SIMON HYDRO-SEARCH

175 N. Corporate Drive
Suite 100
Brookfield, WI 53045
Telephone (414)792-1282
Facsimile (414)792-1310

WORK PLAN
FOR CONDUCTING THE
REMEDIAL INVESTIGATION / FEASIBILITY STUDY
AT THE REFUSE HIDEAWAY LANDFILL
MIDDLETON, WISCONSIN

March 17, 1994

Prepared For:

Wisconsin Department of Natural Resources
101 S. Webster Street
Madison, Wisconsin 53701

Prepared By:

Simon Hydro-Search
Brookfield Lakes Corporate Center XII
175 N. Corporate Drive, Suite 100
Brookfield, Wisconsin 53045

Project No. 301483135

WORK PLAN
FOR CONDUCTING THE
REMEDIAL INVESTIGATION / FEASIBILITY STUDY
AT THE REFUSE HIDEAWAY LANDFILL
MIDDLETON, WISCONSIN

March 17, 1994

Theresa Evanson
Project Coordinator
Wisconsin Dept. of Natural Resources

Michael R. Noel
Sr. Vice President
Simon Hydro-Search

Colleen Hart
Remedial Project Manager
U. S. Env. Protection Agency

Judy L. Fassbender
Project Manager
Simon Hydro-Search

SIMON HYDRO-SEARCH

TABLE OF CONTENTS

TABLE OF CONTENTS (CONT'D)

TABLE OF CONTENTS (CONT'D)

TABLE OF CONTENTS (CONT'D)

TABLE OF CONTENTS (CONT'D)

FIGURES

TABLES

ACRONYMS

ARAR	Applicable or Relevant and Appropriate Requirements
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act of 1980
CLP	Contract Laboratory Program
COD	Chemical Oxygen Demand
DNAPL	Dense, Non-aqueous Phase Liquid
FS	Feasibility Study
HRS	Hazard Ranking System
LNAPL	Light, Non-Aqueous Phase Liquids
NCP	National Contingency Plan
NPL	National Priority List
NR140	Chapter NR140, Wisconsin Administrative Code
NR141	Chapter NR141, Wisconsin Administrative Code
NR500	Chapter NR500, Wisconsin Administrative Code
OU	Operable Unit
PID	Photoionization Detector
PVC	Polyvinyl Chloride
QA	Quality Assurance
QAPTM	Quality Assurance Project Technical Memorandum
RA	Remedial Action
RD	Remedial Design
RI	Remedial Investigation
SAP	Sampling and Analysis Plan

ACRONYMS (Cont'd)

SER	Site Evaluation Report
SOP	Standard Operating Procedure
SOW	Statement of Work
TAL	Target Analyte List
TCL	Target Compound List
TM	Technical Memorandum
TDS	Total Dissolved Solids
USBR	U.S. Bureau of Reclamation
U.S. EPA	U. S. Environmental Protection Agency
USGS	U.S. Geologic Survey
VOC	Volatile Organic Compound
WDNR	Wisconsin Department of Natural Resources
WP	Work Plan

1.0 INTRODUCTION

This document presents the Remedial Investigation/Feasibility Study (RI/FS) Work Plan (WP) for the Refuse Hideaway Landfill site listed on the National Priorities List (NPL) under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended. Simon Hydro-Search was contracted by the Wisconsin Department of Natural Resources (WDNR) to prepare the RI/FS work plans for the Refuse Hideaway Landfill located in Middleton, Wisconsin. The purpose of the RI/FS is to determine the nature and extent of contamination, and to develop and evaluate remedial alternatives as appropriate. The design and implementation of selected remedies identified would follow in the Remedial Design/Remedial Action (RD/RA) phase.

The purpose of this Work Plan is to document the decisions and evaluations made during the RI/FS scoping process, and define the specific scope and objectives of anticipated RI/FS tasks. The Plan also assigns project personnel responsibilities and estimates the project schedule.

The objectives of the RI are to:

- Assess the general characteristics of the waste in the landfill;
- Compile previous investigative results from the Refuse Hideaway Landfill, particularly those related to ground water;
- Assess the nature and extent of ground-water contamination at the Refuse Hideaway Landfill through information already gathered, including characterization of the hydrogeologic and physical setting to determine the most likely contaminant migration pathways and physical features that could affect potential remedial actions;

- Determine the migration rates, and characteristics of impacted media that may be present at the site;

- Gather data and information to the extent necessary and sufficient to support the development and evaluation of remedial alternatives in the FS; and

- Assess the actual and potential exposure routes.

As data collected during the RI becomes available, the FS will be prepared. The objectives of the FS are to:

- Identify general response actions necessary to comply with ARARs for the protection of public health, welfare, and the environment;

- Develop and screen remedial alternatives; and

- Evaluate remedial alternatives to determine if they protect human health and the environment, attain applicable or relevant and appropriate requirements (ARARs), are cost effective, use permanent solutions and alternative treatment technologies to the maximum extent practical, and meet the other criteria of the NCP 300.430(e)(9)(iii).

The format of this Work Plan is consistent with that recommended in the "Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA", October, 1989 (EPA/540/G-89/004, OSWER Directive 9355.3-01).

2.0 SITE BACKGROUND AND PHYSICAL SETTING

2.1 Site Description

The Refuse Hideaway Landfill accepted municipal, commercial, and industrial wastes during its operation and is located in the SW 1/4, NW 1/4, section 8, T7N, R8E, Town of Middleton, Dane County, Wisconsin. The landfill operated for 14 years between 1974 and 1988. The site was closed under court order in 1988 when volatile organic chemicals (VOCs) were discovered in private wells southwest of the site. VOCs and elevated inorganic chemicals have been detected in ground water surrounding the site. The contaminated ground water extends at least 3,800 feet southwest of the landfill boundary. Methane gas has migrated off the site and standing leachate has been documented within the waste mass.

Site geology/hydrogeology includes shallow bedrock, consisting of Prairie du Chien dolomite overlying late Cambrian age sandstone, which is present north, east, and west of the site. South of the site, up to 300 feet of unconsolidated materials exist, consisting of till, glaciolacustrine, outwash, and recent alluvium deposits. Ground water occurs in the sandstone and in the glacial deposits. Ground-water flow is primarily southwest, toward the Black Earth Creek Valley.

Known contaminants in the ground water consist of VOCs, including, but not limited to, benzene, dichloroethane, trichloroethane, dichloroethylene, trichloroethylene (TCE), tetrachloroethylene (PCE), vinyl chloride, ethylbenzene, toluene, dichlorodifluoromethane, and trichlorofluoromethane.

2.2 Site History

John DeBeck, the owner and operator of the Refuse Hideaway Landfill, received a landfill license from the WDNR in 1974 to operate a 23 acre landfill. The main engineering requirement was that he maintain at least 10 feet of soil between the waste and bedrock and that he cover the waste daily. Numerous violations of the daily cover requirements are noted in the file. The site was filled from south to north, but was not operated in "phases". Therefore, the entire waste volume (approximately 1.5 million cubic yards) was exposed to leaching by rain and snow melt throughout the operating history.

2.3 Previous Investigations

On October 31, 1986, Residuals Management Technology, Inc. (RMT) submitted a closure plan for the landfill to the WDNR. Additional Information was submitted for the plan on November 21, 1986. The closure plan was conditionally approved by the WDNR on April 7, 1987, pending receipt and approval of an in-field conditions report.

In 1986 and 1987, private water supply wells within a 1-mile radius of the landfill were sampled for VOCs by RMT and WDNR. No VOCs were detected in the private wells in 1986. However, in 1987, three private water supply wells, located approximately 1/2 mile to the southwest of the landfill, had measurable concentrations of VOCs. It appeared to the WDNR that the landfill was having an effect on ground water in these wells located to the southwest of the landfill.

The In-Field Conditions Report (RMT, 1988) documented the installation and sampling of 12 additional ground-water monitor wells, one additional leachate head well, and six gas probes. Ground-water samples were collected from the new and existing monitor wells and analyzed for VOCs to determine the nature and extent of ground-water impacts. The results of the VOC analyses indicated that Chapter NR140 Wisconsin Administrative Code Enforcement Standards (ESs) were exceeded at 12 of 14 monitor wells, including wells which were apparently upgradient and downgradient. The compounds exceeding ESs included PCE, TCE, vinyl chloride, benzene, and 1,2-dichloroethane. The impacts at apparently upgradient wells indicated that the potential for radial flow from the landfill existed.

In May of 1988, the WDNR issued Special Consent Order SOD-88-02A. The Consent Order required Refuse Hideaway, Inc. to close and cap the landfill, conduct an expanded hydrogeologic investigation, and prepare the Remedial Action Report. The hydrogeologic investigation goals were to determine the degree and extent of ground-water contamination around the landfill, evaluate the local and regional ground-water flow directions, and determine the nature, persistence and likely fate of the contaminants. In addition, existing and potential health effects posed by the landfill were to be evaluated. Potential remedial actions for mitigation of the landfill's impacts on the ground water were to be identified and long-term monitoring goals were to be defined.

John DeBeck closed the landfill under court order in May, 1988. At that time, he covered the landfill in accordance with NR504.07, Wisconsin Administrative Code, and placed a 6-inch grading layer of coarse soil over the waste, followed by 2 feet of clay soils. Two and a half feet of general soil was placed over the clay and 6 inches of topsoil, seeded and mulched, finished the cap. The final cover was completed in October, 1988. In January, 1989, John DeBeck declared bankruptcy and refused to undertake additional remediation of the landfill or investigation of the degree and extent of groundwater contamination.

Therefore, in early 1989, the State of Wisconsin undertook the continued remediation and investigation of the site. Costs for this work were paid by the Environmental Fund which are monies directly appropriated by the State legislature for environmental clean-ups.

2.4 State Funded Clean-up Actions

In Fall, 1989, the State began a number of actions designed to remediate the immediate problems of:

1. methane gas and leachate migration from the landfill.
2. private water supply contamination at three wells.

3. extent of ground-water contamination and possible involvement of additional private wells.

The following actions have been accomplished as of the end of 1992:

1. **Gas and leachate extraction system.** A gas and leachate extraction system is in place and operating on the landfill surface. A partial system was installed in fall, 1989 to conduct gas extraction tests that led to design of the full extraction system. The complete system consists of 13 gas/leachate extraction wells, header piping, blower, flow control systems, electrical control systems, telemetry system, a ground flare that meets all applicable air emission standards, and a leachate holding tank. Leachate is extracted from 3 of the 13 wells. The other ten wells have leachate heads of less than 6 feet at the base of the wells.

2. **Long-term operation and maintenance of the gas/leachate extraction system.** A consulting firm, Terra Engineering & Construction Corporation (Terra) has been hired to operate and maintain the extraction system and landfill surface for the next 3 to 5 years. Besides actual O & M of the extraction system, they monitor gas probes surrounding the landfill for methane migration, analyze leachate samples for compliance with a wastewater permit for discharge to the Madison Metropolitan Sewerage District, ensure subcontractors (e.g., leachate hauler) perform all duties, inspect the landfill cover for erosion problems, and ensure that applicable air emission standards are met.

3. **Repair of Final Cover Soils.** Several areas of the landfill cover experienced significant erosion between 1988 and 1992. In Fall, 1992 a cap repair and restoration project was undertaken. Geomembrane and heavy riprap was installed in the areas of worst erosion, settlement cracks were repaired, an access road over the landfill surface was constructed, top soil, seed and mulch was added to areas of sparse vegetation. At this time, the landfill surface is in fairly good repair. The landfill surface will continue to be maintained through the State's O & M contract with Terra, at least until RD/RA.

4. **Methane gas monitoring at private homes.** In 1989 and 1990, private homes were monitored for the presence of methane gas. The homes were all in excess of 1600 feet from the landfill and no gas was ever detected in any of the homes.

5. **Private Water Supply Wells.** Three private water supply wells, serving three homes, were discovered to be contaminated with VOCs in January, 1988. The landfill owner supplied bottled water until January, 1989 at which time the State took over payment for bottled water deliveries. In Fall, 1989, testing for design of a point-of-entry (POE) water treatment system was undertaken. The system, an activated carbon filtration system manufactured by Hellenbrand Water Systems, was installed in 2 homes in April and May, 1990. The third home is no longer occupied and the water well has been shutdown. The third property (owned by Randall Swanson) is used as a business and the State continues to supply bottled water to the business.

The State maintained and tested the POE systems for two years. In Summer, 1992, ownership of the POE systems was transferred to the homeowners, who are now permanently responsible for maintenance of the system and testing of the water supply. All testing to date indicates that the filtration systems reliably produce safe, drinkable water.

6. **Testing of Private Water Supplies Within One Mile of the Landfill.** In Fall, 1989, 43 private water supply wells (serving 53 homes) were tested for the presence of Volatile Organic Compounds. Two testing rounds were conducted, in October, 1989 and January, 1990. The tests showed that all private wells (except the 3 previously mentioned) were free of VOCs. In one of the testing rounds, toluene was detected at approximately 1 part per billion in several private wells. Laboratory contamination is believed responsible for this. Subsequent testing showed all VOCs to be below detection at all the homes.

