RECORD OF DECISION

FINAL REMEDY

LAND AND GAS RECLAMATION LANDFILL

Site Name and Location

Land and Gas Reclamation Landfill
(Listed on the National Priorities List as the Hechimovich Sanitary Landfill)

Located in the Town of Williamstown, Dodge County, Wisconsin (approximately 3.5 miles east of the City of Horicon and approximately 2 miles south of the City of Mayville)

Statements of Basis and Purpose

This document presents the decision of the Wisconsin Department of Natural Resources (WDNR) on the final source control and groundwater remedy that is necessary at the Land and Gas Reclamation Landfill site in the Town of Williamstown, Dodge County, Wisconsin. This remedy was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended by the Superfund Amendments and Reauthorization Act, and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). The attached Decision Summary identifies the information contained in the administrative record for this site upon which this decision is based.

Description of the Selected Remedy

The final remedial action for this site consists of the existing NR 504 Wis. Adm. Code clay cap and, if necessary, an expansion of the current operating gas extraction system. The details of the proposed action are contained in Section VII. The cap and gas extraction system installed in 1992 as an interim source control measure form the backbone of the final remedial action. The additional actions proposed in this Record of Decision (ROD) will increase the landfill gas extraction rate. The increased gas extraction rate will be accomplished either by adding additional gas extraction wells in the waste or by increasing the gas flow rate through the existing well system. The intent will be to, as rapidly as possible, reduce the volatile organic chemical (VOC) concentration in the landfill wastes and consequently reduce the VOC loading from the landfill to groundwater. This reduced loading, in conjunction with the natural contaminant attenuation processes already occurring in groundwater, should reduce the existing groundwater contamination levels at a satisfactory rate.

Groundwater monitoring will be required to track improvement in water quality. The WDNR may require additional active remedial measures in the future if water quality does not improve at an acceptable rate. Specific goals for the rate and extent of expected water quality improvements are detailed in this ROD.

Declaration Statement

The WDNR has determined that the landfill waste and groundwater contaminants pose a limited current and potential threat to human health or the environment. Exposure to waste and contaminated soil has been eliminated and the potential release of contaminants from the landfill waste to the groundwater has been minimized with the installation of the improved landfill cap and gas extraction system. This potential for release to groundwater will be further reduced by the measures described in this ROD. Potential exposure to methane and volatile organic compounds in the landfill gas has been eliminated with the installation of the active gas collection and incineration system. The remedy selected in this ROD constitutes the final remedy for this site. The selected remedy is protective of human health and the environment, attains state and federal regulations and is cost effective. The remedy uses permanent solutions and treatment technologies to the extent practical for this site. Because hazardous substances remain on site, a review will be conducted within five years after the implementation of the final remedy to ensure that the implemented actions continue to provide adequate protection of human health and the environment.

George E. Meyer — 9/6/95

George E. Meyer, Secretary
Wisconsin Department of Natural Resources

Date

DECISION SUMMARY

FINAL REMEDY

LAND AND GAS RECLAMATION LANDFILL

I. SITE NAME, LOCATION AND DESCRIPTION

The Hechimovich Sanitary Landfill was listed on the National Priorities List (NPL) by the U.S. Environmental Protection Agency (USEPA) in March of 1989. The site, now known as the Land and Gas Reclamation Landfill (LGRL), does not include the active landfill ("the new Hechimovich Sanitary Landfill") which is located immediately to the north of the closed Land and Gas Reclamation Landfill. The new landfill meets current state design and operation requirements and is licensed to accept only nonhazardous waste. The site does not include a licensed demolition debris landfill directly west of the Land and Gas Reclamation Landfill.

The Land and Gas Reclamation Landfill site is located in a rural area in the Town of Williamstown, approximately 2 miles south of the City of Mayville, and approximately 3.5 miles east of the City of Horicon, Wisconsin (See Figure A). This 24.3 acre closed landfill is located in the east one-half of the southwest quarter of Section 35, Township 12 North, Range 16 East, Town of Williamstown, Dodge County, Wisconsin. This site is unfenced and access is not controlled.

The area surrounding the site is primarily agricultural land with low density residential development. Horicon Wildlife Area, a major migratory bird habitat, is approximately 2.5 miles west of the site.

The dominant landform in the area is drumlins, long narrow glacially formed hills, with the water table at or near the land surface between the hills.

II. SITE HISTORY AND ENFORCEMENT ACTIVITIES

The Land and Gas Reclamation Landfill was a licensed landfill, operated by the City of Mayville from 1959 to 1970 and then privately operated from 1970 to October 1986 when it ceased accepting waste. The Mayville landfill was a small open dump that now is part of the northern end of the closed landfill (see Figure B). A variety of waste disposal activities occurred at the Mayville site including open burning, battery

recycling operations and solvent disposal. It appears these past activities are a significant contributor to the current groundwater problems as the highest groundwater contamination levels are directly down gradient and adjacent to the old dump site.

Beginning in 1970 the site was operated by George Hechimovich and the site was then called the Hechimovich Sanitary Landfill. The Mayville site was sold to and became part of the Hechimovich Sanitary Landfill in 1971. In March 1984 site ownership and operations were transferred to Land and Gas Reclamation, Inc. and the site name was subsequently changed to LGRL in July 1985. The site was closed in October 1986.

During part of the 1970-1986 time period, the site was licensed to accept hazardous waste. Paint sludges and cutting oils from local industries, possibly containing lead, chromium and solvents, were disposed of in several lagoons on-site. It is estimated by USEPA that 53,000 gallons of liquid hazardous waste were disposed of at this site. In addition, the site accepted approximately one million cubic yards of nonhazardous household and commercial wastes. The landfill does not have a liner. An initial cover, consisting of two to 4 feet of local till soils and 6 inches of topsoil, was placed in 1987. A system of groundwater and surface water monitoring locations were included in a monitoring program required by the WDNR at site closure.

In July 1987, the Land and Gas Reclamation Landfill site was the subject of a WDNR state enforcement action, resulting in a Stipulation and Order signed by the Dodge County Circuit Court, which directed George Hechimovich, Hechimovich Sanitary Landfill, Inc., and Land and Gas Reclamation, Inc. to undertake certain actions at the landfill, including the installation of a clay cap and a gas collection system. The court ordered clay cap was installed, under WDNR supervision and approval, in 1991 and 1992. To date the cap has been satisfactorily installed and maintained. In addition, since March 1992 the active gas extraction system has been operating according to design specifications. The installation and operation of these measures were documented and approved as a source control interim action in a January 1994 Record of Decision signed by WDNR and concurred with by USEPA. The enhancement of this gas extraction system is the main activity in the final remedy for the site.

The WDNR nominated the Land and Gas Reclamation site for listing on the NPL in 1988. The site was listed on the NPL, as the Hechimovich Sanitary Landfill, in March 1989. Based on the information obtained from landfill records in the possession of Daniel and George Hechimovich, the WDNR issued special notice letters to fourteen potentially responsible parties ("PRPs") on August 15, 1990 and special notice letters to two additional PRPs on September 20, 1990.

The potentially responsible parties entered into an environmental repair contract with the WDNR, which became effective on September 28, 1990, to perform a remedial investigation/feasibility study ("RI/FS") pursuant to s. 144.442, Wisconsin Statutes. After the environmental repair contract was signed, the WDNR decided that, due to the timing of the remedial actions, remediation at the site should be divided into two operable units; a source control (landfill closure) operable unit and a groundwater operable unit. The January 1994 Record of Decision documented successful completion of the source control operable unit. This Record of Decision establishes the final remedy for the site and includes both source control and groundwater remedial measures.

III. HIGHLIGHTS OF COMMUNITY PARTICIPATION

An Administrative Record has been established at the Mayville Public Library, 111 North Main Street, Mayville, Wisconsin.

