WORK PLAN FOR REMEDIAL INVESTIGATION AND FEASIBILITY STUDY

STOUGHTON CITY LANDFILL
STOUGHTON, WISCONSIN

REVISION: 2

SUBMITTED BY:

STOUGHTON CITY LANDFILL STEERING COMMITTEE

NOVEMBER 28, 1988

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1.0 INTRODUCTION

This Remedial Investigation and Feasibility Study (RI/FS) Work Plan for the Stoughton City Landfill is being submitted in accordance with Article VIII (C)(1) of the Administrative Order by Consent (Consent Order). The Work Plan was developed in conformance with the Detailed Statement of Work (Exhibit B of the Consent Order), the standards set forth in Section 121 of CERCLA and the USEPA draft document "Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA" (RI/FS Guidance) dated March, 1988. This latter document was recommended as guidance by the USEPA Remedial Project Manager in place of the May 1985 version as stated in the Consent Order.

The general mutual objectives of the RI/FS, as stated in the Consent Order are to:

- fully determine the nature and extent, if any, of the release or threatened release of hazardous substances, pollutants or contaminants from the Stoughton City Landfill site, and

- identify and evaluate alternatives for the appropriate extent, if any, of remedial action to prevent or mitigate the migration or the release or threatened release of hazardous substances, pollutants or contaminants from the site.

In response to these objectives, the RI will serve as the mechanism for collecting data for site and waste characterization and for conducting treatability testing, if necessary. The FS will serve as the mechanism for the development, screening, and detailed evaluation of potential remedial alternatives. The RI and FS will be conducted concurrently and the data collected in the RI will influence the development of remedial alternatives in the FS.

The Stoughton City Landfill RI/FS will be a phased process. Data will be collected in several stages and as the site and adjacent area are better characterized, subsequent data collection efforts will be focused to fill any existing gaps in the data. This phased sampling approach will encourage identification of key data needs as early in the process as possible to ensure that data collection is always directed toward providing information relevant to selection of a remedial action. In this way, the overall site characterization effort can be continually scoped to minimize the collection of unnecessary data and maximize the data quality.

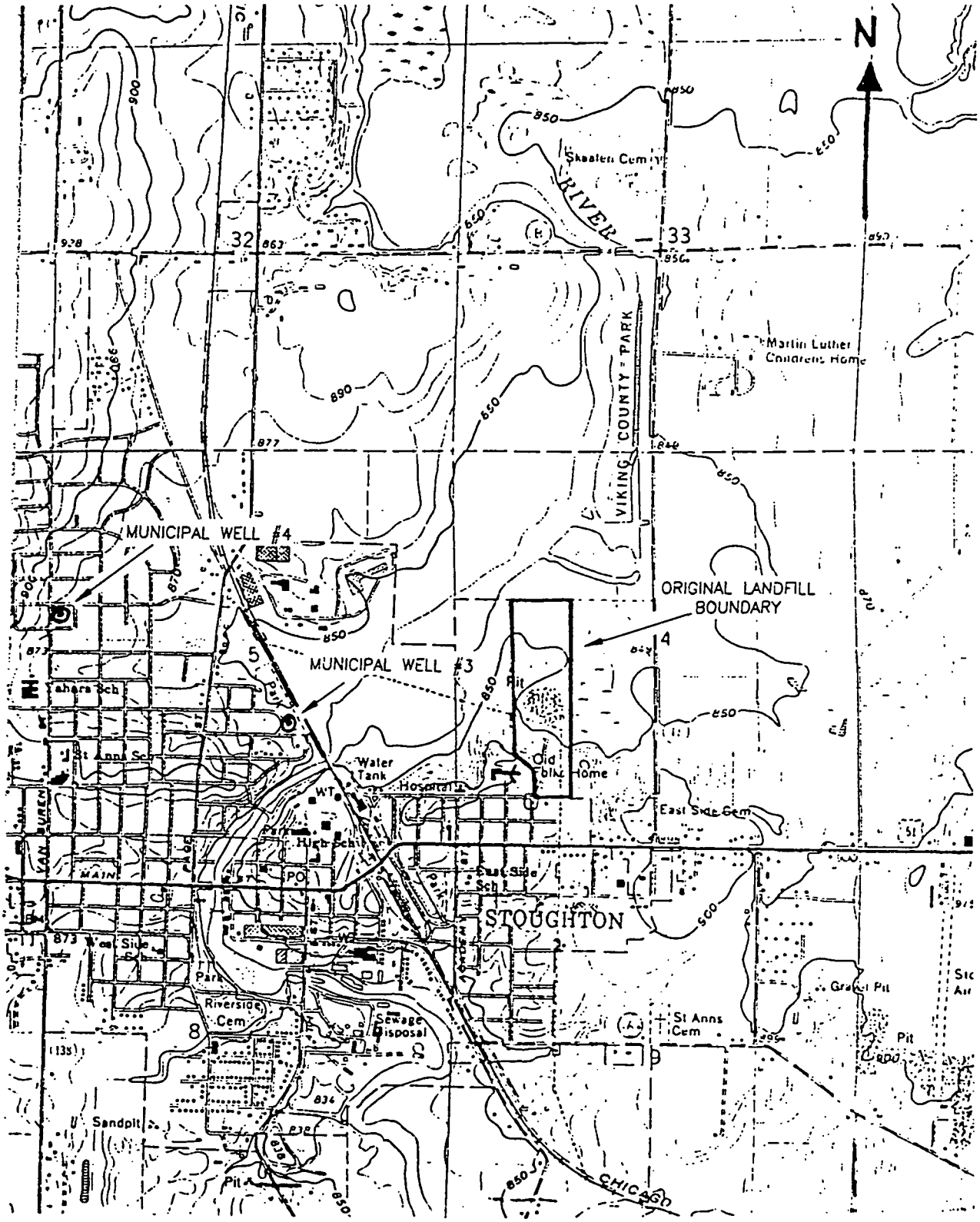
This Work Plan documents background information and evaluations made during the scoping process and summarizes anticipated future RI/FS tasks. Detailed procedures and protocols for implementation of the RI/FS are contained in the accompanying project plans: (1) a Sampling Analysis Plan (SAP) consisting of a Field Sampling Plan (FSP) and a Quality Assurance Project Plan (QAPP); (2) a Data Management Plan; and (3) a Health and Safety Plan. These documents were prepared in accordance with applicable USEPA guidance as noted in the respective plans.

2.0 SITE BACKGROUND AND SETTING

2.1 Site Location and History

The Stoughton City Landfill is located in the City of Stoughton, Dane County, Wisconsin and occupies portions of the S1/2 of the NW1/4 and the SW1/4 of Section 4, T5N, R11E (see Figure 2-1). Although the original Landfill property occupied approximately 40 acres, landfilling has occurred on only about 15 acres of the property. (See Figure 2-2). Since 1982, land exchanges between the City and an adjacent land owner have modified the original site boundary. (See Figure 2-2). Current ownership of adjacent land will be determined during the initial task of the RI.

The City of Stoughton purchased the original site in July, 1952 and then annexed it in September, 1952 after which landfill operations began. Between 1952 and 1972, the site was operated as an uncontrolled dumpsite. During this time, refuse was usually burned and at times covered by dirt. In 1972, the site began to be operated as a State-licensed landfill. In 1978, the Wisconsin Department of Natural Resources (WDNR) required that the site be closed according to State regulations. Closure activities included: construction of a trash transfer station, placement of cap material borrowed from the northwest portion of the site and from agricultural areas, application of topsoil also derived from an agricultural area, and seeding. From 1978 to 1982, only brick, rubble, etc. were accepted at the site while closure work was performed. The unit was officially closed in 1982.



SCALE IN FEET

1000 0 1000 2000

SOURCE: USGS, 7.5 MINUTE STOUGHTON QUADRANGLE, DANE CO., WISCONSIN

STOUGHTON CITY LANDFILL LOCATION MAP	FIGURE 2-1
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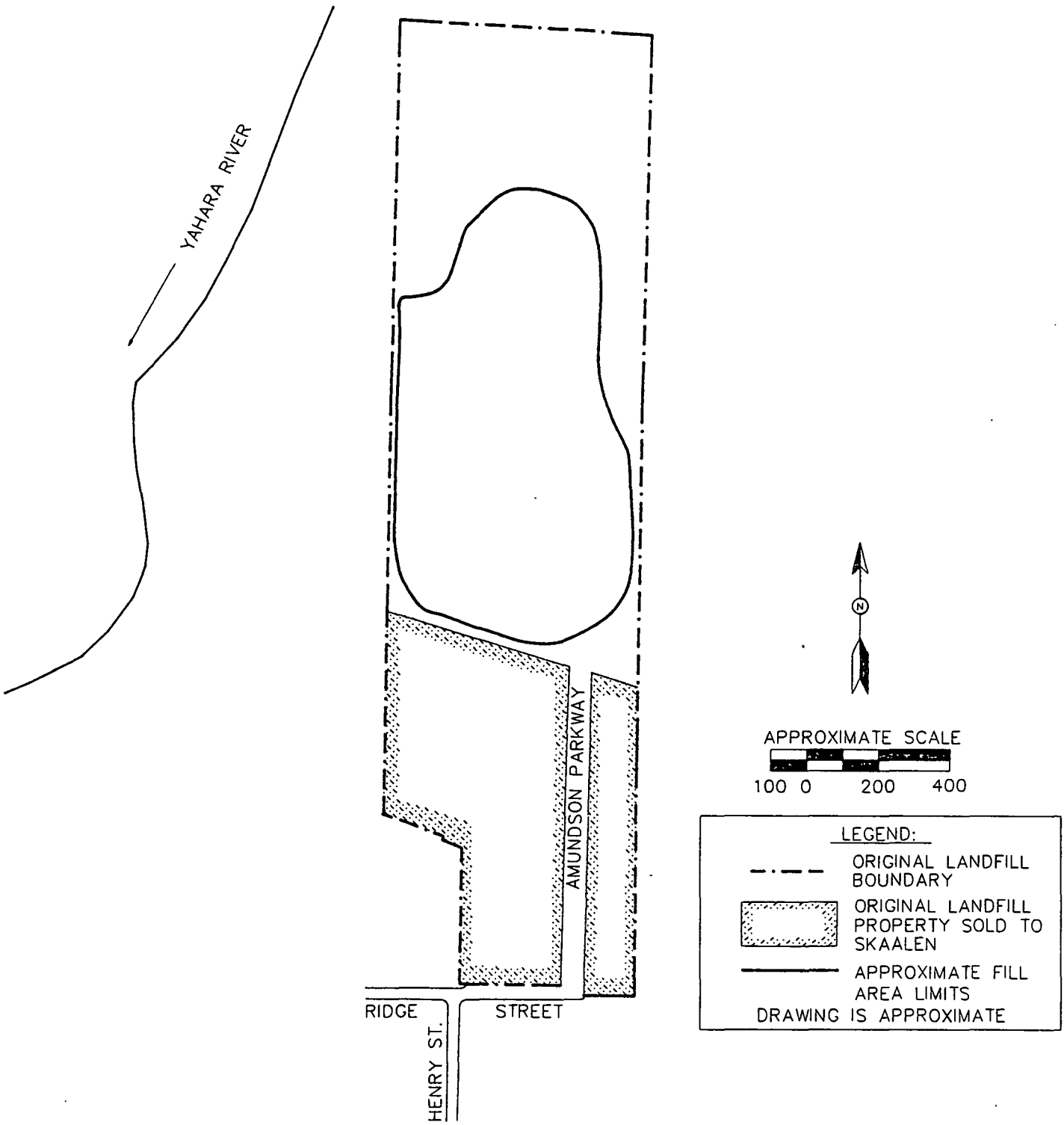

STOUGHTON CITY LANDFILL PROPERTY BOUNDARIES	FIGURE 2-2
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The Landfill was established for use by City residents (including commercial establishments, industrial operations, major industries as well as smaller-scale machine shops, autobody/repair operations, dry cleaners, and other maintenance facilities). Uniroyal Plastics (formerly U.S. Rubber) disposed of liquid and solid waste from 1953 until late 1962. Most of these liquid wastes were disposed of by incinerating in the refuse burning areas; however, some were reported to have been dumped down boreholes drilled by a local firm which tested truck-mounted earth auger equipment on high ground within the west-central portion of the Landfill boundary. In 1962, the City contracted for the collection of garbage and rubbish from residences and commercial places of business, and this waste was reportedly disposed at a site other than the City-owned landfill. Large items of residential rubbish such as appliances, furniture, etc. were not picked up by the contractor but were carried to the Landfill by property owners. The City disposed of street refuse, trees, and grit from the wastewater treatment plant.