7. **Ground-water Monitoring Study.** In Summer, 1990, the State undertook an intensive groundwater investigation to determine the degree and extent of VOC contamination.

Simon Hydro-Search of Brookfield, Wisconsin performed the investigation. Twenty-seven groundwater monitoring wells were installed. There were 30 existing monitoring wells at the site, for a total of 57 monitoring wells in the study. The study evaluated the geology, the vertical and horizontal groundwater flow, the average groundwater velocity in each geologic unit, the extent of aquifer contamination, the direction of plume movement, preliminarily evaluated four remedial actions, and made recommendations on future work at the site.

The study showed that the groundwater plume has the potential to contaminate the Deer Run Heights subdivision, located approximately 1 mile southwest of the landfill. In January, 1991, the State began monitoring private wells in the eastern portion of Deer Run Heights.

8. **Numerical Model Simulation and Assessment of Contaminant Plume Migration.** In Summer, 1991, a numerical model was performed by Simon Hydro-Search in an effort to estimate movement of the plume front downgradient of the landfill. A number of simulation scenarios were performed, resulting in a range of possible outcomes. The modeling effort provided an evaluation of the State's groundwater monitoring strategy and suggested that at least one additional monitoring well be installed in the Black Earth Creek Valley. Other conclusions and recommendations are contained in the study.

9. **On-going groundwater monitoring.** The State has established a long-term groundwater monitoring program that monitors the movement of the plume and tests private wells closest to the plume. Testing is conducted semi-annually (in May and October) on 21 monitoring wells and 12 private wells. A present, this monitoring will continue through the end of 1994. Simon Hydro-Search is under contract to perform this monitoring.

10. **Community Relations.** A community relations program was instituted at the beginning of the State's involvement with investigation and response actions at the Refuse Hideaway Landfill. Six public meetings have been held in the last 3 years. Public meetings are always announced by way of fact sheets and news releases. There currently is a mailing

list of approximately 150 interested persons. In addition, 3 or 4 "technical availability sessions" have been held. These are less formal, but serve as a mechanism for interested persons to directly ask questions of WDNR staff involved in the Refuse Hideaway clean-up. A copy of each fact sheet and information sheet produced for the public are available at the WDNR.

Table 2.1 summarizes the reports produced to date for the WDNR.

3.0 INITIAL EVALUATION

3.1 Nature and Extent of Impacts

VOCs and elevated inorganic chemicals have been detected in ground water surrounding the site. Known contaminants in ground water consist of VOCs including, but not limited to, benzene, dichloroethane, trichloroethane, dichloroethylene, TCE, PCE, vinyl chloride, ethylbenzene, toluene, dichlorodifluoromethane, and trichlorofluoromethane.

Samples collected in 1990 and 1991 had detectable VOC Concentrations in 29 of the 54 monitor wells at the site. Five compounds, including benzene, 1,2-dichloroethane, PCE, TCE, and vinyl chloride, were detected in concentrations which exceed the ES. The wells on the landfill property, particularly near the west and south landfill boundaries, have the highest VOC concentrations. No VOCs were detected in the private wells sampled. Samples analyzed for inorganic parameters appear to be more closely related to geologic materials and anthropogenic effects other than the landfill than to the landfill itself.

Contamination originating from the landfill extends radially from the landfill for approximately 1,500 feet in all directions. This flow pattern is of local extent and ground water travelling radially from the landfill eventually merges with the regional flow pattern, trending to the southwest. Ground-water mounding at the northwest portion of the fill is believed to be responsible for elevated VOC concentrations in ground water to the northwest of the landfill.

A contaminant plume has been identified with contaminants detected as far as 3,800 feet to the southwest of the landfill. In general, the contaminant plume appears to be limited to the upper 250 feet of the saturated zone. Based on modeling studies completed to date, it appears that the plume configuration would reach an equilibrium state after approximately five years from the January 1991 plume observance due to dilution, dispersion, and degradation processes and that the contaminant constituents are unlikely to migrate further downgradient with time. Due to the high ground-water velocities, the model predicts that the plume will stay at equilibrium, unless contaminant release rates from RHL change from current conditions.

Domestic water supply wells intercepting impacted ground water are the major concern for human exposure off site. Two wells are currently intercepting the plume; however, no other apparent human exposures are presently occurring in the RHL area based on private water supply sampling conducted to date. Contaminants have not been detected in water table wells adjacent to Black Earth Creek, indicating that the plume is not affecting this area of the creek.

A conceptual site model is presented in Figure 3-1 which illustrates potential migration pathways, routes of exposure, and potential receptors. A migration pathway describes the movement of a contaminant from a source to a receptor. The potential for migration from a source to a receptor depends on the physical and chemical properties of the compound, environmental transformation processes, and physical and chemical characteristics of the media through which the compound migrates. The original source of impacts at the site is due to the generation of leachate and combustible gases from the decomposition and degradation of landfilled refuse. Potential migration pathways at the site include ground water, surface water, surface soil and/or sediments, air, and soil gas.

The presence of VOCs in site ground-water monitor wells indicates that migration from landfilled refuse has previously occurred. Once in the ground water, contaminants may move both horizontally and vertically due to advection, molecular diffusion, and mechanical dispersion. Horizontal migration occurring at the site has been shown to be moving towards the southwest. Significant vertical migration has also been noted, especially as the contaminant plume migrates toward the southwest. VOCs have been detected in both the unconsolidated materials and bedrock at locations to the southwest of the landfill.

No contaminants have been identified as discharging in surface water runoff from the site. Due to this and the previous surface water and shallow ground-water sampling results, it is unlikely that surface water, and thus sediments, received leachate and/or ground-water discharge from the Refuse Hideaway Landfill.

The atmosphere and soil gas are potential migration pathways for combustible gases. However, the landfill currently has an active gas extraction system to reduce gas migration from the landfill. Gas is collected and combusted by the extraction system to reduce the potential for flammable or explosive conditions at the site.

Potential risk to human health posed by the site is associated with ground-water use by private domestic water-supply wells. Previous sampling results indicated three private wells contained detectable VOC concentrations above WDNR NR140 ESs. Two of the wells have been equipped with point-of-entry treatment systems. The third well is no longer in use. Additional domestic water supply wells have been monitored under WDNR authority and no impacts have been detected to date. Based on a preliminary evaluation of the migration pathways and current extent of site impacts, there is no substantial imminent or short-term risk to public health.

3.2 Preliminary Remedial Action Objectives

Preliminary remedial action objectives are: 1) control the source of contamination, and 2) protect human health and welfare and the environment.

3.3 Implemented Remedial Actions

The WDNR has already implemented remedial actions at the site which include the following:

- Repairs, improvements, and continued maintenance to the NR504 landfill cap installed by John DeBeck to direct surface runoff away from the landfill and limit the amount of water entering the landfill.

- Installation of leachate and gas extraction systems to remove leachate accumulation and landfill gas within the fill. The leachate is transported to a waste water treatment facility for treatment and discharge. The gas is combusted on site by a specially designed flare.

- Installation of point-of-entry treatment systems at two homes found to have VOC-contaminated ground water.

3.4 Probable Response Actions

Probable response actions to address the preliminary remedial action objectives have been identified as operable units (OU) below. These are not intended to replace or abandon previous remedial efforts. Rather, data collected during the RI stage, as well as previous investigations (see Section 2) will be analyzed and used to identify and evaluate additional alternatives and select appropriate remedies for potential areas of impacted media or to verify the operational effectiveness of existing systems. Data required for this screening and selection process are a function of the preliminary remedial action objectives and probable response actions.

3.4.1 Source Control

Source control will be addressed through control of waste (landfill cap), leachate and landfill gas. Response actions for OUs include the following elements.

- OU-1 Landfill Cover: Reduction of percolation through the landfill cover would reduce leachate generation and contaminant releases. Response actions may include modifications to the existing landfill cover.

- OU-2 Leachate: Removal of leachate from the landfill reduces the leachate quantity which may be released to the ground water from the landfill.

The Response Actions addressing leachate may include enhancement of the existing leachate extraction system.

- OU-3 Landfill Gas: Reduction of gas quantities and pressures within the landfill results in a reduction in the likelihood of gas migration from the landfill. Response actions for landfill gas may include additional or enhanced gas collection and/or treatment.

3.4.2 Human Health & Welfare and Environmental Protection

Protection of human health, welfare, and the environment will be accomplished by addressing ground water, surface water, soil/sediment, and air.

- OU-4 Ground Water: Ground-water contamination is the primary concern with respect to protection of human health, welfare, and the environment. Reducing the contaminant concentrations in ground water and the extent of contamination will reduce the potential hazard. Probable Response Actions addressing ground water include alternative water supplies, ground-water extraction and treatment, and insitu alternatives such as air sparging or bioremediation. A broader range of alternatives will likely be addressed due to the existence of institutional as well as technical considerations.

- Surface Water and Soil/Sediment: Impacts to these media are not likely present at this site. Response Actions are not anticipated to be required for these media.

- Air: Discharge of contaminants to the air from landfill gas, surface water, or sediment/soil, if these media are impacted, is possible. However, discharge concentrations are unlikely to be of concern. No response actions for air are anticipated at this time.

4.0 WORK PLAN RATIONALE

4.1 Overview

The goal of this RI is to determine the extent to which hazardous constituents have been released into the environment at the site, to characterize the impacted media, and to evaluate the effectiveness of existing remedial actions. The data needed to meet this goal may be grouped into three general categories addressing each of the following:

- Source Characterization - Characterize the physical and chemical nature of the waste material and media in which they are contained;

- Physical, Migration Pathway, and Contaminant Characterization - Physically characterize the various media at the site, identify active migration mechanisms, determine the direction and rate of movement of impacted media, and determine the location, magnitude and extent of impacted media migrating along pathways of concern; and

- Risk Characterization - Assess the risk to human health and the environment.

It is anticipated that the data obtained during previous site investigations will satisfy the RI objectives and support remedial alternative screening and evaluation in the Feasibility Study; therefore, no additional site investigation is planned. Data for each of these general categories are summarized on Table 4-1 and described below.

4.2 Source Characterization

Source characterization is performed to define waste types and characteristics. Source characterization objectives are as follows:

4.2.1 Waste

The waste constituents will be characterized. Of specific concern with respect to the waste is the risk associated with ingestion, inhalation, and direct dermal contact. A summary of information available pertaining to the type and quantity of waste at the site will be prepared. The information will include a summary of all prior work performed and how the waste has been investigated or controlled. Waste composition will be determined based on analytical results from waste samples collected during leachate well installation. No additional data are needed.

4.2.2 Leachate

Leachate constituents will be evaluated by summarizing previous leachate investigations specifically to characterize the quantities and concentrations of various chemicals in the leachate at the site. Leachate composition data is available from samples from the leachate tank collected to meet disposal requirements. The current leachate containment and control system will be presented as well as information available pertaining to the system's performance, including historical leachate levels and monthly leachate removal rates. No additional data are needed.

4.2.3 Landfill Gas

The nature and distribution of gas within and around the landfill will be characterized by reviewing gas composition and pressure data collected from previous monitoring programs conducted at the site. The effectiveness of the current gas extraction system will be evaluated using this data. The potential for ingestion, inhalation, and direct dermal contact with the landfill gas will be summarized. The investigation will encompass evaluations of the existing active gas collection system as data permits to assess the adequacy of the system. No additional data are needed.

4.2.4 Landfill Cover

The integrity of the existing cap will be evaluated using data collected during previous investigations of the cap and documentation reports. Information required for comparing the integrity of the current cap as constructed with an upgraded composite cap will be compiled for use with the HELP model during the Feasibility Study. No additional data are needed.

4.3 Physical and Migration Pathway Characterization

Information on the physical setting of the facility has been collected to complete definition of potential migration pathways and receptor populations as well as to provide sufficient engineering data for development and screening of remedial action alternatives.

Based on the available information, the most significant pathways for migration of wastes are as follows:

- Migration of leachate and its constituents into the ground-water flow system;
- Landfill gas production and migration; and
- Release of leachate and its constituents at the surface or to ground water and its subsequent migration to surface water and/or sediments;

This section describes the information needed to evaluate these migration pathways and potential receptors and if the existing information is suitable for this purpose.

4.3.1 Hydrogeology

4.3.1.1 Stratigraphy

The stratigraphic data available for the site consists of over 50 ground-water monitor well boring logs and several near site private well logs. Information for geologic characterization is available on site and radially in all directions from the site with depths in excess of 250 feet in several areas. Stratigraphy of the unconsolidated deposits, the depth to bedrock and limited bedrock stratigraphy are available for the site and surrounding area. No additional data are needed.

4.3.1.2 Ground-Water Flow Directions

The ground-water monitoring study provides information on the regional and site-specific geologic and hydrogeologic characteristics affecting ground-water flow, including regional and site-specific stratigraphy, the regional bedrock surface, depositional history, recharge and discharge areas, and regional and site-specific ground-water flow patterns. Potentiometric data for the site includes measurements which date back to prior to 1987, when the first ground-water monitor wells were installed.

Since 1991, ground-water elevation measurements have been obtained biannually from all existing monitor well locations enabling evaluation of ground-water flow direction, horizontally and vertically. Data collected from 1992 and 1993 will be used to refine existing data compiled in 1991 with respect to water table/potentiometric maps, hydrogeologic cross-sections, horizontal and vertical components of flow, and seasonal changes in horizontal and vertical gradients. No additional data are needed.

