the initially developed Tekmar volatile purge apparatus to GC/MS, and the analysis and resolution/identification of individual PCB congeners within Aroclor mixtures by capillary column and mass spectra.

Guardsman Chemical Company: February 1977 - November 1979

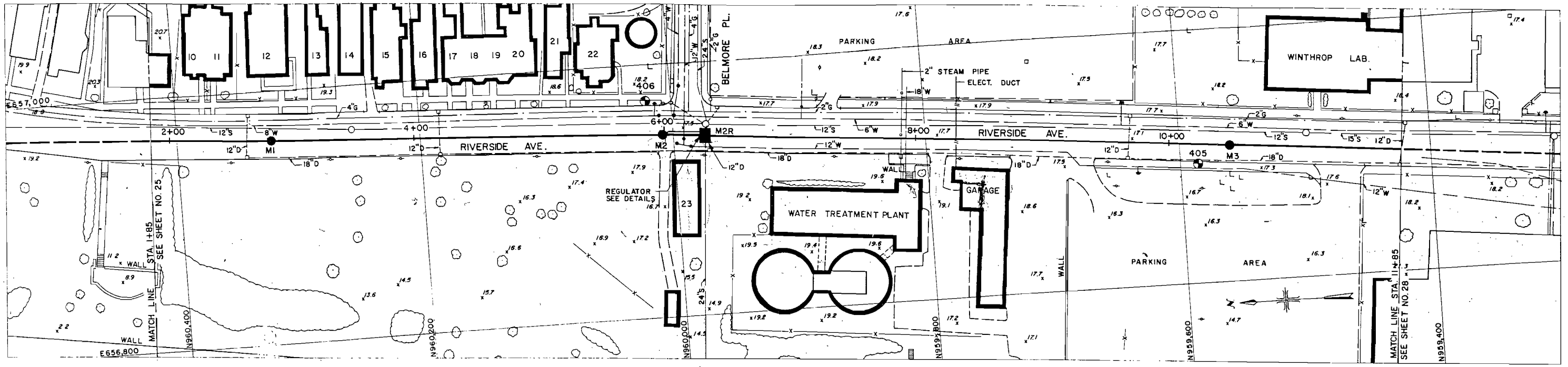
Performed all quality control functions for the manufacturing plant. Performed research and development on coatings and dyes.

Almay Cosmetics: May 1976 - December 1976

Product evaluation chemist. Responsible for analytical QC of manufactured products.

APPENDIX E

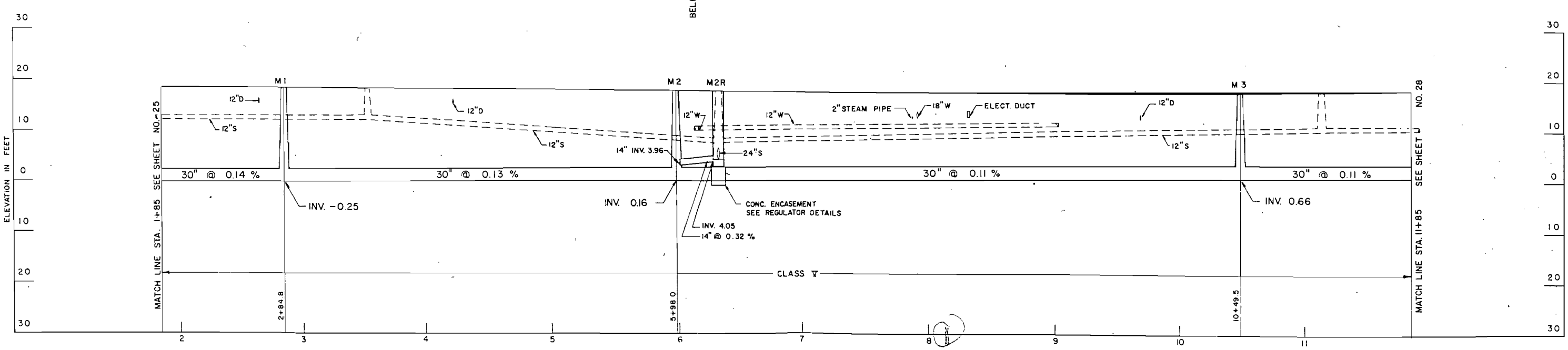
Rensselaer County Sewer District Maps



4" Force Main

THE CONTRACTOR SHALL INCLUDE IN THE PRICES BID FOR CONTRACT ITEMS THE COST OF RELOCATING ALL UTILITIES, PIPES AND MISCELLANEOUS STRUCTURES AS REQUIRED.