In September 1991, a Superfund Fact Sheet on the Land and Gas Reclamation Landfill was issued by the WDNR. On September 25, 1991, representatives of WDNR, USEPA, and the Wisconsin Department of Health and Social Services held a public information meeting at 7:00 p.m. at the Senior Center located at 330 N. Walnut Street in Mayville, Wisconsin, and discussed the Land and Gas Reclamation Landfill and the landfill closure and groundwater investigation work that was being conducted at this site. Approximately 50 residents of the area attended the public meeting.

A proposed source control ROD which selected the source control for the Land and Gas Reclamation Landfill was made available for public comment from December 3, 1992 through January 6, 1993. Based on public comments a new proposed ROD was made available for public comment, from October 15, 1993 to November 15, 1993. Comments received during both public comment periods and WDNR's responses to those comments were included in a Responsiveness Summary, which was a part of the source control interim action ROD. A notice announcing the availability of the new proposed ROD and the start of the second public comment period was published in the Mayville News on October 21, 1993. The source control ROD was signed by the WDNR in January 1994.

The public participation requirements of s. 144.442(6)(f), Wisconsin Statutes, and the community relations requirements of Sections 117 and 113(k)(2)(B)(I-v) of CERCLA were met in the source control interim remedy selection process.

The Proposed Plan for the final remedy at this site was available for public comment from February 16, 1994, to March 17, 1994. A public meeting to present and discuss the plan was held at the Mayville Senior Center on February 16, 1994. Approximately 30 people attended. During the public comment period one written comment was received. The state and federal public participation requirements were also met in this final remedy selection process.

IV. SCOPE AND ROLE OF RESPONSE ACTION

The response action for this site, described in detail in Section VII, is an expansion or modification of the current landfill gas extraction system. The system will include operation and maintenance of the landfill cap and gas control system, groundwater monitoring, deed restrictions as appropriate, continued natural breakdown of groundwater contaminants and enhancement of the gas extraction system. The enhancement will be either through the addition of new extraction wells or an increase in the air flow through parts of the existing extraction system. Results of the Remedial Investigation show that the northern portion of the site appears to be the most significant contributor of VOCs to the groundwater. This is the location of the old Mayville Dump. If necessary, additional extraction wells, screened through the entire waste thickness, will be placed in this area to accelerate the decrease in VOC concentration in the waste mass. It is possible that a similar concentration reduction could be achieved by increasing the air flow through the current gas system. With either approach the reduction in contaminant mass will reduce the VOC loading to groundwater and will consequently reduce down gradient groundwater contaminant concentrations. This will reduce groundwater concentrations to acceptable limits consistent with state and federal guidelines within an acceptable time frame.

Monitoring the groundwater at well nests one and three will be the primary means of evaluating the performance of the remedial action. Improvements in groundwater quality should reasonably follow the concentration decreases shown in Table 4. If the concentration changes do not follow the expected trend, additional remedial measures may be necessary. It is most likely that some form of active remedial measures would be installed on the north edge of the landfill.

V. SITE CHARACTERISTICS

A. Topography

The Land and Gas Reclamation Landfill site occupies the northern portion of a drumlin (a glacial landform consisting of a long, narrow hill) in a drumlin field. There are two wetland areas adjacent to the Land and Gas Reclamation Landfill site, one west and one north and east of the site.

B. Geology/Hydrogeology

The unconsolidated material in the area of the site consists of five distinct units. Some of these units were glacially deposited while others are of more recent origin. The five units and their distribution are:

1) Peat - This organic material is of recent origin and exists southwest, east and north of the site. The peat lies at the land surface and together with underlying silts and clay is up to 45 feet thick. Where the peat is present the water table lies within it. The peat, because of its high organic matter content, significantly retards groundwater contaminant migration through it. Consequently, the peat is not a significant migration pathway of concern and contamination in the peat is restricted to an area close to the north edge of the waste fill.

2) Organic Silt and Clay - This material is almost only present where the peat is and underlies the peat. It is of recent origin. Because of its low hydraulic conductivity it provides a limited migration pathway potential for groundwater contaminants based on the groundwater results from the site.

3) Brown Till - This material was identified in discontinuous layers to the north, west and south of the waste fill. Its thickness varies from 10-20 feet and it is of medium density. Because of its discontinuous nature the unit is not a groundwater contaminant migration pathway of concern.

4) Silty Gray Sand - Where present north of the site this unit is the primary groundwater contaminant migration pathway. It directly underlies the refuse and varies from 2-27 feet in thickness.

5) Sandy Gray Till - This is the lowest glacially deposited unit and consists of a very dense till that extends to the top of bedrock at most locations. It underlies much of the fill area. Because of its dense nature, it offers limited contaminant migration potential.

The bedrock underlying the entire site is Maquoketa Shale. The shale is massive and very impermeable. It provides a "bottom layer" through which contaminant migration is restricted.

Groundwater flows radially away from the landfill. To both the east and west this flow discharges to either adjacent wetlands and their drainage ditches or turns north and leaves the site as groundwater flow to the north-northeast. Groundwater flow leaving the site to the north, through the more permeable silty sands, is of the greatest groundwater contaminant migration concern. The furthest migration distance and highest pollutant concentrations are found along this flow direction.

Hydraulic conductivity values vary across the site depending on the type of material. The unit of most concern, the silty sand, has values ranging from .0001 to .04 centimeters/second.

Vertical hydraulic gradients at the site are variable and are not strong influences on contaminant migration. Horizontal gradients to the north of the site were measured at .03 foot/foot.

C. Contamination Extent

1. Groundwater

Groundwater contamination levels of concern exist to the north and west of the site. The northern plume is the largest and contains the highest contamination concentrations. Vinyl chloride, trichloroethene and 1,2-dichloroethene are the predominant constituents of concern. They exist in the highest concentrations at the northern edge of the fill (wells MW-1AR, MW-1RR) and decrease in concentration through wells W-3AR and MW210 before reaching nondetectable levels approximately 900 feet north of the site (see Table 1 and Figure D). The plume appears to be at steady state and is not expanding or contracting at this time. It is this plume which is of the greatest concern and which drives the remedial action decision making at this site.

The western plume is summarized in Table 2 and exists only to a limited extent to the west. Because of the nature of groundwater flow at the site, contaminants leaving the west side of the site quickly turn north following the groundwater flow. Consequently, contaminants leaving the west of the site move north and become part of the north plume leaving the site.

Groundwater contamination of concern was not found east or south of the site. No detectable levels were found east of the site and to the south only well A-3A

showed detectable concentrations. These results were not a factor in evaluating the remedial options at the site.

The primary groundwater contaminants at the site are VOC's. (See Tables 1 and 2) Heavy metals and semi-volatile compounds are not compounds of concern. Limited migration of these materials was found at the site and they were not considered when choosing a remedial action.

2. Surface Water, Sediment, Soil and Drinking Water

In addition to groundwater sampling; surface water, sediment, soil and nearby residential wells were tested for the same contaminants as were tested for in groundwater. Surface waters, soils and sediment were not found to be contaminated at levels of concern. However, the baseline risk assessment did indicate a potential for environmental impacts to surface waters from groundwater discharge of vinyl chloride to the wetlands. These impacts are addressed by the proposed remedial actions. The gas extraction system is removing vinyl chloride and other VOCs from the waste mass. This reduction will decrease the rate vinyl chloride enters groundwater and consequently the surface water concentrations will decrease.

As part of the Remedial Investigation, eleven nearby private water supply wells were tested. Only one well contained detectable levels of contamination. A single water supply well approximately 1200 feet northeast of the site did contain 1-2 parts per billion of 1,2-dichloroethene. These levels are below health standards and are not believed to be related to the site. The affected well is believed to be hydraulically side gradient of the site and has well casing into the Maquoketa Shale. As stated, the shale retards contaminant migration downward and makes it very unlikely that contaminants could move from the site to this well. The source of the private well contamination appears to be from a source other than the landfill.

VI. SUMMARY OF SITE RISKS

As part of the site investigation, a baseline risk assessment was conducted to assess the current and potential risks posed by the site. The risk assessment determines whether contamination at the site could pose an unacceptable health or environmental risk. Potential threats are estimated by making assumptions about the manner, frequency and

length of time a person or the parts of the environment could be exposed to site related contaminants.