4.3.1.3 Hydraulic Conductivity

Aquifer parameters and hydraulic conductivity were evaluated for the 1991 ground-water monitoring study. The data obtained from the performance of field hydraulic conductivity (baildown) tests in 1991 will be used for hydraulic conductivity information. No additional data are needed.

4.3.2 Hydrology

Information from the ground-water monitoring study, site topographic maps and previous physical inspection of the site will be used to identify potential pathways of surface discharges from the site. The potential for these areas to be impacted or to represent a migration pathway for contaminants at the site will be evaluated through the determination of migration routes for surface water discharge and previous surface water sampling. No additional data are needed.

4.3.3 Landfill Gas

Landfill gas data will be compiled and reviewed to characterize gas migration pathways, especially with respect to pathways that have the highest potential to affect receptors. These receptors are the maintenance buildings east of the landfill and residences near the landfill. If appropriate, landfill gas characterization information will be used to determine the need for enhancing the existing gas collection system and/or evaluating alternative gas control measures. No additional data are needed.

4.3.4 Human Populations

Information will be collected to identify, enumerate, and characterize human populations potentially exposed to impacted media from the site. Special consideration will be given to identifying potentially sensitive populations. Census and other survey data may be used to identify and describe the population potentially exposed to impacted media. Information may also be collected from visual surveys, U.S. Geological Survey maps, land use plans, zoning maps, and regional planning authorities. Information from the ground-water monitoring study will be used as appropriate.

Data describing the type and extent of human contact with impacted media, if any, will include:

- Use of surface waters
  - Recreational (swimming, fishing) areas
  - Connection between surface-water bodies

- Local use of ground water as a drinking-water source
  - Number and location of any private wells

- Human use or access to the site and adjacent areas
  - Residential
  - Commercial
  - Industrial
  - Recreational use

- Location of population with respect to site
  - Proximity
  - Prevailing wind direction

4.3.5 Ecological Investigations

The ecological characterization will include general identification of flora and fauna in and around the site. WDNR records will be consulted regarding the potential existence of critical habitats and endangered or threatened species known in the area. The WDNR will also be contacted to determine if other ecological data are available that may be relevant to the investigation.

4.4 Contaminant Characterization

Contaminant characterization activities encompass data compilation to define the source, nature, extent, and direction and rate of movement of site contaminants. To characterize the extent of contamination, compilation of existing data will be completed. Information from the ground-water monitoring study will be updated using more recent data. The objectives of the characterization are as follows:

- Determine the presence/absence of ground-water impacts to assess current conditions;
- Determine the lateral extent of ground-water impacts;
- Determine the vertical extent of impacted ground-water;
- Determine the magnitude and extent of ground-water impacts off-site;
- Determine the magnitude and extent of surface water, sediment, and/or surface soil impacts, if any.

This section describes the information needed to characterize the contamination at the site and if the existing information is suitable for this purpose.

4.4.1 Ground Water

The results of ground-water sampling and analysis performed to date will be used to meet the objectives of this site investigation as it pertains to ground water. A total of 21 monitor wells have been sampled biannually for VOCs since 1991. In addition, 12 private wells are sampled annually for VOCs. Inorganic indicator sampling was completed for 27 off-site wells in 1991. The 1991 data was originally presented in the ground-water monitoring study. More recently, in 1993, 17 wells, both on and off-site, were sampled for TAL metals and cyanide plus TCL semivolatiles twice. Three on-site wells were also sampled two times for PCBs and pesticides in 1993. The ground-water sample results will be used to confirm ground-water flow direction and to determine lateral extent of impacts. No additional data are needed.

4.4.2 Surface Water, Sediment, and Surface Soil

Contaminants in surface water and sediment/surface soil are not anticipated at the site. Contaminant characterization will include evaluation of the potential for discharge of impacted ground water to surface water or sediments. Previously collected surface water samples and shallow ground-water samples collected near surface water, confirm the absence of residual compounds of interest. No additional data are needed.

5.0 REMEDIAL INVESTIGATION TASKS

The scope of the RI consists of seven tasks. The task numbering below is consistent with the tasks identified in the SOW:

Task 2: Project Planning
Task 3: Summary/Validation of Existing Data
Task 4: Community Relations (WDNR Activity)
Task 5: Data Evaluation
Task 6: Qualitative Risk Assessment
Task 7: Treatability Studies
Task 8: Remedial Investigation Report

These tasks are described below.

5.1 Task 2: Project Planning

The project planning task includes preliminary activities required to initiate the RI/FS. Activities conducted to-date have included scoping of the RI and preparation of the Work Plan.

5.1.1 Quality Assurance Project Technical Memorandum

Preparation of the Quality Assurance Project Technical Memorandum (QAPTM) is currently underway. The QAPTM will be submitted as part of the work plan under Task 2, and must be approved by the WDNR prior to the start of the RI for the site. The purpose of the QAPTM is to document the quality control/quality assurance procedures used by previous WDNR contractors in sample collection and analyses. A pre-QAPTM meeting was held with the WDNR and the U.S. EPA at the U.S. EPA office in Chicago on October 5, 1993. Simon Hydro-Search is preparing the QAPTM utilizing the input provided at that meeting.

The QAPTM will be prepared according to the most recent U.S. EPA format for preparing Quality Assurance Plans. The QAPTM will address the activities which have already been completed and will include the following:

a. A project description (duplicated from the work plan).

b. A project organization chart illustrating the lines of responsibility of the personnel involved in the project.

c. Quality assurance objectives for data including the required precision and accuracy, completeness of data, representativeness of data, comparability of data, and the intended use of collected data.

d. Sampling procedures

e. Sample custody

f. Calibration procedures for field and laboratory instruments.

g. Analytical procedures

h. Internal quality control checks

i. Data reduction, validation and reporting

j. Performance and system audits

k. Preventative maintenance

l. Specific procedures to assess data precision, representativeness, comparability, accuracy, and completeness of specific measurement parameters.

m. Data documentation and tracking procedures.

5.1.2 Monthly Progress Reports

Simon Hydro-Search will prepare monthly progress reports to describe the technical progress of all activities for which Simon Hydro-Search is responsible. The reports and all deliverables will be submitted to the WDNR Project Manager (PM) no later than the 15th day of each month. The reports will include the following information:

1. Identification of site and activity.

2. Status of work and the progress to date.

3. Percentage of the work completed and the status of the schedule.

4. Difficulties encountered and corrective actions to be taken.

5. The activity(ies) in progress.

6. Activities planned for the next reporting period.

7. Any changes in key project personnel.

8. Actual expenditures (including fee) and direct labor hours for the reporting period and for the cumulative term of the project.

9. Projection of expenditures needed to complete the project and an explanation of significant departures from the original budget estimate.

10. A tabular representation of proposed verses actual expenditures (plus fee) and comparison of actual versus target direct labor hours. A projection to completion will be made for both.

11. A list of target and actual completion dates for each task element including project completion and provide an explanation of any deviation from the milestones in the work plan schedule. The proposed budget includes funding for 12 Progress Reports to include both the RI and FS activities.

5.1.3 Quarterly Report (WDNR Activity)

The WDNR-PM will prepare Cooperative Agreement Quarterly Reports for submittal to the U.S. EPA Wisconsin Project Officer.

5.2 Task 3: Summary/Validation of Existing Data

The purpose of this task is to determine if existing data (past sampling and analyses by the WDNR and its contractors) is acceptable for use in conjunction with the remaining tasks of this RI/FS investigation.

All existing information pertaining to laboratory analyses of groundwater samples collected by the WDNR for the Refuse Hideaway Landfill will be compiled by Simon Hydro-Search. Based on the information available on historical sampling the following events will have data packages compiled and reviewed:

5.2.1 Private Well Water

A. Volatile organic and NR140 indicator parameters (alkalinity, chloride, NO_3-N, sulfate, TOC, Ca, Fe, Mg, Mn, K, Na, coliform) data from the three residential wells currently on POE treatment systems may be used in characterizing contaminant extent; however, this data will not be validated as the treatment remedy is already in place. Since the monitoring began, no detectable volatile contaminants have been detected in the treated water.

B. Volatile organic data from 35 residential well samples collected within 1 mile of the landfill in 10/89 (11 samples) and 1/90 (24 samples) will be validated. The samples were analyzed by U. S. EPA method 502.2 by Warzyn. The quality of this data is important in the assessment of the extent of contamination from the plume.

C. Volatile organic data from the 1/91 sampling of 10 unimpacted private wells will be validated to provide an assessment of the data quality used to evaluate plume extent and human exposure. A total of 12 samples were analyzed by Swanson Environmental, Inc. for VOCs by U. S. EPA method 502.2.

5.2.2 Ground Water

A. Volatile organic and indicator (alkalinity, COD, chloride, hardness, Fe) data generated during the placement of the monitor well screens will not be validated as the data was not used to assess the extent of contamination.

B. Two sampling rounds of the 27 newly installed wells occurred in 12/90 and 1/91. The volatile organic data from the 1/91 event will be validated as it coincided with the sampling of the 25 preexisting monitor wells and 10 unimpacted private wells. A total of 58 samples from monitor wells were analyzed by Swanson Environmental for VOCs by U. S. EPA method 8021.

C. Semi-annual volatile organic analysis of samples from 21 selected monitor wells has been conducted since June 1990. Twelve residential wells have also been monitored annually. Five residential wells have been sampled in spring and six in the fall. One additional well has been monitored twice per year, in both the spring and fall. The data from the most recent event planned for November, 1993 will be validated as well as the data from two previous events that exhibited significant concentrations of detectable volatiles (10/2-8/92, 5/13-21/93) to compare compounds identified and assess any concentration gradients over time. These samples, a total of 88 in all, were analyzed by Swanson using U. S. EPA method 8021 and/or 502.2.

D. Ground-water samples from 18 monitor wells and 2 residential wells were collected on 5/17-19/93, and again on 10/18-22/93. These samples were analyzed by CLP protocol OLM01.8 for TCL semivolatiles, and SOW 3/90 TAL metals. Three samples from downgradient wells impacted by volatiles were also analyzed for TCL PCB/pesticides. Data from the 5/93 event will be validated, as the data from the 10/93 event will not be available in time to be validated in order to meet the QAPTM due date in December. These analyses were completed by Southwest Laboratory of Oklahoma.

E. A new deep residential well installed for the Shultz home in April, 1992 was found to be contaminated by PCE and DCE and was retained in the monitoring program as deep well. Volatile organic data from this well will be validated to verify the presence of PCE and DCE. Analyses of samples from this well were completed by Swanson Environmental.

5.2.3 Leachate

Holding tank leachate has been collected and analyzed for TCLP organics (VOA, semivolatiles, pesticides, herbicides) and metals since 1991. Data from the most recent event in October, 1993 will be validated to determine the data quality supporting the classification of the leachate as nonhazardous. Additionally, leachate is sampled quarterly in accordance with WDNR requirements and analyzed by the treatment plant for BOD, TSS, and TKN. Metals, pH, CN, hexavalent chromium, and oil and grease are also quarterly analytes. As this data is not consequential to the RI, it will not be validated. Midstates and Enviroscan have completed the analyses on the leachate samples.

5.2.4 Waste

During the installation of gas/leachate wells, samples from the borings were tested for EP toxicity, TCLP organics (VOA, semivolatiles, pesticides, herbicides), TCLP metals: As, Ba, Cd, Cr, Pb, Hg, Se, Ag in October, 1989. In October, 1990, during additional installation, TCLP analysis was conducted. Data from this 1990 event will not be validated because the supporting documentation from the laboratory is not readily available; however, this information will be used to define the landfill waste source. Analysis of the four waste samples was completed by Warzyn and Warzyn's subcontractors.

5.2.5 Landfill Gas

Landfill gas has been collected and analyzed for the purposes of assessment of methane migration in nearby homes, flare design, destruction efficiency, and compliance with WDNR NR445. As this data is not quantitative due to the lack of accurate data on actual gas volumes collected, and is not associated with the ground-water remediation activity, it will not be validated.

5.2.6 Surface Water

Surface water samples were collected from Black Earth Creek in 1989 for volatile organic analysis. As the quality of the ground water collected from the closest wells to the creek is essentially equivalent to the surface water, the surface water data will not be validated. The ground-water data will be validated as described above.

5.2.7 Validation Approach/Rationale

Simon Hydro-Search's approach to validation of ground-water data will concentrate on the most recent data which is easiest to retroactively pull together data packages. Backup laboratory raw data prior to 1992 has been requested in writing from the laboratories involved, but not given a priority for review. Since the laboratories can assemble these data packages with a minimum of cost, one event from each year (1989-1991) will be validated.

The information required from the laboratories includes, but is not limited to documentation of holding times, instrument calibration, internal standards performance, field and matrix spike/matrix spike duplicate analysis, and compound quantitation and reported detection limits. This information will be submitted to the US EPA's Central Regional Laboratory (CRL) where 10% of the data package from each sampling event will be reviewed pursuant to established US EPA data assessment/validation protocols. The validation itself for those analyses not covered by existing National Data Validation Guidelines (Method 8021) has been clarified and discussed with the EPA CRL reviewers prior to initiation of the data package assembly to ensure that the approach and documentation proposed by Simon Hydro-Search's subcontractor is consistent with U.S. EPA's needs. CRL's data review will determine the useability of the data for its intended purpose and identify any qualifications or limitations that must be considered.