On November 17, 1983 the WDNR sampled monitoring wells at the Stoughton City Landfill site. The results showed elevated levels of volatile organic compounds (VOCs) in two of the six wells. Subsequent testing by the City of Stoughton found additional VOCs during routine sampling of the ground water. The site was added to the USEPA National Priorities List (NPL) in June, 1986.

The Stoughton City Landfill is currently an inactive facility. Vehicular access to the site is controlled by two gates that are locked at all times; however, security fencing is not in place around the site at this time.

2.2 Environmental Setting

The Stoughton City Landfill site is located in the northeast portion of the City of Stoughton and borders apparent wetland areas east of the Yahara River (Figure 2-1). Land surface elevation ranges from a high of about 900 feet above mean sea level (AMSL) in the southwestern portion of the Landfill to about 840 feet AMSL along the north border of the Landfill and in its central portion. An apparent wetland area in the east-central portion of the site -- bounded on the north, west, and south by higher ground -- was the primary area of waste disposal. The approximate north one quarter of the site also contained an area of lowland. Land exchanges since 1982 have modified the original property boundaries.

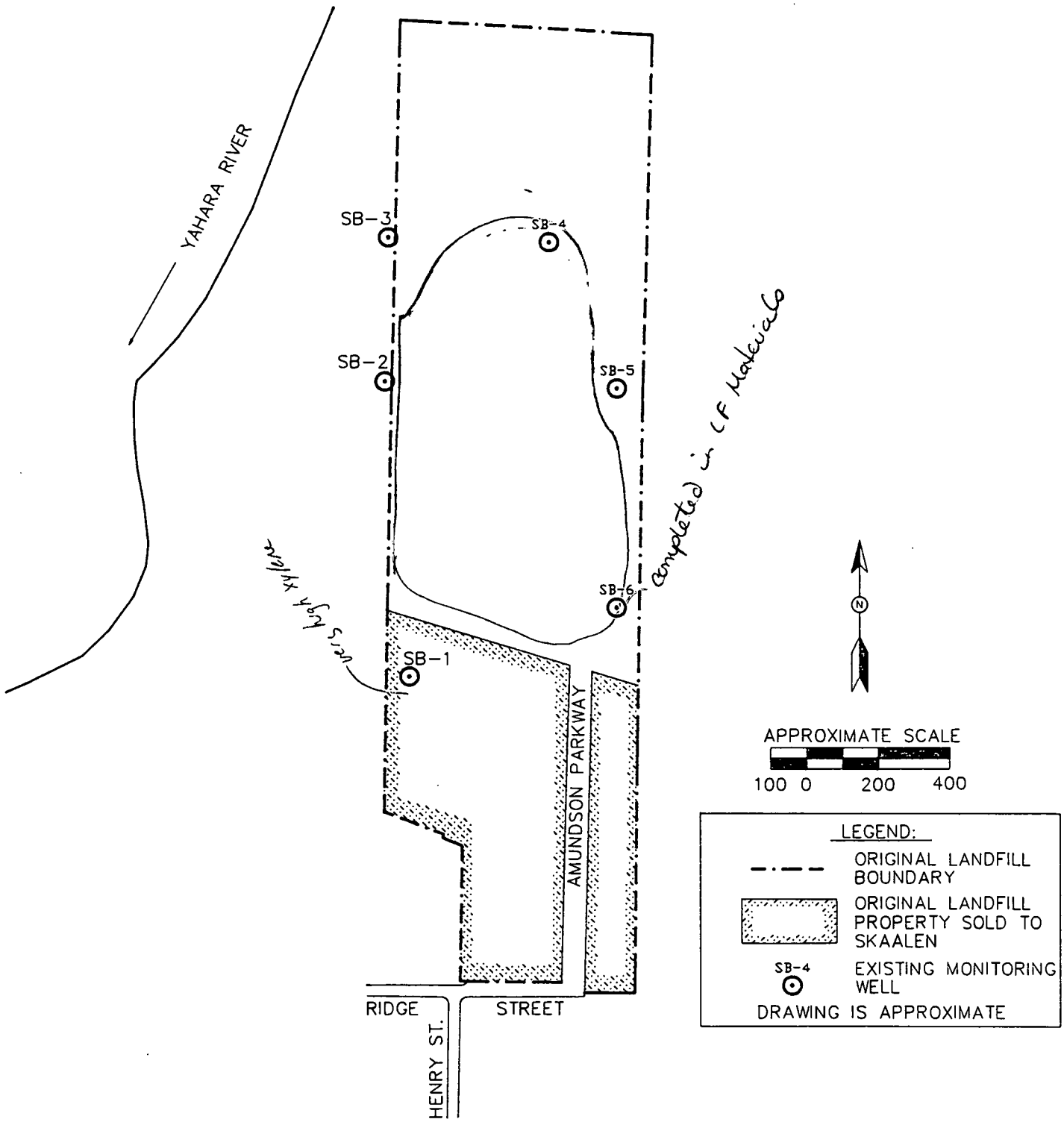
Surficial deposits in the vicinity of the site include ice-contact stratified deposits and lacustrine plain sediments (Mickelson and McCartney, 1979). Ice-contact stratified deposits generally include significant sand and gravel deposits and landforms such as kames and eskers. These deposits occupy higher ground within the Landfill. Lacustrine plain or glacial-lake bottom sediments are generally comprised of fine-grained silt and clay with some sand present near former shorelines and stream inlets. These areas are often flat, poorly drained, and show evidence of peat accumulation. Lacustrine plain deposits occupy the east-central portion of the site, which was developed for primary waste disposal and the low-lying north portion of the site. Approximately 150 to 250 feet of unconsolidated glacial sediments are reported to overlie Cambrian sandstone bedrock in the vicinity of the site.

Surface water drainage features of the site are limited to drainage ditches along the south portion of the primary disposal area and along the north property boundary. The Yahara River flows from northeast to southwest in the vicinity of the Stoughton City Landfill and then generally in a southerly direction towards the Rock River. The Yahara River flows within approximately 200 feet of the northwest corner of the property and is located approximately 800 feet west of the primary disposal area. Apparent wetlands exist adjacent to the east property boundary.

A total of six monitoring wells have been installed in and adjacent to the Stoughton City Landfill. These monitoring wells were installed in 1978 and were designated wells SB-1 thru SB-6. Four of these wells (SB-1, SB-4, SB-5, and SB-6) were destroyed by landfill closure operations and were replaced in 1982. Figure 2-3 shows the location of these existing monitoring wells and Table 2-1 lists construction details reported for them.

At least one of these wells, SB-6, is currently completed in landfill materials while others are screened in surficial sand, sand and gravel, or clay. Ground water flow direction within the upper surficial sediments is uncertain based on review of available data. Both northwest and southeast flow direction have been indicated.

Water supply for the City of Stoughton is derived from wells located in the deeper Cambrian sandstone strata. The closest City well is located about 3,000 feet due west of the Landfill across the Yahara River and is designated Well No. 3 (Figure 2-1). This well penetrated a 75-foot - thick clay layer from 85 to



EXISTING MONITORING WELL LOCATIONS STOUGHTON CITY LANDFILL	FIGURE 2-3
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TABLE 2-1

STOUGHTON CITY LANDFILL
REPORTED CONSTRUCTION DETAILS
OF
EXISTING MONITORING WELLS

Well	Total Depth (ft.)	Screened Interval (ft.)	Completion Material
SB-1	12.5	7 - 12	Sand
SB-2	28.0	23 - 28	Sand/Gravel
SB-3	20.0	15 - 20	Sand/Gravel
SB-4	15.0	6 - 11	Peat/Clay
SB-5	14.0	5 - 10	Sand
SB-6	11.5	4 - 9	Fill

Notes:

1) Data obtained from original boring logs prepared by Soils and Engineering Services, Inc. and Warzyn Engineering, Inc.

2) Well SB-2 construction altered due to grading operations associated with landfill closure and also was reported to have been vandalized prior to the placement of security casing/locks. Other wells also may have been affected by vandalism.

160 feet below ground surface. When Franconia Sandstone was encountered at a depth of 210 feet, casing was installed in Well No. 3. The remainder of the well is an open hole to a total depth of 950 feet.

2.3 Previous Site Investigations

Since 1983, sampling operations have been conducted on monitoring wells at the Stoughton City Landfill for volatile organic compounds (VOCs) by the City, its contractors or the WDNR. Analyses have been performed by commercial laboratories or the Wisconsin State Laboratory of Hygiene. Table 2-2 summarizes data for the period November 1983 to November 1984 for the most frequently detected VOCs. Well SB-1 has shown the presence of ethyl benzene, toluene and xylenes while Wells SB-2 and SB-3 have shown the presence of various chlorinated solvent compounds at low levels. In addition, tetrahydrofuran has been detected in Well SB-3 and dichlorodifluoromethane and trichlorofluoromethane have been qualitatively identified in samples from Wells SB-2 and SB-3. Toluene and tetrahydrofuran were detected in Well SB-4 on one occasion during the above period and 1,1-dichloroethene and tetrahydrofuran were measured once in Well SB-6. No VOCs were detected in Well SB-5 during the above period. The City of Stoughton is required by the WDNR to sample the site monitoring wells for limited physicochemical properties and inorganic parameters. Electrical conductivity data for November 1983 indicate a range of conductivity of 578 umhos/cm (SB-5) to 2,310 umhos/cm (SB-6). Water level measurements taken during this sampling event indicate a range of depth to ground water of 0.6 feet (SB-3) to 8.9 feet (SB-2). The water level in Well SB-3 has been measured above the land surface on other occasions.

TABLE 2-2

STOUGHTON CITY LANDFILL
SUMMARY OF MOST FREQUENTLY DETECTED VOCs IN GROUND WATER
NOVEMBER 1983 - NOVEMBER 1984

Parameter (ug/l)	Well SB-1		Well SB-2		Well SB-3	
	No. of Times Detected	Concentration Range	No. of Times Detected	Concentration Range	No. of Times Detected	Concentration Range
Ethyl Benzene	3/4	ND - 1,400	0/4	ND	0/4	ND
Toluene	3/4	ND - 113	1/4	ND - 7.3	0/4	ND
Xylene	4/4	3,400 - 12,200	0/4	ND	0/4	ND
Benzene	0/4	ND	2/4	ND - 4.5	0/4	ND
1,1-Dichloroethane	0/4	ND	4/4	2.0 - 7.7	1/4	ND - 7.6
Tetrachloroethene	0/4	ND	4/4	ND - 26.0	3/4	ND - 5.3
1,2-trans-Dichloroethene	0/4	ND	2/4	ND - 18.0	1/4	ND - 54
Trichloroethene	0/4	ND	4/4	7.1 - 14.0	1/4	ND - 8.7
Tetrahydrofuran	0/4	ND	1/4	ND - 11.3	3/4	ND - 1,000

Notes:

1) Data include those from a number of different laboratories; therefore, laboratory detection limits vary for particular sampling events.