BELMORE • PLACE



HALF SIZE

MALCOLM PIRNIE, INC.

LICENSED PROFESSIONAL ENGINEER — CLIFFORD C. LEGNINI — No. 27161 — STATE OF NEW YORK

SURVEY BY AMERICAN AERIAL SURVEYS, INC

DESIGNED [illegible] DRAWN [illegible] CHECKED TCA

REVISIONS:

RENSSELAER COUNTY SEWER DISTRICT NO. 1
RENSSELAER COUNTY, NEW YORK

INTERCEPTOR AND TRUNK SEWERS

CONTRACT NO. 13

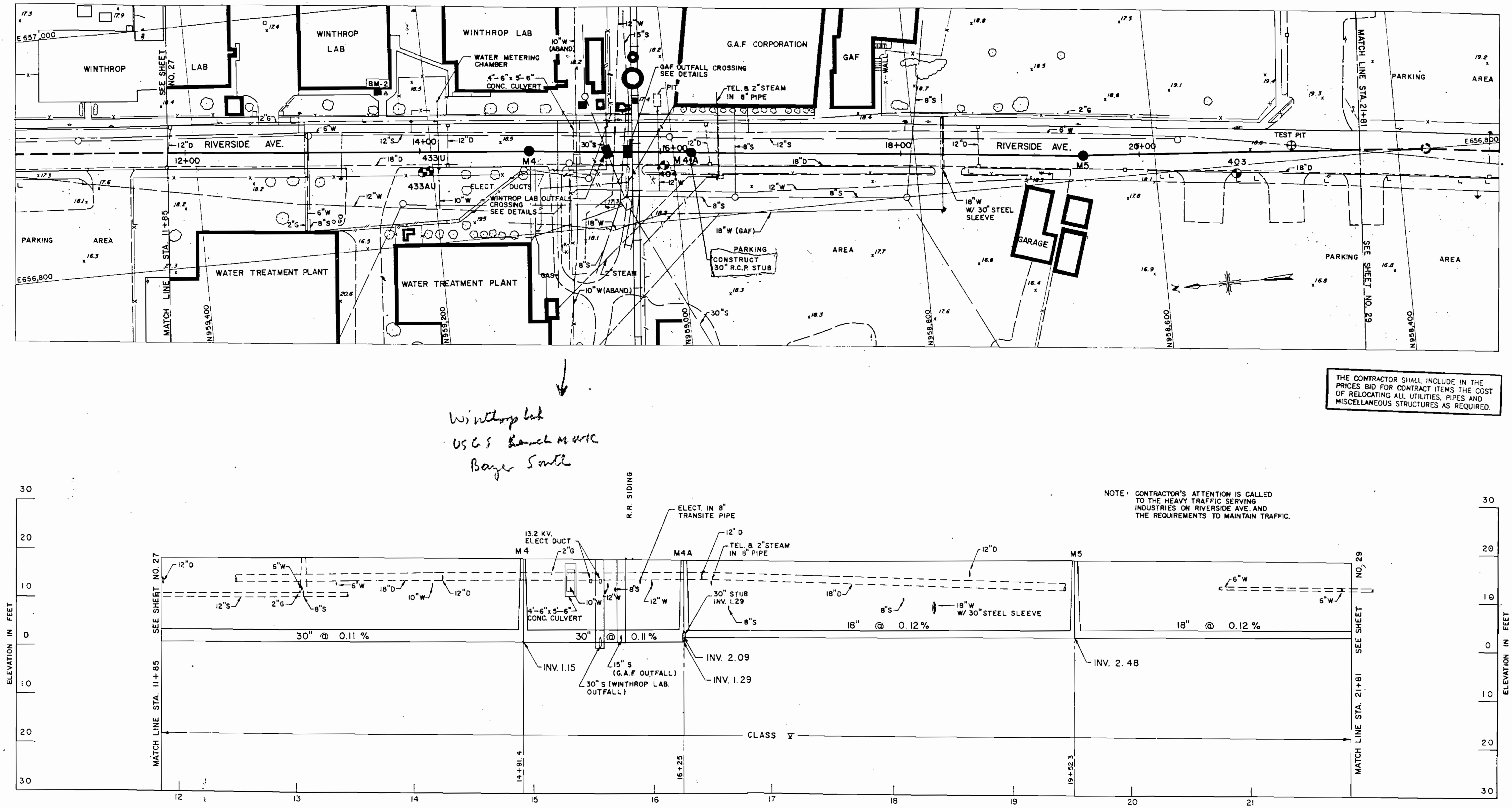
RENSSELAER INTERCEPTOR SEWER
BROADWAY AND RIVERSIDE AVE. SOUTH
STA. 1+85 TO STA. 11+85