Our assumptions for this task include:

- Warzyn and Swanson can assemble full data packages for less than $1,000 each.
- On-site conference at Swanson covers both private well and monitoring well data review.
- Deliverable to WDNR consists of a data validation memorandum for each laboratory.
- Laboratories other than Swanson and Warzyn do not required on-site conference.
- CRL has one round of comments on Technical Memorandum necessitating revision.

5.2.8 Existing Data Use Objectives

All existing groundwater characterization information validated under this task is intended to be used by Simon Hydro-Search for the following objectives:

- Determination of the extent of contamination in the bedrock and sand and gravel units near the site.
- Identify potential preferential contaminant flow paths.
- Determining possible remedial options.

5.3 Task 4: Community Relations (WDNR Activity)

5.3.1 Community Relations Plan

The WDNR will prepare, for review by U.S. EPA, a community relations plan (CRP) for this site from available background information which also includes interviews with residents and public officials in the community. This RI/FS community relations plan will incorporate and utilize information gathered from community relations activities conducted by the WDNR since 1989. The plan will include:

1. A site description and area map.

2. Site history.

3. Key community concerns and level of interest.

4. Schedule of community relation activities for the site.

Dates for plan development will be determined.

5.3.2 Community Relations

The WDNR will provide the personnel, services, materials, and equipment to undertake a community relations program. This program will be integrated closely with all remedial response activities to ensure community understanding of actions being taken and to obtain community input on RI/FS progress. Community relations support provided by the WDNR will include, but may not be limited to, the following:

1. Revisions or additions to the community relations plan, including definitions of community relations program needs for each remedial activity.

2. Establishment of a community information repository(s), one of which will house a copy of the administrative record.

3. Preparation and dissemination of news releases, fact sheets, slide shows, exhibits, and other audio-visual materials designed to apprise the community of current or proposed activities.

4. Mailing list that includes nearby and interested residents, public interest groups and elected officials.

5. Arrangements of briefings, press conferences, workshops, and public and other informal meetings.

6. Analysis of community attitudes toward the proposed actions.

7. Assessment of the successes and failures of the community relations program to date.

Deliverables and the schedule for submittal will be identified in the community relations plan discussed above.

As part of this community relations effort, Simon Hydro-Search will attend three public meetings to assist the WDNR.

5.4 Task 5: Data Evaluation

Simon Hydro-Search will analyze all existing site investigation data and present the results of the analyses in an organized and logical manner so that the relationships between site investigation results for each medium are apparent. Simon Hydro-Search will prepare a summary that describes: 1) the quantities and concentrations of specific chemicals at the site and the ambient levels surrounding the site; 2) the number, locations, and types of nearby populations and activities and, 3) the potential transport mechanism and the expected fate of the contaminant in the environment.

This evaluation will include a summary of all prior work performed at the site and how each medium of concern has been investigated and/or controlled, including:

a. ingestion, inhalation, and direct dermal contact with waste,

b. ingestion, inhalation, and direct dermal contact with landfill gas,

c. surface water runoff, erosion and impacts on nearby surface waters and wetlands,

d. leachate contamination and control,

e. groundwater contamination

Previously implemented controls including the landfill cover, the leachate extraction system, the landfill gas extraction system, and the private well point of entry treatment systems will also be evaluated.

<u>5.5 Task 6: Qualitative Risk Assessment</u>

Simon Hydro-Search will conduct a qualitative risk assessment to assess the potential human health and environmental threats posed by the site, and in conjunction with chemical specific ARARs, determine the need for remedial action. The elements of the qualitative risk assessment will include:

A. <u>Contaminant Identification and Concentration</u>. Simon Hydro-Search will review available information on the hazardous substances, pollutants, and contaminants present at the site and identify the major pathways, contaminants of concern, their concentration and their hazardous properties that may pose a risk through the various routes of exposure. Contaminants of concern will be selected based on their intrinsic toxicological properties because they are present in large quantities (volume of the source), and/or because they are currently in, or potentially may migrate into, critical exposure pathways (e.g., drinking water; exposure pathways).

B. Exposure Assessment. Simon Hydro-Search will identify pathways that are an obvious threat to human health or the environment by comparing contaminant levels for contaminants of concern to standards that are potential chemical-specific applicable or relevant and appropriate requirements (ARARs) for the action.

C. Toxicity Assessment. Simon Hydro-Search will evaluate whether the contaminants of concern are carcinogenic or have other toxicity effects and evaluate the long and short term health effects associated with exposure.

D. Risk Characterization. Simon Hydro-Search will assess information developed on the contaminants of concern and exposure assessment to qualitatively evaluate and characterize the current and potential risk to human health and/or the environment. This characterization will identify how prior remedies have reduced/eliminated exposure pathways and the need for remedial action to address chemical-specific ARARs in specific media.

The risk assessment will be submitted to WDNR as part of the RI report.

5.6 Task 7: Treatability Studies

In consultation with the WDNR and the U.S. EPA, Simon Hydro-Search will determine the need to conduct any necessary bench and pilot scale testing required to evaluate the effectiveness of remedial technologies and establish engineering criteria. Simon Hydro-Search will submit a separate work plan for any proposed work under this task to the WDNR and the U.S. EPA for review and approval. No treatability studies are anticipated at this time.

If required, this task involves identification of those data requirements which are not already available and which are specific to the Remedial Alternatives identified for detailed analysis in Task 9. These additional data needs may involve collection of additional site characterization data, supplemental remedial investigations, or treatability studies to better evaluate technology performance at the site. All treatability studies and the technical memoranda documenting them will be performed in compliance with the National Contingency Plan (NCP) and relevant U.S. EPA and WDNR guidance. Activities necessary to accomplish this task are:

Determination of Data Requirements,
Bench/Pilot Testing Studies, and
Treatability Testing.

The results of bench/pilot testing and treatability studies will be incorporated into a technical memorandum.

5.6.1 Determination of Data Requirements

Additional data needs will be identified by conducting a literature survey which will be more focused than the survey originally conducted when potential technologies were initially being identified. The objectives of a literature survey will be as follows:

- ♦ Determine whether the performance of those technologies under consideration have been sufficiently documented on similar wastes considering the scale and the number of times the technologies have been used;
- ♦ Gather information on relative costs, applicability, removal efficiencies, O&M requirements, and implementability of the candidate technologies;

- Determine testing requirements for bench or pilot studies, if required.

5.6.2 Bench/Pilot Testing Studies

As necessary, bench and/or pilot scale testing studies will be performed to determine the feasibility of remedial technologies to site specific conditions. The studies may include treatability and cover studies, aquifer testing, and/or material compatibility testing. It is anticipated that if these studies are required, the studies would be conducted in the later stages of the RI or preferably during the RD/RA. If required, supplements to the appropriate project plans (i.e., SAP, QAPjP) will be prepared and submitted to WDNR for review and approval prior to initiation of this activity.

5.6.3 Treatability Studies

Treatability testing may be used to adequately evaluate a specific technology, including evaluating short and long term effectiveness, determining process sizing, and estimating costs in sufficient detail to support the remedy-selection process. Bench-scale or pilot-scale techniques may be utilized, but, in general, the treatability studies will include the following steps:

- Preparing a work plan (or modifying the existing RI/FS work plan) for the bench or pilot studies;

- Performing field sampling, and/or bench testing, and/or pilot testing;

- Evaluating data from field studies, and/or bench testing, and/or pilot testing;

- Preparing a brief report documenting the results of the testing.

5.7 Task 8: Remedial Investigation Report

Simon Hydro-Search will prepare a Draft Remedial Investigation Report using the "Ground-Water Monitoring Study, Refuse Hideaway Landfill, Dane County, WI" dated June 24, 1991 as a basis for the RI. The format for the RI report will generally follow the October 1988 U. S. EPA RI/FS guidance document. Information on source control (including the landfill cap, erosion control, gas/leachate extraction and treatment), surface water/groundwater interaction, private water supply testing and treatment, and groundwater sampling and analysis performed subsequent to the report will all be included in the Draft RI. The RI will contain a thorough analysis and summary of all site investigations and results.

A summary will be prepared that describes: 1) the quantities and concentrations of specific contaminants at the site and the ambient levels surrounding the site; 2) the number, locations, and types of nearby populations and activities and, 3) the potential transport mechanism and the expected fate of the contaminant in the environment. This summary will also include how each medium of concern has been investigated and/or controlled.

The objective of this task will be to ensure that the investigation data are sufficient in quality and quantity to meet the goals of the RI and support the FS. The Draft Remedial Investigation Report will be presented to the WDNR and U.S. EPA for review and approval. WDNR and U.S. EPA comments on the draft will be addressed in the final document to be prepared by Simon Hydro-Search and submitted to the U. S. EPA and the WDNR.

Support data, information, and calculations will be included in appendixes to the report.

6.0 FEASIBILITY STUDY

6.1 Overview

The purpose of the Feasibility Study (FS) for the Refuse Hideaway Landfill is to develop and evaluate alternative remedial actions, based upon the results of the RI, that will mitigate impacts to human health and welfare and the environment, and present the relevant information needed to allow for the selection of a site remedy which will be protective of human health and welfare and the environment.

The FS will conform with state laws, CERCLA, as amended, the NCP as amended, and the RI/FS Guidance. The FS is comprised of the following tasks:

Task 9:	Remedial Alternatives Development and Screening
Task 10:	Ground-Water Modeling
Task 11:	Detailed Analysis of Alternatives
Task 12:	Feasibility Study Report

6.2 Task 9: Remedial Alternatives Development and Screening

Simon Hydro-Search will develop a range of distinct, hazardous waste management alternatives that will remediate or control contaminated ground water remaining at the site, as deemed necessary in the RI, to provide adequate protection of human health and the environment. The potential alternatives shall encompass, as appropriate, a range of alternatives in which treatment is used to reduce the toxicity, mobility, or volume of wastes but vary in the degree to which long-term management of residuals or untreated waste is required, one or more alternatives involving containment with little or no treatment; and a no-action alternative. A limited number of remedial alternatives will be developed which attain site-specific remediation levels within different restoration time periods utilizing one or more different technologies. Alternatives that involve minimal efforts to reduce potential exposures (e.g., site fencing, deed restrictions) shall be presented as "limited action" alternatives. Two meetings with the WDNR at the WDNR office in Madison are planned to discuss the proposed alternatives.

The following sections detail the steps that will be followed to determine an appropriate range of alternatives for this site.

6.2.1 Establish Remedial Action Objectives and General Response Actions

Based on existing information, site-specific remedial action objectives to protect human health and the environment shall be developed. The objectives shall specify the contaminant(s) and media of concern, the exposure route(s) and receptor(s), and an acceptable contaminant level or range of levels for each exposure route (i.e., preliminary remediation goals).

Preliminary remediation goals shall be established based on readily available information (e.g., RFDs) or chemical-specific ARARs (e.g., MCLs). Simon Hydro-Search will meet with WDNR to discuss the remedial action objectives for the site.

General response actions shall be developed for each medium of interest defining contaminant, treatment, excavation, pumping, or other actions, singly or in combination to satisfy remedial action objectives. Volumes or areas of media to which general response actions may apply shall be identified, taking into account requirements for protectiveness as identified in the remedial action objectives and the chemical and physical characteristics of the site.

6.2.2 Identify and Screen Technologies

Based on the developed general response actions, hazardous waste treatment technologies shall be identified and screened to ensure that only those technologies applicable to the contaminants present, their physical matrix, and other site characteristics will be considered. This screening shall be based primarily on a technology's ability to effectively address the contaminants at the site, but shall also take into account a technology's implementability and cost.

Simon Hydro-Search will select representative process options, as appropriate, to carry forward into alternative development. Simon Hydro-Search will identify the need for treatability testing (as described under Task 7) for those technologies that are probable candidates for consideration during the detailed analysis.

Based upon preliminary discussion with the WDNR, the following alternatives will be evaluated under this contract.

- No Action - This will serve as the baseline to which other alternatives will be compared.

- Limited Action - Minimal efforts to reduce potential exposures such as site fencing and deed restrictions.

- Cover Alternatives - The existing cover on the RHL complies with NR504 rules. An alternative which will be considered is to provide a partial geosynthetic cover over the plateau portion of the landfill. This alternative will be evaluated using the HELP Model (See Subtask 9.1).

- Alternative Water Supplies - In December, 1989, Warzyn Engineering, Inc. evaluated Alternative Water Supply options for the RHL. The report evaluated several alternatives, and recommended installing a community well off-site to provide water to the Swanson, Schultz and Stoppleworth residences. This report will be used as a starting point for evaluating options for water supply replacement. Other options to be considered include deepening wells, providing individual treatment units, and providing bottled water.

- Pump and Treat Alternative - An alternative of pumping and treating ground water, including alternatives that attain site-specified remediation goals within different restoration periods, will be included for evaluation. The major limitation to this alternative that has been identified is where the treated ground water can be discharged.