A baseline risk assessment conducted by a consultant under contract to the WDNR was completed in July 1993. The assessment found that under the no action alternative, the human health risks from the site are not in excess of acceptable levels set by the USEPA. The analysis of potential ecological effects suggests a potential for limited environmental impacts. However, this potential was evaluated through a qualitative screening analysis only. The following discussions summarize the chemicals of concern and the risk levels they present.

A. Chemicals of Potential Concern

The primary chemicals of potential concern identified in the risk assessment based on frequency of occurrence and concentration were vinyl chloride, trichloroethene, 1,2-dichloroethene, 1,1-dichloroethene, 1,1-dichloroethane, and benzene. A complete listing of all potential chemicals of concern is shown in Table 3.

B. Human Health and Environmental Risk Characterization

The exposure assessment, developed as part of the human health and environmental risk assessment, developed a conceptual model for the LGRL site based on general site characteristics. The conceptual model (Figure C) describes ways by which chemicals from the LGRL site might contact potential receptors. This exposure pathway analysis identified four potential mechanisms for exposure:

- direct contact with exposed waste;
- release of waste constituents to the ambient air via volatilization or wind-driven erosion, followed by airborne migration to receptor locations;
- contaminant release to groundwater followed by migration through groundwater to water supply wells;
- contaminant release to groundwater followed by migration through groundwater to surface water or wetlands.

Based on these mechanisms, a list of potential exposure pathways were developed and evaluated for viability (i.e., the potential to be complete) based on site-specific information (e.g., analysis of groundwater flow, contaminant distribution, location of potential receptors).

Contaminant release to groundwater, followed by groundwater migration and discharge to the nearby wetlands and ditches west and north of the site was determined to be the only viable migration pathway which might lead to exposure. Terrestrial and aquatic wildlife could be exposed to site-related chemicals released to the ditches and wetlands. Similarly, people walking through the wetlands and ditches could also be exposed to site-related chemicals. Site monitoring data did identify surface water contamination from constituents found in groundwater. Consequently, this was determined to be a completed exposure pathway.

The direct contact and the air pathways were not considered viable due to engineering controls from the source control operable unit. Contaminant migration to existing water supply wells was also not considered viable because analysis of groundwater flow indicates the site is not hydraulically connected to the aquifers in which water supply wells are screened. The presence of the Maquoketa Shale, an aquitard restricts groundwater contamination from migrating deeper to the depths that the water supply wells are drilled to. Physical characteristics of the site (e.g., potential for landfill subsidence), the nature of the adjacent land (wetlands not readily developable), limited population growth pressures, and Wisconsin regulations (e.g., prohibition of development on former landfills) severely limit the potential for site development, and thereby also preclude the exposure to contaminated groundwater from installation of water supply wells within the zone of contaminated groundwater.

The human health risk characterization evaluated exposure of "site visitors" to chemicals released to the ditches and wetlands. Potential site visitors were assumed to include hunters, hikers, or children from nearby homes trespassing onto the site and adjacent areas.

There are no reports of people routinely visiting the site or adjacent wetlands. Although there are no physical barriers limiting access, the general remoteness of the site from large developments or major roadways reduces the ready access of the site to people. There are approximately 14 homes within one-half of the

site. There are no apparent features about the site or adjacent areas that might draw hunters or hikers to the area in preference to any other area in the vicinity. Hunting is not allowed on the site by the landfill's owners. Similarly, there are no parks or wildlife areas adjacent to the site that could attract hikers near the site.

The human health risk characterization quantitatively evaluated exposure through dermal absorption of surface water while walking through the ditches and wetlands and incidental ingestion of sediment (other routes of exposure while possible were determined to be less significant than those quantitatively addressed.) Surface water exposures were evaluated for three cases; one based on measured surface water concentrations, and two others based on chemical concentrations detected in groundwater and assumed to be discharging to the surface water. Both carcinogenic and noncarcinogenic human health risks were evaluated.

The estimated human health risks were not in excess of levels identified by USEPA warranting remedial action. All evaluations of noncarcinogenic risks were substantially below EPA's threshold of a hazard index of one. EPA has stated that individual excess lifetime cancer risks less than 1×10^{-4} (one in ten thousand) generally do not warrant remedial action at Superfund sites, although a risk of 1×10^{-6} (one in a million) is the point of departure for developing remedial goals. All estimated individual excess lifetime cancer risks were less than 1×10^{-4}. Only one scenario, based on the highest concentrations detected in groundwater, had estimated risks exceeding 1×10^{-6} (risks ranged from 2×10^{-6} to 3×10^{-6}). The primary chemical contributing to the risk was vinyl chloride.

The results of the human health risk assessment did not identify a need for action. The need for the proposed remedial actions is based on compliance with Applicable, Relevant and Appropriate Requirements (ARARs) as discussed later.

C. Ecological Risk Assessment

The screening level ecological risk assessment was conducted by comparing measured surface water and sediment concentrations and potential future surface water concentrations to federal ambient water quality criteria, Wisconsin water quality standards and criteria, and toxicity values. The results of the ecological

risk characterization indicate that potential fish and wildlife habitat adjacent to the LGRL may be potentially exposed to contaminants migrating from the landfill. The fish and wildlife habitat consists primarily of a wetland complex with associated ditches lying east and north of the landfill. The exposure pathways analysis and results of the RI indicate that this wetland complex is the discharge point for contaminated groundwater migrating from the landfill. These exposures were based on hypothetical future conditions. This potential concern did not alter the selection of the preferred remedy.

An ecological survey of the area was conducted and no significant adverse ecological effects of landfill contamination were observed. There was evidence to suggest that the wetlands have been disturbed as a result of encroachment by landfill activities and the construction of ditches. Ditches within the wetlands were shown to have a poor quality community of aquatic organisms and minnows. It does not appear that the ditches are capable of supporting a sustainable population of aquatic organisms due to frequent drying out of the ditches.

In summary, the baseline risk assessment indicates that there may be potential for ecological effects under the no-action alternative. The ecological evaluation, however, was only a preliminary screening level analysis. The baseline risk assessment further indicates that human health risks do not appear to be outside USEPA's range of protectiveness.

VII. SCOPE OF REMEDIAL ACTION

The planned remedial action will be a continuation and expansion of the current source control measures. The current clay cap will be maintained. The existing gas extraction system will continue to operate. The expansion of the existing gas extraction system will involve accelerating the gas extraction rate. Either by adding additional extraction wells or by increasing the air flow rate through the existing well system, the system will remove the VOCs in the landfill waste quicker. This will reduce the potential VOC loadings to the groundwater. Consequently, there should be improvements in groundwater quality at an acceptable rate.

The expansion of the gas system will likely be targeted toward the northwest portion of the site. It appears, based on the groundwater quality data and site history, that the area around gas well 14 is the most significant VOC source in the waste fill. Increasing the VOC removal rate in this area should be the most productive in terms of

groundwater quality improvement. Currently the gas system is operating at an average of 200 cfm and in 1993 removed approximately 7000 pounds of VOCs from the landfill. By placing additional gas extraction wells, in a closely spaced grid, additional volatile contaminants will be removed from the waste fill before they can migrate to groundwater. There are no specific estimates of what the increased air flow or subsequent increased VOC removal rate will be. These specifics will be defined in the Remedial Design phase. The extracted wastes will then be burned in the already operating flare system.

It is also possible that the current gas system could be used to accelerate the VOC removal from the waste. By closing off the air flow through other portions of the landfill it may be possible to increase the vacuum and air flow through the area around gas well 14. This would have the same effect of increasing the VOC removal rate and decreasing the contaminant mass moving to groundwater.

Groundwater monitoring at the site will be continued to document improvements in water quality. The groundwater quality improvements north of the site will be used to evaluate the success of the remedial system. Monitoring well nests 1, 3, 210 and 214 will be the best indicators of environmental improvement. Table 4 shows the improvements expected at well nest 1 over the next several years. If the expected improvements are seen at this nest, then the remediation system will be working and improvement will be seen in the nests further downgradient from the site. Because well nest 1 is right next to the site it should be the first to show water quality improvement.