SCALES: HORIZ. 1" = 40'
VERT. 1" = 10'

DATE MARCH 1973

SHEET 27 OF 43

DWG NO. 181 L-71.056-0



THE CONTRACTOR SHALL INCLUDE IN THE PRICES BID FOR CONTRACT ITEMS THE COST OF RELOCATING ALL UTILITIES, PIPES AND MISCELLANEOUS STRUCTURES AS REQUIRED.

NOTE: CONTRACTOR'S ATTENTION IS CALLED TO THE HEAVY TRAFFIC SERVING INDUSTRIES ON RIVERSIDE AVE. AND THE REQUIREMENTS TO MAINTAIN TRAFFIC.

Winthrop lab
USGS bench mark
Bayer South

HALF SIZE

MALCOLM PIRNIE, INC.

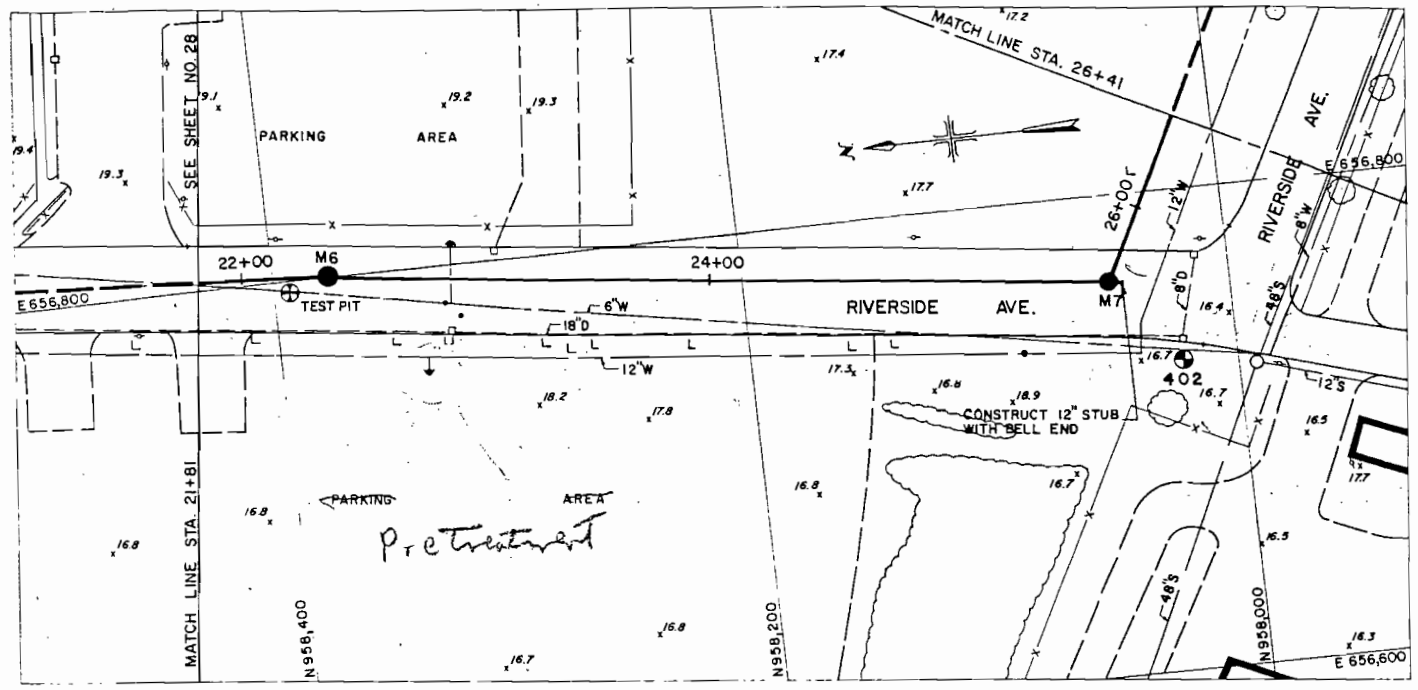
DESIGNED JBM DRAWN TGC CHECKED TCA
REVISIONS:
3-30-73 PIPE DIA. REDUCED TO 18" MANHOLE M4A ADDED