The technical aspects of this alternative will be developed in "Task 10. Ground-Water Modeling."

- In-Situ Alternatives - Three in-situ alternatives will be considered for evaluation: air sparging with vapor collection, bioremediation, and providing a hydraulic barrier with a grout/slurry wall. The latter alternative will also be considered in conjunction with ground water pumping and treatment.

6.2.3 Configure and Screen Alternatives.

The potential technologies and process options shall be combined into media-specific or site-wide alternatives. The developed alternatives shall be defined with respect to size and configuration of the representative process options; time for remediation; rates of flow or treatment; spatial requirements; distances for disposal; and required permits, imposed limitations, and other factors necessary to evaluate the alternatives.

If many distinct, viable, options are available and developed, a screening of alternatives shall be conducted to limit the number of alternatives that undergo the detailed analysis and to provide consideration of the most promising process options. The alternatives shall be screened on a general basis with respect to their effectiveness, implementability, and cost. Simon Hydro-Search will meet with WDNR to discuss which alternatives will be evaluated in the detailed analysis and to facilitate the identification of action-specific ARARs.

The following considerations must be used as a basis for the initial screening:

1. Environmental Protection. Only those alternatives that satisfy the response objectives, that effectively minimize or mitigate actual or potential harm to public health, welfare, or the environment and that are in compliance with federal, state

or local environmental and health statutes (ARARs) shall be considered further. Source control alternatives shall achieve adequate control of source materials. Off-site alternatives shall minimize or mitigate the threat of harm to public health, welfare, and the environment.

2. Environmental Effects. Alternatives posing significant adverse environmental effects will be excluded.

3. Costs. Total costs include the cost of implementing the alternative and the cost of operation and maintenance. The cost of operation and maintenance shall be computed on a present worth basis for a 30 year period.

4. Implementability and Reliability. Alternatives that may prove extremely difficult to implement, will not achieve the remedial objectives in a reasonable time period, or rely on unproven technologies shall be eliminated.

6.2.4 Subtask 9.1 HELP Modeling

The objectives for model evaluation of the RHL cap are the following:

- evaluate the amount of average annual leachate production from the present RHL cap design; and

- evaluate the average annual leachate reduction from a proposed composite cap consisting of soil and a synthetic membrane emplaced over the top portion of the RHL cap.

The Hydrologic Evaluation of Landfill Performance (HELP) computer program (Schroeder et.al, 1993) will be used to evaluate RHL leachate production. HELP is a quasi-two-dimensional, deterministic, hydrologic model of water movement across, into, through, and out of landfills. The model is a widely-used and recognized program which provides rapid estimates of surface runoff, subsurface drainage, and leachate production that could be expected for a particular landfill cover design. The model accepts weather, soil, and design data, and utilizes solution techniques to simulate surface storage, runoff, infiltration, percolation, evapotranspiration, soil moisture storage, and lateral drainage. Landfill systems, including various combinations of vegetation, cover soils, waste cells, special drainage layers and impermeable barrier soils, drainage nets, and synthetic membrane liners, may be modeled.

The HELP model requires climatologic data, soil characteristics, and landfill cap design specifications to perform the analysis. Default data in HELP for Madison, Wisconsin will be used for climatologic input.

Soil characteristics used by HELP include porosity, field capacity, wilting point, hydraulic conductivity, water transmissivity, evaporation coefficient, and Soil Conservation Service runoff curve number. Where site-specific estimates are not available, soil characteristic values will be based on HELP default parameters. The model stores default soil characteristics for 21 soil types.

Design specifications consist of the number of layers and their descriptions including type, thickness, slope, and maximum lateral distance to a drain, if applicable, and whether synthetic membranes are to be used in the cover and/or liner. The existing landfill design, with and without the proposed composite cap, a synthetic membrane in the cover, will be modeled in HELP.

The HELP model will be used to estimate the daily water movement on the surface and through the landfill for both the existing design and for a proposed design that includes a synthetic liner near the top of the cover. Average annual leachate production for both design scenarios will be estimated and compared. The effects of aging of the landfill cap over time will not be modeled.

Simon Hydro-Search's report will provide full documentation of project modeling methodology. This will include descriptions of the modeling code, landfill conceptual designs, input data, and model results. The report's conclusions will state Simon Hydro-Search's assessment of leachate reduction from the proposed cap over the top of the RHL cover.

6.3 Task 10: Ground-Water Modeling

To support the evaluation of alternatives in the Feasibility Study, Simon Hydro-Search will develop a numerical ground-water flow model of the RHL site. The objectives for the modeling are the following:

- Simulate the in-field geologic and hydraulic conditions;
- Evaluate the number of, locations of, pumping rates of, and volume of water generated from wells along the western and southern RHL boundaries to effectively capture the most contaminated ground water near the landfill;
- If appropriate, evaluate the hydraulic effects of injection wells upgradient of the RHL to investigate bioremediation treatment options;
- If appropriate, evaluate the hydraulic effects of infiltration galleries in areas surrounding the RHL to investigate reinfiltration options for treated ground water, and in-situ treatment of the aquifer;
- Evaluate well field capture zones in relation to the most contaminated ground water near the landfill; and
- Prepare a concise report documenting all modeling methods and results.

6.3.1 Numerical Model Selection

Simon Hydro-Search proposes to use the U. S. Geological Survey's (USGS) modular MODFLOW code (McDonald and Harbaugh, 1988) to perform numerical flow modeling.

MODFLOW is currently the most widely-used numerical model in the USGS for ground-water flow studies. The design and creation of the finite difference model grid and data input files will also be facilitated by the use of an interactive graphical interface, MODELCAD (Geraghty and Miller, 1993).

If the available data for the site are sufficient to accurately and uniquely estimate flow parameters, the use of MODFLOWP (Hill, 1992) may be appropriate. MODFLOWP is the parameter estimation version of MODFLOW. Flow parameters are estimated using nonlinear regression which produces the best match between simulated and observed hydraulic heads and flows.

Simon Hydro-Search also proposes to use the particle tracking model PATH3D (Zheng, 1991) for capture zone analysis. The PATH3D code calculates ground-water flow paths and travel times in two or three-dimensional, steady or transient flow fields in the presence of wells, rivers, or drains. The particle tracking model uses a velocity interpolator consistent with the USGS MODFLOW model, to which PATH3D is linked for the head solution. The model is also implemented with an automatic step-size adjustment procedure which makes it possible to achieve a predetermined accuracy with a minimum of computational effort.

6.3.2 Ground-Water Flow Model Protocol

Simon Hydro-Search proposes a work plan consisting of five tasks for the development and utilization of a viable ground-water flow model to accurately simulate hydraulic conditions and remedial scenarios at the RHL. These six tasks are:

- Subtask 10.1: Development of the Conceptual Model
- Subtask 10.2: Model Design
- Subtask 10.3: Flow Calibration and Sensitivity Analyses
- Subtask 10.4: Well Field and Remedial Design Simulations
- Subtask 10.5: Capture Zone Simulations
- Subtask 10.6: Interpretation and Report Preparation

A brief description of each Subtask follows. In most cases, standard modeling procedures will be followed, such as those presently under development by the American Society for Testing and Materials (1991), to ensure scientifically sound methods in model development and application, and quality assurance in modeling results.

6.3.2.1 Subtask 10.1 Development of the Conceptual Model

The most important part of any modeling study is having an accurate mental perception and working description of the physical hydrogeologic system. Conceptualization involves identifying and describing important aspects of the physical system, including the hydraulic properties and behavior of all relevant geologic formations, sources and sinks (water budget), and hydrologic boundaries surrounding the model area.

The purpose of the conceptual model is to assemble field data related to hydrostratigraphic units and system boundaries, including information on the water balance and hydrologic stresses, into a set of assumptions and concepts that can be evaluated quantitatively. Simon Hydro-Search's involvement in performing hydrogeologic characterization studies at the Refuse Hideaway Landfill over the past three years makes us extremely confident in our ability to provide a detailed and accurate conceptualization of the site.

6.3.2.2 Subtask 10.2 Model Design

Model design is the process of transforming the conceptual model into a mathematical form suitable for modeling. This process involves the construction of the model grid, boundary and initial conditions, physical and temporal dimensionality, and the initial selection of aquifer parameters and hydrologic stresses. Simon Hydro-Search's hands-on experience at the site will assure that the model design will be an accurate representation of the actual site hydrogeological conditions, and not merely a transfer of site information into the computer model grid.

To aid and speed the design and construction of the model grid and data sets, a flexible, graphical interface, MODELCAD (Geraghty and Miller, 1993) will be used. MODELCAD also performs extensive error-checking of model input during interactive design because input is visually inspected before translated into the model-specific format.

Where appropriate, Simon Hydro-Search proposes to use SURFER (Golden Software, 1990) and kriging to generate input values for the flow model because the interpolation method is an efficient means (compared to hand-digitizing) of producing realistic contours from well, borehole, and other data. Validation of the kriged data will be performed using graphical display methods (contour maps). The maps will also be used to evaluate general trends, to characterize the site hydrogeology, and to document input data for the flow model. Once validated, kriged and observed values can be easily entered into MODELCAD for translation into the model-specific data format.

The unique, almost horst and graben type of geologic structure that is present in the ridge and valley topography surrounding the RHL does not exactly conform to a horizontal layer design that many models are constructed around. Therefore, the preliminary modeling approach to the ground-water flow problem will be as a three-dimensional, six-layer system with the spatial distribution of valley sand and gravel deposits and sandstone/dolomite bedrock represented by spatially-variable horizontal values of hydraulic conductivity in the model input arrays. Four 25-foot thick layers will be simulated above one 100-foot layer and one 200-foot thick bottom layer. All layer hydrogeologic properties input to the model will represent sandstone/dolomite bedrock except where valley sand and gravel deposits are present. Bedrock will be treated as a continuum porous medium due to the highly fractured character of rock units on site and the similarities in average measured hydraulic conductivity between sand and gravel deposits and dolomite/sandstone units. The thinner layers proposed at the top of the model are designed to facilitate the supply of water to the lower layers and account for vertical hydraulic gradients, although no significant upward or downward vertical gradients have been observed between bedrock units underlying unconsolidated sediments and the sand and gravel deposits themselves. More layers will also help in the design of the well field by allowing pumping depths to be lowered or raised to adjacent layers. Finally, the additional model layers will provide greater resolution for the head solution in the upper 100 feet of aquifer so that greater resolution in particle tracking in the vertical direction can be made (more ground-water flow velocities calculated).

Preliminary model development plans for the RHL site include a grid design covering a total area of approximately 12 square miles to keep model boundaries from affecting any solution and to incorporate ground-water divides that are present to the northeast and southeast. Analytical evaluation and/or early model results may indicate this grid size can be reduced for subsequent model runs. Grid refinement over the landfill area of interest will include 50-foot square node cells. The model grid axes will be aligned with the principle flow direction near the landfill (southwest). As no ground-water fluxes moving across the proposed model boundary areas are known, specified heads will be simulated for the northeast and southeast ground-water divide model boundaries. The bottom boundary will be a no-flow boundary. Specified head boundaries will be changed to specified flux boundaries during transient pumping simulations to represent more realistic conditions.

Pumping and, if appropriate, injection wells will be simulated in the top layer using MODFLOW's Well Package. Infiltration galleries, if appropriate, will be simulated in the top layer with either MODFLOW's Recharge or River Package (depending on gallery locations).

6.3.2.3 Subtask 10.3 Flow Calibration and Sensitivity Analyses

Initial runs of the flow model will be carefully checked to verify that input data are correctly interpreted by the model. Simon Hydro-Search will then calibrate the model to steady-state with 1991 hydraulic head measurements (the most recent data believed to be representative of long-term conditions) before using the model in a predictive capacity. A transient calibration would require information on the change in heads or flux along the model's boundaries. This information that is most likely unavailable or unknown.

The objective of flow calibration will be to predominantly adjust recharge, the permeability of geologic units, and boundary conditions within reasonable observed/published ranges such that predicted hydraulic heads are in approximate agreement with measured field data. The calibration process also allows considerably more information to be extracted from available data (e.g. matching predicted to observed heads provides bounds for permeabilities in areas not measured). A true verification of the model is not possible with present-day data, however, as no ground-water flux or aquifer test measurements for the study site are available. Future maturing of the model would be possible if information related to the above is acquired.

If MODFLOWP is used, the model would be utilized specifically to evaluate what hydrogeologic parameters or areas of the model are most sensitive to change. This type of information could significantly shorten the time required for flow model calibration.

Sensitivity analyses will play a key role in the calibration process by identifying those parameters that are most important to model performance, and in establishing the level of uncertainty or confidence in the calibrated model. Sensitivity analyses will be performed during model calibration and during predictive runs. Parameters found to be sensitive should be well characterized by field measurements. Model results for sensitive parameters will be presented for a reasonable range of values.