2) ND - Not detected during any one sampling event at the method detection limit of the analyzing laboratory.

The WDNR sampled ground water from Municipal Well No. 5 in April 1982 and determined that "no synthetic industrial chemicals were detected in the well". In November 1983, the WDNR sampled the wells serving the City of Stoughton water system and found that none of the 45 VOCs that were analyzed were detected. In July 1986 the WDNR again sampled ground water from Municipal Wells 3, 4 and 5 for 45 VOCs and none were detected.

The City of Stoughton collected a single surface water sample on September 22, 1984 from the Yahara River. No VOCs were detected in that sample. During October, 1985, WDNR conducted ambient air sampling by using Tenax sampling tubes. No detected VOCs were found in the ambient air samples.

The potentially responsible parties (PRPs) recognize that these data may not have been collected or analyzed under currently rigorous protocols; therefore, the data must be further reviewed to evaluate them for quality and applicability. Furthermore, the sufficiency of the data may not be adequate to fully evaluate the actual or potential impact of the site on environmental receptors. Therefore, sample collection and analytical procedures for characterization of the above media will be reviewed during Task 1 to determine the utility and relevance of these results to the RI/FS.

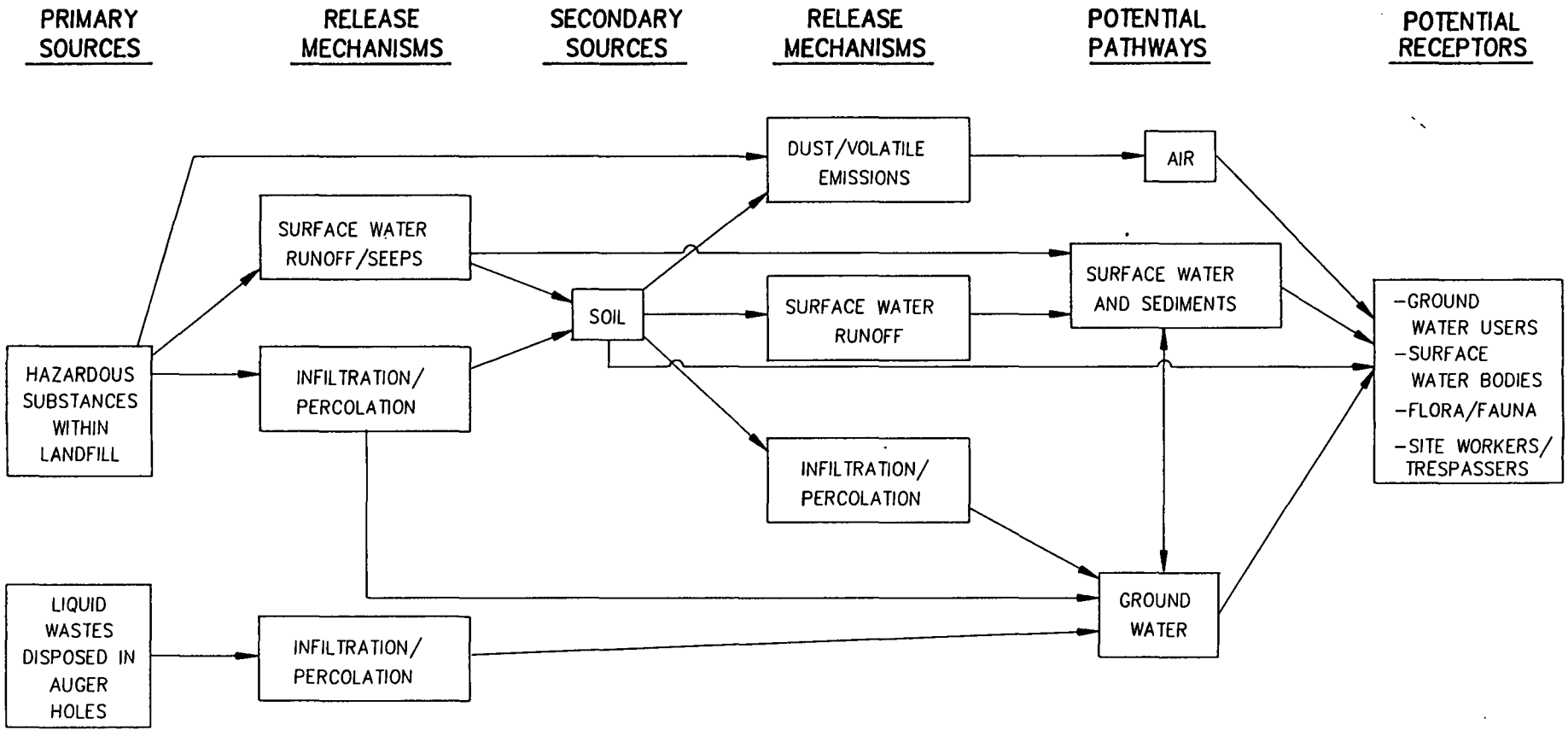
3.0 INITIAL EVALUATION

3.1 Types and Volumes of Waste Present

No records are available of the types and volumes of specific hazardous wastes that were disposed of at the Landfill. The general types of waste disposed at the Landfill are discussed in Section 2.1 of this Work Plan and under Article V of the Consent Order. The waste stream operative at the time of landfill operation will be researched during Task 1 in an effort to better characterize the nature of hazardous wastes that were disposed.

3.2 Preliminary Conceptual Site Model

A preliminary conceptual site model is presented in Figure 3-1 and includes all known and suspected sources of contamination, potential routes of migration, and potential human and environmental receptors. Ground water users, and potentially surface water bodies, are anticipated to be the primary receptors of concern for contamination attributable to the Landfill proper or the suspected disposal of liquid waste down auger holes. However, other potential migration pathways such as air, will also be evaluated during the RI. The conceptual site model is poorly defined, primarily because of a lack of information on specific hazardous substances disposed at the site, ambiguous data pertaining to ground water flow direction, and a general lack of information on other potential pathways and receptors. Because of this, potential contaminant migration routes and receptors will be reevaluated during Task 1 of the RI using both field and nonfield methods to ensure sufficient scope for



PRELIMINARY CONCEPTUAL SITE MODEL STOUGHTON CITY LANDFILL	FIGURE 3-1
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subsequent phases of the RI. Task 1 field investigations will be conducted in a phased manner. Initially, these investigations will be focused within the current Landfill boundary and in the area just south which encompasses Well SB-1. After Task 1 field data from these areas have been evaluated, Task 1 field investigations may be extended outside of these areas. In this way, the collection of unnecessary data will be minimized.

3.3 Preliminary Identification of Operable Units

Beyond the need for site control measures, no immediate problems are known that would require early interim action or that would achieve a significant risk reduction in a rapid manner. Because of the small size of the site and the suspected interrelatedness of its problems, it will most likely be appropriate to address these problems together rather than as separate operable units. However, should data developed during the course of the RI indicate that an operable unit approach may be appropriate (such as the need for provision of an alternative water supply), phased responses may be undertaken.

3.4 Preliminary Identification of Response Objectives and Remedial Action Alternatives

3.4.1 Response Objectives

Response objectives consist of medium-specific or operable unit-specific goals for protecting human health and the environment. Because little is known of the types of waste that were disposed of at the Stoughton City Landfill, medium-specific objectives for contaminants cannot be stated at this time. The operable unit

approach at the Stoughton City Landfill will be applied, as stated above. Generally, acceptable exposure levels for human health will be determined on the basis of the risk factors and contaminant-specific Applicable or Relevant and Appropriate Requirements (ARARs) identified during the site characterization. Contaminant levels in each medium will be compared with these acceptable levels. Acceptable exposure levels for both human health and the environment will be determined on the basis of an evaluation of the factors listed in Section 4.2.1 of the RI/FS Guidance.

3.4.2 Remedial Action Alternatives

This section identifies preliminary remedial alternatives that are consistent with available site information. This initial identification of potential alternatives will ensure that sufficient data will be collected during the RI to evaluate candidate remedial strategies. The alternatives have been selected on a preliminary basis using information currently existing for the site. The array of alternatives to be evaluated may change as a better understanding of site conditions is gained throughout the RI and action-specific ARARs are identified. Information compiled during the scoping process indicates that burned and landfilled refuse, as well as ground water, are potentially contaminated from past activities or waste disposal at the Stoughton City Landfill site. Contamination of limited areas of site soils may also have occurred as a result of liquid waste disposal practices at the site. Based on data from preliminary site investigations, possible remedial alternatives have been identified for evaluation. Since minimal data on the extent and constituents of contamination at the site are

available, additional remedial alternatives may be developed during the RI.

Remedial Alternative 1 - No Action

This remedial action must always be evaluated, as a point of comparison.

Remedial Alternative 2 - Access Restrictions

Access restrictions would include fencing and deed restrictions such as prohibition of the excavation and installation of drinking water wells. These restrictions would eliminate risk associated with exposure to site soils, but they would not eliminate the source of contamination. Snow fence construction along with warning sign placement is proposed as a site control measure to be implemented during Task 1.

Remedial Alternative 3 - Soil Excavation and Treatment On Site

Excavation and treatment of the contaminated soil would eliminate the source of ground water contamination, but these actions would not eliminate current ground water contamination. Treatment processes available include incineration, aeration, solidification, and chemical treatment.

Remedial Alternative 4 - Soil Excavation and Treatment/Disposal Off Site

Treatment/disposal off site is generally discouraged under CERCLA. Off-site treatment and disposal options available include incineration, solidification, and disposal in a secure landfill.

Remedial Alternative 5 - Soil Excavation and Land Disposal On Site

This response action would include the excavation and subsequent disposal of contaminated soil at a RCRA-approved hazardous waste disposal cell constructed on site. This option would require long-term monitoring.

Remedial Alternative 6 - In Situ Soil Treatment

Biodegradation, aeration, or chemical oxidation could be used to remove some of the contaminants found in the soils. Additional methods of contaminant fixation/alteration, such as in situ vitrification, may also be considered for some control alternatives.

Remedial Alternative 7 - Ground Water Extraction, Treatment and Disposal

Contaminated ground water directly related to the site could be extracted and treated by chemical precipitation, aeration, activated carbon adsorption, or biodegradation. Ground water could be withdrawn by using extraction wells or subsurface

drains. Treated ground water could be discharged to the closest surface water, directed to a Publically Owned Treatment Works (POTW) or used to recharge the aquifer system through land application or subsurface drainage in accordance with Wisconsin state law.

Remedial Alternative 8 - Containment of Contaminated Soil and/or Ground Water

This alternative would prevent migration of contaminants off site by controlling the influx of clean ground water. Appropriate technologies during any ground water extraction and treatment program would include: synthetic or clay cap systems, slurry walls, grout curtains, or sheet pilings.

Multiple Remedies

A combination of two or more of the remedial alternatives identified in this section could be implemented as the final remedial action. For example, a ground water extraction and treatment remedy would most likely require source elimination or treatment to be effective.

Potential remedial technology types and process options will be evaluated in terms of their effectiveness, implementability, and cost in accordance with the steps listed in Section 4.2 (Alternative Development Process) of the RI/FS Guidance.

4.0 WORK PLAN RATIONALE

4.1 Development of Data Quality Objectives

Data quality objectives (DQOs) are qualitative and quantitative statements which specify the quality of the data required to support decisions during remedial response activities. DQOs are established prior to data collection to ensure that the data collected are sufficient and of adequate quality for their intended end uses.