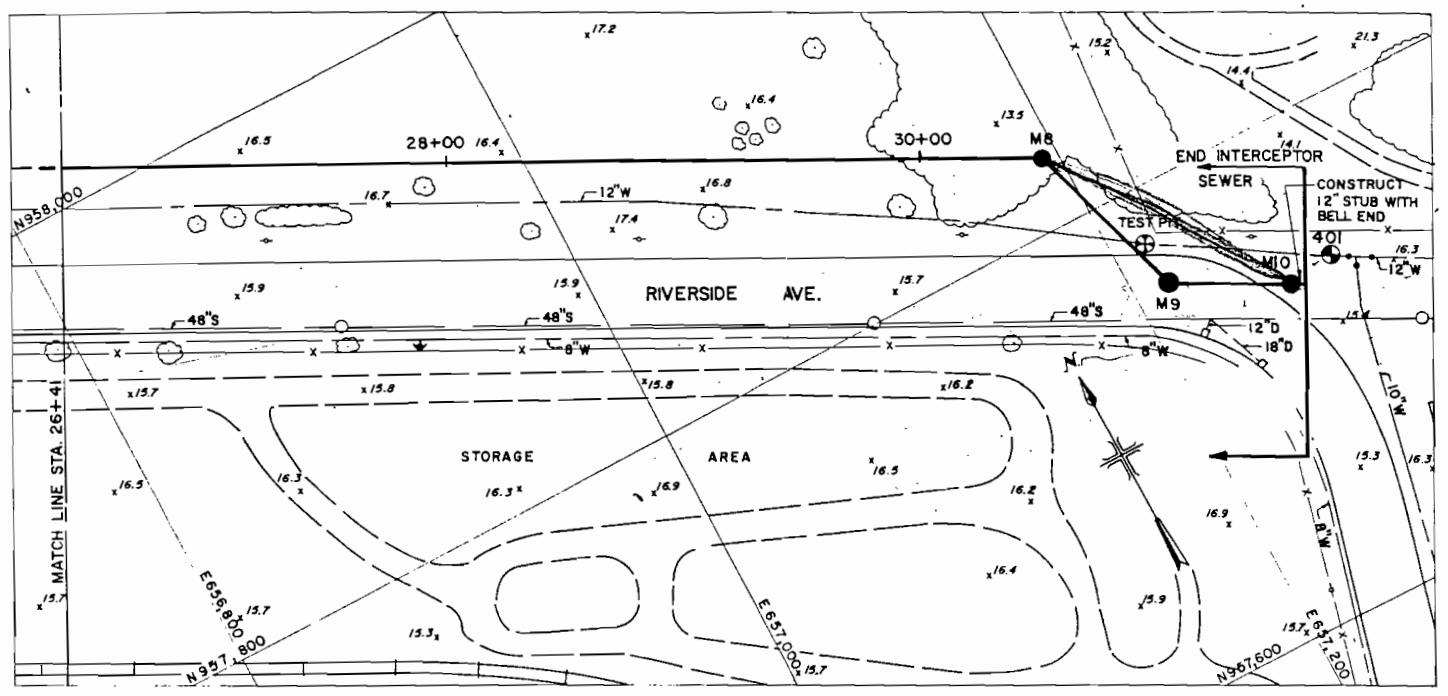
RENSSELAER COUNTY SEWER DISTRICT NO. 1
RENSSELAER COUNTY, NEW YORK
INTERCEPTOR AND TRUNK SEWERS
CONTRACT NO. 13

RENSSELAER INTERCEPTOR SEWER
BROADWAY AND RIVERSIDE AVE. SOUTH
STA. 11+85 TO STA. 21+81
SCALES: HORIZ. 1" = 40'
VERT. 1" = 10'