6.3.2.4 Subtask 10.4 Well Field and Remedial Design Simulations

The calibrated flow model will be used to predict the hydraulic effects of a well field simulated along the western and southern boundaries of the RHL, and to evaluate the number, location, and pumping rates of the wells. An estimate will also be made of the volume of water produced from pumping to aid in any decisions made regarding disposal options such as to Black Earth Creek. The radii of influence of the well field will be designed so that only the areas of highest contaminated ground water around the landfill will be remediated. No movement or change in solute concentration in ground water will be modeled. Furthermore, the proposed scope of modeling and remedial design is based on a no action approach for cleaning up the leading edge of the contaminant plume. A previous modeling study conducted by Simon Hydro-Search (1992) predicted that, under assumptions believed to be reasonable and representative of site conditions, the plume would reach an equilibrium state after approximately five years from the January 1991 plume observance due to dispersion, dilution, and degradation processes within the bedrock valley sand and gravel deposits immediately northeast of the Deer Run Subdivision. An increase in the plume front's solute concentration was also predicted to have negligible effects on plume shape or travel rate.

If appropriate, the feasibility of bioremediation will also be evaluated hydraulically by the simulation of injection wells upgradient of the RHL which would, if constructed, pump treated ground water into the aquifer. Mounding, well field drawdown, and water balance (pumping out = pumping in) effects will be investigated with these injection wells.

Finally, and if appropriate, a model evaluation of the effects of infiltration galleries will be performed to investigate disposal options for pumped and treated ground water.

6.3.2.5 Subtask 10.5 Capture Zone Simulations

The calibrated flow model solutions for various well field designs will be coupled to PATH3D for particle tracking and capture zone analysis. The final well field design will be optimized to produce the minimum quantity of water while maintaining hydraulic control of the most contaminated ground water near the landfill. Limitations on surface access may affect the well field design, however, which could prevent a truly optimal solution from being realized.

6.3.2.6 Subtask 10.6 Interpretation and Report Preparation

Simon Hydro-Search's flow model report will provide full documentation of project modeling methodology. This will include description of the conceptual model, grid design, input data, and calibration procedures and results. Model results will be analyzed and interpreted by Simon Hydro-Search. The report's conclusions will include Simon Hydro-Search's well field design for remediating impacted ground water at the RHL and our assessment as to the effectiveness of the ground-water recovery system, and, if appropriate, injection wells and infiltration galleries. All final maps will be prepared and drafted with SURFER (Golden Software, 1990) and a computer-aided drafting program, AutoCad.

The proposed scope of the final report will include the following:

- Contour maps of observed and model-simulated hydraulic heads, including topographic features within and surrounding the study area;
- Contour maps of the study area's head and drawdown fields to show the effects of the simulated well field;
- Contour maps of injection well and infiltration gallery effects when appropriate;
- Contour maps of the well field's capture zones; and
- Documentation of all findings of the modeling effort.

It is estimated that the modeling study will require 15 weeks to complete.

6.4 Alternative Array Document

An Alternative Array Document will be developed, based on the results of Tasks 9 and 10 and the meeting with WDNR, and submitted to WDNR and U. S. EPA for review of state and federal ARARs.

6.5 Task 11: Detailed Analysis of Alternatives

Simon Hydro-Search will conduct a detailed analysis of alternatives which will consist of an individual analysis of each alternative against a set of evaluation criteria [as presented in the NCP 300.430(e)(9)] and a comparative analysis of all alternatives against the evaluation criteria with respect to one another.

The evaluation criteria are as follows:

1. Overall Protection of Human Health and the Environment addresses whether or not a remedy provides adequate protection and describes how risks posed through each pathway are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

2. Compliance with ARARs addresses whether or not a remedy will meet all of the applicable or relevant and appropriate requirements of other Federal and State environmental statutes and/or provide grounds for invoking a waiver.

3. Long-Term Effectiveness and Permanence refers to the ability of a remedy to maintain reliable protection of human health and the environment over time once cleanup goals have been met.

4. Reduction of Toxicity, Mobility, or Volume Through Treatment is the anticipated performance of the treatment technologies a remedy may employ.

5. Short-Term Effectiveness addresses the period of time needed to achieve protection and any adverse impacts on human health and the environment that may be posed during the construction and implementation period until cleanup goals are achieved.

6. Implementability is the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement a particular option.

7. Cost includes estimated capital and operation and maintenance costs, and net present worth costs.

8. U.S. EPA Acceptance (Support Agency) addresses the technical or administrative issues and concerns the support agency may have regarding each alternative. This criteria will be addressed in the ROD once comments on the RI/FS report and proposed plan have been received and will not be included in the RI/FS report.

9. Community Acceptance addresses the issues and concerns the public may have to each of the alternatives. This criteria will be addressed in the ROD once comments on the RI/FS report and proposed plan have been received and will not be included in the RI/FS report.

The individual analysis shall include: 1) a technical description of each alternative that outlines the waste management strategy involved and identifies the key ARARs associated with each alternative; and 2) a discussion that profiles the performance of that alternative with respect to each of the evaluation criteria. A table summarizing the results of this analysis shall be prepared. Once the individual analysis is complete, the alternatives shall be compared and contrasted to one another with respect to each of the evaluation criteria.

6.6 Task 12: Feasibility Study Report

Simon Hydro-Search will prepare a Feasibility Study Report based upon Tasks 9 and 10. Two meetings with the WDNR at the WDNR Madison office are planned during FS preparation and reporting. Support data, information, and calculations shall be included in appendixes to the report. The contractor shall prepare and submit five copies of the draft FS report to WDNR and U.S. EPA for review. Once comments on the draft FS have been received, Simon Hydro-Search will prepare a final FS report reflecting the comments. Copies of the final report shall be made and distributed to those individuals identified by WDNR.

Monthly contractor reporting requirements for the FS are the same as those specified for the RI under Task 2.

7.0 PROJECT ORGANIZATION AND PERSONNEL

7.1 Project Organization

A project organizational chart is presented in Figure 7-1 illustrating the organizations and personnel involved in conducting the RI/FS.

Wisconsin Department of Natural Resources (WDNR)

The WDNR is the lead agency and is responsible for providing oversight of the Contract. The WDNR project manager is Theresa Evanson. Her responsibilities encompass coordinating communications between WDNR and Simon Hydro-Search, and assuring contract compliance. WDNR is responsible for final review of all deliverables.

U.S. Environmental Protection Agency (U.S. EPA)

The U.S. EPA is the support agency and is responsible for oversight and support of WDNR activities. The U.S. EPA Remedial Project Manager (RPM) is Colleen Hart. Her responsibilities include coordination of WDNR activities to assure compliance with the Federal Superfund program. In addition, the U.S. EPA RPM is responsible for assisting in the review of the major project deliverables as requested by the WDNR.

Simon Hydro-Search

Simon Hydro-Search is the contractor for WDNR implementing the requirements of the Contract. The project manager for Simon Hydro-Search is Judy Fassbender. Ms. Fassbender is responsible for execution of the RI/FS in accordance with the work plan.

7.2 Simon Hydro-Search Project Team

Hydro-Search, Inc. (Simon Hydro-Search) has assigned specific responsibilities to each member of the Simon Hydro-Search project team. The technical/administrative functions of each team member are described below.

7.2.1 Project Manager

Ms. Judy Fassbender is the Simon Hydro-Search Project Manager. The Project Manager has primary responsibility for oversight of all activities scheduled to be performed during the RI/FS. Ms. Fassbender will provide technical direction to the project personnel, be responsible for assuring Simon Hydro-Search conformance to the contract requirements, and provide technical and financial control.

7.2.2 Project Director

Mr. Michael Noel will serve as the Project Director. The Project Director will provide team management and supervision on the project. The Project Director will also be responsible for assuring that proper corporate resources are balanced with the project requirements and provide peer review of the project deliverables. Input on project direction will be provided to the Simon Hydro-Search Project Manager.

7.2.3 Project Administrator

Mr. Dennis Behr will serve as the Project Administrator. The Project Administrator will provide support and coordination to the project manager to ensure management awareness to project budgets and schedule deadlines. The Project Administrator meets with the Project Manager at key financial milestones to determine the status of project progress versus expenditures and whether changes in the scope of work have occurred which require contact modifications and approvals. His evaluation of each project is reported directly to the Project Director.

7.2.4 Project Quality Assurance Manager

Mr. Dan Morgan will also serve as the RI/FS QA Manager. The RI/FS QA Manager is responsible for periodically auditing the tasks and responsibilities of subcontractors and other team members, and the Project Manager. The RI/FS QA Manager may conduct audits to assure that QA protocols are in conformance with the work plans. Peer review will be provided on project deliverables.

7.2.5 Project Health and Safety Officer

Mr. Steven E. Carlson, Simon Hydro-Search Director of Health Sciences, will serve as the Project Health and Safety Officer. Since no field work is planned, the project Health and Safety Officer's role will be minimal for this project.

7.2.6 Modeling Coordinator

Mr. David Nader will serve as the Modeling Coordinator. The Modeling Coordinator will be responsible for coordinating and executing all modeling activities, including data analysis evaluation and reporting related to the modeling aspects of the project. The Modeling Coordinator will also be responsible for preparing applicable sections of the RI and FS reports.

7.2.7 Feasibility Study Task Coordinator

Mr. Gerald DeMers will serve as the FS Task Coordinator. The FS Task Coordinator will assist the Simon Hydro-Search Project Manager in performing and coordinating the evaluation and screening of remedial action alternatives and preparing the FS Report. The FS Task Coordinator also provides peer review of project work plans and other project deliverables to assure that RI data being compiled and RI results encompass information needed to perform alternative screening and remedial design.

7.2.8 Remedial Design Task Coordinator

Mr. J. J. Rao, P.E. will serve as the Remedial Design (RD) Task Coordinator. The RD Task Coordinator will coordinate with the Project Manager and FS Task Coordinator on engineering design elements of the FS. He will assist in alternatives screening and evaluation during the FS on implementability, cost, and related criteria as well as assist in design of treatability studies/pilot testing tasks, if required.

7.2.9 Subcontractors

Various subcontractors will be utilized to support the RI/FS, as follows:

- Technical support - National Resources Technology
- Data validation and related assistance - M. A. Kuehl Company

8.0 PROJECT SCHEDULE

The proposed schedule for conducting the RI is presented in Figure 8-1. The schedule on Figure 8-1 indicates that the RI/FS commenced on September 13, 1993, the effective date of the Contract. For project planning purposes, completion of the QAPTM is anticipated in late December. Ground-water modeling and landfill cap (HELP) modeling are currently underway. Work on the other RI/FS tasks will begin following the WDNR approval of the work plan.

9.0 REFERENCES

American Society for Testing and Materials, August 19, 1991, Draft of Standard Guide for Application of a Ground-Water Flow Model to a Site-Specific Problem, ASTM Designation D18.21.91.19.

Geraghty and Miller, Inc., Modeling Group, 1993, MODELCAD, Version 2.0, Reston, Virginia.

Golden Software, 1990, Surfer, Version 4, Golden Colorado.

Hill, M., 1992, MODFLOWP: A Computer Program for Estimating Parameters of a Transient, Three-Dimensional Ground-Water Flow Model Using Nonlinear Regression, USGS, Open-File Report 91-484, 358 pp.

Hydro-Search, Inc., 1991, Ground-Water Monitoring Study at the Refuse Hideaway Landfill, Middleton, Wisconsin, June 14.

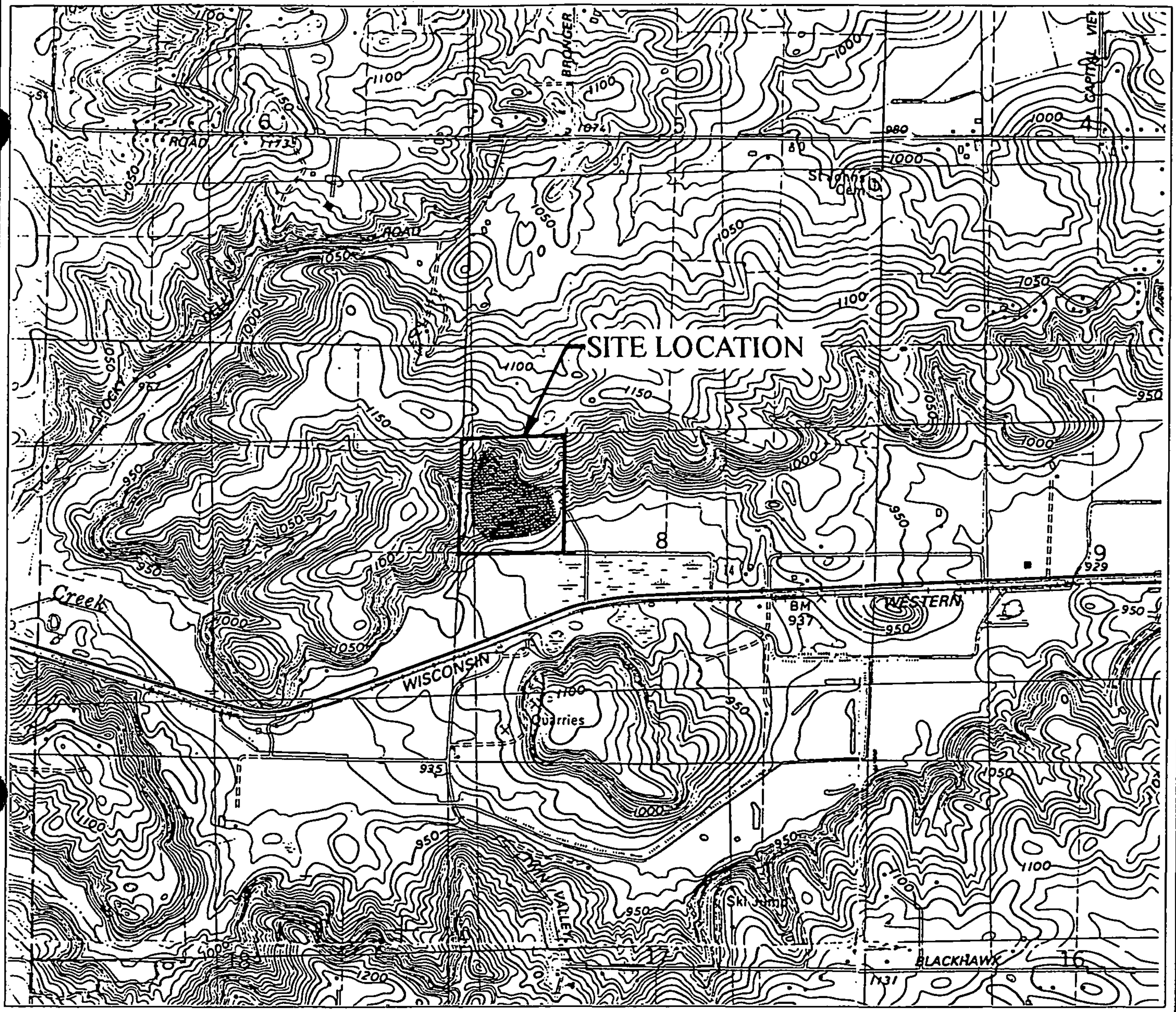
McDonald, M. G., and Harbaugh, A. W., 1988, A Modular Three-Dimensional Finite-Difference Ground-Water Flow Model: Techniques of Water Resources Investigations of the U. S. Geological Survey, Book 6, 586 pp.