The values in Table 4 were developed taking existing water quality data from the site and then predicting future concentrations using a simple statistical model. Since models are not very precise tools confidence intervals were placed around each predicted concentration to account for some of the variability in contaminant migration rates. Predicting contaminant migration is not a highly developed science so the potential responsible parties were given some flexibility in meeting water quality improvement goals. Also, it is expected that as additional water quality data are generated through long term monitoring at the site, there will be refinements in the predicted water quality improvements.

Groundwater evaluations will be done annually for the first five years to closely monitor site conditions. If water quality does not improve as predicted in Table 4, active remedial measures would likely be necessary. The decision to implement an

active groundwater remedial system could be done, at a minimum, any time in the first five years of operation.

VIII. DESCRIPTION OF ALTERNATIVES

A. Remedial Action Objectives

Remedial action objectives were developed for this site to provide for long-term protection of human health and the environment, and to meet ARARs. ARARs are any federal or state standard, requirement, criteria or limitation that are determined to be legally applicable or relevant and appropriate to the site cleanup. The final remedial action objectives for this site are:

- Reduce groundwater contamination concentrations to levels below the Preventive Action Limits established in NR 140 Wis. Adm. Code at the landfill waste edge.

- Maintain human exposure levels to contaminants below state and federal guidelines. These are primarily the state and federal groundwater and drinking water standards. The federal standards are Maximum Contaminant Levels set in the Safe Drinking Water Act and the state drinking water standards are set in NR 809 Wis. Adm. Code.

- Maintain ecological exposure levels to contaminants below potential levels of concern based on state and federal criteria such as the federal surface water quality criteria.

B. Development of Alternatives

The remedial action objectives for this site involve eliminating or reducing human and ecological exposure levels and reducing groundwater contaminant concentrations to acceptable levels.

The remedial alternatives were assembled from applicable remedial technology options. Some of the alternatives incorporate the source control measures already installed at the site during the source control work. These measures include primarily the landfill cap and gas extraction system. The alternatives

surviving the initial screening in the Feasibility Study document were evaluated and compared with respect to the nine criteria set forth in the National Contingency Plan (NCP). In addition to the remedial action alternatives, the NCP requires that a no-action alternative also be considered for the site. The no-action alternative serves primarily as a point of comparison for other alternatives.

C. Alternatives

1. Alternative 1 - No Further Action - Because some source control actions, installation of the clay cap and gas extraction system, have already been completed, a no-action alternative cannot be defined for this site. In this case, a no further action option has been defined as only the physical installation of the clay cap and gas system. It does not include operation, maintenance or monitoring of either component. Groundwater monitoring and institutional controls on land use are also not included.

2. Alternative 2 - Natural Degradation/Institutional Controls - This option consists of the following actions:

   - Operating, maintaining and monitoring the source control measures (clay cap and gas extraction).
   - Implementing deed restrictions to prevent residential development in the area of groundwater contamination.
   - Conducting groundwater monitoring.
   - Relying on natural attenuation processes to help achieve compliance with groundwater standards.

   This alternative relies heavily on the natural breakdown of VOCs already in the groundwater to achieve compliance with groundwater standards. The anaerobic groundwater environment down gradient of the landfill allows microbiological dechlorination of the organic contaminants. Past research has shown that under such conditions naturally occurring microbes can break down some chlorinated compounds. This process is likely already occurring to some extent in the groundwater on site. Based on experience at other sites, the existing condition at this site probably

provides for some biological breakdown. It is proposed, under this option, that the natural degradation rate (in conjunction with source control) will bring groundwater concentrations down to acceptable levels in a reasonable period of time generally defined as less than 30 years if no current nearby wells are impacted. Groundwater monitoring, especially on the near down gradient edge of the fill, will be required to track water quality improvements. Site reviews would be conducted annually to track site progress. The rate of groundwater quality improvement should follow that shown in Table 4. If improvement did not occur at a satisfactory rate, active groundwater treatment would be required.

3. Alternative 3 - Enhanced Source Control - This alternative includes additional source control measures and also relies on the natural degradation process discussed previously. Increased gas extraction would be accomplished either by increasing the number of extraction wells or the air flow rate through the existing well system. This will be determined in the Remedial Design phase. This is the selected remedy for the site and is discussed in more detail earlier in this document.

   A continency for further action if remediation goals are not met as expected is included, and would be some form of active remediation.

4. Alternative 4 - Groundwater Extraction, Treatment and Discharge - This alternative involves pumping the most contaminated groundwater north of site, treating the water through an air stripper and discharging it to one of the existing drainage ditches. Groundwater extraction would be accomplished either using wells or trenches immediately down gradient of the landfill. Treatment would be done with an air stripping tower to remove the VOC's. Discharge of contaminants to the air and drainage ditches would be regulated under WDNR administrative rules.

IX. SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

A. Introduction

USEPA has established in the NCP nine criteria that balance health, technical, and cost considerations to determine the most appropriate remedial alternative. The criteria are designed to select a remedy that will be protective of human health and the environment, attain ARARs, utilize permanent solutions and treatment technologies to the maximum extent practicable, and be cost-effective. The relative performance of each of the remedial alternatives listed above has been evaluated using the nine criteria set forth in the NCP at 40 CFR 300.430(e)(9)(iii) as the basis of comparison. These nine criteria are summarized as follows:

THRESHOLD CRITERIA

1. Overall Protection of Human Health and the Environment

   A remedy must provide adequate protection of human health and the environment and describe how risks are eliminated, reduced or controlled through treatment, engineering controls or institutional controls.

2. Compliance with Applicable or Relevant and Appropriate Requirements (ARARs).

   The remedy must meet all applicable or relevant and appropriate requirements of federal/state environmental laws. If not, a waiver may apply.

PRIMARY BALANCING CRITERIA

3. Long-term Effectiveness and Permanence

   Once cleanup goals have been met, this criterion refers to expected residual risk and the ability of a remedy to maintain reliable protection of human health and the environment over time.

4. Reduction of Toxicity, Mobility or Volume Through Treatment

   The purpose of this criterion is to anticipate the performance of the treatment technologies that may be employed.

5. Short-Term Effectiveness

This criterion refers to how fast a remedy achieves protection. Also, it weighs potential adverse impacts on human health and the environment during the construction and implementation period.

6. Implementability

This criterion requires consideration of the technical and administrative feasibility of a remedy, including whether material and services are available.

7. Cost

Capital, operation and maintenance, and 30-year present worth costs are addressed through this criterion.

MODIFYING CRITERIA

8. State Acceptance

This criterion evaluates the state's acceptance of the proposed action.

9. Community Acceptance

This criterion summarizes the public's response to the alternative remedies after the public comment period. The comments from the public will be addressed in the Responsiveness Summary attached to this ROD.

B. Remedial Alternatives for Final Remedial Action

The nine criteria evaluation is as follows:

1. Threshold Criteria

The threshold criteria are CERCLA statutory requirements that must be satisfied by any alternative in order for it to be eligible for selection as a CERCLA-quality remedy. These two criteria are discussed below.

a. Overall Protection of Human Health and the Environment

Alternative 1 (modified no action) does not provide adequate protection of the environment. Under this scenario there would not be a long-term significant reduction in VOC loadings to the groundwater. By not maintaining the existing cap, eventual soil erosion will increase the amount of water infiltrating through the waste. This will, in time, increase contaminant movement to the groundwater. Also, by not operating the gas extraction system, contaminants will not be removed from the waste. These contaminants, under this alternative, would likely migrate to groundwater causing additional contamination. Groundwater standards would not be met under this option.

Alternatives 2, 3 and 4 all meet this threshold criteria by reducing the mass of contaminants in the landfill available for leaching to the groundwater. The difference between each option is the rate of reduction. These differences are evaluated under the upcoming criteria.

b. Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)

Alternatives 3 and 4 meet the ARARs pertaining to this site. Both options satisfy the key provisions of NR 140 Wis. Adm. Code of reducing groundwater contamination levels within a reasonable period of time. Only the rate at which the reduction would occur separates these choices.