DATE MARCH 1973
SHEET 28 OF 43
DWG. NO. 181 L-71.057-1

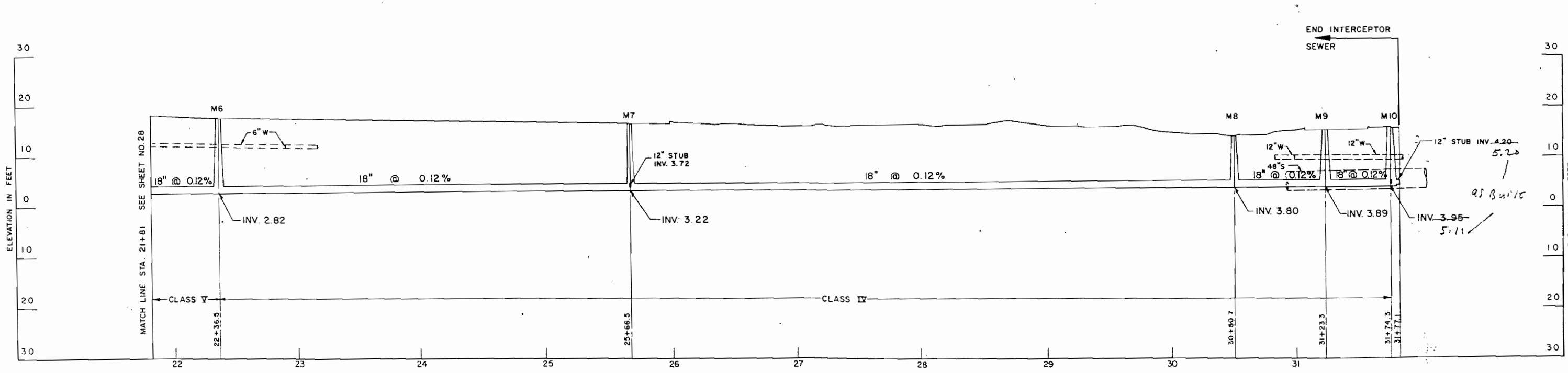
AMERICAN AIR SURVEYS, INC





THE CONTRACTOR SHALL INCLUDE IN THE PRICES BID FOR CONTRACT ITEMS THE COST OF RELOCATING ALL UTILITIES, PIPES AND MISCELLANEOUS STRUCTURES AS REQUIRED.

M9 Eliminated



HALF SIZE

MALCOLM PIRNIE, INC

DESIGNED [illegible] DRAWN [illegible] CHECKED [illegible]

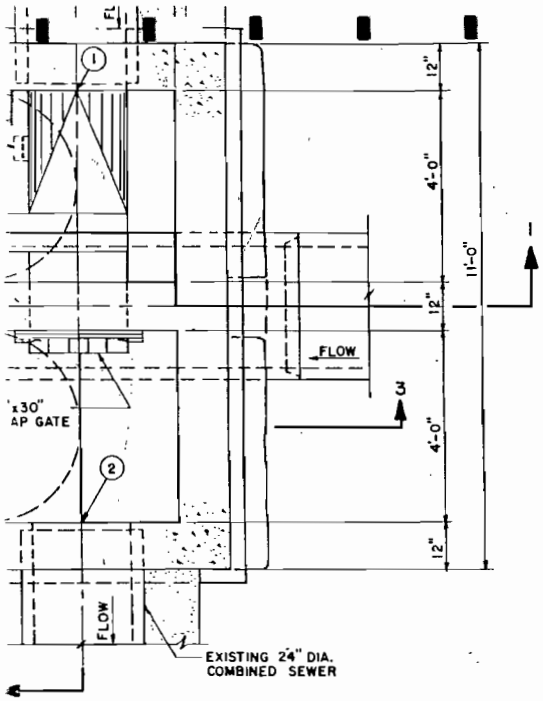
REVISIONS:
3-30-73 PIPE DIA REDUCED TO 18"

RENSSELAER COUNTY SEWER DISTRICT NO. 1
RENSSELAER COUNTY, NEW YORK
INTERCEPTOR AND TRUNK SEWERS
CONTRACT NO. 13

RENSSELAER INTERCEPTOR SEWER
BROADWAY AND RIVERSIDE AVE. SOUTH
STA. 21+81 TO STA. 31+77.1
SCALES: HORIZ. 1" = 40'
VERT. 1" = 10'