Residuals Management Technology, Inc., January, 1988, In-Field Conditions Report for Refuse Hideaway Landfill, Middleton, Wisconsin.

Simon Hydro-Search, 1992, Numerical Model Simulation and Assessment of Contaminant Plume Migration, Refuse Hideaway Landfill, Middleton, Wisconsin, March 17.

U.S. EPA, 1988, Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA, United Stated Environmental Protection Agency, EPA/540/G-89/004, OSWER Directive 9355.3-01.

Zheng, C., 1991, PATH3D Version 3.0, A Ground-Water Path and Travel Time Simulator: S. S. Papadopulos and Associates, Inc., Rockville, Maryland.



QUADRANGLE LOCATION

SCALE

0 5000

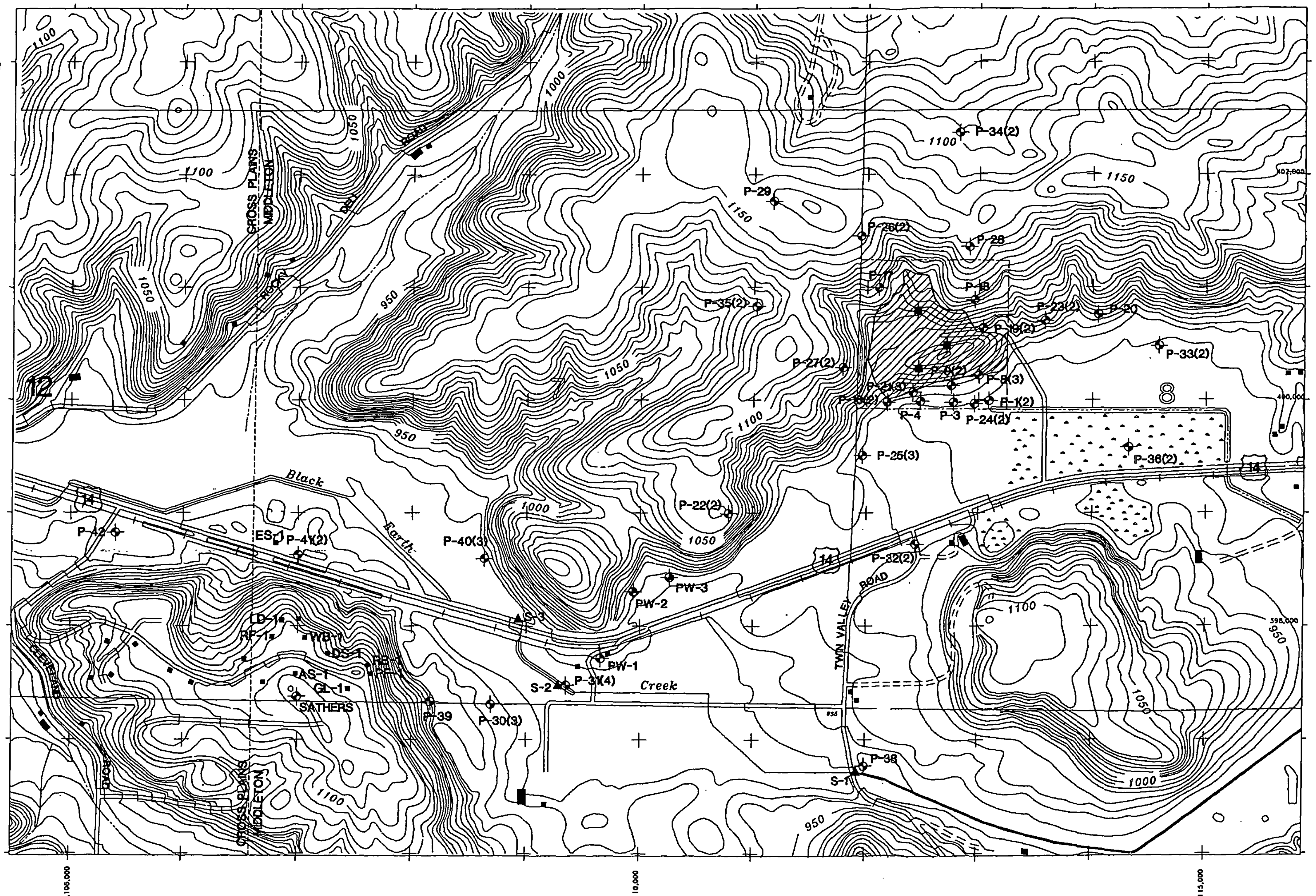
FEET

National Geodetic Vertical Datum of 1929
Contour Interval 10 Feet

N

Base map from U.S.G.S. 7.5' MIDDLETON, WI topographic quadrangle map, photorevised 1971.

SIMON HYDRO-SEARCH Brookfield Lakes Corporate Center XII 175 N. Corporate Drive, Suite 100 Brookfield, Wisconsin 53045	WI DEPT OF NATURAL RESOURCES REFUSE HIDEAWAY LANDFILL
Dsgn. by: ZAG / Chk. by: JJ7 / Apprv. by: DCN	SITE LOCATION and LOCAL TOPOGRAPHY
PROJECT: 301483135 / DATE: 12/02/93	DRAWING: 1367-4 / FIGURE: 2-1



EXPLANATION

- REFUSE HIDEAWAY LANDFILL PROPERTY BOUNDARY
- FILL LIMITS
- RESIDENCE
- P-19(2) MONITOR WELL LOCATION AND DESIGNATION (number of wells in nest)
- PW-1 PRIVATE WELL LOCATION AND DESIGNATION
- S-1 ▲ STREAM GAGE LOCATION AND DESIGNATION

N

SCALE

0 2000

Feet

SIMON HYDRO-SEARCH

Brookfield Lakes Corporate Center XII
175 N. Corporate Drive, Suite 100
Brookfield, Wisconsin 53045

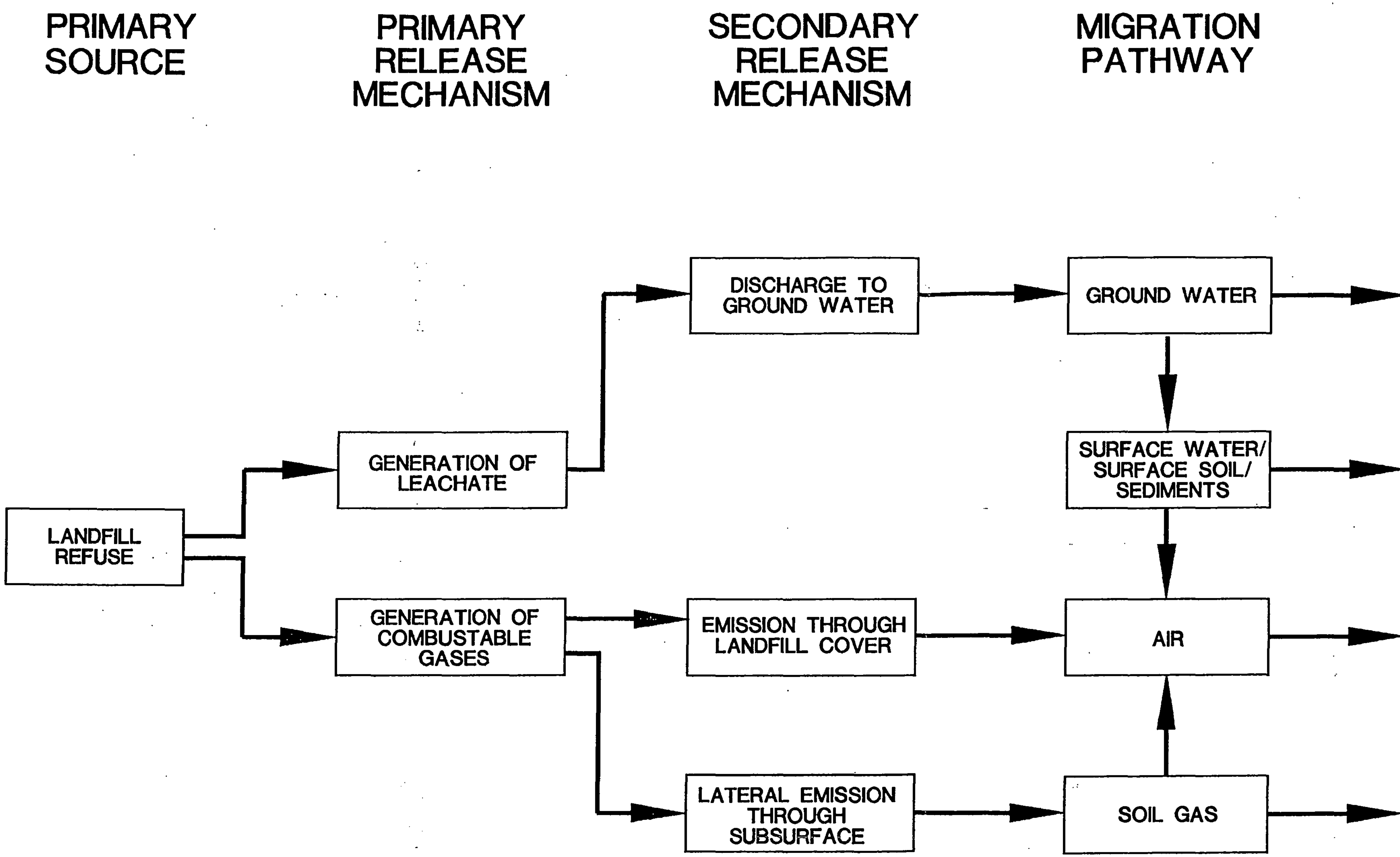
Dsgn. by: ZAG	Chk. by: [illegible]	Apprv. by: [illegible]
PROJECT: 301483135	DATE: 12/02/93	

REFUSE HIDEAWAY LANDFILL
MIDDLETON, WISCONSIN

EXISTING CONDITIONS

DRAWING: 3135-B2	FIGURE: 2-2

/hsi/148/3135/3135-b2



RECEPTOR

Ground water

EXPOSURE RATE	HUMAN: AREA RESIDENTS	HUMAN: SITE PERSONNEL	BIOTA: TERRESTRIAL	BIOTA: AQUATIC
INGESTION	●	●	NA	NA
INHALATION	●	●	NA	NA
DERMAL CONTACT	●	●	NA	NA

Surface water/surface soil/sediments

EXPOSURE RATE	HUMAN: AREA RESIDENTS	HUMAN: SITE PERSONNEL	BIOTA: TERRESTRIAL	BIOTA: AQUATIC
INGESTION	●	●	●	●
INHALATION	NA	●	●	NA
DERMAL CONTACT	●	●	●	●

Air

EXPOSURE RATE	HUMAN: AREA RESIDENTS	HUMAN: SITE PERSONNEL	BIOTA: TERRESTRIAL	BIOTA: AQUATIC
INGESTION	NA	NA	NA	NA
INHALATION	NA	●	●	NA
DERMAL CONTACT	NA	NA	NA	NA

Soil gas

EXPOSURE RATE	HUMAN: AREA RESIDENTS	HUMAN: SITE PERSONNEL	BIOTA: TERRESTRIAL	BIOTA: AQUATIC
INGESTION	NA	NA	NA	NA
INHALATION	NA	NA	NA	NA
DERMAL CONTACT	NA	NA	NA	NA

