FINAL ENVIRONMENTAL IMPACT STATEMENT

FREEWAY SANITARY LANDFILL EXPANSION

BURNSVILLE, MINNESOTA

March 27, 1981

Metropolitan Council
Suite 300 Metro Square Building
Saint Paul, Minnesota 55101

METROPOLITAN COUNCIL
Suite 300 Metro Square Building, St. Paul, Minnesota 55101

M E M O R A N D U M

April 2, 1981

TO: Physical Development Committee

FROM: Environmental Planning (Paul Smith)

SUBJECT: Filing of the Final Environmental Impact Statement (EIS) on the Proposed Freeway Sanitary Landfill Expansion
City of Burnsville
Metropolitan Council District No. 15

Attached is the final EIS on the Freeway Sanitary Landfill expansion. The EIS examines a broad range of environmental issues, including the impact of the expansion on air quality, surface water and groundwater, local drinking water supplies, wildlife, local geology and hydrology, aquatic ecology and wetlands. The EIS also discusses reasonable alternatives to the proposed action. A summary of the contents of the EIS is contained in the introductory section.

The final EIS was prepared pursuant to Environmental Quality Board (EQB) regulations (MEQB 21 - MEOB 41). The Council is required to file the EIS with EQB in order that the EQB can review it for adequacy. Once determined adequate by EQB, the Council and other review authorities can begin the permit and licensing processes to make final decisions on the project.

The EIS goes before the EQB and the EQB technical representatives at their respective meetings in May.

RECOMMENDATION

That the Metropolitan Council file with EQB the final EIS on the Freeway Sanitary Landfill expansion.

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4520301

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APPENDICES

4520299

I. SUMMARY

IDENTIFICATION OF DOCUMENT

Preface

In 1979, Richard B. McGowan Co., owner and operator of the Freeway Sanitary Landfill in Burnsville, filed an application with the Minnesota Pollution Control Agency (MPCA) for a permit to expand the disposal area of the landfill. The MPCA received an environmental assessment worksheet (EAW) on the proposal and, based on information contained in the EAW, determined that an Environmental Impact Statement (EIS) should be prepared. On January 29, 1980, the MPCA board recommended to the Environmental Quality Board (EQB) that an EIS be prepared and that the Metropolitan Council prepare the EIS. The EQB concurred with the MPCA recommendations on February 21.

Organization of EIS

The EIS has 10 sections. Section Two briefly describes the existing landfill operations and the proposed action. Section Three describes the existing environment of the Freeway Landfill and the surrounding area. It covers air quality, water quality, ecology, and socio-economic aspects. Section Four covers the environmental impacts of the proposed expansion. This section of the EIS describes the primary impacts of the proposed action, direct effects that cannot be avoided, irreversible and irretrievable resource commitments, the relationship between local short-term uses of the environment and long-term productivity and any cumulative impacts. Section Five describes mitigating measures that might be undertaken to alleviate any significant environmental impacts. Section Six discusses alternatives to the proposal including a "no action" alternative, site design alternatives, waste reduction, and materials and energy recovery. Section Seven describes the impacts of any federal controls associated with the proposed action on state government. Section Eight describes multi-state responsibilities associated with the proposed action. Sections Nine and Ten discuss, respectively, impacts on county solid waste planning efforts and impacts on the Metropolitan Council's regional solid waste plan.

PROPOSED ACTION

The application is for a permit to the existing landfill which is in Section 28, T.27 N., R. 24.W in Burnsville, Dakota County, Minnesota. The landfill is a 126-acre site which has been in continual operation since 1968. The proposed project is for a vertical expansion of the existing landfill, increasing the maximum permitted elevation of the landfill from 738 to 760 feet. This area will be filled with general residential and commercial refuse. The existing landfill has a remaining permitted capacity of 951 acre-feet (as of January 1980). At this capacity, the landfill has another two-to three-year "life" given normal receiving rates.

The proposed vertical expansion would provide for an additional 1,860 acre-feet of space (3.0 million cubic yards), and will increase the estimated life of the landfill by three to six years. If allowed to expand, the landfill could operate for another six to nine years given normal receiving rates.

MAJOR ENVIRONMENTAL IMPACTS

Air Quality and Noise

The construction, operation and closing of the proposed expansion area will result in a minimum amount of fugitive dust and odors. Current operational procedures at the landfill should be sufficient to handle most of these problems associated with the proposed expansion area. The increased elevation of the expanded landfill will increase the potential for fugitive dust and blowing litter. The surrounding topographic and land use features of the area should, however, provide adequate protection from adverse impacts on local people and property.

The potential for adverse methane gas impacts will be increased by the proposed expansion area. If buildings are constructed on the former fill area or near the perimeter of the landfill, there is potential for gas accumulation in these structures in explosive concentrations. It may be necessary prior to closure of the facility, or sooner, to install a gas control system or methane monitoring system to evaluate future requirements for on-site and perimeter gas control measures.

Water Quality

The primary impact on groundwater from the proposed expansion will be increases in the length of time in which leachate will be produced and increases in the total volume of leachate produced over time. Since the proposed action is a vertical expansion only, there will be no increase in surface area. The leachate production rate should, therefore, not increase. The area where leachate may potentially influence shallow levels of groundwater should not increase.

Results of the analysis to determine the impact of the proposed expansion on Minnesota River quality indicate that there is no significant impact from the expanded landfill. Most measures show no appreciable change due to the landfill's expansion. The same is true for nearby wetland areas.

The application and grading of daily and final cover material at the landfill will serve to direct on-site drainage to a drainageway. Surface leachate should rarely occur with continued cover soil placement, grading and seeding practices. Continued seeding will promote natural vegetative growth which will subsequently stabilize fill surface areas, prevent erosion and enhance the appearance of the site.

The area of groundwater impacted by leachate from the landfill's expansion is influenced by two factors. The area between the landfill and the river is designated as a floodway in which no development can occur. No future wells, therefore, should be impacted in this area. Second, commercial and industrial areas to the south are served by municipal water supplies provided by Burnsville and Savage. The Savage area wells are upgradient and outside the landfill's area of groundwater impact and no impact from the landfill's expansion should occur. The work to date, with respect to the Burnsville wells, shows the landfill to be influenced hydraulically by the city's wells.

Terrestrial and Aquatic Ecology

Construction activities in the proposed expansion area, particularly the excavation and fill procedure, will unavoidably delay the onset of new vegetative growth. While considerable time will lapse between replanting and full restoration of a vegetative cover and subsequent reintroduction of associated wildlife species, impacts are generally not substantive.

Operating activities in the proposed expansion area should have only negligible impacts on off-site ponds and wetlands. With daily cover and surface runoff controls (such as slope structure and seeding), potential impacts should be negligible.

Socio-Economics

The expansion of the landfill will delay use of the property for other purposes for about three to six years. Transportation-related impacts will not be new; rather, they will reflect existing impacts. Existing impacts have been identified as traffic congestion in the vicinity of the landfill, traffic operating deficiencies at the I-35W-113th Street South interchange, and litter on local streets in the vicinity of the landfill.

Nearby homes that look directly on the landfill will be exposed to the operation of the facility during the expansion period. Visual impacts will be greater than at present, since the final elevation of the expansion area will create an isolated mound.

The expansion area will add about nine months of life to the metropolitan land disposal system. This will, in turn, lessen the need and expense for new landfills and the need for re-routing and/or additional fuel costs for area haulers. Filling of the expansion area will, therefore, lessen the need to develop new landfills sooner, and help maintain present land disposal charges and collection rates.

REASONABLE ALTERNATIVES

Without expansion, the landfill will close in 1983. No resource recovery or new landfill facilities would likely be operating in time to represent reasonable alternatives to the proposed expansion. Disposal at nearby existing landfills represents the only land disposal alternative to this proposal.

Other alternatives to the proposed expansion include waste reduction and material recovery. Neither of these waste management methods could provide a reasonable alternative to the entire capacity proposed for expansion. Source separation and materials reuse and recovery methods do, however, provide cost-effective alternatives for a portion of the waste materials presently landfilled. Additional support for existing programs and stepped-up efforts to implement new programs could be deemed as reasonable and prudent alternatives to a portion of the proposed expansion.

FEDERAL, STATE AND LOCAL PERMITS OUTSTANDING

The applicant is required to obtain a modification of its existing solid waste disposal permit with the Minnesota Pollution Control Agency (MPCA). The Metropolitan Council must approve the modification. The applicant is also required to obtain modification of its license with Dakota County and its conditional use permit with the City of Burnsville.

AGENCIES, ORGANIZATIONS AND INDIVIDUALS CONSULTED

The Metropolitan Council staff prepared this EIS. The MPCA's staff prepared Sections VII, VIII and a portion of Section VI.

The following agencies, organizations and individuals were consulted during preparation of this EIS.

American Lung Association	B. Hughes
Barr Engineering	L. Dalen, D. Farb, A. Gebhard
City of Burnsville	M. Falk, W. Johnson
City of Bloomington	G. Shirley, J. Truax
City of St. Paul	F. Forsberg, R. Person
City of Minneapolis	M. Enquist
Dakota County	D. Gurney
Dakota County Historical Society	F. Miller
Dakota County Soil and Water Conservation District	B. Christenson
Lake Sanitation, White Bear Lake	M. Ayde
Minnesota Department of Health	D. Anderson, T. Bosman, M. Convery, G. England, P. Gutkowski, R. Koch, L. Seliga, J. Washburn

Minnesota Department of Natural Resources	C. Cohen, J. Davidson, J. Dustrude, K. Gill, C. Henderson, T. Kucera, R. Norrgard
Minnesota Historical Society	R. Fridley
Minnesota Occupational Safety and Health Administration	J. Berg, B. Brach, W. Mergens, D. Schilling
Minnesota Pollution Control Agency	G. Blaha, D. Korpela
Minnesota State Planning Agency	P. Ashbrook
Minneapolis Refuse, Inc.	C. Baker, C. Kutter
Northern States Power Company	J. Bechtold, L. Eberly, G. Kelly, T. Williams.
Peterson Forage Seed Co., Savage	S. Peterson
Pope-Reid Associates	R. Reid, S. Smith
Private Hauler	L. Willman
R. B. McGowan Company	R. McGowan, M. McGowan
St. Paul Refuse Haulers Association	F. Rauschnot
U.S. Corp of Engineers	J. Esson
U.S. Fish and Wildlife Service	K. Carr, M. Timmins
University of Minnesota	C. McJilton, J. Mulhansen, H. Paulus, F. Thompson

II. DESCRIPTION OF EXISTING LANDFILL AND PROPOSED ACTION

DESCRIPTION OF EXISTING LANDFILL

SITE LOCATION

Legal Description

The Freeway permit application is for a vertical expansion of the existing landfill located in the southeast quarter of Section 28, T27N, R24W in the City of Burnsville, Dakota County, Minnesota. The location and limits of the landfill are shown in Figures II-1 and II-2. The legal description of the existing landfill property is included in Appendix I.

The Burnsville zoning map, dated November 1977, identifies the site and surrounding lands within one-quarter mile as I-2, general industrial district. The 1965 Burnsville Comprehensive Plan identifies the site as general industry.

As Figures II-2 and II-3 indicate, the area to the west, north, and east of the landfill is open land; I-35W is adjacent to the landfill's eastern boundary. A quarry operated by Edward Kraemer and Sons is immediately south of the landfill. The Minnesota River is approximately 400 feet north of the landfill.

The landfill is an existing permitted landfill (MPCA Permit No. SW-57) which has been in continual operation since July 1968. It is operated under a conditional use permit with the City of Burnsville and a license with Dakota County. The landfill occupies 126 acres and is owned and operated by the Richard B. McGowan Company.

Major Access Roads

Solid waste is brought to the disposal site by commercial haulers or private individuals along the haul roads shown in Figure II-1. The primary haul road is I-35W, with access to the landfill from 113th Street South. Access to the landfill site is provided by an all weather, blacktopped entrance road.

SOLID WASTE SERVICE CONDITIONS

Areawide

For a description of areawide solid waste collection and disposal conditions, see Sections III and IV, Socio-Economics, Collection and Management System Costs.

Solid Waste Quanities and Composition

The landfill was originally permitted at a capacity of 1,962 acre-feet. There is approximately 951 acre-feet of capacity remaining, representing about two to three years of landfill life. Solid wastes are normally disposed at the landfill at a rate of approximately 15,000 to 40,000 tons per month. However, because of recent tipping fee increases, receiving rates at the gate have dropped approximately 50 percent.