Data quality objectives are developed through a three-stage process comprised of: 1) identifying the decision types, 2) identifying data uses/needs, and 3) designing the data collection program. Stage 1 results in the specification of the decision making processes and identification of why new data are needed. Stage 2 includes selection of the sampling approaches and the analytical options for the site. Stage 3 results in the specification of methods by which data of acceptable quality and quantity will be obtained to make decisions. This DQO development process has been applied to the Stoughton City Landfill in accordance with the USEPA guidance document "Data Quality Objectives for Remedial Response Activities", dated March, 1987, and is summarized below. The SAP identifies the detailed procedures for field activities and sample analysis.

The major elements of Stage 1 include evaluating available information, developing a conceptual site model, and specifying RI/FS objectives and decisions.

Previous investigations at the Stoughton City Landfill site have been described in Section 2.3 and have been used to prepare a preliminary conceptual site model (Section 3.2) which describes, in general, the potential or suspected sources, routes of migration, and receptors. As noted previously, the conceptual site model is poorly defined and additional data are required.

Additional data collected must be of sufficient quality and quantity to provide an acceptable level of risk in decision making and must address the following general response objectives.

- Determine the presence/absence and types of volatile contaminants in the Landfill and auger hole disposal source areas and in the outdoor air potential pathway and the presence/absence and types of contaminants in the other potential pathways including ground water and surface water/sediment.

- Determine the mechanism of contaminant release to the various pathways.

- Determine the direction of transport pathway(s).

- Determine the horizontal/vertical boundaries of source(s) and pathways of contamination, and

- Determine routes of exposure and potential environmental and public health threats.

The major elements of Stage 2 of the DQO development process are: 1) identifying data uses, 2) identifying data types, 3) identifying data quality needs, 4) identifying data quantity needs, 5) evaluating sampling/analysis options, and 6) reviewing PARCC (precision, accuracy, representativeness, completeness and comparability) parameters.

There are several categories of RI/FS data uses identified in the DQO guidance document including site characterization, health and safety, risk assessment, evaluation of alternatives, engineering design of alternatives, monitoring during remedial action, and PRP determination. The primary data uses for the Stoughton City Landfill will be for site characterization, risk assessment, and evaluation of alternatives; however, health and safety and engineering design of alternative uses are also anticipated. The priority of data uses, beyond those health and safety data used to establish the level of protection needed for investigators at the site, are for site characterization, risk assessment and in the evaluation of the alternatives. These data uses will require the highest level of confidence, and therefore the lowest level of uncertainty. These low limits of uncertainty will serve to drive the selection of both the analytical and sampling approaches for the Stoughton City Landfill project.

Based on these intended data uses, data types have been developed. Broad classes of data types include soil gas samples, soil samples, ground water samples, surface water/sediment

samples, air samples, and background and QA/QC samples as appropriate. Within these broad classes of data types, various chemical and physical characteristics will be examined. Chemical characteristics will include analysis for volatile and semi-volatile organic compounds, pesticides/PCBs, inorganic compounds, cyanide and various water-quality parameters. Physical characteristics will include the measurement of various aquifer properties and water parameters.

Three analytical levels are anticipated currently during the course of the RI/FS. These analytical levels are defined as follows:

- Level I - Real-time field screening or analysis using portable instruments. These instruments may include the use of trace gas detectors, and pH and specific conductance.

- Level IV - Contract Laboratory Program (CLP) routine analytical services (RAS). These analyses will be performed at an off-site CLP analytical laboratory following rigorous QA/QC protocols and documentation. These analyses will include volatile and semi-volatile organic compounds, pesticides/PCBs, and inorganic compounds on the Target Compound List (TCL) and cyanide.

- Level V - Analyses using non-standard methods which will be performed at an off-site CLP laboratory. These types of analyses will include analyzable VOC compounds in soil gas and outdoor air and analyses for dichlorodifluoromethane, trichlorofluoromethane and tetrahydrofuran in soil and ground water and if necessary in surface water.

The determination of data quantity needs, the sampling and analysis approaches and the PARCC parameters are discussed in the SAP which accompanies this Work Plan. In general, these elements were formulated to allow a high level of confidence in subsequent remedial response decision making.

Stage 3 of the DQO process entails design of the detailed data collection program for the remedial action project. The data collection program for the Stoughton City Landfill project is summarized in the SAP where, in addition, specific information regarding sampling and analytical protocols and procedures is presented.

4.2 Work Plan Approach

The Work Plan provides the general description of the activities to be performed as part of the RI/FS. Because the RI/FS process is dynamic and iterative, the Work Plan should be prepared using a phased, iterative approach that recognizes the interdependence of the RI and FS. In this way, the Work Plan can be modified during the RI/FS process to incorporate new information and to

refine project objectives. The primary intent of the phased approach is to minimize the need for conducting supplemental RI and FS activities by thorough characterization of the migration pathways and early identification of the site-specific data requirements associated with the applicable remedial technology.

The conceptual site model for the Stoughton City Landfill is poorly defined, primarily because of lacking and/or insufficient existing site data. Therefore, a limited field investigation will be undertaken during Task 1 of the RI to better develop the conceptual site model. The results of these reconnaissance activities conducted under Task 1 will be reviewed with USEPA and WDNR personnel, along with the results of concurrent site background investigations, to modify as necessary, subsequent tasks necessary to characterize the site and its potential hazard to public health and the environment. The necessity and nature of further characterization outside of the intial investigative area will also be discussed with regulatory personnel at this time. Once these data have been reviewed and the conceptual site model has been refined, data needs can be better defined to substantiate or refine the stated data quality objectives. Task 1 of the RI and subsequent tasks are further defined in the following section.

5.0 RI/FS TASKS

A total of eight tasks are to be performed during the course of the RI/FS including five RI site characterization/treatability tasks and three FS tasks. These tasks are presented below.

5.1 Task 1 - Description of Current Situation and Limited Field Investigations

Task 1 activities comprise the initial phase of the RI and FS program. The purpose of the initial phase is to describe the background information pertinent to the site such that potential migration pathways may be clearly identified for subsequent, more detailed study under the site investigation phase of the RI. In this way, activities conducted under Task 1 provide focus and support for subsequent tasks.

Beyond general background information gathering including a data quality assessment of previously collected data, certain limited field investigations are proposed under Task 1. These include: 1) geophysical surveys to delineate disposal area limits and areas potentially characterized by ground water contamination, 2) a soil gas investigation to evaluate the areal distribution of volatile organic compounds (VOCs) in the refuse, the near-surface soil, and in the ground water at the landfill, and 3) the installation of surface-water staff gages and piezometers for the determination of ground water flow direction. The inclusion of these activities in Task 1 is necessary because of data deficiencies that currently exist with regard to the above aspects, and the need to clarify these items prior to the initiation of the site investigation. These limited field

investigations will lead to better definition of the conceptual site model and will serve to direct further investigation outside the initial investigative area.

5.1.1 Site Boundary Survey, Current Ownership Determination, Detailed Land Survey and Site Control Measures

A site boundary survey will be conducted to define the study boundaries and delineate the Stoughton City Landfill property line.

Existing land use information available from public records will be used to determine current owners of adjacent properties who will have to be contacted for off-site investigation.

A detailed land survey of the Stoughton City Landfill property will be conducted to locate any features that may be of significance in conducting the site investigation. The land survey will be conducted by a licensed Wisconsin surveyor. Based on this survey, a detailed site map will be prepared, which will include all pertinent site features as well as any wetlands, floodplains, water features, easements, and other features of the surrounding properties.

Site control measures will include the construction of a snow fence around the current Landfill boundary and the placement of warning signs.

5.1.2 Site Grid and Topographic Survey

A grid system will be established on the Stoughton City Landfill site to allow accurate siting of sampling points and delineation of contaminated areas. The site grid will consist of two perpendicular baselines with 25 foot grid intervals, and will be used to establish transect lines for geophysical surveys and sampling locations for the soil gas survey.

Ground elevation data will be collected at a sufficient number of grid points to establish one (1) foot elevation contours across the entire site. These data will be used as ground control during site investigation activities to determine the locations of geophysical cross-sections and in estimating contaminated soil quantities. Surface runoff patterns will be evaluated using this topographic map to assess for potential off-site impact to adjacent surface water bodies.

5.1.3 Historical Aerial Photograph Analysis

All available historical aerial photographs, from the beginning of site operations to the present, will be obtained for review. These photos will be used to determine the growth and expansion sequence of the Stoughton City Landfill operations and to identify any past waste disposal or storage areas. The previous location of identifiable disposal or storage areas will be of special interest. In addition, historical run-off patterns will be studied to guide an assessment of potential off-site surface water impact.

5.1.4 Area Ground Water Usage Survey

A survey of residential, municipal, and industrial wells in the vicinity of the Stoughton City Landfill site will be conducted. Municipal and state records will be searched to obtain drilling logs and well installation records for existing wells within three (3) miles of the site. The objectives of this survey are to:

- Identify usable aquifers in the area.
- Identify the number, type and location of wells in the vicinity of the Stoughton City Landfill site. Information concerning well construction (depth, casing and screen materials, screened interval, etc.) will be obtained.
- Determine if any wells are pumped from surficial or bedrock aquifers in the vicinity of the Stoughton City Landfill Site.

5.1.5 History of Response Actions and Evaluation of Existing Data

A summary of all response actions and data collected during previous site investigations conducted by any regulatory agencies or private parties will be compiled and evaluated. This summary will include a review of technical reports and any other documentation of sampling results prepared subsequent to each response action or site investigation. A chronological summary

indicating the date, principal investigator, and results of all response actions and site investigations will be prepared. Specific tasks have been established to review and evaluate historical air and surface water data in Sections 5.1.7 and 5.1.8, respectively.

The nature of the waste stream operative at the time of operation of the Stoughton City Landfill will also be investigated under this subtask.

Background information collected during this subtask will be used to refine the scope of work for the detailed site investigation conducted in Task 2.