NR 140 Wis. Adm. Code requires active remediation measures when groundwater enforcement standards are exceeded at a point of standards applications. Because this is an NPL site, the point of standards application is the waste fill boundary. As discussed previously, there are a number of health-based enforcement standards exceeded at the fill edge. The active measures proposed for this site under Alternatives 3 and 4 should reduce groundwater concentrations at an acceptable rate. These measures meet the requirement to take an active response.

Because Alternative 4 employs pump and treat, it would reduce groundwater contamination levels the fastest. However, as is discussed later there are site specific concerns that would likely limit the success of a pump and treat system.

Alternative 2, with its heavy reliance on natural attenuation, likely will not meet NR 140 requirements. It is not clear that natural attenuation with the existing source control measures would reduce groundwater contamination at an acceptable rate. It is the WDNR's opinion that Alternative 2 likely does not meet NR 140 and therefore fails this threshold criteria test. However, since the field data are not conclusive in this matter, Alternative 2 is reviewed by the following balancing and modifying criteria to determine its value.

Alternatives 2, 3 and 4 do meet the solid waste closure requirements in NR 500-520 Wis. Adm. Codes. Most importantly the provisions regulating the clay cap and gas extraction systems are met. Also, the applicable air requirements in NR 445 are met.

2. Primary Balancing Criteria

Alternatives which satisfy the two threshold criteria are then evaluated according to the five primary balancing criteria. Because Alternative 1 does not satisfy the threshold criteria, it will not be evaluated any further.

a. Long-Term Effectiveness and Permanence

All three remaining choices fulfill this criteria. Alternative 4, pump and treat, likely would decrease groundwater concentrations the fastest, while Alternative 2, natural degradation, would be the slowest. Alternative 3 would fall somewhere in between.

All three possibilities are seen as permanent solutions because they ultimately reduce and destroy the contaminant through treatment of some kind. The residual risk to human health or the environment remaining after completion of any of the three approaches would be low.

With all three options it will take a period of years to reduce groundwater contamination to acceptable levels. During this interim, public health will be additionally protected through the use of deed restrictions and state solid waste regulations preventing private well development in the area of groundwater contamination.

b. Reduction in Toxicity, Mobility and Volume Through Treatment

All three remaining alternatives provide waste treatment and consequently reduce contaminant mobility. Alternative 2 uses the existing gas extraction system to draw VOC's from the landfill waste and incinerate it. However, there are concerns that the existing system is not reducing VOC contaminant levels in the waste fast enough. Based on site studies it appears that the northwest corner of the landfill, the old Mayville dump area, is the greatest contaminant source. It does not appear that the current gas system adequately addresses this area. Consequently, the waste treatment provided under this option is not acceptable.

Alternative 3 provides for an enhanced gas extraction system in the area of the old Mayville Dump. Consequently, this choice provides a more acceptable level of waste treatment and is an improvement over Alternative 2. It reduces at a faster rate the mass of contamination available to migrate to the groundwater.

Alternative 4 includes both the existing waste treatment features, while adding treatment of groundwater contamination. This makes this option superior to either of the previous choices. However, there are limits to the effectiveness of this option. Because of the fine nature of much of the unconsolidated materials northwest of the site groundwater extraction rates may be limited. This limitation applies whether a trench or extraction well system is used to pump groundwater. The resulting low pumping rate would make a pump and treat system less effective. The area of influence and the volume of water treated under this scenario appears to be too limited to practically remediate the contaminated groundwater. In addition, the pumping may reduce the water levels in the wetlands north of the site adversely effecting their functions. Consequently, even though Alternative 4 provides the opportunity for accelerated

remediation, the site geology appears to severely limit the effectiveness of the groundwater extraction effort while causing possible additional undesirable impacts on the surrounding wetlands.

c. Short-Term Effectiveness

All remaining options can be implemented relatively quickly. Alternative 2 is essentially already in place. The enhanced gas extraction system of Alternative 3 can be implemented in 1-2 years time with no significant threats to public health, the environment or site workers during construction. A similar time frame could be achieved with Alternative 4, again with little or no threats to the environment, public health or site workers during construction.

There appears to be significant differences in the time required for each alternative to achieve groundwater standards. Alternative 2 is the lowest because of its reliance on natural degradation. Alternative 4 is the fastest because it entails groundwater pumping and Alternative 3 is somewhere in between with its enhanced gas extraction system.

d. Implementability

All remaining alternatives use existing, well established, technologies. Consequently there are no foreseeable technical obstacles to implementation. Also, none of these choices face any major administrative or agency approval problems. These types of remediation systems are routinely reviewed and approved by both state and federal agencies.

e. Cost

Table 5 summarizes the estimated costs of each remedial action. For Alternatives 2 and 3, costs are not a deciding factor. However, for Alternative 4, the costs associated with the groundwater system are difficult to justify. As stated, the nature of the unconsolidated material and the presence of on-site wetlands both work to reduce the rate at which groundwater could be

extracted. The low pumping rate would likely make a pump and treat system ineffective at containing the existing plume. Consequently, the additional costs do not appear to be warranted.

3. Modifying Criteria

a. State Acceptance

The WDNR is the agency proposing this solution. USEPA concurrence is expected based on comments received on the Proposed Plan.

b. Community Acceptance

There appears to be community support for this proposal. At the public meeting presenting the Proposed Plan no opposition was voiced. Also, there were no written comments provided opposing the plan. The strong community concerns are that the site cleanup move ahead quickly and that surrounding water supplies remain free of contamination. The WDNR believes the chosen remedial option will meet these concerns.

4. Summary

Based on the comparisons made above, the WDNR believes Alternative 3, Enhanced Source Control, presents the most balanced approach for achieving acceptable environmental cleanup at a reasonable cost. The chosen remedial action achieves the remedial objectives for this site in an acceptable time frame and at a reasonable cost.

Conclusions of Law

The implementation of an enhanced gas control system, in conjunction with the proposed deed restrictions and environmental monitoring will protect human health and the environment from the exposure pathways identified in the Baseline Risk Assessment for this site, complies with all legally applicable relevant and appropriate requirements, and is cost-effective. This action is designed to be final; it represents the best balance of tradeoffs with respect to pertinent criteria, given the scope of the remedial actions. CERCLA's preference for treatment is satisfied with the action.

Statutory Determinations

A. Protection of Human Health and the Environment

The selected remedy provides adequate protection by reducing contaminant loadings from the landfill. Current and future water supplies will be protected. The reduced contaminant loadings will protect future groundwater and surface water quality and will over time remediate the already contaminated groundwater near the site.

B. Attainment of ARARs

The selected remedy will be designed to meet all applicable, or relevant and appropriate requirements (ARARs) under federal and more stringent state environmental laws. All permits and approvals required to implement the remedy will be obtained. The primary ARARs that will be achieved by the selected alternatives are:

1. Action Specific ARARs

Wis. Adm. Codes NR 500-520 regulate the installation, operation and maintenance of the landfill cap and gas extraction system. Some of the more important specific codes are:

NR 504 Landfill cap design and construction
NR 508 Landfill groundwater and gas monitoring

2. Chemical Specific ARARs

Wis. Adm. Code NR 140 regulates the responses taken to groundwater contamination, determines when those responses should be taken and when those responses are completed. The selected action will over time result in compliance with NR 140 Groundwater Quality Preventive Action Limits at the waste boundary.

Wis. Adm. Code NR 445 regulates air emissions from the landfill gas extraction system. This code establishes specific emission rates for VOCs from the landfill gas extraction system.

C. Cost Effectiveness

The selected remedy provides overall cost-effectiveness. The long-term human health and environmental benefits of the selected alternative justify the cost.

D. Utilization of Permanent Solutions and Alternative Treatment Technologies

The remedy is believed to be a permanent solution and satisfies the preference for treatment.