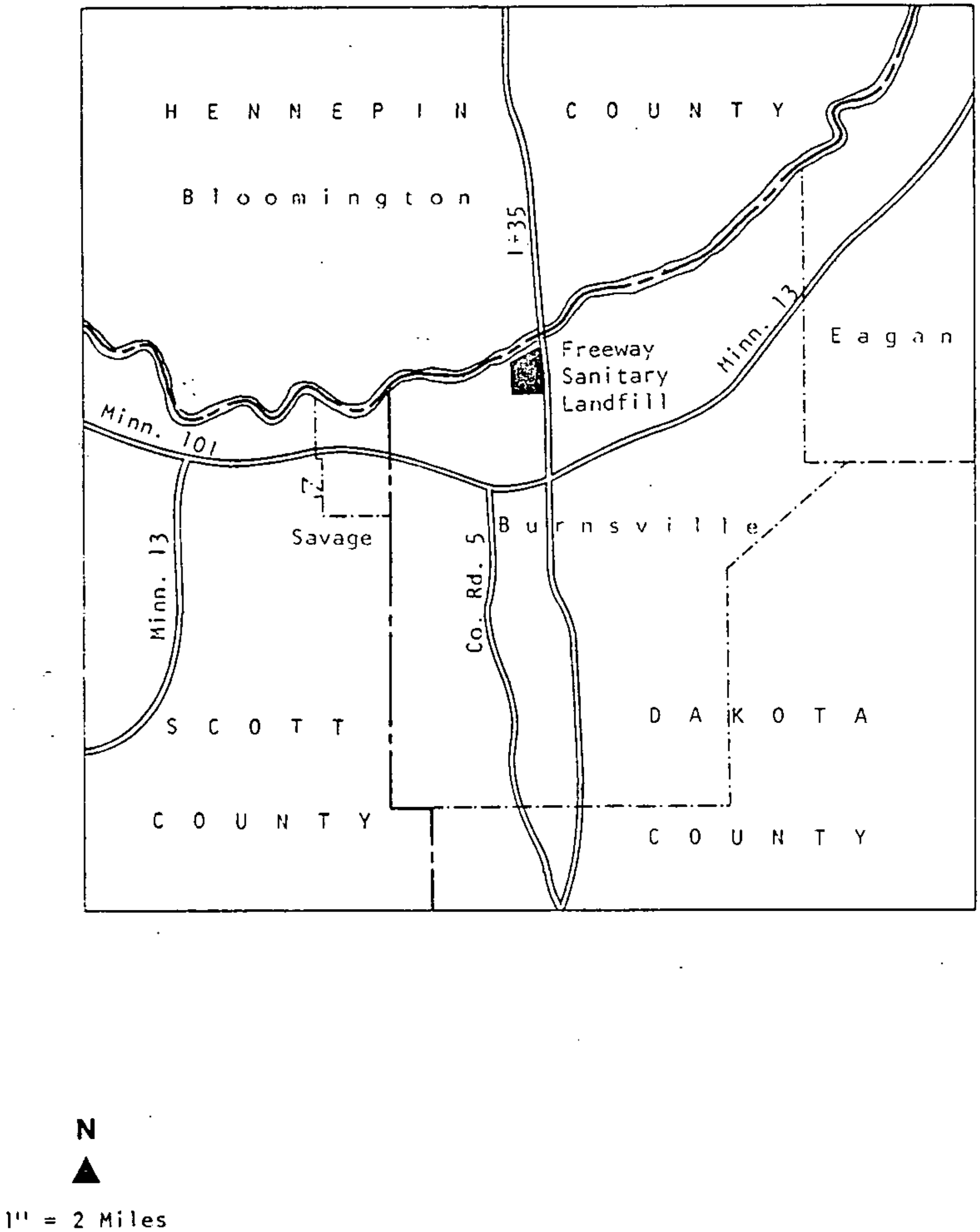

FIGURE II-1

REGIONAL LOCATION
and
EXISTING HAUL ROADS

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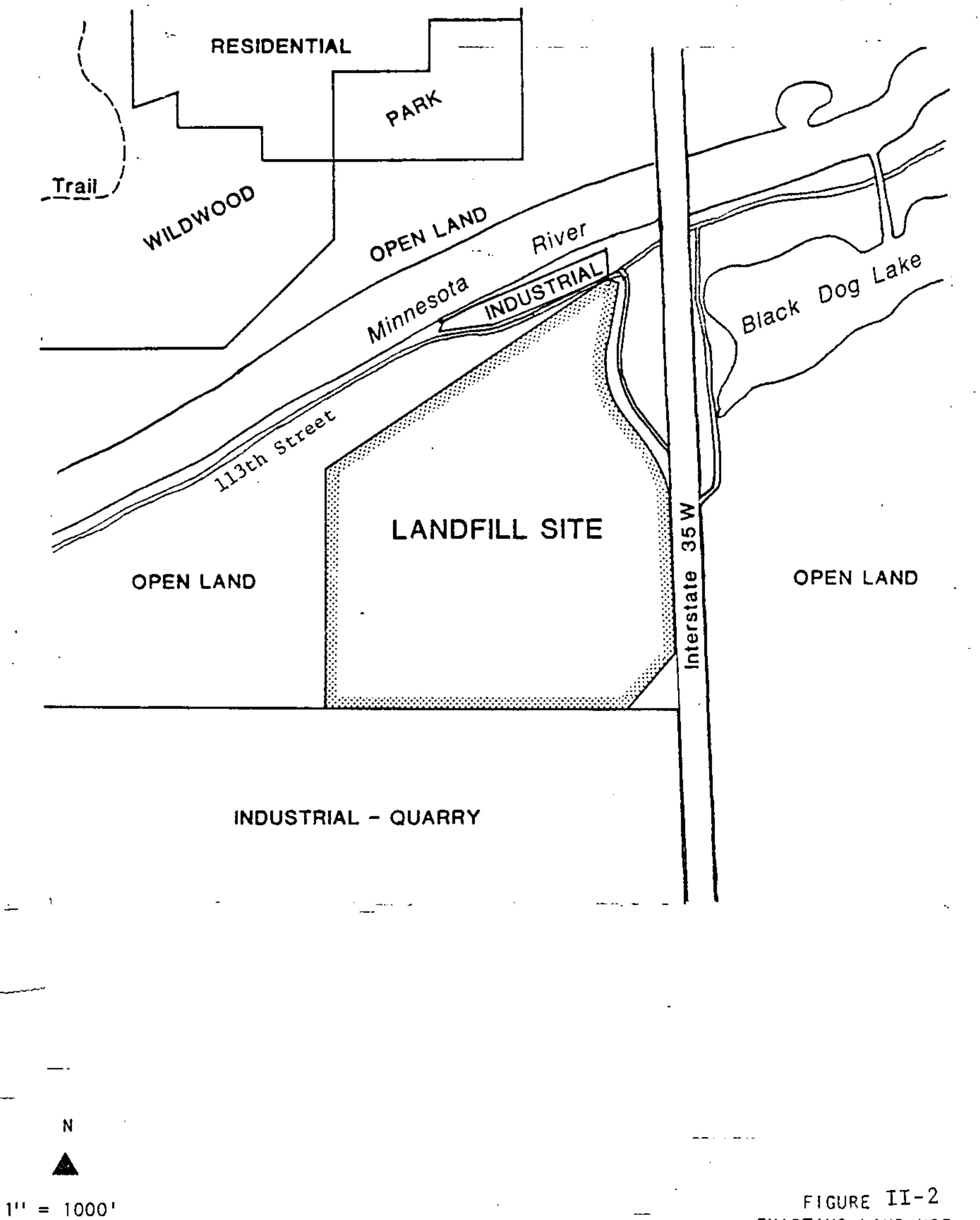

FIGURE II-2
EXISTING LAND USE

FREEWAY SANITARY LANDFILL

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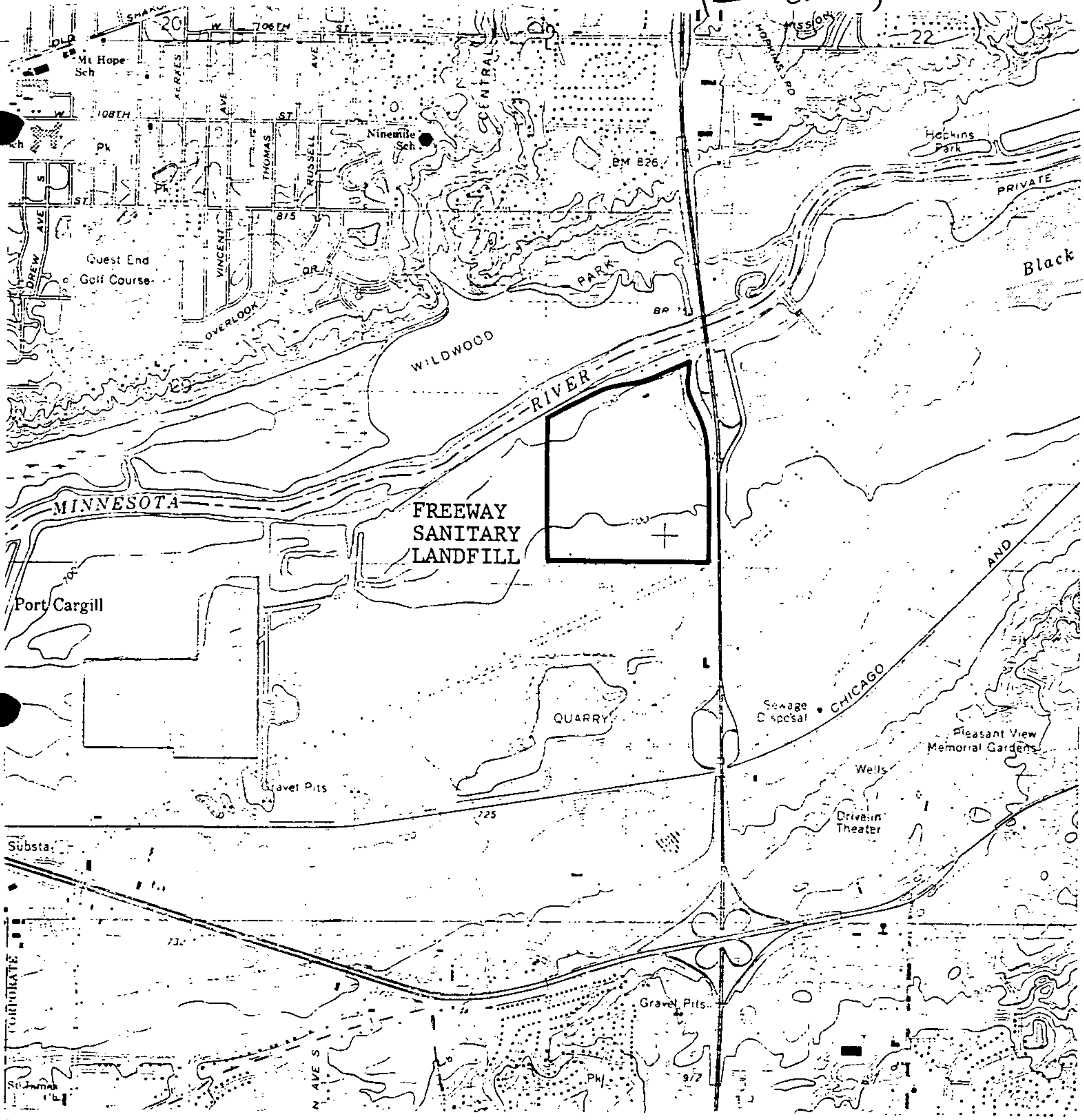
Poor quality



-Figure II-3 Quad Map Excerpt

Scale 1" = 2000'

From: USGS Bloomington Quadrangle

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The landfill disposes of any solid waste material other than hazardous waste. Although the landfill will accept trees, demolition and construction waste material (i.e., clean fill), the disposal charges for these materials make this disposal option prohibitively expensive. Since the amount of tree waste, clean fill, and industrial waste materials has been insignificant in the past years, it can be assumed that the solid waste presently in the landfill is predominately municipal solid waste generated from residential and commercial sources. Municipal solid waste generally contains the following components: food waste, paper, cardboard, plastics, textiles, rubber, leather, garden trimmings, wood, glass, tin cans, nonferrous metals, ferrous metals, dirt, ashes, brick, and other miscellaneous materials.

Collection and Disposal Systems

The landfill serves a collection area bounded approximately by Minneapolis' northern boundary southward to Lakeville in Dakota County and from St. Paul's east boundary westward to Hopkins in Hennepin County (see Figure II-4).

Waste is brought to the disposal site by commercial haulers or private individuals. The majority of the trucks dumping at the landfill are rear-loading compactor trucks with capacities of 10 to 30 cubic yards. Since most of the waste comes directly to the landfill without prior processing at a transfer station, the compaction within the packer trucks themselves represents the only compaction before disposal at the landfill.

SITE OPERATION

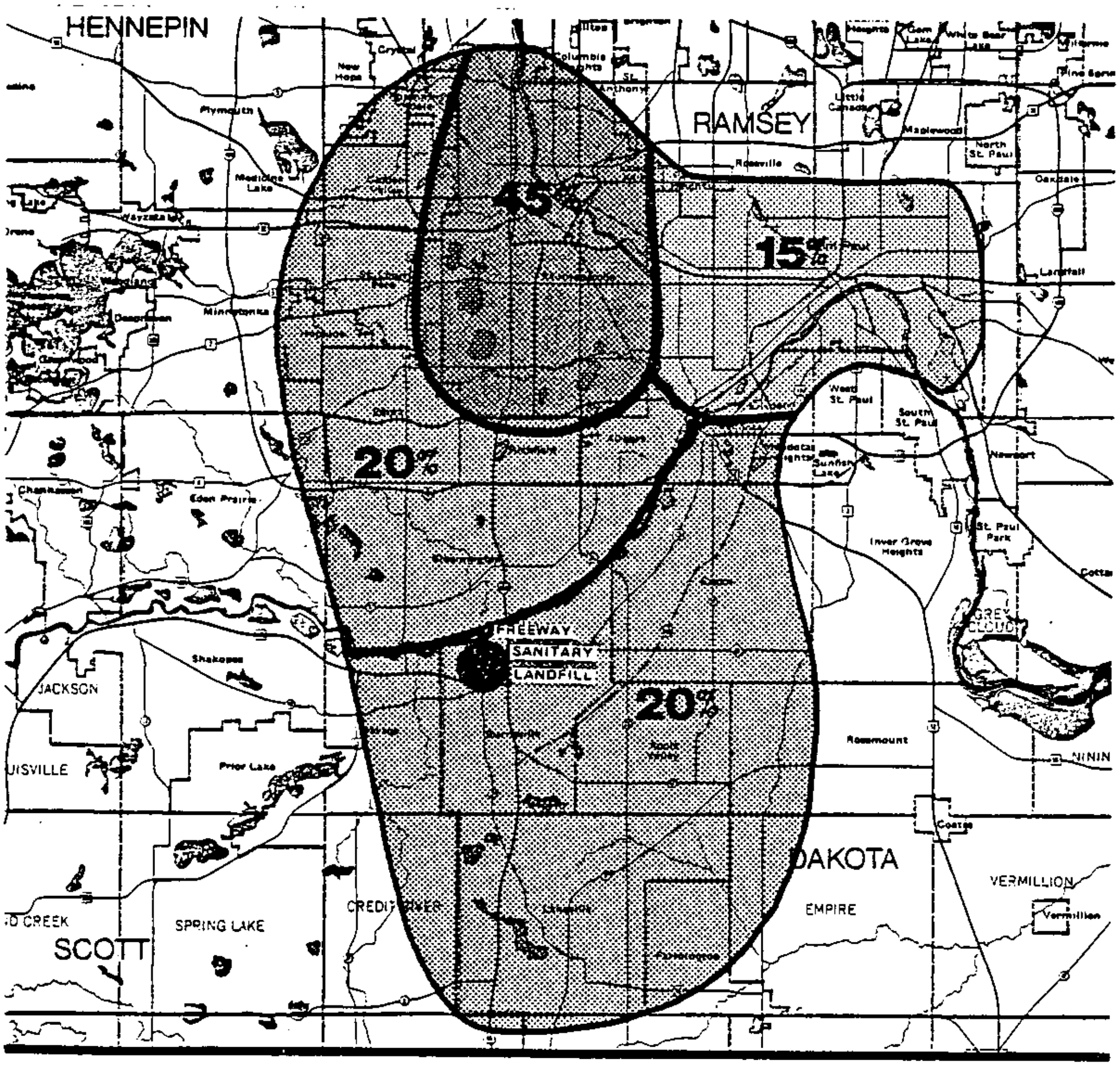
General Methods of Landfilling

The landfill contains three buildings on-site including an office, maintenance garage, and a portable building near the working area of the fill. The landfill is operated nine hours a day (8 a.m. to 5 p.m.), seven days a week. A sign is posted near the site's entrance indicating where vehicles are to unload. An attendant is on duty during operating hours, limiting access to the site and providing directions for unloading. The attendant also assures that the unloading area is confined to as small an area as possible. Tables II-1 and II-2 show the equipment used at the landfill and the personnel needed to operate the facility.

The following discussion describes the disposal procedures presently used at the landfill.

Filling Sequence -- The staging of the development of the landfill consists of three phases as shown in Figure II-5. Phase I has already been completed as planned. Phase II is near completion and Phase III is just beginning to be developed. The landfill manager is presently constructing berms along the eastern edge of the fill area for visual screening purposes. The berms are being constructed of demolition and construction debris as such material becomes available.