EXPLANATION

● — POSSIBLE EXPOSURE TO RECEPTORS

NA — NOT APPLICABLE

SIMON HYDRO-SEARCH
Brookfield Lakes Corporate Center XII
175 N. Corporate Drive, Suite 100
Brookfield, Wisconsin 53045

Dsgn. by: RAG | Chk. by: [illegible] | Apprv. by: DEN

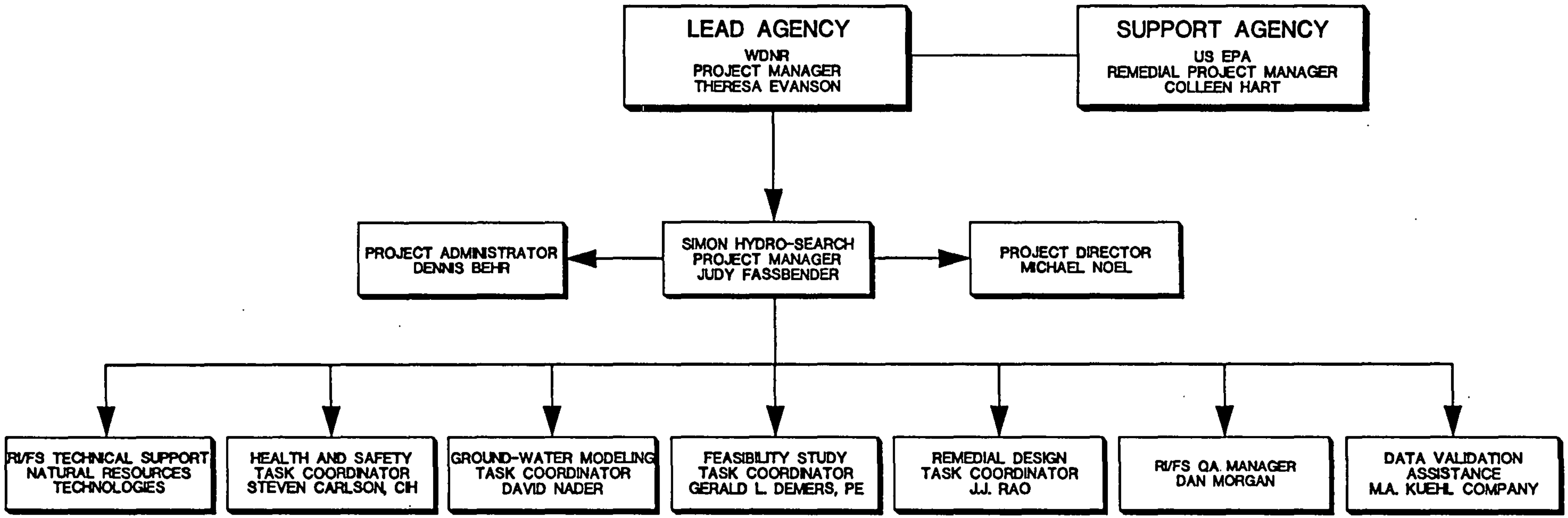
PROJECT: 301483135 | DATE: 12/02/93

REFUSE HIDEAWAY LANDFILL
MIDDLETON, WISCONSIN

CONCEPTUAL SITE MODEL

DRAWING: 3135-B1 | FIGURE: 3-1

/hsi/148/3135/3135-b1



SIMON HYDRO-SEARCH

Brookfield Lakes Corporate Center XII
175 N. Corporate Drive, Suite 100
Brookfield, Wisconsin 53045

REFUSE HIDEAWAY LANDFILL
MIDDLETON, WISCONSIN

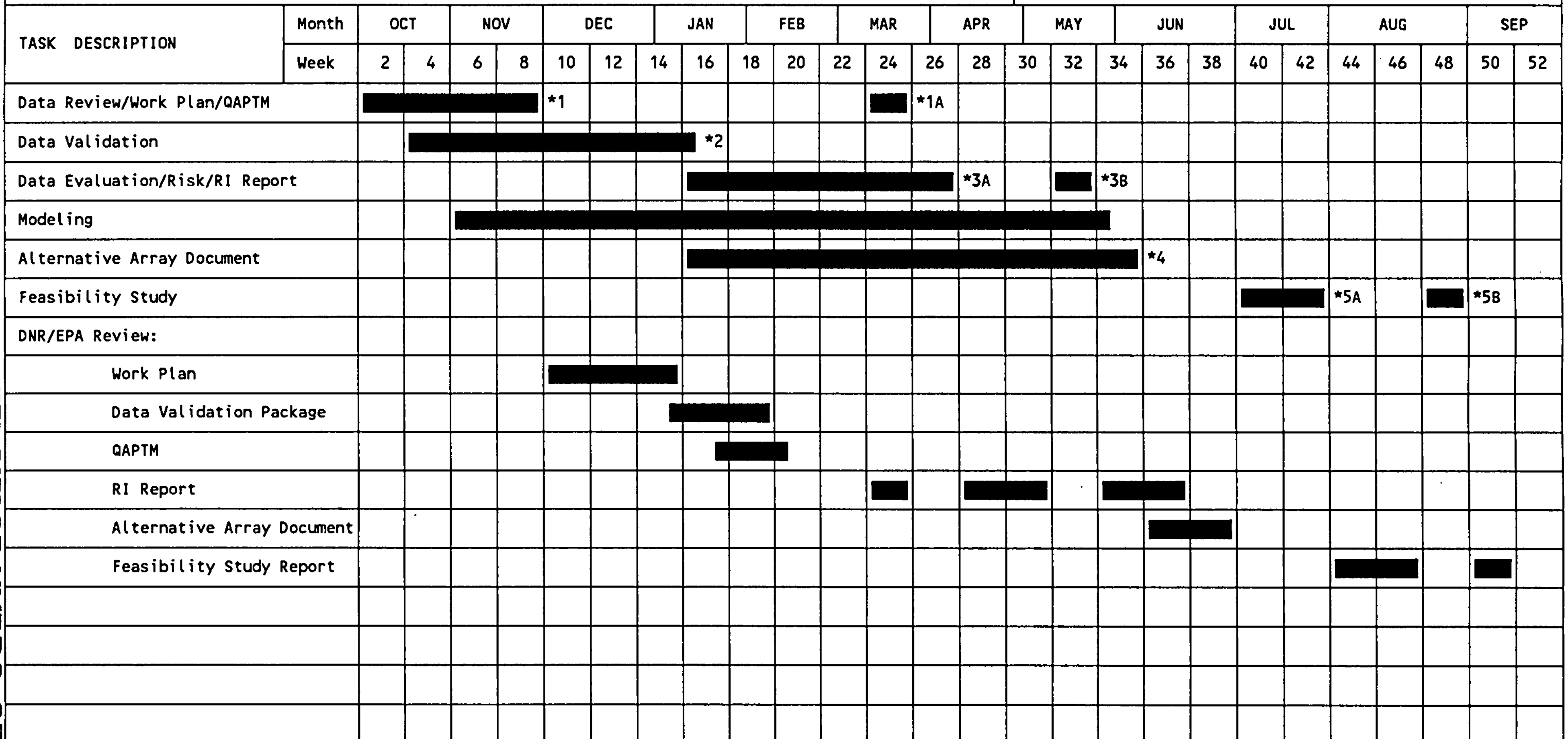
PROJECT ORGANIZATION AND PERSONNEL

Dsgn. by: RAG	Chk. by: [illegible]	Apprv. by: DCN
PROJECT: 301483135	DATE: 12/02/93	
DRAWING NO.: 3135-1	FIGURE: 7-1	

/hsi/148/flow-chart/3135-1

WORK SCHEDULE

PROJECT: Refuse Hideaway RI/FS
PREPARED BY: Simon Hydro-Search
PREPARED FOR: Wis. Dept. of Natural Resources



COMMENTS:
* = Deliverables
1 = Draft Work Plan (WP)
1A= Final Work Plan (WP)
2 = QAPTM (TM)
3A = Draft RI Report (RI) - April 7, 1994
3B = Final RI Report (RI) - May 26, 1994
4 = Alternative Array Document - June 9, 1994
5A = Draft Feasibility Study Report (FS) - July 28, 1994
5B = Final Feasibility Study Report (FS) - September 1, 1994

SIMON HYDRO-SEARCH

Figure 8-1

Table 2-1 Summary of Reports Pertaining to Refuse Hideaway Landfill Produced Under Contract for the WDNR

Report Date	Preparer	Report Title
November 1989	Warzyn	Health and Safety Plan, Interim Remedial Measures, Refuse Hideaway Landfill
November 1989	Warzyn	Report and DILHR/DNR Applications, Point-of-Entry Water Treatment, Interim Remedial Measures, Refuse Hideaway Landfill.
December 1989	Warzyn	Alternative Water Supply, Interim Remedial Measures, Refuse Hideaway Landfill
December 1989	Warzyn	Engineering Design, Partial Gas and Leachate Extraction System, Interim Remedial Measures, Refuse Hideaway Landfill
January 1990	Warzyn	Gas Monitoring Program, Refuse Hideaway Landfill
February 1990	Warzyn	Sampling and Analysis of Residential Wells, Interim Remedial Measures, Refuse Hideaway Landfill
March 1990	Warzyn	Estimate of Costs - Phase II, Groundwater Monitoring, Refuse Hideaway Landfill
April 1990	Warzyn	Community Relations Activities, Refuse Hideaway Landfill
April 1990	HSI	Proposal, Groundwater Monitoring Study, Refuse Hideaway Landfill (includes QAPP, and Health & Safety Plan)
August 1990	Warzyn	Contract Documents, Gas and Leachate Extraction System, Refuse Hideaway Landfill
September 1990	Warzyn	Engineering Design, Gas and Leachate Extraction System, Refuse Hideaway Landfill
November 1990	Warzyn	Construction Observation Report, Partial Gas and Leachate Extraction System, Interim Remedial Measures, Refuse Hideaway Landfill

Table 2-1 Summary of Reports Pertaining to Refuse Hideaway Landfill Produced Under Contract for the WDNR (Cont'd)

Report Date	Preparer	Report Title
February 1991	Warzyn	Gas Monitoring Program, Annual Report, Refuse Hideaway Landfill
March 1991	Warzyn	Phase III, Remedial Option Plan, Refuse Hideaway Landfill
May 1991	Dames & Moore	Proposal for Cap Restoration and Improvements to Refuse Hideaway Landfill, Dane County, WI
June 1991	HSI	Groundwater Monitoring Study, Refuse Hideaway Landfill, 2 Volumes
October 1991	Mostardi Platt,	Refuse Hideaway Landfill Gas System Destruction Efficiency Tests, August 1 & 2, 1991
November 1991	Warzyn	Construction Documentation Report, Landfill Gas and Leachate Extraction System, Refuse Hideaway Landfill
November 1991	Warzyn	Operation and Maintenance Manual, Landfill Gas and Leachate Extraction System, Refuse Hideaway Landfill
March 1992	HSI	Numerical Model Simulation and Assessment of Contaminant Plume Migration, Refuse Hideaway Landfill, Middleton, WI
May 1992	Dames & Moore	Contract Documents, Refuse Hideaway Landfill, Cap Restoration and Improvements, Middleton, Dane County, WI
February 1993	Dames & Moore	Construction Observation Report, Cap Restoration and Improvements, Middleton, Dane County, WI
Fall, 1993	HSI	Groundwater Quality Data for Semi-Volatiles, Metals, PCBs, Pesticides

WP Table 4-1 RI Objectives and Existing Data

RI Objective	Existing Data
Source Characterization	
♦ Landfill Cover Characterization	♦ Existing cover integrity evaluation.
♦ Landfill Gas Characterization	♦ Historical landfill gas methane content and gas pressure measurements.
♦ Refuse Characterization	♦ Analysis results from waste samples collected during leachate well installation.
♦ Leachate Characterization	♦ Leachate levels measured at leachate wells and monthly leachate extraction quantities.
	♦ Laboratory analysis from samples collected from the leachate for disposal requirements.
Physical and Migration Pathway Characterization	
♦ Stratigraphy	♦ Borehole logs from 59 monitor wells and several private well logs.
♦ Ground-Water Flow Directions	♦ Fluid level elevations from existing monitor wells, one private well, and three staff gages.
♦ Hydraulic Conductivity	♦ Hydraulic testing of 24 wells and piezometers.
♦ Hydrologic Characterization	♦ Site topographic maps and site physical inspection data.
♦ Human Population	♦ Existing data to characterize human population.
♦ Ecology	♦ Existing data to characterize ecology in proximity to the site.

WP Table 4-1 RI Objectives and Data Needs (Cont'd.)

RI Objective	Data Needs
Contaminant Characterization	
♦ Lateral and Vertical Extent of Impacted Ground Water	♦ Results from laboratory analysis of samples from well locations for VOCs and near source wells for TAL metals, PCBs, and pesticides.
♦ Residential Well Supply	♦ Results from sampling of 35 private wells for volatile organic compounds.
♦ Surface Water	♦ Laboratory analysis of surface water samples for VOCs collected in 1989 and ground-water samples from shallow monitor wells located near surface water.