DATE MARCH 1973
SHEET 29 OF 43
DWG. NO 181 L-71 058-1

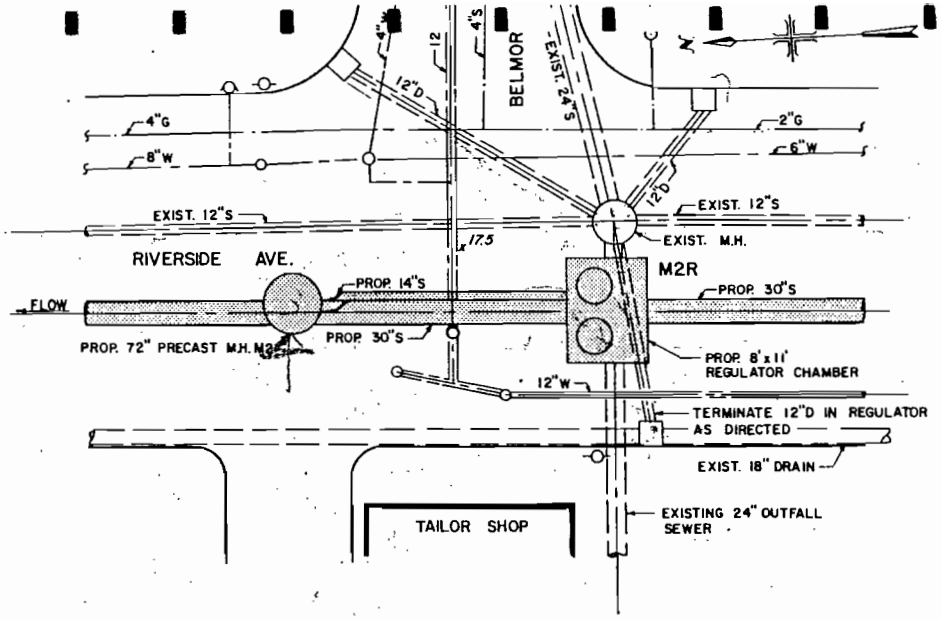
TOPOGRAPHY BY AMERICAN AIR SURVEYS, INC



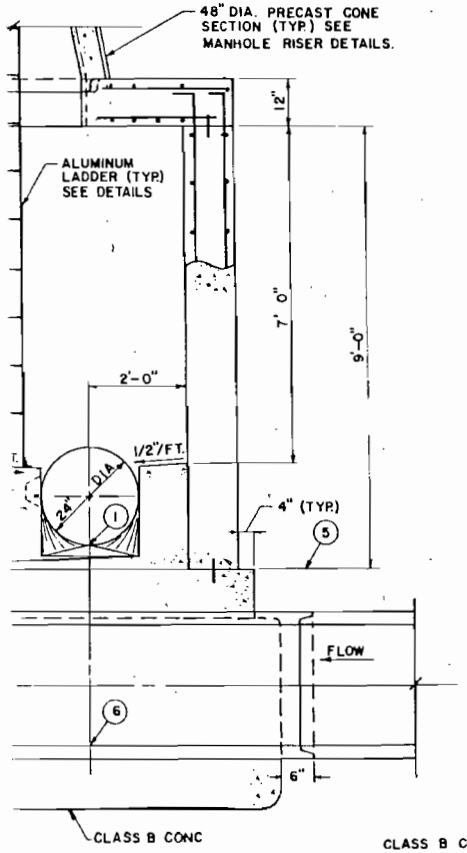
ELEVATIONS (USGS DATUM)	
1	4.3±
2	4.2±
3	4.05
4	4.88
5	3.87
6	0.19
7	3.96
8	0.16
FIN. GRADE	17.5±