FREEWAY SANITARY LANDFILL WASTESHED, 1980



% — Estimated Relative Contribution of Designated Wasteshed to Total Refuse Deposited at Freeway Sanitary Landfill (170,000 tons/year)

Primary Source Area

Secondary Source Area

Tertiary Source Area

Source: Richard B. McGowan Co./Metropolitan Council

Figure II-4

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TABLE II-1

EQUIPMENT INVENTORY

Machine	FUNCTION Excavation	Earth Moving	Spreading & Compacting	Other	Number of Units
Compactor			x		2
Tractor/Dozer	x	x	x		1
Scraper		x			1
Pickup Truck				x	1
Water Tank Truck (45,000 gal. capacity)				x	1

TABLE II-2

LANDFILL SITE PERSONNEL

Classification	Number
Foreman	1
Equipment Operators	2
Clerk	1
Night Watchman	1
Part-time Personnel	2

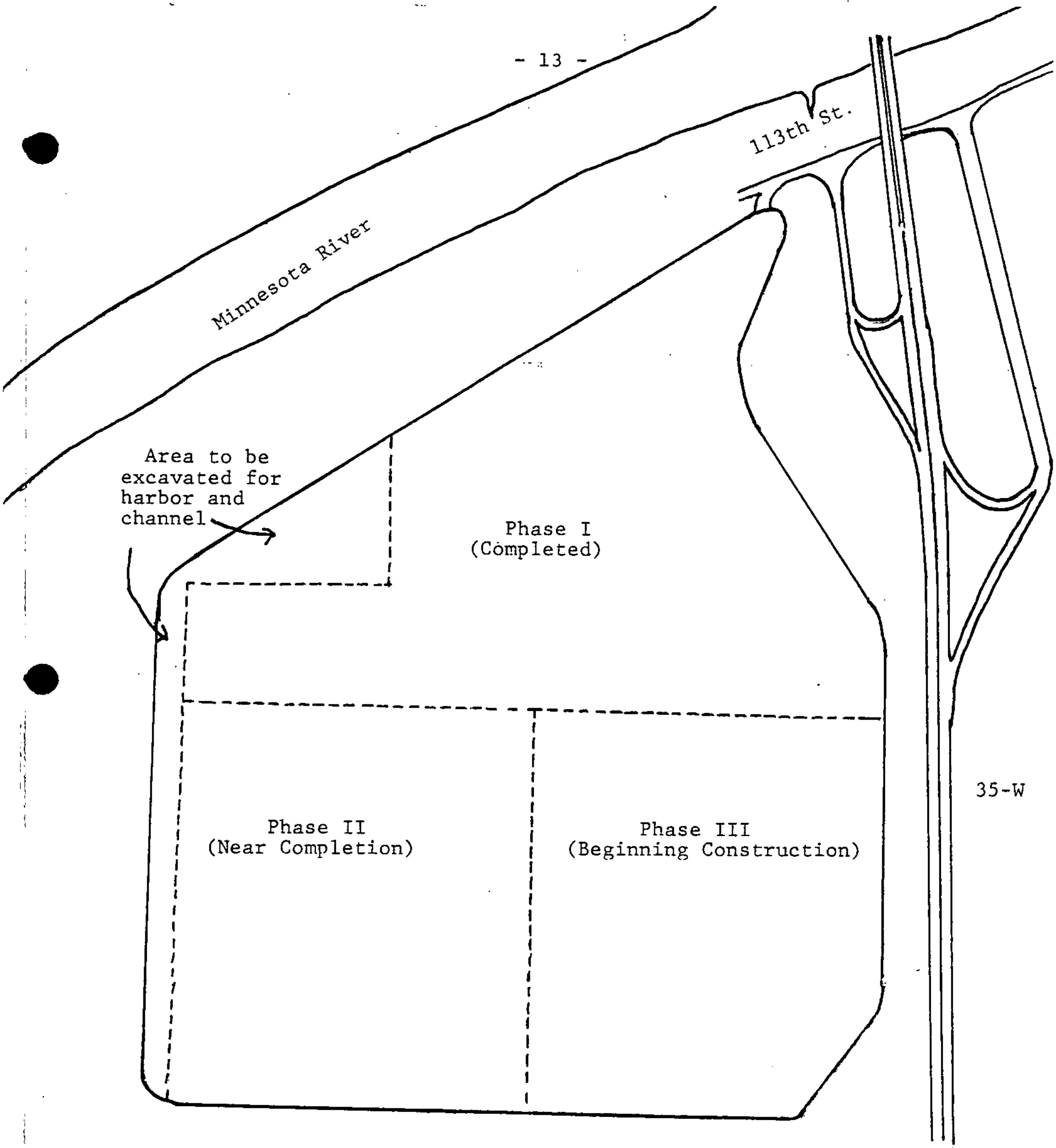


Figure II-5

Phase Development Plan
Freeway Sanitary Landfill

Compaction Procedure -- Refuse is compacted on the working face by one or two compactors seven days a week. The working face is kept as small as possible to minimize the amount of wind-blown debris. Refuse is worked from the unloading area either below or above the working face through the use of the blades on the compactor. The working face, is maintained at slopes of five to 15 percent and is compacted in approximately eight-foot lifts. This procedure insures more complete compaction of the refuse.

Cover Procedure -- Six inches of cover material is applied daily to the top and side slopes of the working face by a scraper. In addition, areas over which another lift will not be placed for more than 120 days is covered with one foot of cover material. Cover material is taken from a 40-acre site adjacent to the western edge of the landfill. Cover material for winter operations is available from this site or from stockpiles on the finish grade of the landfill.

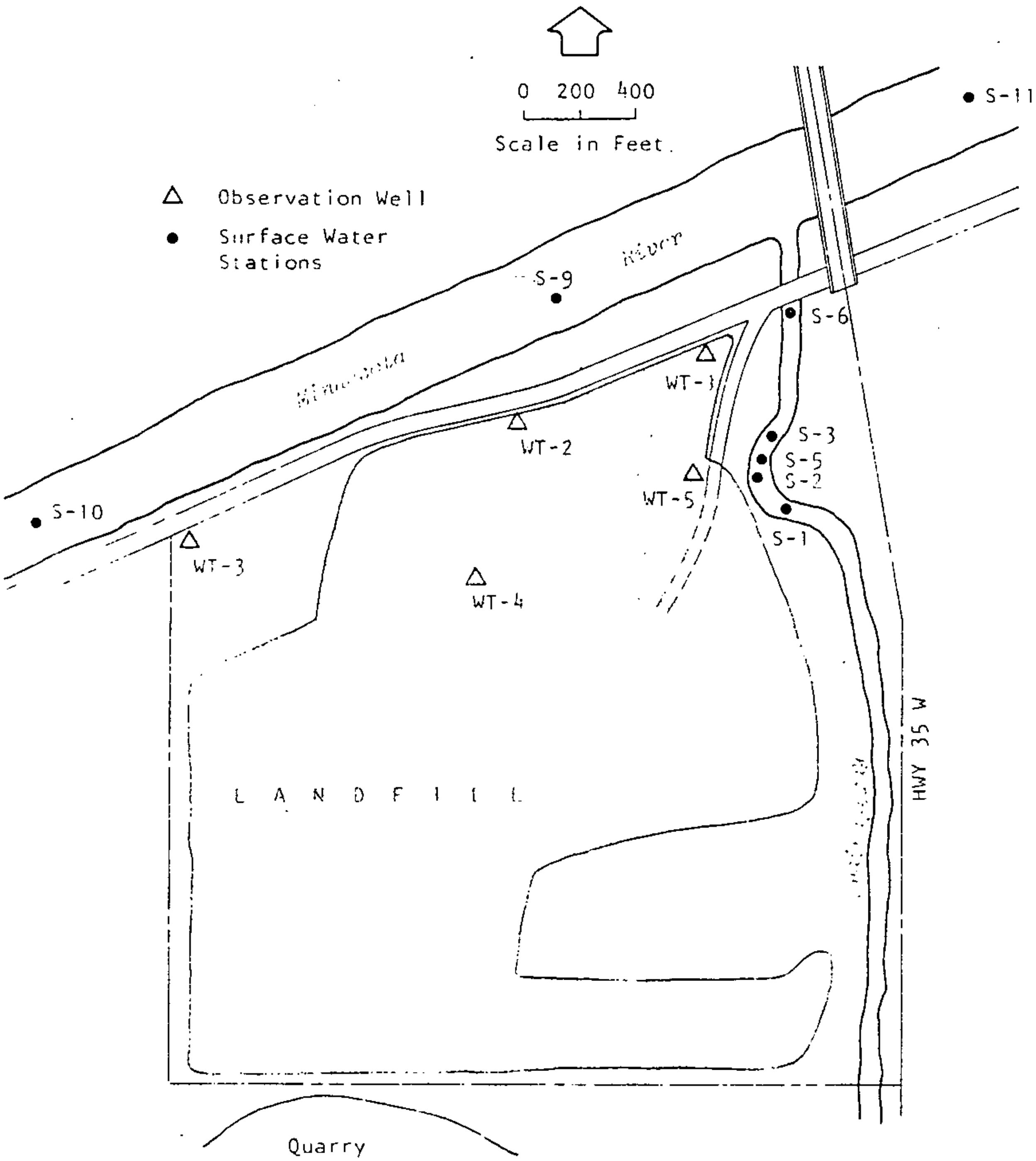
Within one month after the final contours of the landfill are achieved, or any continuous, unbroken area of approximately two acres is brought to the final contours, the area is covered with two feet of compacted cover material and properly sloped to provide surface water runoff control. The finished surface of the landfill is covered with topsoil and seeded with native grasses. Side slopes are covered with mulch as required to prevent erosion.

The landfill has been cited a number of times recently by the MPCA for daily cover violations (see Appendix II). Appendix II contains a chronology of significant events that have occurred at the landfill including MPCA and Dakota County site inspections. The landfill has a long history of operating violations of Minn. Rule SW-6(2). The most consistent violations have been for operating too large a working face, inadequate daily cover and improper termination of previously filled areas. Other violations noted on a less frequesnt basis include filling directly into surface water, ponding surface water on-site, leachate generation, litter, inadequate covering of demolition areas, excavating to bedrock, salvaging and accepting hazardous wastes. The problems have been of such magnitude, that on Nov. 28, 1979, the MPCA issued a Notice of Noncompliance and referenced 14 violations of Minn. Rule SW-6(2) noted by MPCA staff during the period June 1, 1979 to Nov. 5, 1979. After this notice was received, the facility greatly improved its operation and level of compliance until recently (July 1980), when problems with lack of daily cover and improper termination of previously filled areas were again noted.

Environmental Controls

Leachate Control -- There is no leachate collection system under the landfill.

Groundwater Monitoring System -- Five piezometers have been installed to monitor possible impacts by the landfill including subsequent surface water impacts (see Figure II-6 for locations). The monitoring plan includes quarterly sampling of four surface stations and the five groundwater wells for the following parameters: COD



FREEWAY LANDFILL
WATER SAMPLING STATIONS

FIGURE II-6

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BARR ENGINEERING CO.
CONSULTING ENGINEERS

(filtered and total), BOD (filtered and total), chloride, specific conductance, pH, copper and total chromium. This monitoring system will remain in operation during and subsequent to the filling of the landfill including the proposed expansion.

Surface Water Drainage -- The entire landfill, including the fill surface, is graded and/or provided with drainage facilities to minimize run-off onto and into the fill, to thus prevent erosion or washing of the landfill and to prevent collection of standing water. The final contours and runoff water flow direction, after completion of the landfill including the proposed expansion, are shown in Figure II-7. The general plan is to construct hills of refuse with fairly steep slopes. Surface runoff is directed to adjacent drainage ditches which then flow into the Minnesota River north of the site.

The landfill is bordered by a drainageway between the landfill's eastern boundary and I-35W. This drainageway receives surface runoff water from the landfill, I-35W and other parts of the watershed further south. The runoff flows in the drainageway until it reaches the Minnesota River. A flood gate operated by the Department of Transportation (MnDOT) prevents back flow from the river during high water conditions. According to the operator of the landfill, on one occasion during flood conditions the gate was not properly closed, which caused river water to back up beyond 113th Street and onto the landfill.

Vector Control -- Periodically, or at the County Engineer's request, the operator has the landfill inspected by a licensed exterminator company, who sends a report of the inspection to the operator. This report is available to the MPCA and the County Engineer's office. To minimize scavenging by rodents and other animals, daily cover is applied at the end of the day's operation. Vectors are apparently not a problem at the site.

Air Quality -- The landfill's operational procedures provide protection against fugitive dust emissions. The approach to the landfill and the main site road for routing trucks to the active fill area are paved. In addition, water from a fire truck is available to sprinkle on the dirt portions of the road if further dust control is necesary.

Noise Control -- The land use features surrounding the landfill site and the topographic features of the working area of the landfill provide physical barriers and buffer areas from noise generated by the landfill operation.

Litter Control -- An attendant picks up paper and other debris which may be scattered on the site. Litter control fences also are used to prevent wind blown material from leaving the site.

The landfill has been cited a number of times by the MPCA for litter violations (see Appendix II).

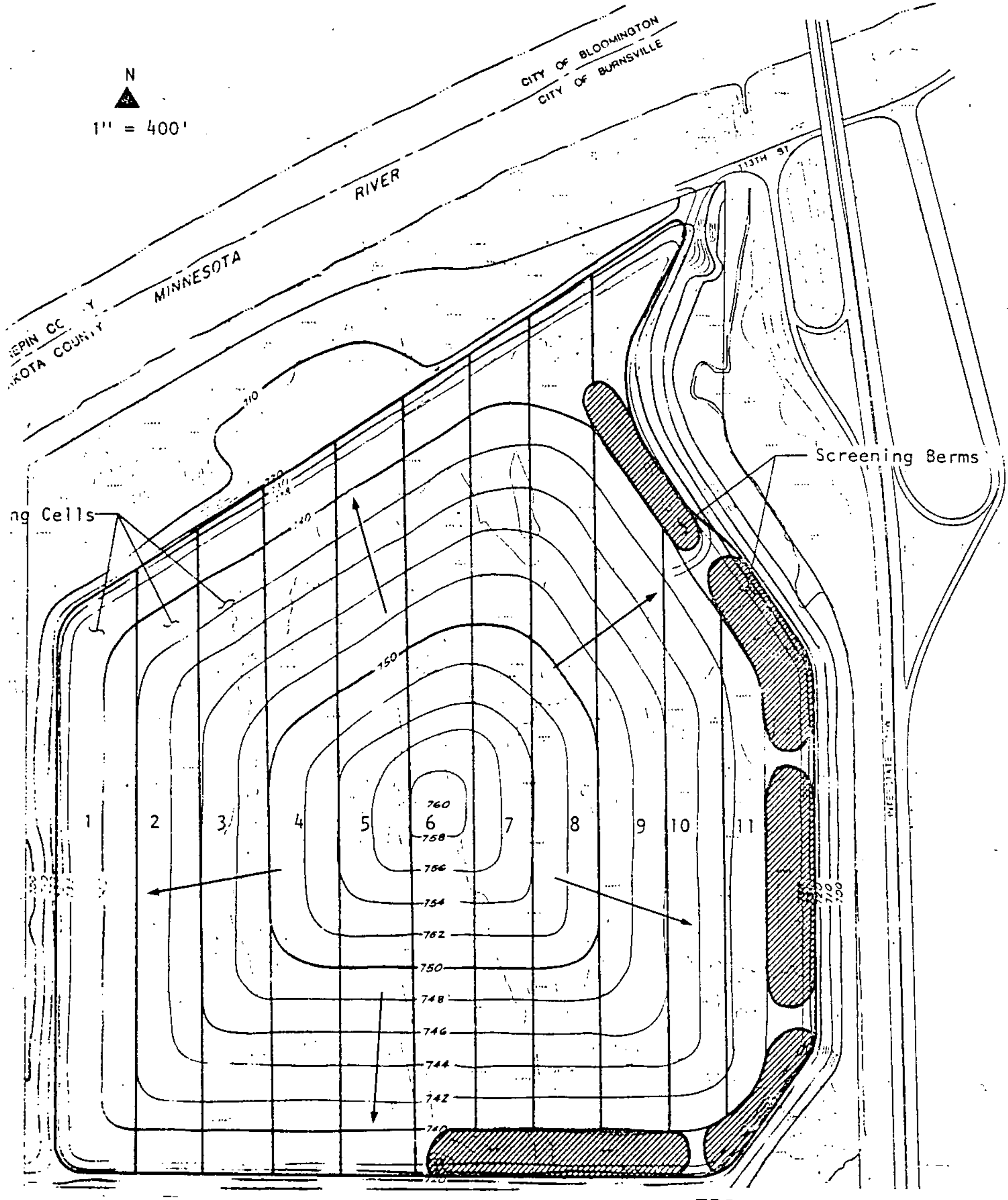

FIGURE II-7

FILLING SEQUENCE of PROPOSED EXPANSION,
FINAL GRADING and DRAINAGE PLAN
FREEWAY SANITARY LANDFILL

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Security and Safety Practices

Fire Protection --Fire protection is provided by a 4,500-gallon water truck equipped with a pressure water pump. An additional pump is available to take water out of the drainageway along the eastern edge of the landfill. In addition, a stockpile of earth is maintained reasonably close to the landfill to be used, if necessary, for extinguishing fires. Fire extinguishers are kept on all site vehicles and in all buildings at the landfill. The Burnsville Fire Department has also been notified of the existing operation, is aware of the access points to the site, and has a fire station within five miles of the site.

Security -- Security at the site is provided by an attendant who is on duty during the operating hours of the landfill. The attendant limits access to the site and provides directions for unloading vehicles. In addition, an employee of the landfill lives in a house-trailer located at the site's entrance. This employee provides security during the nonoperating hours of the landfill. The landfill, however, is not fenced and off-road access is possible.

Sanitary -- The maintenance garage has a rest room for personnel. There is a well on the site to supply water.