E. Preference for Treatment As a Principal Element

Treatment of the waste fill in the landfill through gas extraction to remove the VOC contaminant mass is the principal part of the remedial action.

Decision - The Selected Remedy

Based on evaluation of the alternatives, the WDNR believes that enhancement of the landfill gas extraction system with contingencies for additional remedial measures if necessary will be protective of human health, comply with ARARs, be cost-effective, and will utilize permanent solutions.

The components of the selected remedy are:

- Operation, maintenance and monitoring of landfill cap and gas system
- Groundwater monitoring using existing wells
- Deed restrictions, as appropriate
- Restriction on new water supply well construction
- Use of existing natural contaminant breakdown
- New gas extraction wells and enhanced extraction from areas of high contamination
- Connection of piping from new gas extraction well(s) to existing gas flare system

- Specific goals and deadlines set for contaminant breakdown, if not met, additional work may be necessary

The WDNR has determined that the selected remedy will achieve the remedial action objectives for this site.

TABLE 1

GROUNDWATER CONTAMINANT LEVELS NORTH OF THE SITE

PARAMETER	MW-1A	MW-1RR	MW-3AR	MW-210A	MW-214A	NR 140 ENFORCEMENT STD
Vinyl Chloride	2,800	4,300	1,000	200	ND	.2
Trichloroethene	100	2,800	78	180	ND	5
1,2-Dichloroethene	7,000	19,000	1,700	ND	ND	100

All concentrations in parts per billion, all readings from May, 1992.

Source: RMT Draft-Final Remedial Investigation, September, 1993.

TABLE 2

GROUNDWATER CONTAMINANT LEVELS WEST OF THE SITE

	WELLS				NR 140 ENFORCEMENT STD
PARAMETERS	MW-5R	MW-5AR	P-4RR	MW-205A	
Vinyl Chloride	19	8	14	3	.2
Trichloroethene	29	6	59	3	5
1,2-Dichloroethene	72	10	53	3	100

All concentrations in parts per billion, all readings from May, 1992.

Source: RMT Draft-Final Remedial Investigation, September, 1993.

TABLE 3

CHEMICALS OF POTENTIAL CONCERN
LAND AND GAS RECLAMATION LANDFILL SITE

VOLATILE ORGANICS	SEMI-VOLATILE ORGANICS	METALS	INORGANICS
Benzene	Bis(2-chloroethyl)ether	Aluminum	Alkalinity
Carbon disulfide	Diethylphthalate[b]	Arsenic	Ammonia as N
Chlorobenzene	2,4-Dimethylphenol[b]	Barium	Chloride
Chloroethane	Di-n-butylphthalate	Calcium	Nitrate+Nitrite
Chloromethane	Naphthalene[b]	Chromium	Sulfate
1,4-Dichlorobenzene[b]	Phenol[b]	Copper	
1,1-Dichloroethane		Iron	
1,2-Dichloroethane		Lead	
1,1-Dichloroethene		Magnesium	
1,2-Dichloroethene		Manganese	
Dichlorofluoromethane[a]		Nickel	
1,2-Dichloropropane		Potassium	
Ethylbenzene		Selenium	
Ethyl ether[a]		Sodium	
4-Methyl-2-pentanone[b]		Vanadium	
Syrene[b]		Zinc	
Tetrachloroethene			
Toluene			
Trichloroethene			
Vinyl chloride			
Xylene			

[a] Tentatively identified compound.
[b] Detected only in leachate wells.

Source: Barr Engineering Baseline Risk Assessment, 1993

TABLE 4

ESTIMATED VOC CONCENTRATIONS AND 95 PERCENT CONFIDENCE LIMITS

Well	Parameter	1995			1996			1997			1998			1999		
		Lower 95% Confidence Limit	Estimated Concentration	Upper 95% Confidence Limit	Lower 95% Confidence Limit	Estimated Concentration	Upper 95% Confidence Limit	Lower 95% Confidence Limit	Estimated Concentration	Upper 95% Confidence Limit	Lower 95% Confidence Limit	Estimated Concentration	Upper 95% Confidence Limit	Lower 95% Confidence Limit	Estimated Concentration	Upper 95% Confidence Limit
MW-1RR	DCE	18	245	3,361	5	70	963	1.4	19	262	0.4	5.5	75	0.1	1.7	24
	TCE	0.07	6	545	0.01	1	95	2×10^{-3}	0.2	18	4×10^{-4}	0.03	3	7×10^{-5}	0.01	0.58
	Vinyl chloride	4×10^{5}	0.37	3,752	3×10^{-6}	0.03	308	2×10^{-7}	2×10^{-3}	17	1×10^{-8}	1×10^{-4}	1.3	8×10^{-10}	8×10^{-6}	0.08
MW-1AR	DCE	1,901	5,432	15,522	1,720	4,915	14,045	1,556	4,447	12,708	1,408	4,024	11,499	1,274	3,641	10,405
	TCE	4.9	12	30	2.7	6.7	16.6	1.4	3.5	8.7	0.8	1.9	4.8	0.4	1	2.5
	Vinyl chloride	550	992	1,790	407	735	1,326	302	545	982	217	392	706	162	293	528

NOTE:

All concentrations are in parts per billion (ppb).

TABLE 5 - Clean-up Alternatives Components and Costs
Land & Gas Reclamation Landfill Superfund Site

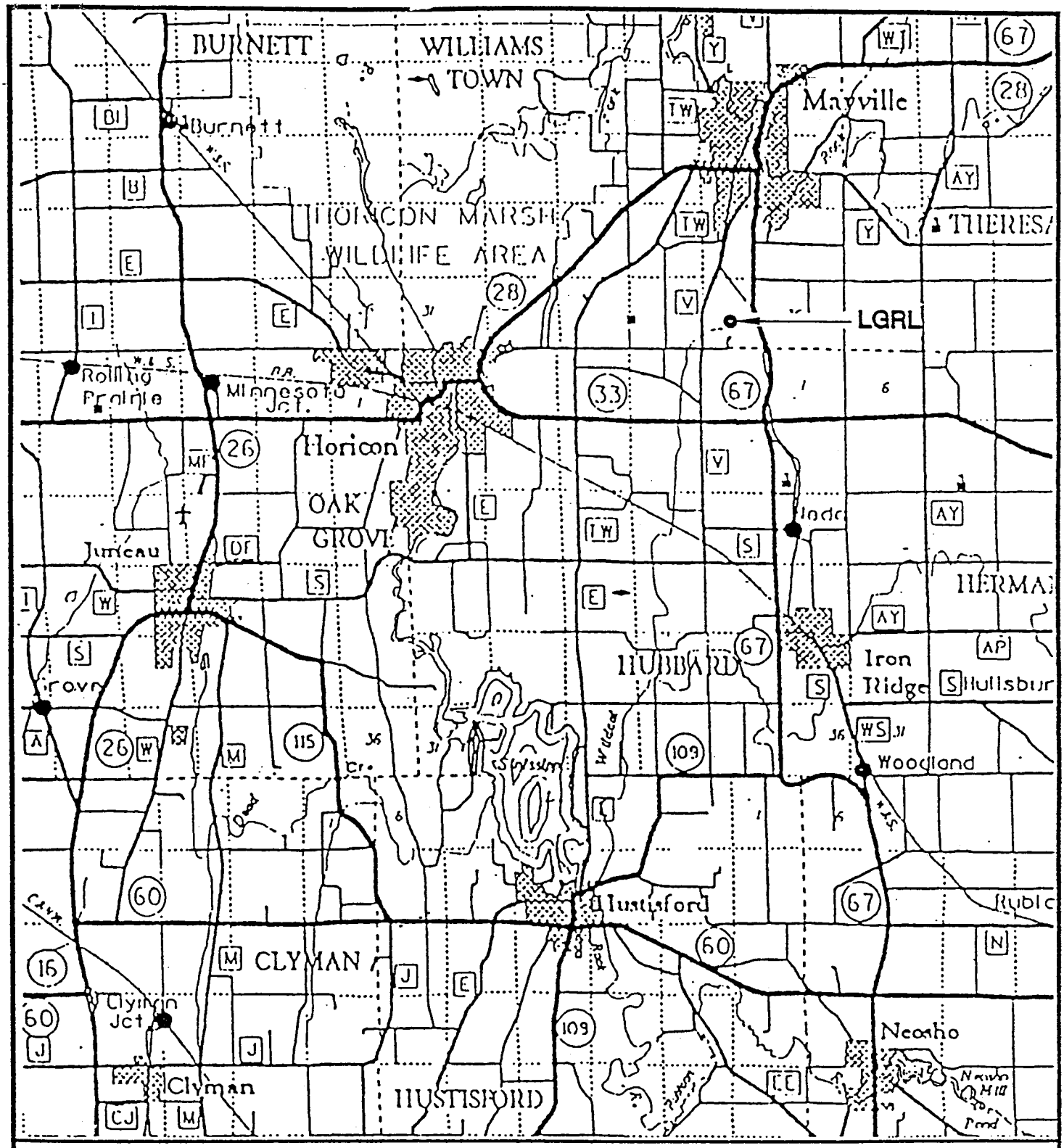
Alternative Description		Capital Cost*	Annual O&M*
Alternative 1 No Additional Action	• No Action	$0	$0
Alternative 2 Natural Breakdown of Contamination	• Operation, maintenance and monitoring of landfill cap and gas system • Groundwater monitoring using existing wells • Deed restrictions, as appropriate • Restriction on new water supply well construction • Use of existing natural contaminant breakdown	$0	$0
Alternative 3 Enhanced Source Control with Natural Breakdown of Contamination	• Operation, maintenance and monitoring of landfill cap and gas system • Groundwater monitoring using existing wells • Deed restrictions, as appropriate • Restriction on new water supply well construction • Use of existing natural contaminant breakdown • New gas extraction wells and enhanced extraction from areas of high contamination • Connection of piping from new gas extraction well(s) to existing gas flare system • Specific goals and deadlines set for contaminant breakdown, if not met, additional work necessary	$107,000	$11,000
Alternative 4 Groundwater Extraction, Treatment and Discharge	• Operation, maintenance and monitoring of landfill cap and gas system • Groundwater monitoring using existing wells • Deed restrictions, as appropriate • Restriction on new water supply well construction • Use of existing natural contaminant breakdown • Interceptor/collection trench and sumps at north end of landfill • Air stripping treatment system with exhaust air discharge to atmosphere • Discharge of treated groundwater to existing drainage ditches • Monitoring of treatment system	$706,000	$104,000