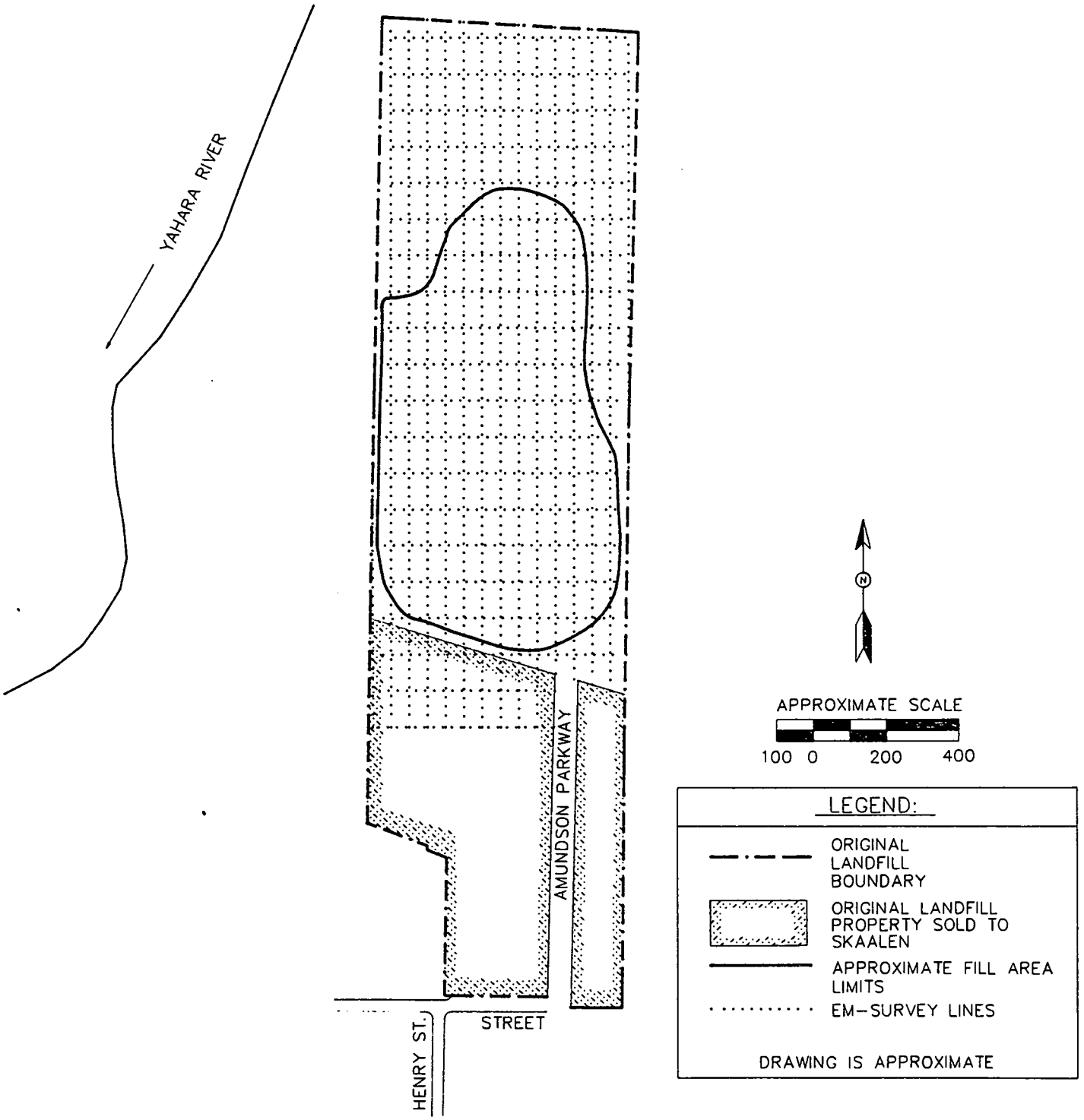
5.1.6 Source Characterization

The objectives of the source characterization sampling program are to delineate areas of refuse disposal and areas characterized by near-surface soil contamination that are potential sources for contamination of ground water at the Stoughton City Landfill site or pose a risk due to contact exposure. In addition, areas potentially characterized by volatile organic ground water contamination will be investigated. Site investigations will focus on the current Landfill property; however, investigation outside the property boundaries will be required to detail the full extent of refuse disposal and to evaluate the contamination detected in monitoring well SB-1 located south of the Landfill property boundary. Additional off-site investigation may be required during Task 1 following review of data collected from the initial investigative area as described above.

5.1.6.1 Geophysical Surveys

Two survey techniques are proposed for the geophysical survey of the site. An electromagnetic (EM) survey will be conducted utilizing an EM-31 to map the disposal areas on site and to evaluate the perimeter of the disposal areas for discrete ground water plumes (Figure 5-1). Typically, landfill leachate will result in an increase in electrical conductivity of the ground water. Alternatively, resistive substances such as many organic compounds will decrease electrical conductivity of the ground water if present in sufficient amounts. These changes in conductivity can be sensed by the EM instrumentation and potentially discrete contaminant plumes can be mapped. The mapping of a plume will usually define the local ground water flow direction of contaminants. As noted in Section 2.3, an electrical conductivity contrast exists for site ground water and the latter is sufficiently shallow such that the site should be amenable to the EM technique.

In support of and to complement the EM survey, an electrical resistivity survey will also be conducted across disposal boundaries as mapped using the EM and around the perimeter of the disposal areas. The survey will consist of vertical electrical soundings to assist in the identification of subsurface lithologies, in addition to profiling to support the EM surveys. Because both of these geophysical techniques can lead to the definition of a contaminant plume, they will be used in conjunction with soil gas investigation results (Section 5.1.6.2) to guide the location of monitoring wells to be installed as part of the site investigation.



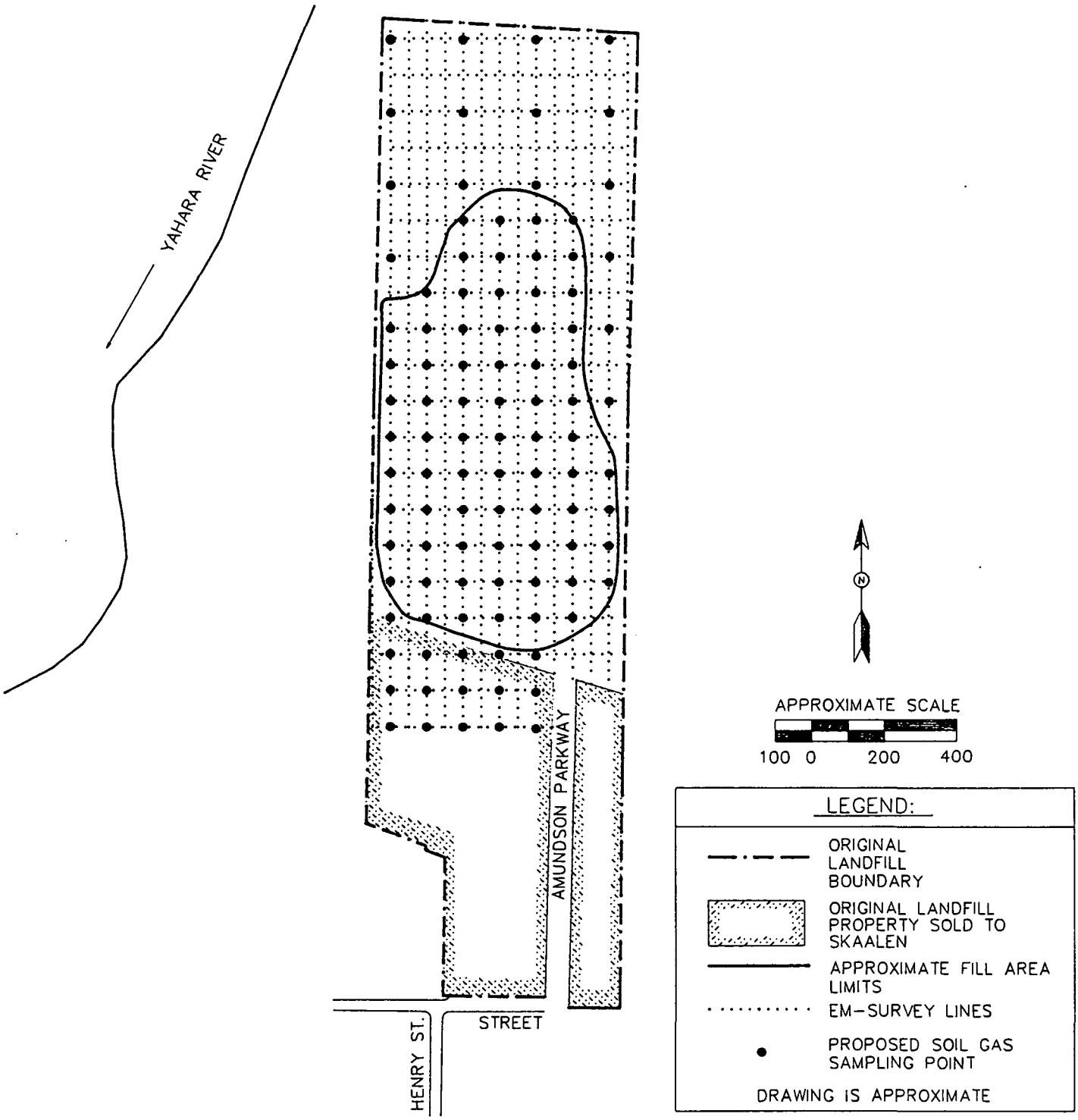
ELECTROMAGNETIC (EM) SURVEY LOCATION STOUGHTON CITY LANDFILL	FIGURE 5-1
ERM ERM-North Central, Inc.	9/15/88 mo

5.1.6.2 Soil Gas Investigation

A soil gas survey will be conducted to evaluate the type and areal distribution of volatile organic contamination at the Stoughton City Landfill site. Source areas or any zones of contaminated soil will be located. Soil gas sampling permits the measurement of organic vapors which volatilize from contamination in the subsurface soil or ground water and are present in the soil pores of the unsaturated zone. The procedure involves pumping soil vapor from the unsaturated zone (minimum probe depth of 1.5 feet), collection of it on carbon tubes placed in series and analyzing them for volatile organic compounds using an off-site laboratory (see Sampling and Analysis Plan, Part II-Quality Assurance Project Plan). This technique will enable the quantitative analysis of specific volatile organic compounds.

Subsequent to collecting a soil gas sample, an HNu photoionization meter will be used to obtain a field measurement of a trace gas concentration (primarily volatile organic) in the soil gas. If a zone of elevated concentration is detected by the HNu meter, additional soil gas sampling points may be added to further investigate the contaminated zone.

Soil gas sampling points will be located across the cleared portion of the site (Figure 5-2). Sampling locations will coincide with the grid system established during the land survey of the site.



SOIL GAS SAMPLING POINTS STOUGHTON CITY LANDFILL	FIGURE 5-2
ERM ERM-North Central, Inc.	9/15/88 mo

Results of the soil gas survey will be plotted, and iso-concentrations lines for each detected compound will be constructed to evaluate the areal distribution of volatile organic compounds below the site. Based on each compound's solubility, air to water partitioning coefficient, and depth to ground water, an estimation will be made as to whether or not concentrations in the soil gas represent contaminated ground water or separate phase contamination within the soil/refuse matrix.

5.1.7 Review of Air Sampling Data

As stated in Section 2.3, historical air data will be evaluated for adequacy and to determine if they meet the requirements for data to be used in the RI report. An additional air sampling program is proposed under Task 2 of the RI to assess potential contaminant release through the air as described in Section 5.2.2.

5.1.8 Surface Water Evaluation

As stated in Section 2.3, historical surface water data will be reviewed for potential incorporation into the RI. Additional surface water sampling may be necessary as noted in Section 5.2.3.

During Task 1, water-level staff gages will be established in the adjacent wetlands and the Yahara River, and tied into the Site Evaluation Survey. These data will facilitate the understanding of surface water and ground water interrelationships within and

adjacent to the landfill. As noted in Sections 5.1.2 and 5.1.3, current and historical surface run-off patterns will be evaluated for potential off-site impact. These data will be assessed along with the ground water data to define the scope of surface water investigations.

5.1.9 Evaluation of Ground Water Flow Direction

Ground water flow direction in the upper surficial deposits is uncertain based on a review of available data. Therefore, three to six piezometers will be installed approximately 5 feet below the water table to evaluate shallow ground water flow direction. Piezometers will be constructed of one inch I.D. PVC and will not be used as sampling points. Piezometer locations will be determined following review of the site topographic survey and the existing ground water elevation data. Final location of monitoring well clusters will be established based on these and other data generated during Task 1.

5.1.10 Technical Memorandum - Task 1

Results of activities under Task 1 will be compiled and interpreted for presentation in a technical memorandum. This technical memorandum will be submitted to USEPA and the WDNR for their review prior to initiation of Task 2. Based on this review, appropriate modifications, in conformance with the objectives of the RI and FS, may be made to the Work Plan. These modifications may include the implementation of geophysical and/or soil gas surveys outside of the initial investigative area prior to the initiation of Task 2. A large scale map of the work site showing the locations of the work zones, site features, and

any unusual topographic features will also be submitted as part of this technical memorandum.

A summary of actual and potential on-site and off-site health and environmental effects will be included in the memorandum. This may include, but not be limited to, the type of hazardous substances; affected media and pathways of exposure; contaminated releases such as leachate or runoff; and any human and/or environmental exposure. Threats or potential threats to public health and the environment will be emphasized.