Emergency Communications -- Telephones are available for emergency communications during all working hours in all three of the landfill buildings.

Closure

Once an area reaches final fill elevation, two feet of earth is spread, graded and compacted. Figure II-7 shows the final grading plan with the proposed vertical expansion. The area is then revegetated with grass species as the final step in the closure.

Prior to termination of the operation of the site, the MPCA and the Dakota County Engineer will be notified to conduct a site inspection to determine the final condition of the completed landfill. Within one month after approval of the final condition, a detailed description and plot of the completed site will be recorded with the Dakota County Recorder's office. This description will give the general type and number of lifts, the original and final elevation of the completed site.

Post-Closure

The landfill site is located in a general industrial area, as shown on the Burnsville Comprehensive Plan. The preliminary end use plans developed for the landfill, as approved by MPCA and the Council as part of the conditions under which a permit to operate (SW-57) was issued for the site, shows general and limited industrial uses for the site. Figure II-8 shows the proposed final uses of the site.

As Figure II-8 indicates, the general and limited industrial areas will possibly be accessed by two roads over the closed landfill area: County Road 5 extension and a I-35W frontage road. Building locations will depend on sufficient subgrade support capacity, methane hazard potential, and approval from appropriate governmental agencies.

The landfill owner has stated an intent to investigate the possibility of developing a marina harbor on the northern edge of the landfill with direct access to the Minnesota River and a nine-foot deep channel directly west of the landfill to provide interior marina access.

Energy

The majority of the energy demand from operations of the landfill comes from the following on-site equipment: a compactor, tractor-dozer, scraper, pickup truck, and water-tank truck. Annual diesel fuel requirements are approximately 70,000 gallons. An on-site storage tank holdsapproximately 30,000 gallons of diesel fuel.

For a description of areawide energy supply and demand forecasts see "Environmental Impact Statement for Woodlake Sanitary Landfill Expansion," Technical Work Paper No. 8, Minnesota Pollution Control Agency, 1980.

DESCRIPTION OF PROPOSED ACTION

PRESENT APPLICATION

The requested permit modification would allow the vertical expansion of the existing 126-acre landfill by increasing the maximum permitted elevation of the landfill from 738 to 760 feet (see Figure II-9). The proposed project does not alter the existing exterior boundaries of the landfill.

The existing landfill has a permitted capacity of 1,962 acre-feet. At this capacity the landfill could continue to operate for approximately another two to three years given normal waste receiving rates.

The proposed vertical expansion would provide for an additional 1,860 acre-feet of capacity which would give an additional four to six years of operating life to the landfill. Allowed the expansion, the landfill could dispose of solid waste for another six to nine years given normal waste receiving rates.

SITE LOCATION

The proposed action is located wholly within the existing, permitted boundaries of the landfill in Section 28, T27N, R24W in the City of Burnsville, Dakota County, Minnesota.

For a description of the surrounding land uses refer to Section III, Socio-Economics.

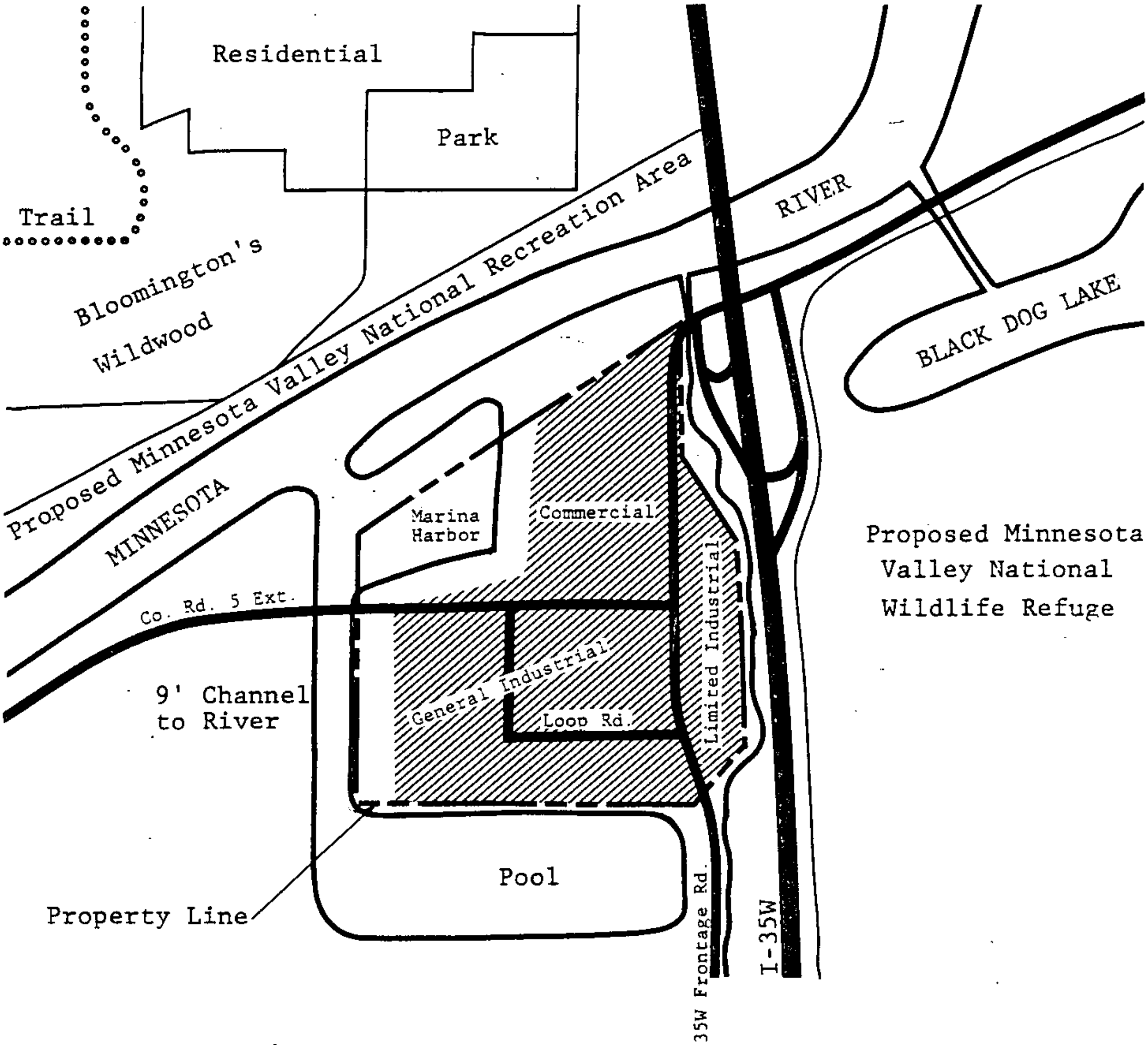

FIGURE II-8

END USE PLAN
FREEWAY SANITARY LANDFILL

Area with Buried Refuse Material

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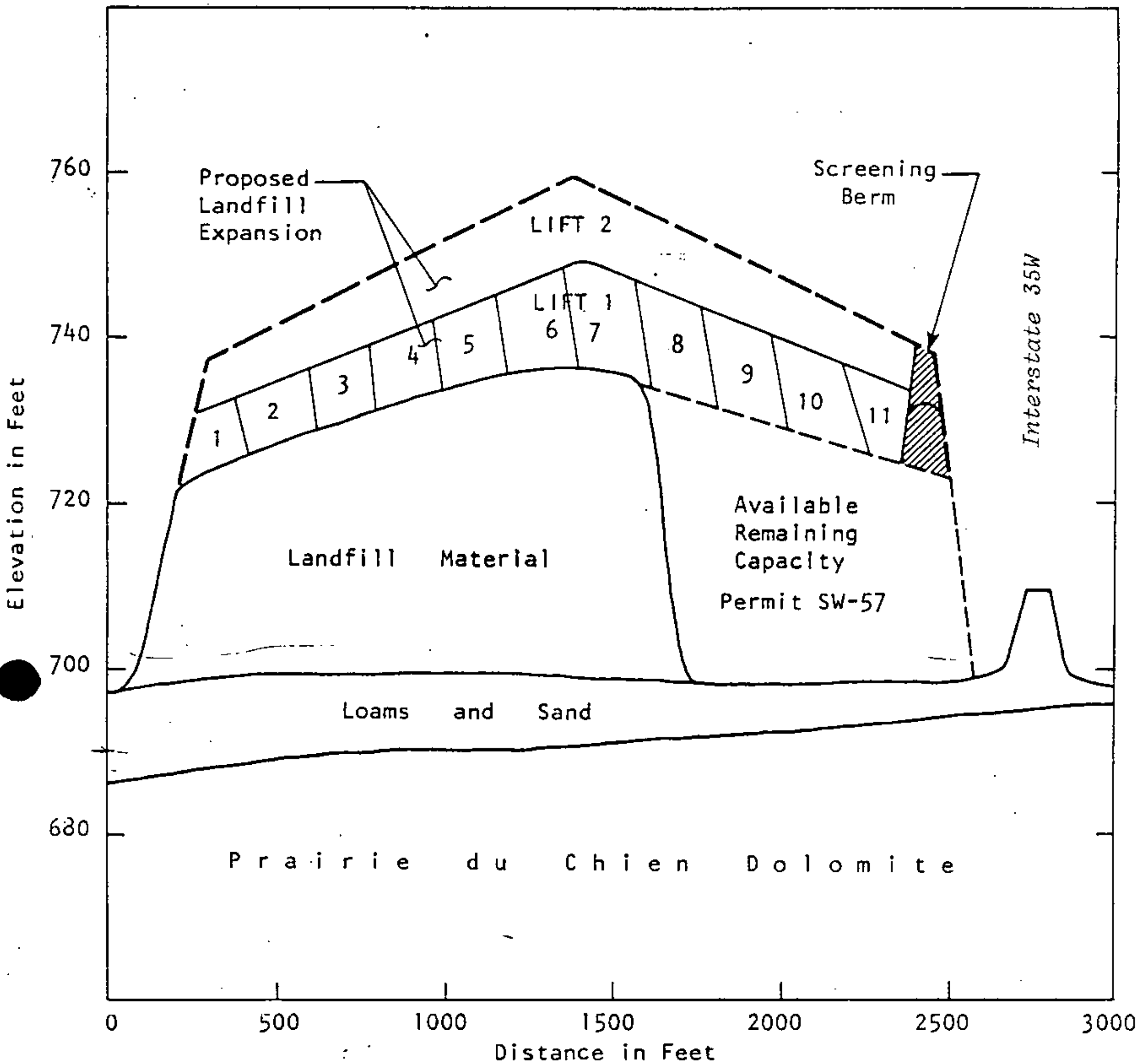

FIGURE II-9

WEST-EAST CROSS SECTION

FREEWAY SANITARY LANDFILL

Note: Different horizontal and vertical scales

LEGAL DESCRIPTION

Since the proposed project is a vertical expansion of the existing landfill, the legal description of the proposed expansion remains unchanged from the legal description of the existing landfill property (see Appendix I).

ANTICIPATED LIFE, REFUSE SUPPLY, DESIGN CAPACITY

The 22-foot vertical addition to the 126-acre landfill will hold approximately 1,860 acre-feet of refuse. Given normal waste receiving rates of about 180,000 to 300,000 tons of refuse a year, this additional capacity will extend the life of the landfill by four to six years.

The type of refuse disposed and the collection area serviced for the proposed vertical expansion will remain the same as that of the present operation.

MAJOR ACCESS ROADS

The major access roads for the proposed vertical expansion are the same as that of the present operation (see Figure II-1).

PROPOSED OPERATION

GENERAL METHOD OF LANDFILLING

The proposed project does not change the current methods of operation at the landfill. The landfill operator proposes no changes in the site's operation respecting evironmental controls.

ENVIRONMENTAL CONTROLS

Environmental controls will remain the same as that of the present operation.

SECURITY AND SAFETY PRACTICES

Security and safety practices will remain the same as that of the present operation.

BUILDINGS

No change in the existing buildings on the landfill will be made. No new buildings will be constructed.

ENERGY

Current energy requirements to operate the landfill are expected to continue with the addition of the expansion capacity.

PROPOSED CONSTRUCTION

The staging of the development of the landfill with the proposed expansion will be as follows. Once all three phases of the originally permitted landfill are completed (see Figure II-5), two lifts will be constructed on top of the inplace landfill material. Construction will proceed from west to east after a screening berm is in place on the eastern edge of the landfill (see Figure II-9).

Figure II-7 shows the proposed final contours and surface water runoff patterns of the completed landfill with the vertical expansion. The 22-foot vertical expansion would not alter the proposed end use plan for the site.

III. DESCRIPTION OF EXISTING ENVIRONMENT

METEOROLOGY/CLIMATOLOGY, AIR QUALITY AND NOISE

METEOROLOGY/CLIMATOLOGY

General

The most significant meteorological parameters associated with sanitary landfill design and operation are wind speed, wind direction, atmospheric stability, temperature and precipitation. Prevailing winds are important in consideration of problems relating to odor, dust, and blowing debris. The advection and diffusion of odorant gases and particulates from the landfill to receptors in the impact area is largely determined by the wind speed, wind direction and atmospheric stability.

Ambient temperature governs such factors as the types and quantities of odorant emissions and probable (indoor versus outdoor) activities of persons (sensitive receptors) in the area. Freezing temperatures may also cause problems. Cover material may be difficult to obtain when the frost line is more than six inches below the ground surface. The stockpiling, transport and placement of cover material may also be difficult during freezing conditions.

Precipitation (both rain and snow) is important in determining surface runoff, the design of an adequate drainage system for its control, the rate of waste decomposition, the generation and control of leachate, the feasibility of maintaining operations at all times at the site, the transport of equipment on the site, and access to and from the site. Loaded vehicles may experience difficulty on steep inclines and snow-covered roads. The combination of mild temperatures (thaw) and rainy conditions can make clayey soil conditions very muddy, thus limiting effective operations at the site. In certain areas, for example, it may be benefical to construct a wet weather site where limited amounts of waste can be disposed of over short periods when weather conditions make access to the main site difficult.

The landfill, like the rest of the Metropolitan Area, is situated in the upper Mississippi River Valley on the borderline between the Humid Continental Warm Summer and Humid Continental Cool Summer Climates. The boundary between the milder and more severe cool-summer phase of the Continental Climates (Da and Db) is the 71.6°F. Isotherm for the warmest month. The normal monthly temperature at the Minneapolis-St. Paul International Airport for the warmest month (July) is 71.9°F.

Due to the Metropolitan Area's closeness to the geographical centerline of North America, there exists a tendency for extremes in all climate features. For example, there are wide variations in temperature, plentiful summer rainfall and relatively little winter precipitation.

Temperature

Temperatures in the Metropolitan Area tend to range widely during the course of the year. The coldest month is January, with mean daily maximum and minimum temperatures of 22.4 and 2.4°F., respectively. July is the warmest month with mean daily maximum and minimum temperatures of 83.9 and 60.7°F., respectively. The normal monthly temperature is 44.1°F. The lowest recorded temperature was -34°F. in January 1970; the highest recorded temperature was 104°F. in July 1941.

The maximum temperature for almost one-quarter of the year does not exceed freezing (32°F.) and the minimum temperature for more than one-half of the year (193 days) is below 32°F. These temperatures translate into 8,159 heating degree-days and 585 cooling degree-days annually. Extremely low temperatures during the long winter frequently combine with moderate to high winds to create "wind chill factors" which make outside activity extremely uncomfortable. Winds during the winter months (November to March) consistently average above 10 miles per hour.

Humidity and Precipitation

The Metropolitan Area experiences only a relative brief (May to September) growing season, but precipitation is ample and well distributed during the five month growing cycle (average for the five month growing cycle is 16.78 inches). The average annual precipitation is 25.94 inches, including an average annual snowfall of 40.3 inches. Thunderstorms are the primary source of rainfall during the growing season. Rainfall can be heavy, but is usually brief in duration. Severe thunderstorms occur occasionally and may produce excessive rains, high winds, lightning and hail.