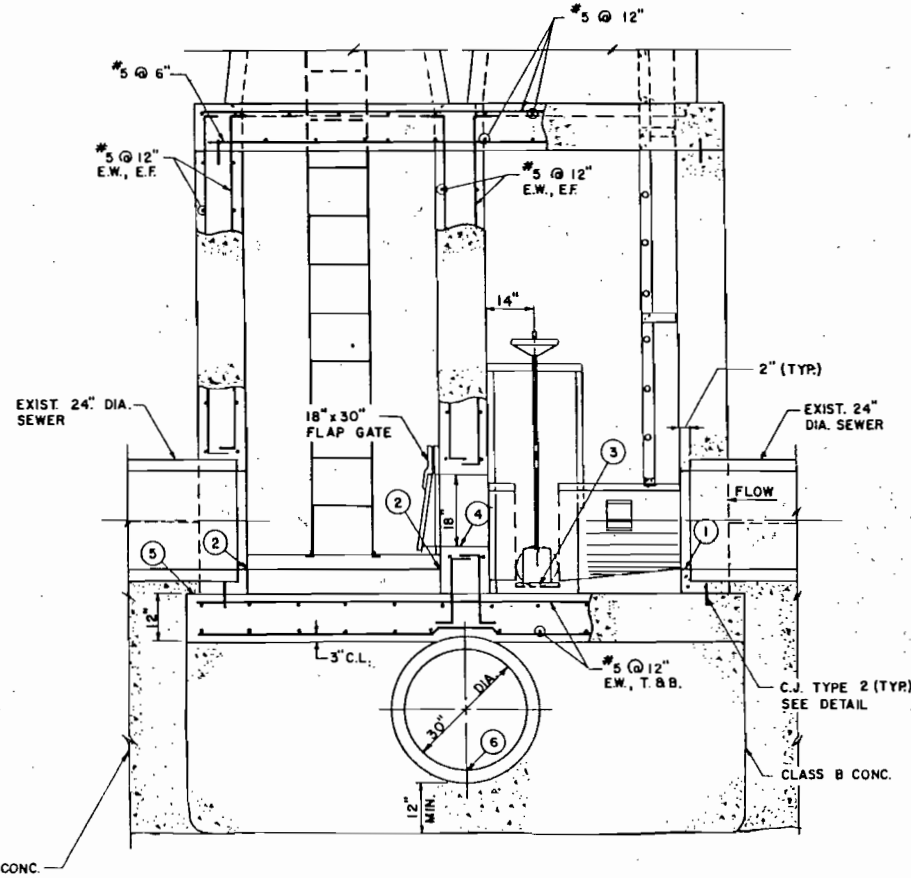
GENERAL NOTES

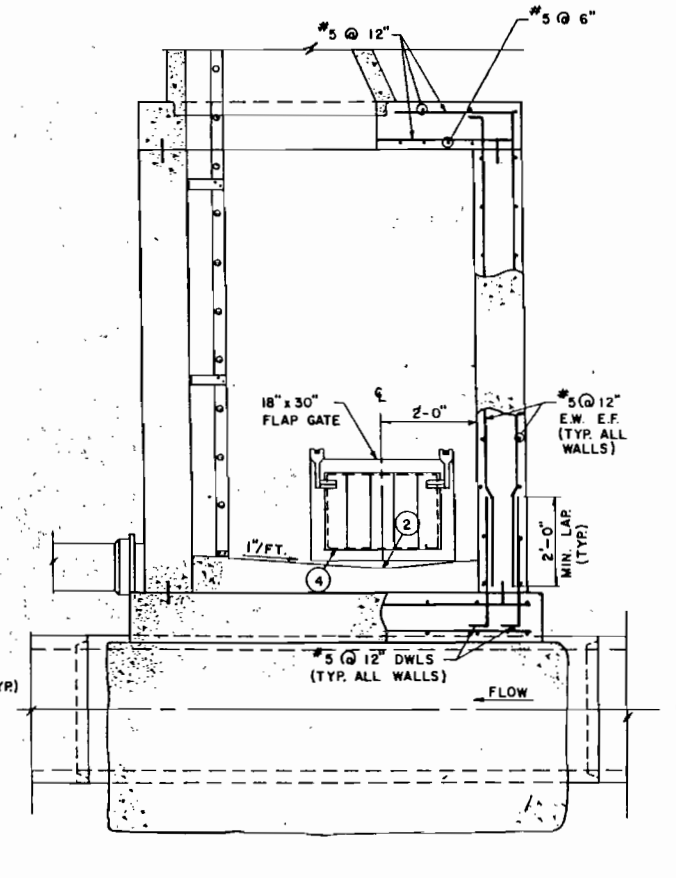
1. SEE SHEET 34 FOR STD. STRUCTURAL DETAILS.
2. MAINTAIN SLOPE OF INTERCEPTOR THRU REGULATOR.
3. CLASS A CONCRETE SHALL BE USED FOR ALL BENCHES AND CHANNELS.
4. SET C.I. TOE POCKETS 15" O.C. VERTICALLY ABOVE THE INVERT CHANNEL, AND STAGGERED 15" O.C.



LOCATION PLAN
SCALE 1"= 10'