5.2 Task 2 - Site Investigation

Detailed investigations conducted during Task 2 will be designed to characterize the site and its potential hazard to the public health and the environment. These studies will provide the additional data needed for the development and evaluation of remedial alternatives during the FS. The goals of the detailed site investigation are to:

- Characterize the nature of potential contamination at the site.
- Locate and delineate contaminant sources at the site.
- Evaluate the vertical and horizontal extent of contamination potentially originating from the Stoughton City Landfill site.

- Evaluate the nature and magnitude of ground water contamination which is not attributable to the Stoughton City Landfill site.

- Identify and evaluate potential contaminant migration characteristics.

- Collect sufficient data to support a Baseline Risk Assessment and Feasibility Study of the Stoughton City Landfill site.

It is anticipated that the primary focus of initial site investigations will be a hydrogeologic investigation. These investigations are designed to characterize contamination within the initial investigative area and evaluate the suspected primary contaminant migration route (ground water). The scope of additional hydrogeologic investigations outside the initial investigative area and of surface water/sediment or flora/fauna surveys will be evaluated based on the results of Task 1 and additional data provided by the installation and sampling of the on-site monitoring wells. This will enable focusing on those areas with potential for impact from a known pathway and a known suite of contaminants.

5.2.1 Hydrogeological Investigation

5.2.1.1 Overview

Monitoring wells, water samples, water level measurements, in situ permeability tests, and geotechnical testing of soil samples will be used to characterize the hydrogeologic environment of the

site. Private water supply wells which may be shown to be potentially at risk will be sampled, following submittal/approval of Standard Operating Procedures (SOPs) for private water supply analysis, to evaluate the potential risk to public health and to provide additional off-site information regarding the potential extent of contamination.

5.2.1.2 Objectives

The objectives of the hydrogeologic investigation for the Stoughton City Landfill RI are:

- Determine details of stratigraphy and geotechnical characteristics of subsurface materials at the site.
- Determine hydrogeologic conditions in the aquifers at the site, including vertical and horizontal flow rates and directions. These will be critical design information for the FS.
- Characterize the interrelationship of area surface water features to the subsurface hydrogeology.
- Characterize the vertical and horizontal extent and migration characteristics of ground water contamination attributable to the Stoughton City Landfill site.

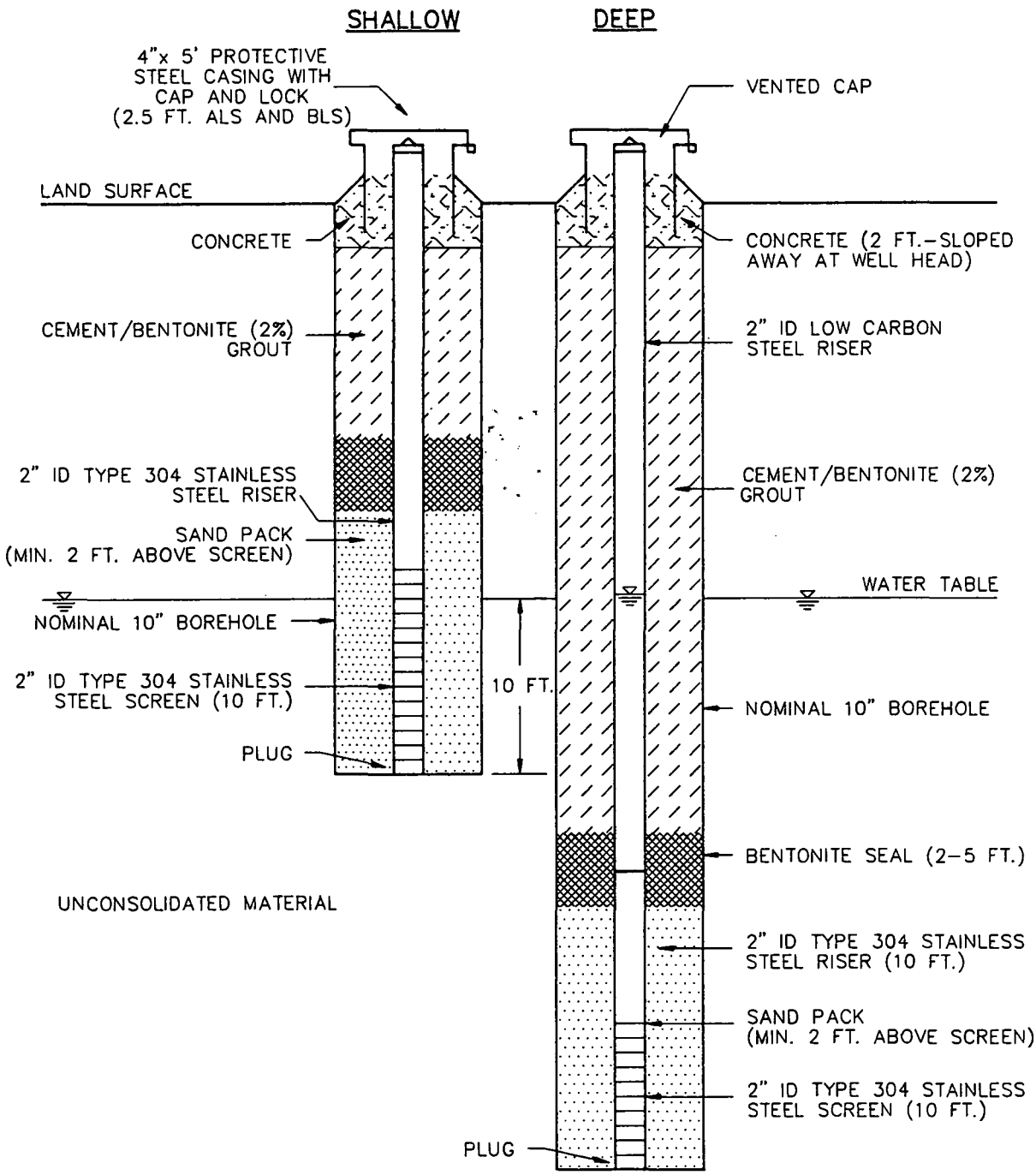
- Determine if private and municipal ground water use is potentially affected by contamination attributable to the Stoughton City Landfill site.

5.2.1.3 Monitoring Well Installation

As previously described the geologic setting for this site is comprised of approximately 150 to 250 feet of unconsolidated glacio-fluvial sediments overlying bedrock. These units generally are considered as a single aquifer in most places in Dane County; however, water movement between the units may be retarded by low permeability silts and clays (Cline, 1965). As noted previously, a 75-foot thick dolomitic clay layer was encountered in Stoughton City Well No. 3 in the depth interval 85 to 160 feet. The areal extent of this low permeability zone is not currently known.

We anticipate six, 2-well monitoring clusters will be installed on-site during the initial field investigation of the Stoughton City Landfill. Additional monitoring wells or monitoring well clusters may be added outside the initial investigative area based on results of Task 1 and/or the initial monitoring well sampling results. The details of monitoring well construction are shown schematically in Figure 5-3.

The shallow well in each cluster will be constructed such that the screen interval will extend 2 feet above the top of the water table so that lighter-than-water contaminants, if present, may enter the well. The deeper well in each cluster will be screened at a depth of 70-80 feet. This will provide an intermediate



NOTE: NOT TO SCALE

STOUGHTON CITY LANDFILL SURFICIAL AQUIFER MONITORING WELL-CONSTRUCTION DETAILS	FIGURE 5-3
ERM ERM-North Central, Inc.	9/15/88 mo

sampling interval between water table and bedrock to evaluate the vertical distribution of contaminants. Vertical gradients in the aquifer will also be determined by comparing data from the two wells in each cluster. The need for and specifications of any deeper wells at the site will be evaluated based on the analytical results and assessment of vertical gradient.

If during the drilling program a potential aquitard/aquiclude is located, drilling procedures for the deeper wells will be modified to prevent possible communication between separate aquifers. In such an instance, the deeper well will be finished in the uppermost portion of the lower aquifer. This will be accomplished by setting and cementing steel casing into the aquitard/aquiclude and continuing the borehole for the deep well through the steel casing into the lower aquifer.

Sediment samples for each boring will be screened in the field for trace gases (primarily volatile organics) using an HNu photoionization detector. We anticipate that the sample collected from above the water table exhibiting the highest concentration of trace gases from each boring will be collected for laboratory analysis for the TCL compounds. In the event that there is no indication of organic vapor above background, at least one (1) two-foot composite soil sample from above the water table will be selected for laboratory analysis of TCL compounds. A soil sample will be collected from the screened interval from each monitoring well installed at the site, and that sample will be submitted to a geotechnical laboratory for particle-size analysis. In the event that a potential confining layer is encountered during monitor well drilling, an undisturbed sample will be taken for laboratory analysis of hydraulic conductivity.

Locations for monitoring well clusters will be finalized based on the results of Task 1. It is anticipated that one cluster will be located upgradient and that additional well clusters will evaluate ground water contamination detected in existing wells SB-1, SB-2 and SB-3. As noted above, additional monitoring wells may be installed outside the initial investigative area based on the results of Task 1 and/or the initial monitoring well sampling results.

Existing monitoring wells SB-1 through SB-6 will be retained for potential use as piezometers contingent upon a quality assurance review for this purpose conducted under Task 1.

5.2.1.4 Ground Water Sampling and Monitoring

Prior to sampling, each well will be purged a minimum of three (3) casing volumes and until the measurement of pH, specific conductance, and temperature have stabilized. Details of the sampling procedures are presented in the Sampling and Analysis Plan (SAP) Part I - Field Sampling Plan (FSP) and analytical details are discussed in Part II - Quality Assurance Project Plan (QAPP) of the SAP.

Initial ground water samples and QA/QC samples will be analyzed for the complete Target Compound List (TCL) and for tetrahydrofuran, trichlorofluoromethane, and dichlorodifluoromethane.

Static water level readings will be taken prior to each sampling episode and on a monthly basis during the field investigations.

Hydraulic conductivity of the aquifer will be evaluated during the field investigation by performing slug tests in the completed monitoring wells. The slug test technique involves either the instantaneous addition (falling head test) or displacement (rising head test) of a known volume of water and the measurement of the subsequent water level transition to static conditions.

It is anticipated that the determination of hydraulic conductivity through slug tests will be suitable for ground water flow path definition. Aquifer pumping tests characterize a greater proportion of the subsurface, but when conducted in settings affected by ground water contamination, they may present problems such as the storage/disposal of potentially contaminated ground water and the potential effects of pumping on an existing waste plume. Such a test would be more appropriately conducted during any bench-scale studies or modeling to ensure that data collected during the test will be sufficiently comprehensive to support later phases of the RI and the FS.

5.2.1.5 Private Water Well Sampling

A survey of ground water utilization in the vicinity of the Stoughton Landfill site will be conducted during Task 1. Area ground water flow patterns and private well construction details will be evaluated. If any of these wells are downgradient from the site or potentially affected by the existing site conditions, they will be assessed for sampling. This sampling would occur after analytical results from the site monitoring wells are available and have been reviewed. Chosen wells will then be sampled and the water analyzed for compounds attributable to the

site. Standard operating procedures for the determination of these specific compounds will be submitted for USEPA/WDNR approval prior to initiation of private well sampling.

5.2.2 Air Investigation

The potential release of contaminants to air at the site will be monitored as part of the RI. Downwind sampling locations will be developed on the perimeter of the property based on readings obtained from portable wind direction/wind speed instrumentation. At each sampling location a known quantity of air will be drawn through two activated charcoal tubes placed in series. Upon removal of any organic contaminants from the charcoal tubes, the extract will be analyzed for target and analyzable VOCs as described in Appendix A of the QAPP.