Table III-1 shows mean humidity (recordings over a 15- year period) and mean precipitation (recordings over a 36-year period) for the Minneapolis-St. Paul area.

The annual precipitation at the Minneapolis/St. Paul Airport (seven miles from the landfill) averages 29.3 inches per year. Table III-2 summarizes the estimated average monthly precipitation at the landfill site. These averages were calculated from precipitation records (1949-1974) at the Chaska, Farmington, Jordan, Minneapolis and Montgomery weather stations.

Table III-1.
MINNEAPOLIS-ST. PAUL MEAN HUMIDITY AND PRECIPITATION

Month	Humidity (Percent) Midnight	6 am	Noon	6 pm	Precip. in.
January	72	73	67	68	0.73
February	73	74	65	65	0.84
March	73	77	64	63	1.68
April	70	76	55	54	2.04
May	70	77	54	52	3.37
June	74	80	55	53	3.94
July	77	82	55	54	3.69
August	78	85	56	56	3.05
September	81	87	60	62	2.73
October	76	83	60	63	1.78
November	79	82	67	71	1.20
December	77	79	72	74	0.89
Year	75	80	61	61	25.94

Source: Local Climatological Data, Annual Survey, 1974, Minneapolis, St. Paul, Minnesota, U.S. Department of Commerce.

Table III-2
AVERAGE MONTHLY PRECIPITATION NEAR FREEWAY SANITARY LANDFILL

Month	Inches
January	0.7
February	0.8
March	1.6
April	2.2
May	4.3
June	5.2
July	4.2
August	3.4
September	3.0
October	1.9
November	1.2
December	0.8
Average Total Annual Precipitation	29.3

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As can be seen from Tables III-1 and III-2, precipitation amounts in the Metropolitan Area are small during winter and relatively high during the summer. The vast majority of precipitation during winter falls as snow. Annual precipitation near the landfill averages about 29 inches.

The Metropolitan Area is subject to periods of severe weather during both the summer and winter months. The vast majority of the severe weather during the summer months derives from either convective or frontal thunderstorm activity. During the winter months, passage of cold fronts can produce very high winds associated with blizzard conditions. The highest recorded wind for the Twin Cities area in the 36 years ending in 1974 was 92 miles per hour.

The State of Minnesota is on the northern edge of the national region of maximum tornado frequency. The state ranks sixteenth among the 50 states and District of Columbia in frequency of tornadoes based on the 49 years ending in 1964.

Wind

Wind data at the Minneapolis-St. Paul Airport indicate that wind velocities are moderate with the annual wind speed averaging 10.5 mph (Table III-3). Prevailing winds are from the northwest during the winter, early spring and late fall. During the remainder of the year south or southeasterly winds predominate. Average wind speeds are highest during the cold portion of the year (12.3 mph in April), while the lowest values occur during the summer (9.1 mph in August). The advance of cold air after the passage of a strong storm system is responsible for most of the high winds which occur in winter. High winds experienced in summer often result from the gustiness produced by strong thunderstorms.

Dispersion Characteristics

The overall dispersion ability of the atmosphere in this area of the country is quite good. The frequent passage of weather systems minimizes periods of air stagnation. Consequently, atmospheric conditions are usually favorable for the dispersion of pollutants and the area seldom encounters "extended" periods of fog or high pollutant levels. The frequency of light winds (0 to 3 mph) at Minneapolis, which is indicative of the frequency of stagnation periods, is low ranging from 11 to 14 percent of the time (MPCA 1979). Pollutants are distributed through the atmosphere by the action of horizontal wind and vertical air currents. At times, atmospheric inversions tend to "clamp a lid" over an area, reducing the volume of air into which the pollutants can defuse. Inversions are commonly associated with stagnating, high pressure systems and are characterized by fog, light winds and very stable conditions. When inversions exist for a long period of time, pollutants are trapped near the ground and can build up to potentially harmful levels. The frequent weather changes common to this section of the country inhibit prolonged inversion conditions so that adequate dispersion conditions generally prevail.

Table III-3
WIND SPEED AND DIRECTION SUMMARY FOR
MINNEAPOLIS-ST. PAUL, MINNESOTA
(1941-1970)

Month	Mean Wind Speed (mph)	Prevailing Direction	Fastest Mile* Speed (mph)	Fastest Mile* Direction	Fastest Mile* Year
Jan	10.4	NW	40	SE	1956
Feb	10.5	NW	52	NW	1952
March	11.2	NW	47	E	1951
April	12.3	NW	52	WSW	1964
May	11.3	SE	61	NW	1964
June	10.5	SE	63	NW	1939
July	9.3	S	92	W	1951
Aug.	9.1	SE	63	N	1967
Sept.	9.8	S	47	N	1951
Oct.	10.4	SE	73	S	1949
Nov.	11.0	NW	60	SW	1958
Dec.	10.4	NW	52	W	1946
Annual	10.5	NW	92	W	July 1951

* Windspeed is fastest observed one-minute value when the direction is in tens of degrees.

Source: J.T. McLaughlin, T.D. Van Epp and W.K. Tusa, Environmental Impact Statement For Woodlake Sanitary Landfill Expansion, Technical Work Paper No. 3, Prepared for MPCA, Roseville, Mn. 1980.

AIR QUALITY

Federal and State Regulations

Since the passage of the federal Clean Air Act of 1970, and the 1977 amendments, each state must revise its clean air strategy to attain the ambient air standards by December 31, 1982. Portions of the Minnesota State Implementation Plan (SIP) were approved by the U. S. Environmental Protection Agency (EPA) in 1979. The plan defines how the state will reduce air pollution in areas where health standards are violated, and prevent deterioration of air quality elsewhere.

The Clean Air Act amendments require each state to identify all areas that meet healthy air standards and those that do not for five major pollutants: carbon monoxide (CO), ozone (O_3), particulates (dust and soot), sulfur dioxide (SO_2), and nitrogen oxides (NO_x). The EPA promulgated two levels of standards for each pollutant (National Ambient Air Quality Standards). Primary air quality standards were developed to protect public health while secondary standards were developed to prevent other deleterious effects of air pollution, i.e., injury to crops, livestock, transportation and nuisance problems. The primary standards for particulates and sulfur dioxide are more stringent than the secondary standards for these pollutants.

Since the establishment of the national ambient air quality standards each state has been faced with the responsibility of meeting the standards. The national standards are minimum requirements that must be met within a specified time table, but the states may establish more stringent standards as Minnesota has done in the case of sulfur oxides, peak-hour carbon monoxide, and photo-chemical oxidants.

Table III-4 presents a comparison between federal and Minnesota state standards. Two units describe the standards: 1) ug/m^3, micrograms /cubic meter, which refers to particulate matter; and 2) ppm, parts per million which quantifies gaseous pollutants. The standards specify exposure periods for each pollutant based on scientific studies concerning possible adverse health effects. With the exception of nonmethane hydrocarbons, all of the pollutants listed in Table III-4 affect the human physiological system. Nonmethane hydrocarbons, along with nitrogen oxides, are of primary concern due to their role in the formation of photochemical smog.

As can be seen from Table III-4, there are significant differences between the federal and Minnesota air quality standards for certain pollutants. For example, the Minnesota annual and 24-hour primary standards for sulfur oxides are approximately one-third less than the federal standard and the state's three-hour secondary standard is only half of the national standard. It should also be noted that Minnesota has established standards for sulfur oxides where none currently exist at the federal level. Specifically, the state has established a three-hour primary standard for sulfur oxides, along with annual and 24-hour secondary standards. In addition, Minnesota's one-hour carbon monoxide standard (both primary and secondary) of 30 parts per million (ppm) is five ppm lower than the corresponding federal standards.

Table III-4: COMPARISON BETWEEN NATIONAL AND MINNESOTA AMBIENT AIR QUALITY STANDARDS

POLLUTANT	WORDING OF STANDARD	PRIMARY[a] STANDARD National	PRIMARY[a] STANDARD State	SECONDARY[b] STANDARD National	SECONDARY[b] STANDARD State
SUSPENDED PARTICULATE MATTER	Annual geometric mean conc.	75 μg/m^3	75 μg/m^3	60 μg/m^3	60μg/m^3
	Maximum 24-hour concentration Not to be exceeded more than once per year	260 μg/m^3	260 μg/m^3	150 μg/m^3	150μg/m^3
SULFUR OXIDES	Annual arithmetic avg. conc.	.03 ppm	.02 ppm		.02 ppm
	*Maximum 24-hour concentration Not to be exceeded more than once per year	.14 ppm	.10 ppm		.10 ppm
	*Maximum 3-hour concentration Not to be exceeded more than once per year		.25 ppm	.50 ppm	.25 ppm
CARBON MONOXIDE	*Maximum 8-hour concentration Not to be exceeded more than once per year	9 ppm	9 ppm	9 ppm	9 ppm
	*Maximum 1-hour concentration Not to be exceeded more than once per year	35 ppm	30 ppm	35 ppm	30 ppm
PHOTOCHEMICAL OXIDANTS	*Maximum 1-hour concentration Not to be exceeded more than once per year	.08 ppm	.07 ppm	.08 ppm	.07 ppm
HYDROCARBONS	*Maximum 3-hour concentration (6-9 a.m.) Not to be exceeded more than once per year	.24 ppm	.24 ppm	.24 ppm	.24 ppm
NITROGEN OXIDES	Annual arithmetic average concentration	.05 ppm	.05 ppm	.05 ppm	.05 ppm

FOOTNOTES: (a) Primary Standard: Protect Public Health
(b) Secondary Standard: Prevent all other adverse affects of air pollutants

*Not to be exceeded more than once per year.

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The National Ambient Air Quality Standards were to be met by June 1, 1975; although substantial improvements have been made in ambient air quality, the standards are not being meet in all areas of Minnesota or the United States. Ambient air quality continues to be assessed by the primary and secondary standards.

With regard to the SIP for Minnesota, areas that violate standards are classified nonattainment for each pollutant exceeding the standard. Areas that do meet health standards are classified attainment. The MPCA is presently identifying the exact sources of pollutants in each area.

In nonattainment areas, industrial growth could occur until July 1, 1979 if the firm's potential pollutant emissions are less than 100 tons per year or the amount of pollution added by the new facility is offset somewhere else in the area and the firm attains the lowest achievable emission rate for its type of operation. After July 1, 1979 new sources must be permitted in accordance with the revised SIP.

In addition to regulations for primary and secondary emissions, Minnesota has established a number of regulations and rules pertaining to the emission of odorous substances. Specifically, Minnesota Air Pollution Control (APC) Rule 9 regulates odorus air pollution from various sources including sanitary landfills. APC 9 sets odor emission limits based on the specific type of source and the nature of the potential odor impact area (residential, industrial, etc.).

Areawide Compliance

The Twin Cities Metropolitan Area has been designated as a nonattainment area for particulates, sulfur dioxide, carbon monoxide and oxidants. It is important to note that nonattainment designations are on an areawide basis. Attainment areas (or pockets of clean air) can exist within a nonattainment area. It is probable that air quality, particularly in the rural portions of the Region, are in compliance with ambient air quality standards.

Freeway Landfill Area

Existing land use in the vicinity of the landfill is industrial or open land. Directly north of the landfill is U. S. Salt, a salt manufacturer. A dolomite quarry operated by Edward Kraemer and Sons is immediately south of the landfill.

The MPCA has established three air monitoring stations (MPCA Nos. 0375, 0376, 0377) in the southern portion of Bloomington located approximately two to four miles from the landfill. Table III-5 shows the results of monitoring at these stations for particulates and sulfur dioxides.

Table III-5

1978 Particulate Summary (Micrograms/Cubic Meter)

Location MPCA No.	State Rank	No. Obs	Geom Mean	Std Dev	Max Obs	2nd High	No. $260u/m^3$	No. $150u/m^3$
0375	50	26	56.5	1.6	128	120	0	0
0376	27	26	40.9	1.5	101	83	0	0
0377	20	33	39.4	1.7	98	71	0	0

1979 Particulate Summary (Micrograms/Cubic Meter)

Location MPCA No.	State Rank	No. Obs	Geom Mean	Std Dev	Max Obs	2nd High	No. $260u/m^3$	No. $150u/m^3$
0375		39	55.6	1.6	153	105	0	1
0376		22	33.8	1.5	60	59	0	0
0377		47	38.3	1.8	124	92	0	0

1978 Sulfur Dioxide Summary (ppm)

				3-Hour Average			24-Hour Average		
Location MPCA No.	No. Obs.	Ari Mean	Std Dev	Max Obs	2nd High	No. Vio	Max Obs	2nd High	No. Vio
0375	8016	.009	.008	.102	.100	0	.030	.029	0

1979 Sulfur Dioxide Summary (ppm)

				3-Hour Average			24-Hour Average		
Location MPCA No.	No. Obs.	Ari Mean	Std Dev	Max Obs	2nd High	No. Vio	Max Obs	2nd High	No. Vio
0375	6134	.007	.009	.113	.061	0	.047	.038	0

Source: Minnesota Pollution Control Agency, 1979.

Suspended Particulate Matter -- For total suspended particulate concentrations, air monitoring stations 0375, 0376, and 0377 recorded (out of 26, 26, and 33 observations respectively) in 1978 no violations of federal or state primary and secondary standards for maximum 24-hour concentrations. In 1979, air monitoring station number 0375 recorded (out of 39 observations) one violation of secondary standards and no violations of primary standards. Air monitoring station numbers 0376 and 0377 recorded (out of 22 and 47 observations respectively) no violations of federal or state primary and secondary standards for maximum 24-hour concentrations.

A list of the major point sources of particulates in the Metropolitan Area are shown in Table III-6 with the location of these sources shown in Figure III-1. Figure III-2 shows the areas in the Region impacted by particulate concentrations from these sources. As can be seen, NSP's Black Dog Electrical Generating Plant, Cargill's and Bunge's grain elevators are the main contributors of particulate concentrations near the landfill. The air quality at the landfill site may also be influenced by the adjacent quarry operation, an adjacent asphalt plant and by transportation-related emissions from I-35W and Minnesota Highway 13.

Sulfur Oxides -- In 1978 and 1979, air monitoring station number 0375 recorded no sulfur dioxide concentrations (out of 8016 and 6134 observations respectively) in violation of federal and state primary and secondary standards for maximium 3-hour and 24-hour concentrations. In 1978 and 1979 the annual arithmetic average concentrations for sulfur dioxide recorded at station number 0375 did not exceed state primary and secondary stan-dards. Also the federal primary standard was not exceeded.

Regulatory Compliance

The landfill area is not in violation of standards for suspended particulates and sulfur oxides.

Existing Landfill Site

The landfill is located in the northwest portion of the City of Burnsville. Given the geographic relationship to other industries in the area and the prevailing wind (from the southeast in the summer and the northwest in the winter), the air quality at the landfill site does change considerably from winter to summer.

Suspended Particulate Matter -- The particulate problem at the landfill site is caused, for the most part, by fugitive dust emissions. The engineering method of sanitary landfilling is by nature a construction activity, and as such, it produces fugitive emissions. Fugitive dust emissions are caused by activities such as the movement of refuse trucks to and from the working area of the landfill, the excavation, stockpiling and grading of cover material, the movement of heavy equipment and vehicles over unpaved areas, and the land clearing of future disposal areas on the site.