* The capital cost of $2,140,000 has already been spent to construct the final landfill cap and gas extraction and flare system. These costs are not shown in this table.

An annual operation and maintenance cost of $79,000 is necessary to operate the existing system. This cost is also not shown in the table.

Source: WDNR Proposed Plan, 1994

FIGURE A



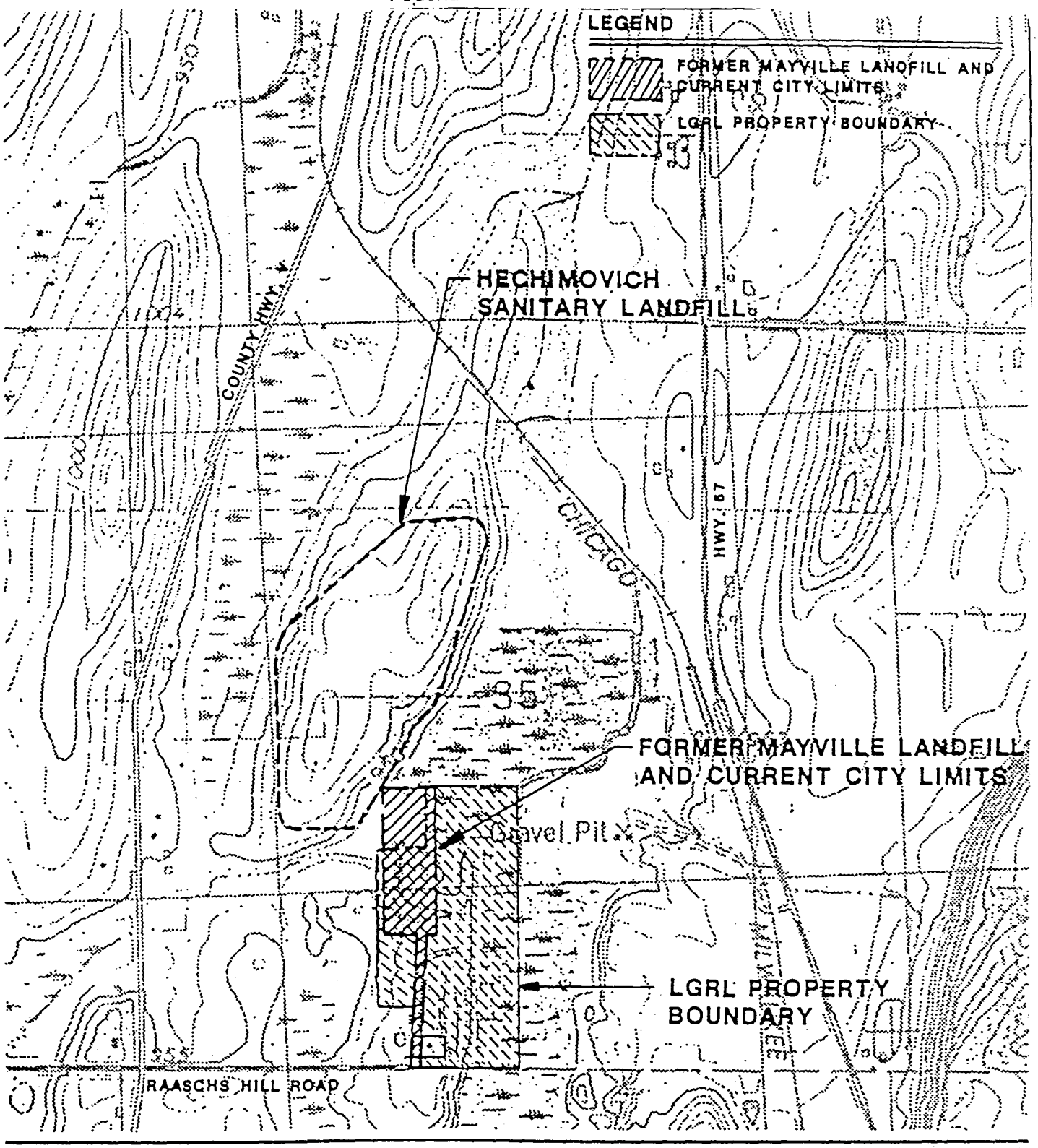
PROJECT LOCATION MAP
LAND AND GAS RECLAMATION LANDFILL
DODGE COUNTY, WISCONSIN

RMT INC.

DWN. BY:	EAS
APPROVED BY:	
DATE:	NOVEMBER, 1993
PROJ.#	1727.59
FILE #	17275903

$$SCALE$$

FIGURE B



N

0 1000 2000

SCALE: 1" = 1000'

SITE LOCATION PLAN
LAND AND GAS RECLAMATION LANDFILL
DODGE COUNTY, WISCONSIN

RMT INC.