5.2.3 Surface Water/Sediment Investigation

Hydrogeological investigation results, as well as current and historical surface run-off data, will be used to reevaluate the potential for surface water/sediment impact. Surface water/sediment sampling locations will be established after reviewing results of ground water sampling on site. Preliminary surface water/sediment sampling locations will be identified in the technical memorandum to be prepared following the completion of Task 1. Potentially impacted areas include the Yahara River and apparent wetlands adjacent to the site.

A water-level staff gage will be established and tied into the site evaluation survey, as noted during Task 1. River elevations would be collected at each well sampling and water level

measurement event during Task 2. Available data will also be acquired regarding average flow rates/volumes for the Yahara River and location and use of surface waters.

5.3 Task 3 - Site Investigation Analysis

5.3.1 Data Validation

At the onset of Task, 3, a quality assurance and data sufficiency evaluation for the RI will be conducted to validate the sufficiency and quality of the supporting data for the Baseline Risk Assessment and Feasibility Study. This data validation will be performed by Environmental Standards, Inc. All of the acquisition procedures and the laboratory data will be reviewed to ensure that Quality Assurance/Quality Control (QA/QC) has been maintained. The validation analysis will ensure that data quality meets the requirements of the QAPP and will be conducted in accordance with current USEPA guidance documentation such as "Laboratory Data Validation Functional Guidelines" available for both organic and inorganic parameters. Once the data validation and QA/QC subtask is completed, a QA/QC and data sufficiency evaluation will be submitted to the USEPA and the WDNR as a technical memorandum for their review.

5.3.2 Data Evaluation

Once it has been verified that the data are of acceptable accuracy and precision, the data will be analyzed and evaluated to describe (1) the site physical characteristics, (2) the source characteristics, (3) the nature and extent of contamination, and (4) the important contaminant fate and transport mechanisms.

Data on site physical characteristics will be analyzed to describe the environmental setting at the site, including important surface features, soils, geology, hydrogeology, meteorology, and ecology. This analysis will emphasize factors important in determining contaminant fate and transport for those exposure pathways of concern.

Data on source characteristics will be analyzed to describe the source location; and the types, chemical and physical properties, and concentrations of hazardous substances found. The actual and potential magnitude of releases from the source and the mobility and persistence of source contaminants will also be evaluated.

An analysis of data collected concerning the study area will be performed to describe contaminant concentration levels found in environmental media in the study area. Analyses that are important to the subsequent risk assessment and subsequent development of remedial alternatives include the horizontal and vertical extent of contamination in soil, ground water, surface water, sediment, and air. Spatial trends in contamination will be considered in evaluating transport pathways.

Results of the site physical characteristics, source characteristics, and extent of contamination analyses will be combined in the analysis of contaminant fate and transport. This information will allow determination of the following:

- Projected direction and rate of contaminant transport in the ground water system.

- Estimated volume of contaminated water.
- Estimated volume of contaminated soils.
- Estimated duration of contaminant source, and
- Prediction of the ultimate fate for contamination attributable to the Stoughton City Landfill site.

Either analytical or numerical modeling may be used to perform the above analysis. The use of numerical modeling will be dependent upon the degree of understanding of site conditions and the ease of evaluation of the potential effectiveness of different remedial actions. Decisions regarding the use of numerical models will be made in consultation with representatives of both the USEPA and WDNR.

5.3.3 Baseline Risk Assessment

Baseline risk assessments provide an evaluation of the potential threat to human health and the environment in the absence of any remedial action. They provide the basis for determining whether or not remedial action is necessary and the justification for performing remedial actions. Detailed guidance on conducting risk assessments as provided in the "Superfund Exposure Assessment Manual" (SPHEM) dated October, 1986 will be followed.

In general, the objectives of a baseline risk assessment may be obtained by identifying and characterizing the following:

- Toxicity and quantity, of hazardous substances present in relevant media (for example, air, ground water, soil, surface water, and sediment).

- Environmental fate and transport mechanisms within specific environmental media such as physical, chemical, and biological degradation processes and hydrogeologic conditions.

- Potential exposure pathways and extent of actual or expected exposure.

- Potential human and environmental receptors.

- Extent of expected impact or threat; and the likelihood of such impact or threat occurring, and

- "Acceptable" levels of exposures based on regulatory and toxicological information.

The goal of baseline risk assessment is to gather sufficient information to adequately, and as accurately as possible, characterize the potential risk from a site, while at the same time conducting this assessment as efficiently as possible. Use of the conceptual exposure model, developed and refined previously, will help focus investigation efforts and, therefore, streamline this effort.

The risk assessment process can be divided into four components: 1) contaminant identification, (2) exposure assessment, (3) toxicity assessment, and (4) risk characterization.

The objective of contaminant identification is to screen the information that is available on hazardous substances or waste present at the site and to identify contaminants of concern to focus subsequent efforts in the risk assessment process. Contaminants of concern may be selected because of their intrinsic toxicological properties, because they are present in large quantities, or because they are present in potentially critical exposure pathways. Indicator chemicals may be used as a part of this process to represent the most toxic and/or mobile substances among those identified or those substances for which the best information is available.

The objectives of exposure assessment are to identify actual or potential exposure pathways, to characterize the potentially exposed populations, and to determine the extent of the exposure. These objectives are developed by identifying the exposure pathways, analyzing exposed populations, and estimating expected exposure levels. Detailed guidance presented in the USEPA document "Superfund Exposure Assessment Manual" (SEAM) dated September 22, 1987 will be followed in addressing these objectives.

To assess the toxicity of contamination attributable to the site, a comparison of acceptable levels of contamination with actual levels identified during the exposure assessment will be made. Contaminant-specific ARARs, when available, will be used to

determine acceptable levels. When ARARs are not available or ARARs represent a risk greater than 10^{-4}, acceptable levels will be based on concentration levels that would yield exposures less than or equal to reference doses for non-carcinogens and specified risk levels based on potency factors for carcinogens. The preliminary goals for carcinogens will be based on the risk range of 10^{-4} to 10^{-7} excess lifetime cancer risk. Other available values may be useful in establishing final chemical-specific cleanup levels.

In the final component of the risk assessment process, risk characterization, the potential for adverse health or environmental effects for each of the exposure scenarios derived in the exposure assessment will be estimated. The estimates will be obtained by integrating information developed during the exposure and toxicity assessments to characterize the potential or actual risk including carcinogenic risk, non-carcinogenic risk, and environmental risk. The final assessment will include a summary of the risk associated with the site, including each projected exposure route for contaminants of concern and the distribution of risk across various sectors of the population.

As data are collected and a better understanding of the site and the risks that it imposes are obtained, the preliminary remedial action alternatives developed during scoping may be reviewed and refined. If sufficient data are available, preliminary remedial response objectives can begin to be developed as part of the FS.

Guidelines prepared by the USEPA, which may be used in the preparation of the baseline risk assessment include: the SPHEM, the SEAM, the Endangerment Assessment Handbook, (USEPA, August, 1985), the Toxicology Handbook (August, 1985) and a USEPA Technical Memorandum dated November 16, 1987 entitled "Updated Reference Dose and Cancer Potency Numbers for Use in Risk Assessments". Lastly, all data will be submitted as directed by the USEPA, for a health assessment by the Agency for Toxic Substances and Disease Registry (ATSDR). It is understood that the results of the ATSDR Health Assessment may not be available prior to completion of the RI report and that the RI report may be finalized without that input.

5.4 Task 4 - Laboratory and Bench-Scale Studies

During the development and initial screening of alternatives conducted as part of the RI, specific laboratory and bench-scale studies, or modeling may be identified as necessary to determine implementability, operability, reliability, and effectiveness of any particular alternative. The need for, design of, and implementation of any laboratory or bench-scale testing will be discussed with the USEPA and WDNR during the progress of the RI to ensure that necessary data are available for conducting the FS.

Treatability investigations may include the evaluation of waste fixation technologies to evaluate containment, as well as physical/chemical or biological processes to evaluate loading effectiveness, sizing, and materials requirements for treatment facilities. An aquifer pump test may also be appropriate under this task. Compatibility studies may be necessary to evaluate

remedial alternatives that incorporate the use of contaminant migration barrier walls. In addition, the synergistic reactions which may occur when different waste materials or contaminants are combined during treatment or decomposition require evaluation.

5.5 Task 5 - Remedial Investigation Reports

During the course of the RI, monthly reports of the status of completion of tasks required under the RI/FS Work Plan will be submitted to the USEPA and the WDNR as outlined in Article IX of the Consent Order. Maps of the selected exclusion and waste drum storage areas will also be transmitted by monthly report. In addition, all laboratory data, memoranda, a mid-project progress report and preliminary and final RI reports will be submitted. The RI report format suggested in the RI/FS Guidance will be followed, with the exception of those media or site characteristics which are not applicable to the Stoughton City Landfill site.

5.6 Task 6 - Remedial Alternatives Screening

Task 6 entails the development and preliminary screening of feasible technologies to remediate the site. When these subtasks are completed, an alternatives array document will be prepared and submitted to the USEPA and the WDNR for review. This document will contain a detailed description of the proposed remedial alternatives including the expected extent of remediation, contaminant levels, and the treatment methods. The results of this task will provide a basis for the development of the standards of performance required by the WDNR and USEPA.

Potentially feasible technologies identified during Task 6 will include on-site and off-site remedies. An initial list of technologies will be screened and modified based on site conditions, waste characteristics, implementation difficulties, implementation schedules, and the state of development of the technologies. Emerging or state-of-the-art technologies will be evaluated and may be carried through this screening process even if insufficient data exist to provide a full evaluation.

Site-specific remedial objectives for the FS will be established to evaluate remedial alternatives. These objectives will be based on RI data, the results of the Baseline Risk Assessment, USEPA interim guidelines, applicable USEPA or State environmental standards, as well as guidelines and advisories as defined under Section 121 of the Superfund Amendment and Reauthorization Act of 1986 (SARA). Preliminary cleanup standards and objectives will be developed in formal consultation with the USEPA and WDNR.

Alternative remedial actions will then be developed that incorporate the identified available technologies and are responsive to the established site specific remedial response objectives. These remedial actions will include treatment alternatives for source control that will eliminate the need for long-term management and treatment alternatives that will reduce the toxicity, mobility, or volume of the Stoughton City Landfill site waste. At a minimum, two of the alternatives will be:

1. A containment option that involves little or no treatment, but provides protection of human health and the environment primarily by

preventing potential for exposure or reducing mobility of the waste.

2. A no action alternative.

If remedial alternatives involving ground water management and treatment are appropriate, a number of alternatives will be developed which reduce cancer health risk potentially attributable to the Stoughton City Landfill site to within the range of 10^{-4} to 10^{-7} for maximum lifetime exposure. The ground water restoration alternatives will also include a range in the rate of restoration. Where feasible, at least one alternative will be included that would restore ground water to a 10^{-6} cancer risk potentially attributable to the Stoughton City Landfill site within five years of implementation.

Combinations of remedial alternatives may possible involve both source control and ground water restoration. The combined elements will be evaluated to ensure that the comprehensive remedial action is effective and the source and ground water restoration elements are complementary. However, each element will be detailed separately in the development and analysis of alternatives.

The final subtask will be to subject the identified alternatives and associated technologies to an initial screening considering the effectiveness, implementability, and cost for each alternative. The effectiveness evaluation will determine if an alternative: (1) adequately protects human health and the environment; (2) attains Federal/State ARARs; (3) significantly and/or permanently reduces the toxicity, mobility, or volume of

hazard constituents; and (4) is technically reliable, including the potential for failure and a need for replacement of the remedy. Implementability will be based on the feasibility and availability of the technologies for each alternative. This includes both the technical and institutional ability to monitor, maintain, and replace technologies as needed and the administrative ability to implement the alternative.