Table III-6

TWIN CITIES METRO AREA

MAJOR POINT SOURCE EMISSIONS INVENTORY, 1977

Site		PARTICULATES Tons/Year	PARTICULATES Effective Stack Hgt.	HYDROCARBONS Tons/Year	HYDROCARBONS Effective Stack Hgt.
1.	H&S Asphalt	n/a	n/a	-	-
2.	NSP-Blackdog	5,866	289'	-	-
3.	Koch Refining Co.	234	50'	11,593	60'
4.	St. Paul Ammonia	105	45'	-	-
5.	Williams Pipe Line Co.	-	-	105	48'
6.	Minnesota Valley Surfacing	7,040	n/a	11,826	n/a
7.	Agg Sinter, Coke	1,260	30'	-	-
8.	Champion Packages Co.	-	-	358	40'
9.	NSP-Riverside	503	335'	-	-
10.	Fleischmann Malting	252	30'	-	-
11.	Tonka Toys	-	-	181	25
12.	University of Minnesota	299	n/a	-	-
13.	A D M nokomis Mill	178	60'	-	-
14.	General Electric Service	-	-	175	25'
15.	Honeymead Products	157	150'	-	-
16.	Commutator Foundry	292	40'	-	-
17.	Honeywell Inc.	-	-	119	n/a
18.	Onan Div. of Onan Corp.	-	-	112	36'
19.	Howe Incorporated	103	25'	-	-
20.	3M Company	-	-	42,919	n/a
21.	Webb Publishing	-	-	17,273	43'
22.	Mobil Oil Corporation	-	-	1,772	n/a
23.	Ford Motor Company	-	-	1,008	50'
24.	William Pipe Line	-	-	1,100	72'
25.	American Can Co.	-	-	611	200'
26.	Union Oil Co. of California	-	-	1,052	10'
27.	Metro. Waste Control Commission	2,050	n/a	-	-
28.	Hoerner Waldorf Corp.	-	-	463	58'
29.	Koppers Co.	180	20'	300	20'
30.	Whirlpool Corp.	-	-	266	68'
31.	Total-Asphalt	257	36'	-	-
32.	Fugta	355	n/a	-	-
33.	Standard Oil	-	-	392	24'
34.	Shell Oil Co.	-	-	604	48'
35.	Texaco Inc.	-	-	194	n/a
36.	Olympia Brewing Co.	184	n/a	-	-
37.	NSP-Highbridge	290	570'	-	-
38.	NSP-3rd Street Stream	136	258'	-	-
39.	National Can	-	-	132	41'
40.	Bryan Rock Products	1,439	20'	-	-
41.	Bunge Corporation	1,292	n/a	-	-
42.	Rahr Malting Co.	554	n/a	-	-

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43.	J.L. Shiely Compan -Shakopee	500	n/a	-	-
44.	Continental Grain Co.	448	20'	-	-
46.	Cargill, Elev. C	147	n/a	-	-
47.	Northwestern Refining Co.	-	-	7,720	53'
48.	3M Company-Cottage Grove	-	-	2,999	31'
49.	NSP-King	659	785'	-	-
51.	Erickson Petroleum Corp.	-	-	1,329	48'
52.	Tower Asphalt Inc.	465	n/a	-	-
54.	Anderson Corp.	-	-	511	25'
55.	Minn. State Prison	397	110'	-	-
57.	J.L. Shiely-Grey Cloud	325	10'	-	-

Source: Metropolitan Waste Control Commission, 1977.

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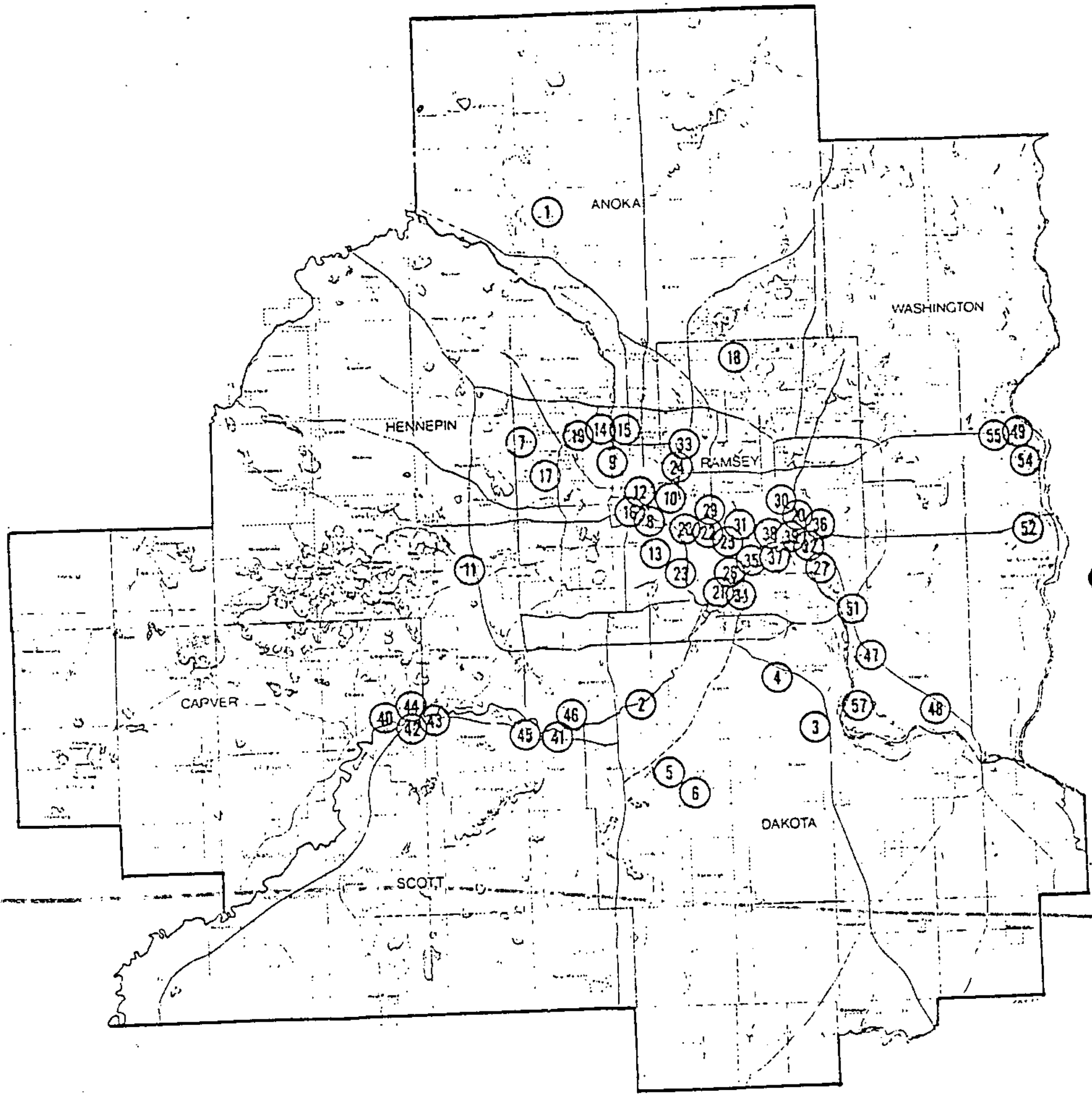
Figure III-1

LOCATION OF MAJOR EMISSION SOURCES



SOURCE: Metropolitan Waste Control Commission, 1977

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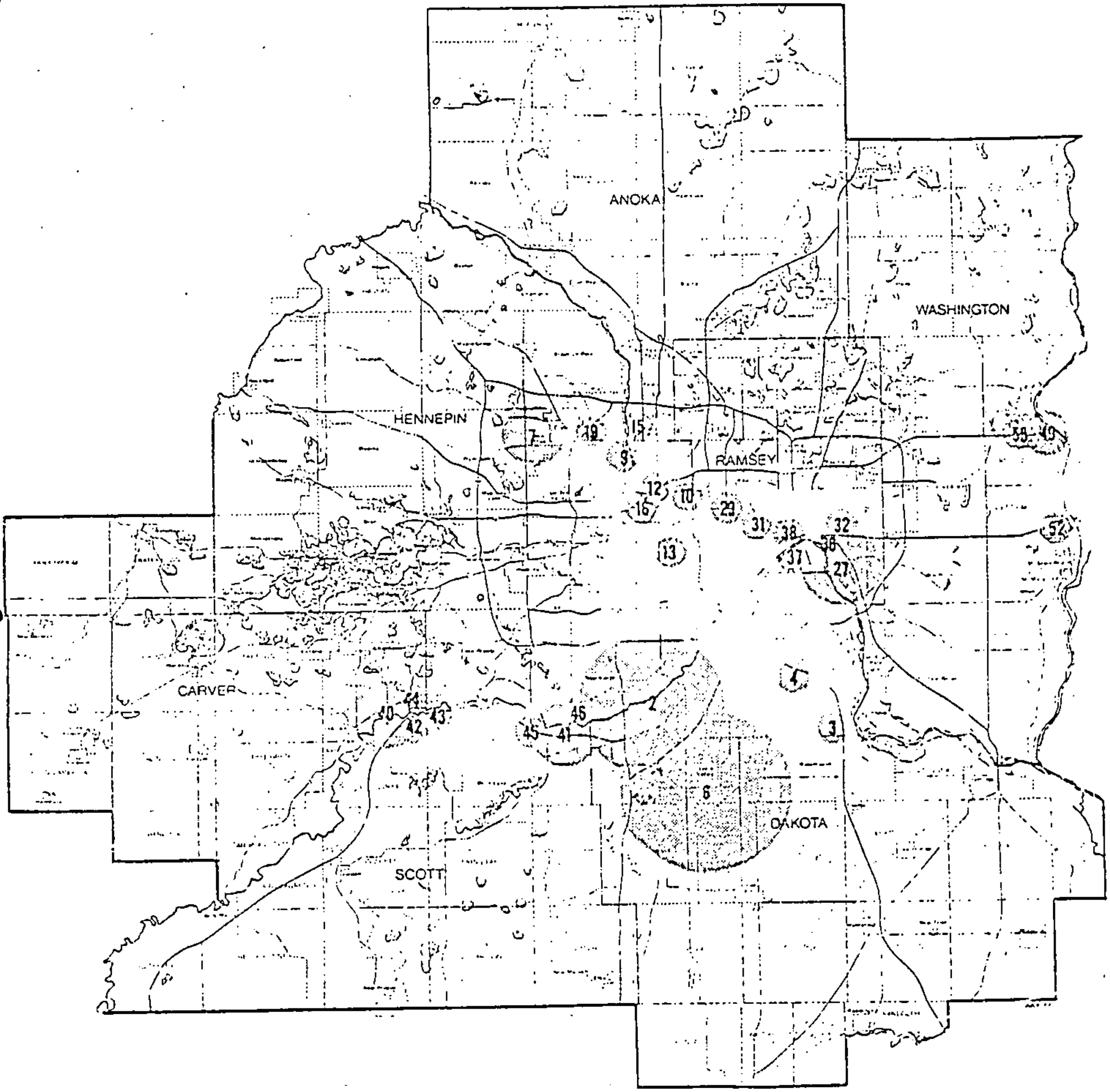
Figure BVI-2

METROPOLITAN AREAS IMPACTED BY PARTICULATES



SOURCE: Metropolitan Waste Control Commission, 1977

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Fugitive dust has not been a significant problem with the existing operation. Fugitive dust has been minimized by the paving of access roads with asphalt or crushed rock, by the type of landfill cover being used, by vegetation of landfill slopes, and by the lack of sensitive receptors in the vicinity of the landfill. In addition, water from a fire truck is available for further dust control when conditions warrant its use.

The primary carrier of refuse traffic to the landfill is I-35W and State Highway 13. Transportation-related emissions from the landfill are small in comparison to those generated by the general traffic flow in the area.

Sulfur Oxides -- Sulfur oxide emissions from the operation of the landfill itself are negligible.

Methane Gas -- Methane gas (CH_4) is a colorless, odorless gas produced by the anaerobic decomposition of refuse. Methane generation in a sanitary landfill depends on the waste composition, internal moisture content, temperature, and other environmental factors. In general, a mature landfill that has reached its maximum generation rate, estimated to occur between one to five years after completion, will produce gas at a high rate for about six to 10 years and will continue to produce gas at lesser rates for up to 100 years.

The composition of landfill gas based on field samples ranges from 45 to 65 percent methane with the most common values lying between 45 and 55 percent. The balance of the gas is carbon dioxide with smaller amounts of hydrogen, oxygen, nitrogen, and traces of other gases.

From a safety aspect, methane is only considered a problem when it is mixed with oxygen at concentrations greater than 15 percent. At such concentrations methane is explosive.

Generally, there is no danger of a methane explosion. Methane, being lighter than air, will naturally vent upwards through the cover material into the atmosphere, where the methane will be at concentrations much lower than 15 percent. If methane is prevented from venting upwards into the atmosphere, possibly by an impermeable cover over the refuse, the gas will migrate laterally beneath the surface until it reaches a permeable surface where it can escape into the atmosphere. If there are buildings with basements near the landfill and if the methane is prevented from venting upward through the cover material and therefore is forced to migrate laterally below the surface, there is a possibility that some methane may concentrate in a basement and be an explosion hazard.

The operational procedures at the landfill should provide adequate protection against any methane hazard. The rate of methane production in a landfill is increased according to the amount of moisture coming in contact with the refuse. Covering and grading practices by the landfill operator and subsequent surface water drainage pattern development should keep water in contact with the buried refuse at a minimum. The rate of refuse decomposition will, therefore, be slow, and as a result methane gas will be produced in small amounts over a long period of time. This low rate of methane production reduces the possibility of explosive concentrations being reached. In addition, the small amount of methane gas that is produced within the landfill should vent through the cover material and at the landfill perimeter, ultimately dissipating at harmless concentrations into the atmosphere.

Odor -- Odorous emissions may result from the operation of sanitary landfills. In general, there are a number of primary sources of odor at sanitary landfills. The most common is that which emanates directly from the incoming refuse. Odorous compounds can also result from the degradation of previously buried refuse. As previously discussed, gas is produced naturally when solid wastes decompose. The quantity generated in a landfill and its composition depend on the types of solid waste and on environmental factors such as temperature, and moisture content.

Some of the chemical compounds that are released during the decomposition process may include odorant gases. While methane and carbon dioxide are the major constituents of landfill decomposition gas, other gases produced may cause a repugnant odor. For example, hydrogen sulfide may be generated at a landfill, particularly if it contains a large amount of sulfate containing wastes or if brackish water infiltrates the solid waste. Other odorant gases which may be produced by the decomposition process include ammonia and trace mercaptans.

Another potential source of odor is leachate which reaches the surface from either seeps or from a collection system. Groundwater and infiltrating percolation in conjunction with landfill liquid wastes can result in leachate, a term denoting a solution consisting of dissolved and suspended solid matter and microbial waste products which results when water comes in contact with landfilled solid waste.

The specific nature and concentration of substances contained in the leachate depend on the composition of the refuse as well as its degradation stage. Odorants may be released into the air as a result of leachate formation, collection or treatment.

Special wastes being received at the landfill may also generate strong odors. Typical examples include manures, fermented grains, and food processing wastes. In general however, properly operated sanitary landfills do not have substantive odor problems. Prompt waste processing, application of daily cover, leachate and gas control measures and exclusion of special wastes, as necessary, generally result in a relatively odor free operation.

On May 14, 1980, Metropolitan Council staff conducted a walking survey of homes and businesses surrounding the Burnsville and Freeway Landfills. The purpose of the survey was to determine attitudes toward the landfills. A number of residents directly across the Minnesota River in Bloomington (homes overlooking the river valley) stated that they noticed odors emanating occasionally from the landfills, particularly in the summer months when there was a south breeze. They could not, however, determine if both or one of the two landfills is the cause of the problem. It should be pointed out that the Freeway Landfill has violated daily cover requirements several times over the past years. This probably accounts for most of the odor problems that can be attributed to the landfill operations.

Regulatory Compliance -- Based on available information, the existing Freeway Sanitary Landfill appears to be in compliance with regulations concerning potential air emissions from the landfill. However, there could be some odor problems at the landfill because of failure to meet daily cover requirements. No significant adverse impacts from fugitive dust emissions and methane gas emissions have been reported.