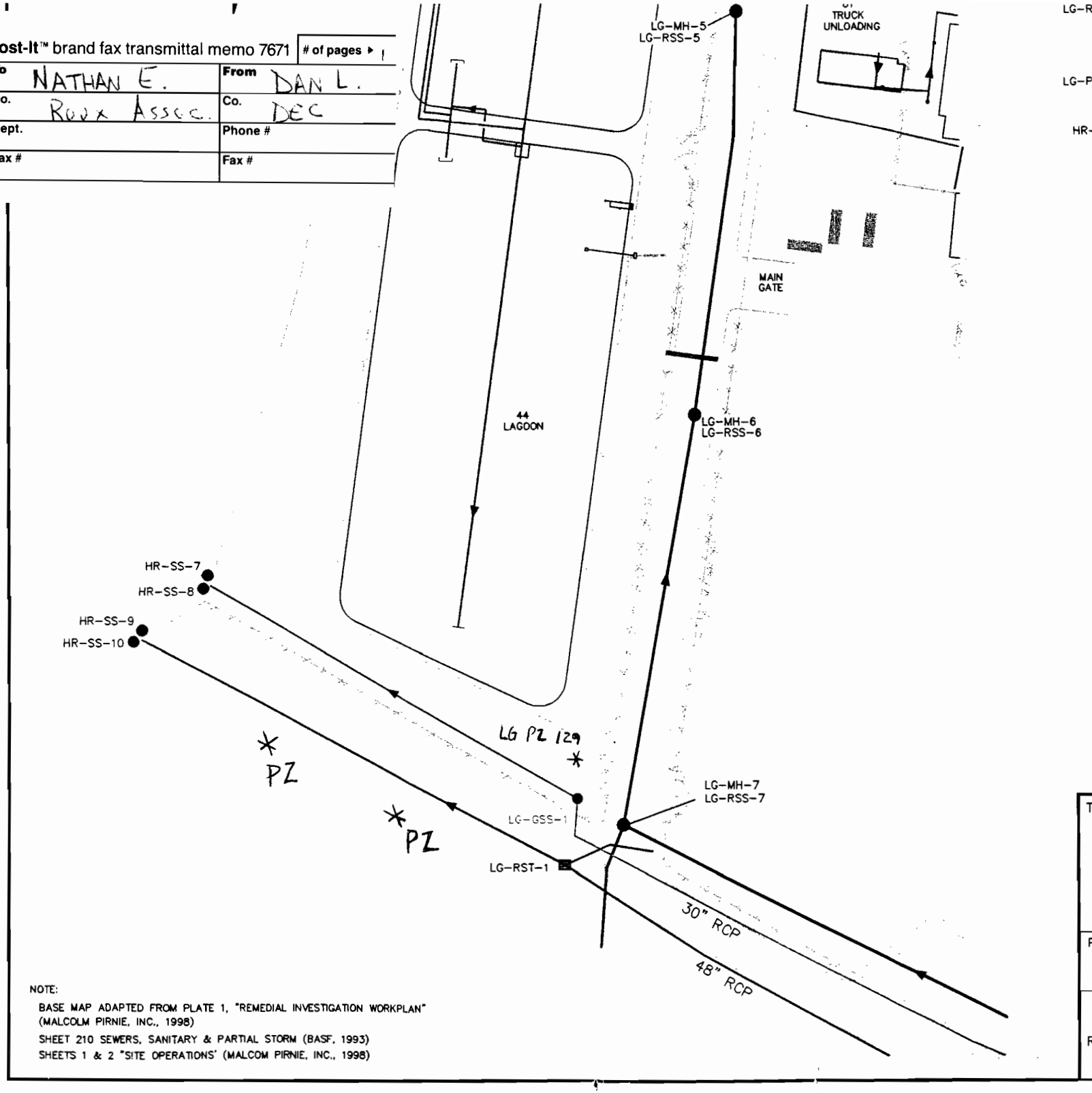






Post-It™ brand fax transmittal memo 7671 | # of pages ▸ 1

To	NATHAN E.	From	DAN L.
Co.	ROUX ASSOC.	Co.	DEC
Dept.		Phone #	
Fax #		Fax #	



LG-RSS-4 ● LOCATION AND DESIGNA
SAMPLING POINT. DESIG
AND SEWER COLORS A

LG-PZ-101 ⊕ LOCATION AND DESIGN
PIEZOMETER

HR-SS-1 ● LOCATION AND DESIGN
PROPOSED SEDIMENT S

RCP REINFORCED CONCRETE

DIP DUCTILE IRON PIPE

NOTE:

BASE MAP ADAPTED FROM PLATE 1, "REMEDIAL INVESTIGATION WORKPLAN" (MALCOLM PIRNIE, INC., 1998)

SHEET 210 SEWERS, SANITARY & PARTIAL STORM (BASF, 1993)

SHEETS 1 & 2 "SITE OPERATIONS" (MALCOM PIRNIE, INC., 1998)

75' 0

Title:

PROPOSED
SAMPLING L

REVISED OU-2
BASF RENSSELAER, N

Prepared For:

BASF CORP
MOUNT OLIVE,

ROUX

ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by:	M
Prepared by:	G
Project Mgr:	N
File No:	BF113