DWN. BY:	EAS
APPROVED BY:	
DATE:	NOVEMBER, 1993
PROJ.#	1727.59
FILE #	17275902

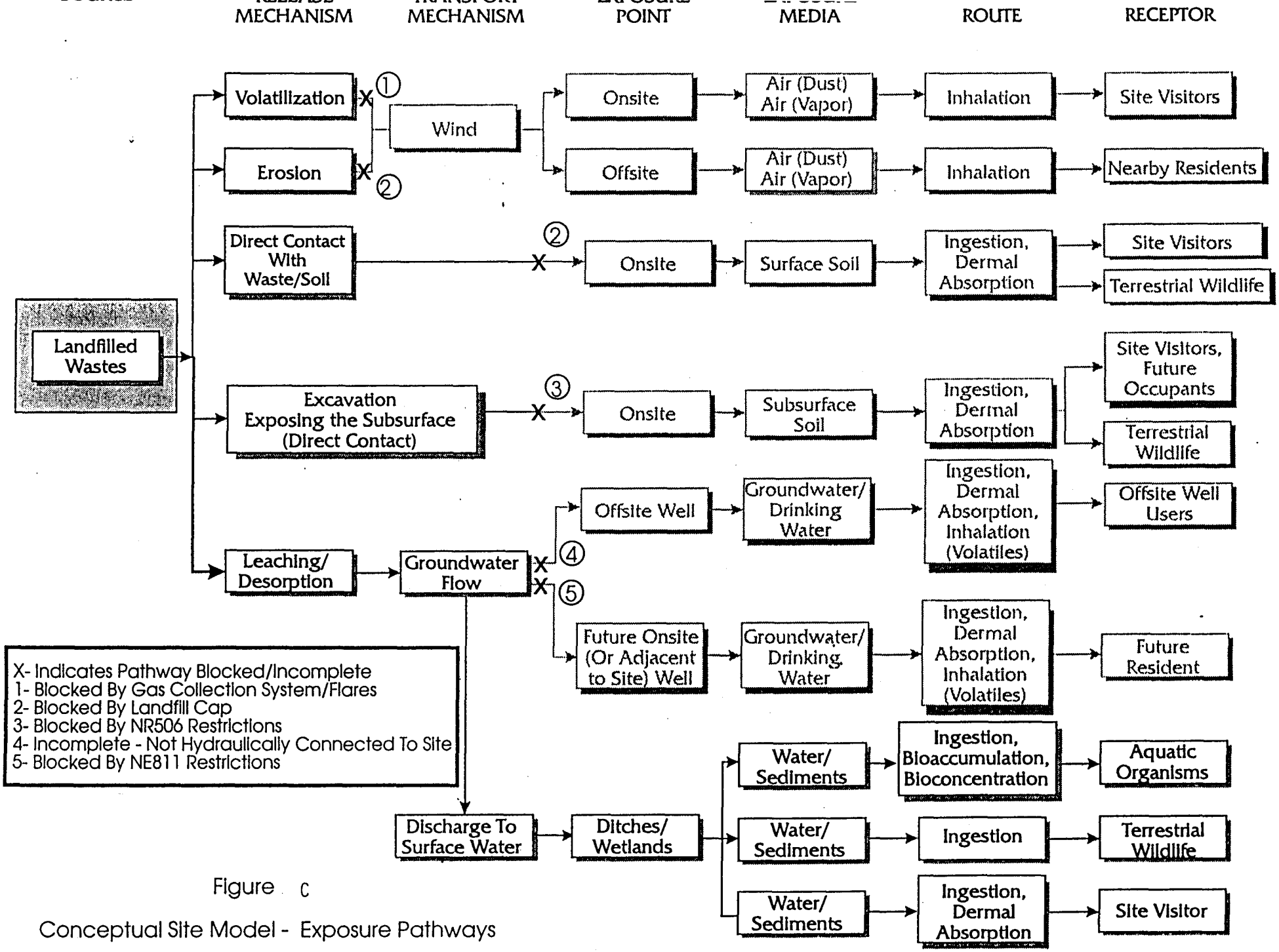
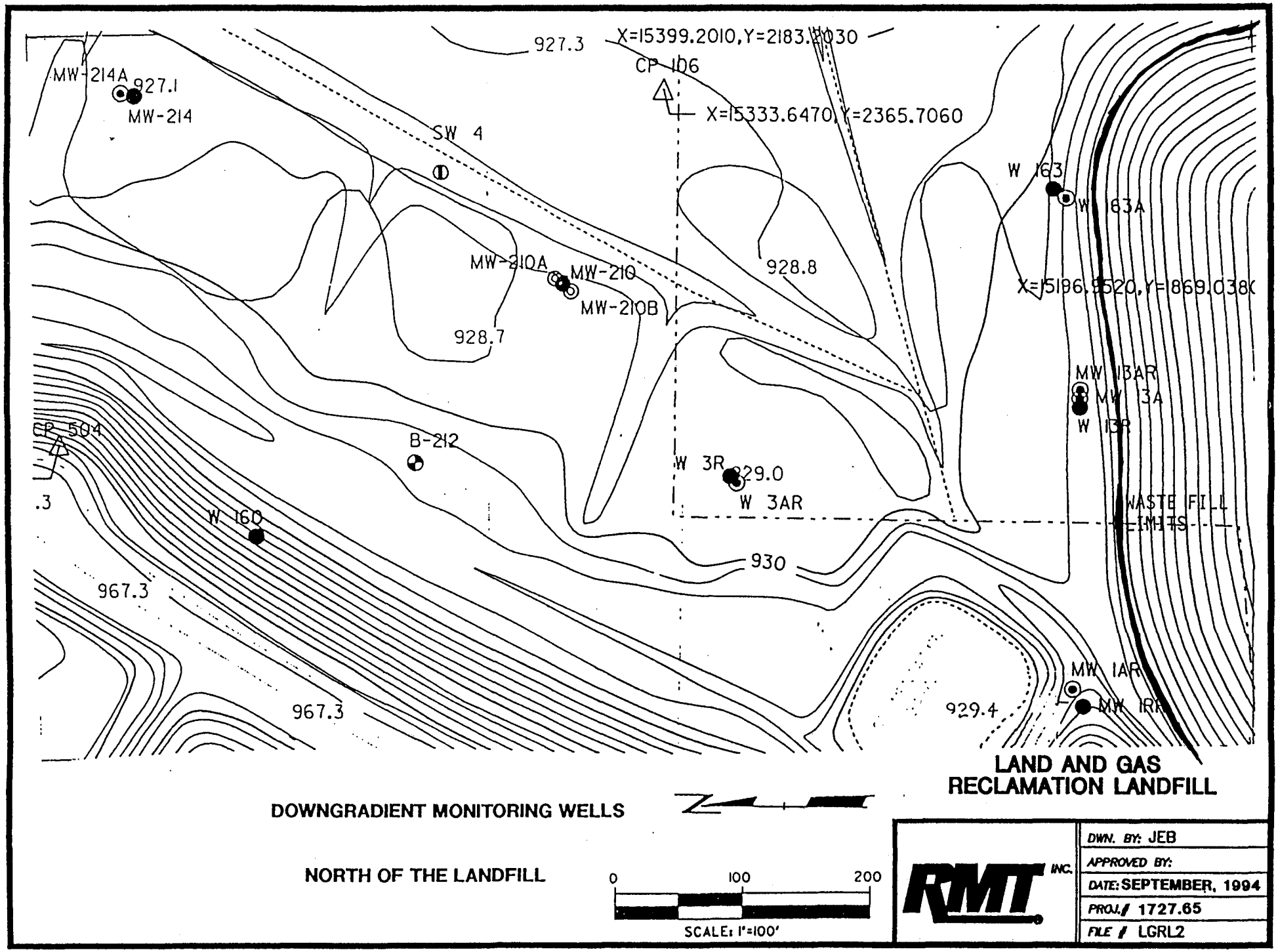


Figure c

Conceptual Site Model - Exposure Pathways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MW-214
SW 4
W 163
W 163A
MW-210A
MW-210
MW-210B
928.8
928.7
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MW 13AR
MW 3A
W 13B
CP 504
B-212
W 3R
929.0
W 3AR
.3
W 160
WASTE FILL
LIMITS
930
967.3
967.3
MW 1AR
MW 1RR
929.4
LAND AND GAS
RECLAMATION LANDFILL
DOWNGRADIENT MONITORING WELLS
NORTH OF THE LANDFILL
0
100
200
SCALE: 1"=100'
RMT INC.
DWN. BY: JEB
APPROVED BY:
DATE: SEPTEMBER, 1994
PROJ.# 1727.65
FILE # LGRL2

FIGURE D