NOISE

Federal and State Regulations

MPCA regulations NPC-1 and NPC-2 govern acceptable noise levels throughout the state. NPC-1 contains relevant definitions and specifies provisions for obtaining a variance from MPCA noise pollution control regulations. Variances may be granted in certain cases involving practicality and feasibility of compliance with the standards. MPCA regulation NPC-2 instituted a three-tier noise area classification (NAC) scheme which limits L_{50} and L_{10} (hourly) exterior noise levels during both the daytime and nighttime periods. The L_{50} parameter is defined as the noise level that is exceeded 50 percent of the time and the L_{10} parameter is the noise level that is exceeded 10 percent of the time. Noise area classification 1, which contains the most restrictive noise standards, pertains to various types of human habitations ranging from single dwellings to camping areas and hotels. Nonresidential public area activity spaces (e.g., commercial establishments) are represented by NAC-2. Manufacturing, industrial, and agricultural land uses are represented by NAC-3. Underdeveloped land is represented by NAC-4; however, no standards have been promulgated for this category. The MPCA noise standards are shown in Table III-7.

The Occupational Safety and Health Act (OSHA) of 1970 established maximum permissible noise exposures for persons working in noise environments. These noise standards are shown in Table III-8 and are intended to protect the hearing of people exposed on a daily basis to elevated noise levels over a lifetime of employment. Violations of the OSHA standards are not common in most work environments.

Existing Landfill Site

Noise monitoring has not been conducted at or near the vicinity of the landfill. It is, therefore, difficult to assess compliance with the above regulations. An important point to consider is that I-35W is located along the eastern boundary of the landfill and substantial noise impacts presently exist due to the highway.

During the operation of the landfill, the primary generators of noise are equipment for earth moving and compaction and vehicular traffic entering and leaving the facility. Table III-9 shows a range of dBA levels for typical equipment used at the landfill site.

Table III-7

MINNESOTA POLLUTION CONTROL AGENCY NOISE STANDARDS (dBA)

	Day (7:00 A.M. to 10:00 P.M.)		Night (10:00 P.M. to 7:00 A.M.)	
NA C	L_{50}	L_{10}	L_{50}	L_{10}
1	60	65	50	55
2	65	70	65	70
3	75	80	75	80

Table III-8

OCCUPATIONAL SAFETY AND HEALTH ACT
MAXIMUM PERMISSABLE NOISE EXPOSURE
IN NOISE ENVIRONMENTS

Duration per day, hours	Sound level (dBA)
8	90
6	92
4	95
3	97
2	100
1.5	102
1	105
0.5	110
0.25 or less	115

Table III-9

Machine	dBA Range (measured at 50 ft.)
Scraper	89-95
Dozer	87-89
Motor grader	77-87
Refuse trucks	85-95

It has been determined that in a typical hour the approximate cumulative ambient noise produced by equipment at the landfill is 99 dBA. The noise received by the nearest private dwelling (2900 feet from the working area of the fill) is 64 dBA. This is a substantial reduction of noise; and is slightly below the MPCA NAC-1 daytime L10 standard of 65 dBA. This analysis does not assume topographical variations at the landfill which could dramatically change sound levels.

Noise generated by the above equipment and vehicles is mitigated at the existing landfill by the following considerations. Extensive buffer zones of industrial and commercial-industrial property lie between the landfill and residential areas. The closest commercial receptor to the landfill is U. S. Salt which is adjacent to the northern boundary of the landfill. The next closest commercial receptor is approximately 1,000 feet from the landfill. The proposed expansion area is about 2,900 feet from the nearest private dwelling.

Operating hours at the site are from 8 a.m. to 5 p.m., seven days a week. After those hours, no heavy equipment is in operation.

WATER QUALITY

CONTAMINATION FROM LANDFILLS

Leachate

The principal source of surface water and groundwater contamination from landfills is leachate. Leachate may be defined as liquid that has percolated through solid waste and has extracted dissolved or suspended materials from it. In most landfills the liquid portion of the leachate is composed of the liquid produced from the decomposition of the wastes and liquid that have entered the landfill from external sources, such as surface drainage, rainfall, groundwater, and water from underground springs.

When leachate percolates through solid wastes that are undergoing decomposition, both biological materials and chemical constituents are picked up. Representative data on the chemical characteristics of leachate, indicates that the range of concentration values for the various constituents is rather extreme. For this reason, no average value can be given for leachate.

In general, it has been found that the quantity of leachate is a direct function of the amount of external water entering the landfill. In fact, if a landfill is constructed properly, the production of measurable quantities of leachate can be eliminated. In some cases leachate treatment may be required.

Leachate Movement

Under ideal conditions, leachate should either be contained within the landfill or removed for treatment. Unfortunately, these conditions are found only in a few modern landfills, and so the movement of leachate from landfills is an important aspect of solid waste disposal.

Under normal conditions leachate is found in the bottom of landfills. From there its movement is through the underlying strata, although some lateral movement may also occur, depending on the characteristics of the surrounding material. As leachate percolates through the underlying strata, many of the chemical and biological constituents originally contained in it will be removed by the filtering and adsorptive action of the material composing the strata.

Once produced from the bottom of a landfill, leachate constituents concentrations may potentially be reduced by the following attenuation mechanism: absorption, ion-exchange, chemical precipitation, oxidation-reduction, biodegradation and dilution. It is difficult to estimate the exact degree of attenuation that will occur within the soils underlying a landfill. Several factors affect the extent of attenuation including soil type, soil permeability, original leachate concentrations, amount of unsaturated soil and reversibility or permanence of each specific attenuation mechanism. In general, clays have the highest attenuation; silts have a moderate attenuations. Fractured bedrock and highly porous gravels do not attentuate leachate in most instances.

<u>Control of Leachate Movement</u>

Because of the potential risk involved in allowing leachate to percolate to the groundwater, best practice calls for its elimination or containment. To date, the use of clay has been the favored method of reducing or eliminating the percolation of leachate. Membrane liners have also been used, but they are expensive and require care so that they will not be damaged during the filling operation.

<u>Surface Water Runoff</u>

Equally important in controlling the movement of leachate is the elimination of surface water infiltration, which is the major contributor to the total volume of leachate. With the use of a relatively impermeable cover material, an appropriate surface slope, and adequate drainage, surface infiltration can be controlled effectively.

Improper surface runoff from a landfill can also result in erosion of the cover material. Erosion may lead to the discharge of suspended solids to streams and possible siltation of adjacent water bodies. Surface runoff diversion may be necessary including channeling and the construction of berms and dikes.

GEOLOGY AND HYDROLOGY OF THE FREEWAY LANDFILL AND SURROUNDING AREA

Geologic and hydrologic conditions are major considerations in determining the environmental acceptability and impacts on an area from a landfill operation. Data on these factors are necessary to assess the pollution potential of a landfill and to establish what must be done to ensure that the movement of leachate and surface water runoff from a landfill will not impair the quality of local groundwaters and surface waters.

The following discussion is presented for background purposes for the later assessment of water quality impacts from the existing operation and proposed expansion of the Freeway Sanitary Landfill.

Regional Setting

The Metropolitan Area has been glaciated several times. On each occasion, as the glaciers advanced and retreated, they deposited a highly complex mantle of glacial drift, ranging from highly permeable sands and gravels of outwash to highly impermeable clays of glacial lakes and tills. In addition, each period of glaciation altered the course of the rivers in the Region. The various rivers cut through the glacial drifts down into the bedrock in several areas and subsequently filled in by drift from a later period of glaciation.

The Freeway Sanitary Landfill is located in the Minnesota River Valley in the southern portion of the Twin Cities Structural Basin. This river valley was eroded by the Glacial River Warren through the St. Croix Moraine down to and into the subcropping Prairie du Chien Dolomite. The majority of the valley bottom is covered by a thin veneer of alluvial deposits with a maximum thickness of less than 80 feet.

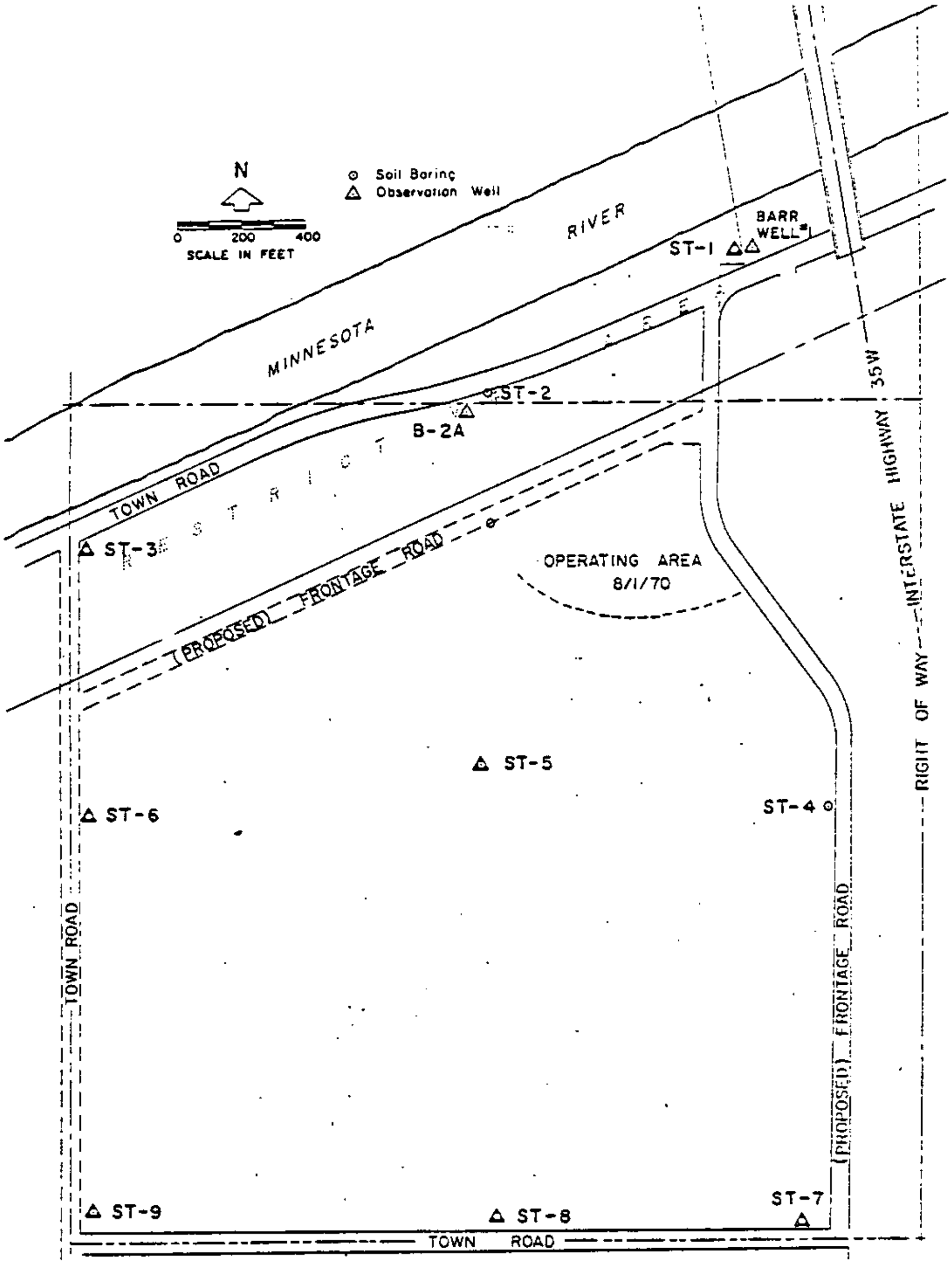
One to two miles north of and paralleling the Minnesota River lies another buried valley eroded into bedrock. This valley is eroded into the Jordan Sandstone which underlies the Prairie du Chien Dolomite. The land surface overlying this valley is covered with ground moraine deposits of the Des Moines Lobe and alluvial terrace deposits of the early phase of the Glacial River Warren. The bluff lands south of the Minnesota River Valley are covered by morainal deposits of both the Des Moines and Superior Lobes.

Area Topography

Topographic relief within this area of the Minnesota River valley varies from the river water surface level of approximately 685 feet to the height of the bluffs in Bloomington of about 810 feet. The presently existing surface elevations of the landfill site vary from Elevation 695 to Elevation 738. The topography of the site prior to any landfilling activity likely varied from about Elevation 696 to Elevation 705.

Site Geology

Bedrock -- The Freeway Sanitary Landfill is shallowly underlain by the Prairie du Chien Dolomite. Borings put down in the vicinity of the landfill indicate that the depth to bedrock varies from three feet to approximately 45 feet. The location of these borings are shown in Figure III-3. The bedrock surface beneath the landfill varies from elevation 656 to elevation 698. Data from the borings show that the bedrock surface contours in the area of the landfill are generally as shown in Figure III-4. (The boring logs are available upon request from the Metropolitan Council.) The bedrock surface is irregular and drops off sharply to the north along the northern boundary of the landfill. This is an eroded valley underlying the river. It should be noted that the MPCA has observed visual bedrock outcrops in unfilled areas of the permitted site. Waste materials are, therefore, currently being placed directly on bedrock.



LOCATION OF SOIL BORINGS
AND
GROUNDWATER OBSERVATION WELLS

Figure III-3

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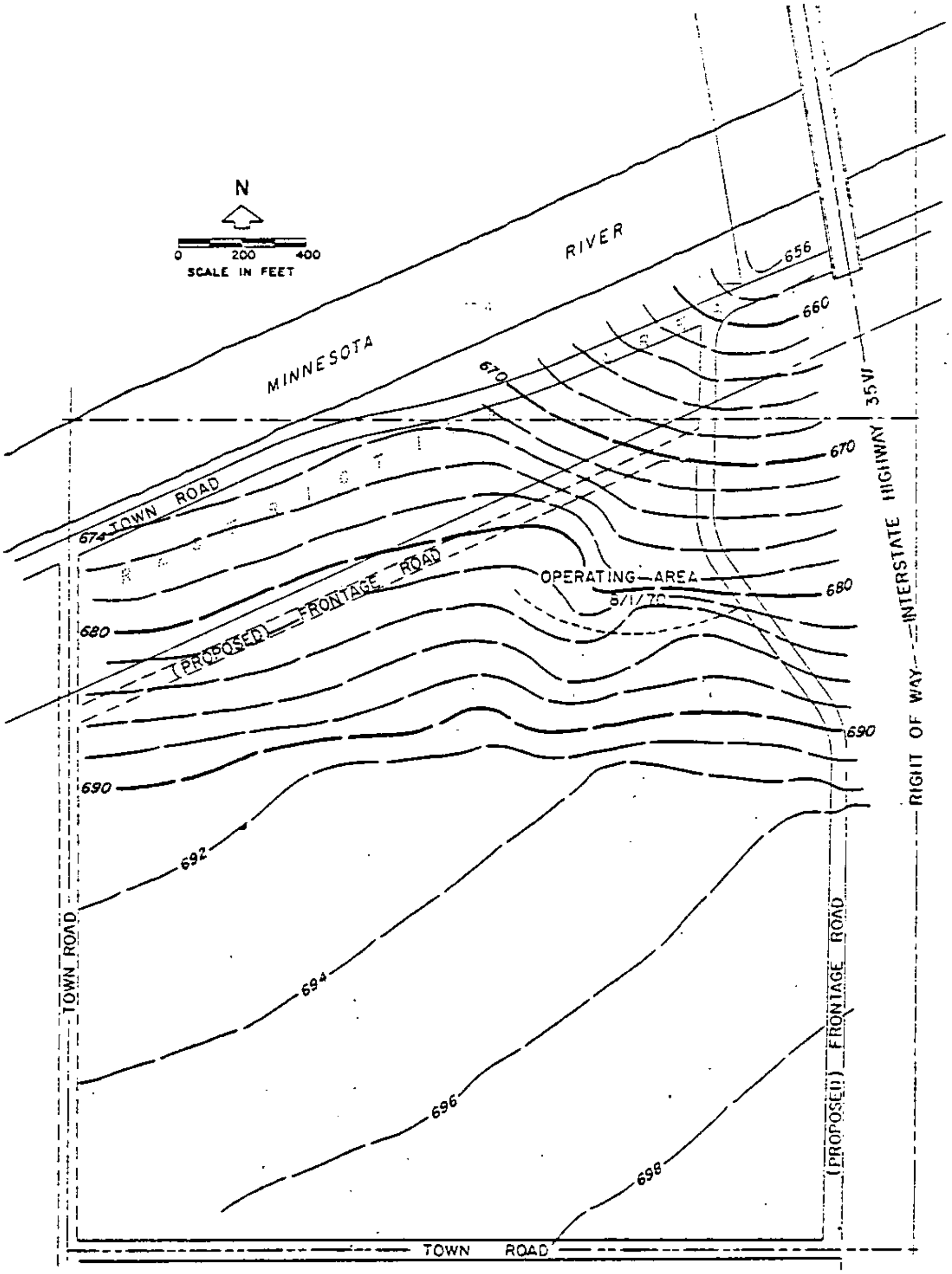

BEDROCK SURFACE CONTOURS

Figure III-4

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Well logs in the vicinity of the landfill indicate the Prairie du Chien Dolomite-Jordan sandstone contact is near elevation 560 in the landfill vicinity. The thickness of the Jordan ranges from 80 to 100 feet. The Jordan is underlain by the St. Lawrence Formation which is considered to effectively separate the Prairie Du Chien-Jordan aquifer from deeper aquifers. A bedrock column for the site is shown in Figure III-5.