Finally, the cost of construction and long-term maintenance will be evaluated for each alternative. During the initial screening, cost will be a significant factor in comparing alternatives that provide similar results. However, cost will not be used to compare treatment versus nontreatment alternatives.

The objectives for screening alternatives will be used through the remainder of the FS with the most promising alternatives based on effectiveness and implementability. Alternatives chosen for more detailed analysis must also satisfy the requirements for treatment alternatives which eliminate long-term management or reduce the toxicity, mobility, and volume of site waste. State-of-the-art or innovative alternative technologies will be carried through the screening process if they offer potential for better treatment performance or lower costs while achieving similar levels of performance. The containment and no action alternatives will be carried through the initial screening to the detailed analysis regardless of their relative effectiveness, implementability, or cost.

5.7 Task 7 - Remedial Alternatives Evaluation

Three subtasks will be necessary to complete the evaluation of remedial alternatives for the Stoughton City Landfill site. The initial subtask will be to provide individualized evaluation of each proposed alternative against the review criteria. Secondly, alternatives will be compared to develop a ranking for the criteria of effectiveness, implementability, and costs. Finally, at the conclusion of Task 7 and as a separate chapter in the FS Final Report, the preferred alternative or combination of alternatives will be discussed in detail with respect to all review criteria. In the case of combined alternatives, this section will present the rationale supporting the combination and discuss the interrelationship between the components of the combined remedy.

The initial evaluation of alternatives will consist of a detailed description of the alternative; specific Federal and State ARARs; and other criteria, advisories, or guidelines to be used in the selection of remedies. The alternatives will be analyzed in sufficient detail to allow selection of a site remedy from a well-defined set of hazardous waste management approaches.

The alternatives will then be evaluated for both short-term and long-term considerations for technical effectiveness, implementability, and costs. A detailed analysis within these major criteria will include specific review criteria such as protection of the public health and environment, compliance with ARARs, reliability, and technical feasibility. Specific review criteria necessary to evaluate the effectiveness of a particular alternative include the:

- Degree to which the alternative is protective of human health and environment.

- Reliability of the remedy, including the need for and cost of replacement.

- Impact on specific environmental receptors.

- Degree to which the mobility, toxicity, or volume of the contaminant source is reduced.

In instances where health based levels are not available, risk assessments will be used to establish levels appropriate for the site. In the case of ground water response actions, the potential for further migration of any contaminant and the technical limits of aquifer restoration will be necessary review factors.

Specific review criteria associated with evaluating the implementability of any response action include the technical feasibility of that alternative, the administrative feasibility of implementing and monitoring the alternative, and the availability of necessary equipment or off-site support facilities. A significant component of this evaluation will be the effectiveness and reliability of any institutional controls that may be required for an alternative.

Cost component review criteria will include an evaluation of short-term capital, operational costs, and any long-term operation/maintenance costs. A present value cost analysis will also be used to compare alternatives.

Once the detailed review of each alternative is completed, alternatives will be compared one to another. Combinations of alternatives that complement each other with respect to technical effectiveness and operational compatibility will be developed and evaluated. Combinations of remedial alternatives will be compared by using the same criteria applied to individual alternatives.

The major objective for Task 7 is to present a detailed analysis of the preferred remedy for the Stoughton City Landfill site. The preferred remedy may be a combination of several individual alternatives and may consist of a program of phased alternatives to be implemented over a period of time. The preferred remedy will reflect a preference for treatment which significantly reduces toxicity, mobility, or volume of hazardous constituents and minimizes the requirements for long-term management. The following guidelines will be satisfied by the chosen remedy:

- The alternative will be protective of human health and the environment.

- The alternative shall attain ARARs identified for the site.

- The alternative shall be cost effective, and

- The alternative will utilize treatment technologies and permanent solution to the extent practicable.

There are conditions under which a preferred remedy may not be required to meet ARARs established for the site. These include the following:

- The alternative chosen is considered an interim measure which will become part of a comprehensive remedy that will satisfy the ARARs.

- Compliance with the ARARs would result in a greater risk to human health and the environment.

- Compliance with the ARARs is technically unfeasible.

- The alternative chosen will attain a standard of performance which is equivalent to the ARARs, and

- The State of Wisconsin has not consistently applied or demonstrated the intention to consistently apply ARARs at other remedial actions within the State.

5.8 Task 8 - Feasibility Study Report

The FS Report will summarize the findings of Tasks 6 and 7, and present a full and detailed description of the preferred remedy for the site. This report will be prepared in accordance with the format suggested in the RI/FS Guidance. Copies of the draft FS Report will be submitted to the USEPA and the WDNR for review and comment. Subsequently, a meeting will be held with the USEPA and WDNR to discuss these review comments and the manner in which they should be incorporated within the final FS Report. Comments will be incorporated as appropriate, and a public comment draft which include a description of the preferred alternative(s) will be prepared for review. The final FS Report will be prepared at the conclusion of the public comment period and will incorporate any additional comments as necessary and appropriate. The final report will then be submitted to the USEPA and WDNR.

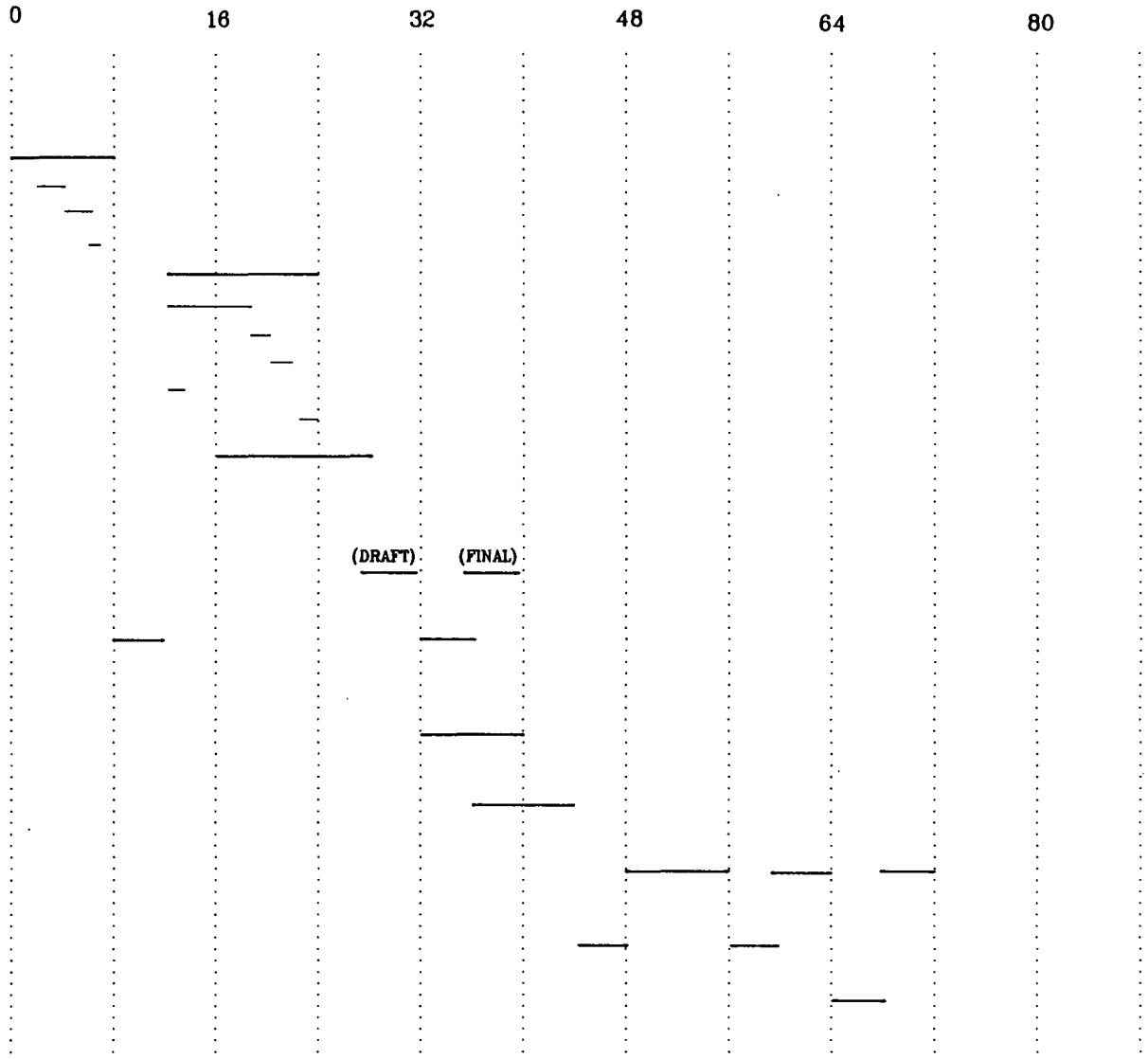
6.0 SCHEDULE

The schedule for completion of the RI/FS is presented in Figure 6-1. The anticipated start and completion dates for each major project task and subtask (for field work items under Tasks 1 and 2) are indicated as number of weeks following work plan/project plan approval. The estimated time from project initiation to presenting the Public Comment Draft of the FS is 64 weeks, with approximately 40 weeks to complete the RI and approximately 32 weeks to complete the FS.

Technical memoranda will be prepared and submitted to the USEPA and WDNR during the course of the RI and FS, prior to preparation and submittal of RI or FS reports. The technical memoranda anticipated during the Stoughton City Landfill RI/FS and the expected preparation dates in terms of weeks from initiation of the project are listed in Table 6-1.

The anticipated dates for the drafts and the final submittals for the RI and FS reports are indicated in Figure 6-1. This schedule for deliverables is based on a regulatory review period of 30 days and a 30 day public comment, where necessary.

ESTIMATED PROJECT SCHEDULE
STOUGHTON CITY LANDFILL
WEEKS FROM EFFECTIVE DATE OF WORK PLAN APPROVAL



(1) REMEDIAL INVESTIGATION TO BE CONDUCTED USING PHASED APPROACH.

(2) SCHEDULE AND NEED UNDETERMINED

NOTE: SCHEDULE ASSUMES 30-DAY REVIEW BY USEPA/WDNR

ESTIMATED PROJECT SCHEDULE	FIGURE 6-1
ERM ERM-North Central, Inc.	

TABLE 6-1

ESTIMATED SUBMITTAL DATES FOR TECHNICAL MEMORANDA DURING THE STOUGHTON CITY LANDFILL RI AND FS

TITLE	SUBMITTAL DATE* (WEEKS)
Task 1 Technical Memorandum	8
1.1 Site Boundary Survey, Current Ownership Determination, Detailed Land Survey, and Site Control Measures	
1.2 Historical Aerial Photo Analysis	
1.3 Area Ground Water Usage Survey	
1.4 History of Response Actions and Evaluation of Existing Data	
1.5 Geophysical and Soil Gas Surveys	
1.6 Review of Air Sampling Data	
1.7 Surface Water Evaluation	
1.8 Ground Water Flow Direction Evaluation	
Report of Monitoring Well Installation	20
Results of Ground Water Sampling at Landfill	28**
Results of Soil Sampling at Landfill	28**
Results of Residential Well Sampling (If Necessary)	32**
Results of Surface Water Sampling (If Necessary)	32**
Results of Air Sampling	32**
Results of Remedial Alternative Screening	44

* Dates are in reference to effective date for Work Plan approval.

** Estimated submitted, actual date will be 4 weeks after receipt of laboratory results to enable validation.

7.0 REFERENCES

Mickelson, D.M, and McCartney, M.C., 1979, "Glacial Geology of Dane County, Wisconsin", Univ. of Wisconsin - Extension Geological and Natural History Survey.

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