Glacial Geology -- The area has been subjected to several episodes of glaciation during the Pleistocene Epoch. The area in the vicinity of the landfill is considered to have been part of the St. Croix Moraine and subsequently overlain by ground morainal deposits from the Des Moines Lobe. However, during the latter phase of the last period of glaciation in this area, the Glacial River Warren began flowing through the area that is now the landfill. In time what is now the Minnesota River valley was eroded by the Glacial River Warren through the St. Croix Moraine and into the subcropping Prairie du Chien Dolomite. The bedrock surface under the landfill site was subsequently covered with alluvial deposits, ranging in thickness from three to about 45 feet.

Soils -- An analysis of the soil samples showed the soil profile at the Freeway Landfill site to be made up of typical alluvial deposits. Borings along the northern boundary of the site showed soils from the surface to a depth of 7 to 9 feet to be mixtures of organic and granular materials consisting of sandy loams, fine sands, and fine loamy sands. Soils along the northern boundary from the 9 foot depth to bedrock are silty cohesive loams and clay loams with evidence of shells and sand lenses. The soil boring designated ST-1 on Figure III-3 in the northeast corner of the site indicated a sand and gravel strata at the 45 foot depth just above bedrock. Soil profiles in the central and southern portion of the site are composed of loams, peat, and some thin strata of silty cohesive materials. The depth from the ground surface to bedrock varied widely throughout the site ranging between 20 feet and 45 feet along the northern boundary and 3 feet to 10 feet along the southern property line.

Groundwater Hydrology

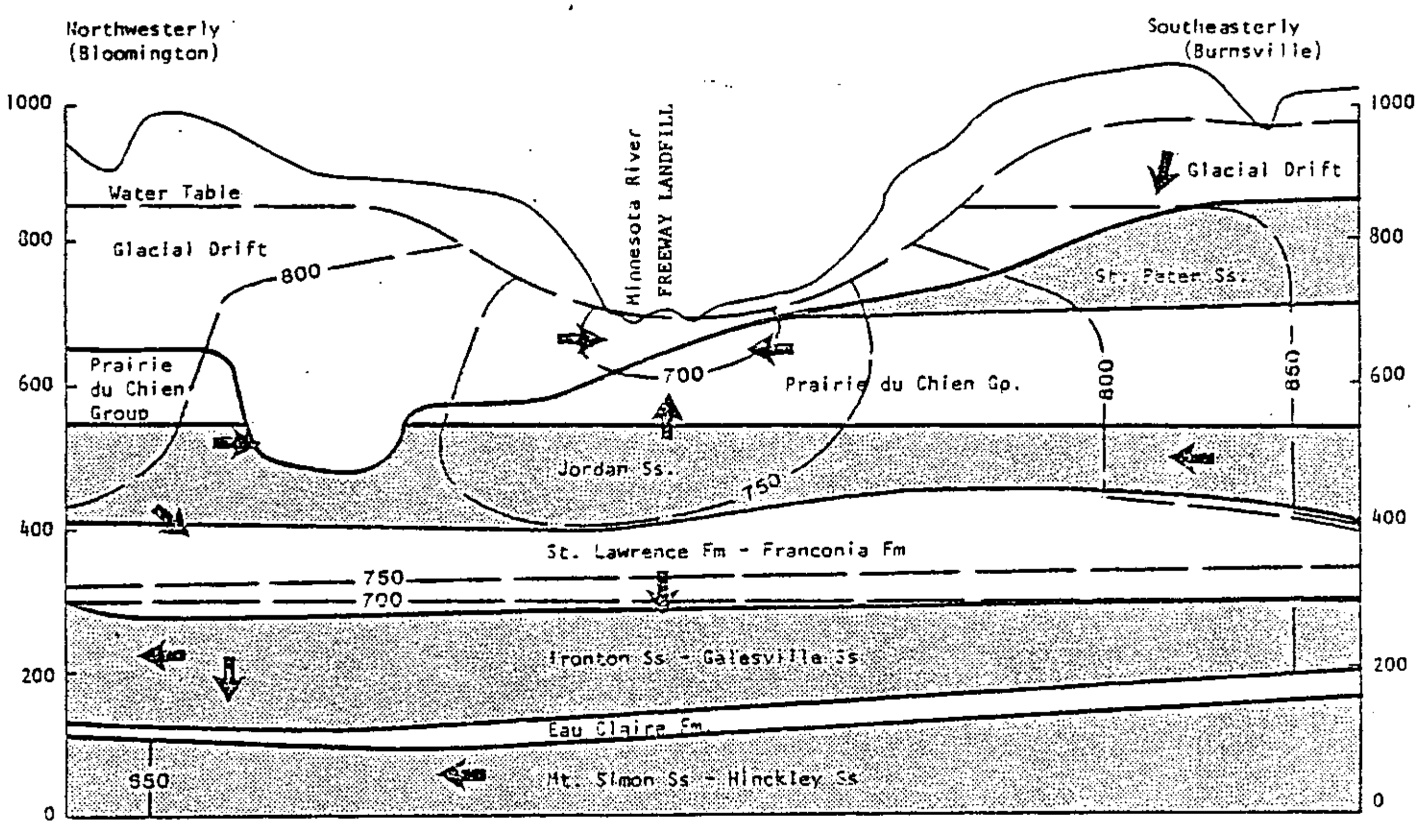
Regional Setting -- The Twin Cities Structural Basin contains several aquifer systems. The aquifer systems which underlie the landfill are the Prairie du Chien-Jordan, Ironton-Galesville, and Mt. Simon-Hinckley. Their relative relationship and thickness are shown in Figure III-6. The St. Peter Sandstone overlies the Prairie du Chien aquifer in the upland areas north and south of the landfill but has been eroded and is not present beneath it. A north-south hydrogeologic cross section showing the regional patterns of groundwater flow in the aquifer systems is shown in Figure III-6. As shown, the Minneota River and its valley serves as a regional discharge zone for groundwater in the Prairie du Chien-Jordan aquifer system and for groundwater in the glacial drift and St. Peter aquifers north and south of the valley. The aquifer systems beneath the Jordan aquifer do not appear to discharge into or to be influenced by the Jordan aquifer or the Minnesota River.

GEOLOGIC COLUMN IN VICINITY OF FREEWAY LANDFILL

Period	Geologic Unit	Range in Thickness (ft.)
Quaternary	Alluvial & Colluvial Deposits (Qd)	Variable
Ordovician	Prairie du Chien Group (Opc)	150±
Cambrian	Jordan Sandstone (Єj)	80-100
	St. Lawrence Formation ($Є_{sl}$)	175-200
	Franconia Formation ($Є_f$)	
	Ironton Sandstone ($Є_i$)	60-65
	Gales Sandstone (Єg)	
	Eau Claire Formation ($Є_{ec}$)	85-90
	Mt. Simon Sandstone ($Є_{ms}$)	over 200
Precambrian	Hinckley Sandstone ($PЄ_h$)	

Figure III-5

GENERALIZED REGIONAL CROSS-SECTION THROUGH FREEWAY LANDFILL



Vertical: 1" = 200' (1:2,400)
Horizontal: 1" = 5,000' (1:60,000)

Vertical Exaggeration: 25x

Generalized Direction of Ground Water Flow

Figure III-6

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Since the landfill is located in the regional discharge zone for the Prairie du Chien-Jordan aquifer which immediately underlies the site, any water percolating through the existing landfill material will not penetrate significantly into the aquifer but will move to the Minnesota River.

Site Groundwater Hydrology -- Information was collected during a study to evaluate the existing groundwater conditions in the landfill area in 1970 (Barr Engineering). Site inspection of the Kraemer quarry was made and through the cooperation of Mr. Faye Pope, superintendent of the quarry, pumping and geological data were obtained. Information on the permeability of the Shakopee-Oneota and Jordan formations was obtained from records of past work by Barr Engineering Company and Adolph F. Meyer. This information was used to calculate the piezometric pressure profile in the Shakopee-Oneota formation to determine the effect of the dewatering operation at the Kraemer quarry. Calculations assumed a Shakopee-Oneota effective permeability of 80 feet per day and a quarry pumping rate of 1.5 MGD Steady state flow and an aquifer of uniform thickness were also assumed.

Figure III-7 represents a vertical cross-section through the landfill and quarry and shows the measured water table at the landfill. The calculated piezometric pressure profile in the Shakopee-Oneota formation is also shown. The computed profile closely matched the elevation of the flowing observation well located in the northeast corner of the landfill site. As discussed previously, this well penetrates a sand and gravel aquifer adjacent to the underlying rock formation. With the existing quarry pumping rate, the piezometric level in the Shakopee-Oneota formation under the landfill varies from approximately 703 at the flowing well at the northeast corner of the landfill site to approximately 698 at the southern property line.

The direction of vertical flow between the alluvial soil and the underlying bedrock aquifers is determined by the relation between the elevation of the water table and the piezometric pressure level in the underlying aquifer. If the piezometric pressure level is above the water table, the vertical movement will be from the bedrock upward into the alluvial soil. If the piezometric level is below the water table, the vertical flow will be from the surface downward but not necessarily into the bedrock formations. The magnitude of the vertical flow is determined by the permeability of the formations. Pumping from the Kraemer quarry has reversed the piezometric gradient in the Shakopee-Oneota formation. A comparison of the measured water table and the calculated piezometric levels indicate that the vertical flow is from bedrock upward within the area approximately 2400 feet south from the river and that the vertical flow is from the water table downward toward bedrock over the southern 400 feet of the landfill. All of the water which percolates from the water table into the bedrock formation in this 400 foot wide area will be captured by the pumping operation at the quarry. Most of the water which percolates into the alluvial soil will be carried laterally into the Minnesota River. Only a small portion of the water which percolates into the alluvial soils under the southern 400 feet of the site will be carried toward the quarry.

At such time as pumping ceases at the quarry, the piezometric pressure in the Shakopee will stabilize at approximately 703 near the river and will slope upwards in a southerly direction across the section shown in Figure III-7. The vertical flow will then be from bedrock upward into the alluvial soils over the entire area. Since the direction of groundwater flow in the underlying aquifers is toward the river, the general piezometric gradient in the bedrock aquifer must generally slope upward toward the south.

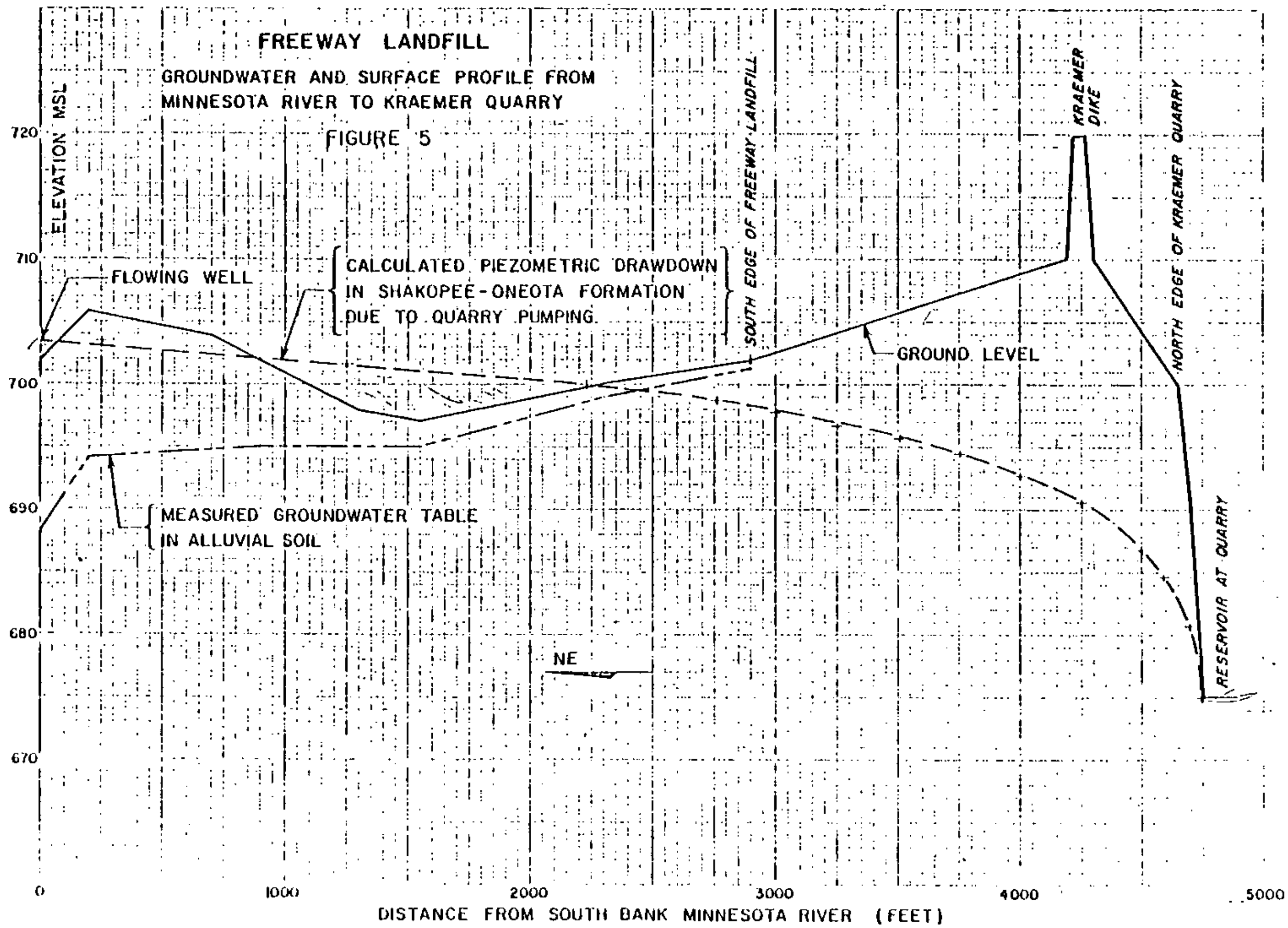
Figure III-8 shows contours of piezometric pressure in the Jordan aquifer. Piezometric contours indicate that the Minnesota River acts as discharge area for the Prairie du Chien Jordan aquifer formations. The aquifers are recharged through the vertical percolation of precipitation falling on the upland areas out of the river valley. In order for the aquifer system to discharge to the river, the aquifer piezometric level at the river must be greater than the river stage. This conclusion is supported by the observation well designated ST-1 in Figure III-3. As discussed previously, this well penetrates a sand and gravel strata directly connected to the bedrock aquifer and has a static water level above the elevation of the surrounding ground. This piezometric level was approximately 15 feet above the October 27, 1970 river state.

The analysis of groundwater, soil and bedrock aquifer peizometric conditions at and adjacent to the Freeway Landfill site leads to the conclusion that leachate from the landfill will not, under natural conditions, recharge water supply aquifers. Under natural conditions the piezometric pressure levels in the Jordan and Prairie du Chien aquifers are great enough to exclude percolation from the landfill area. Under natural conditions all leachate from the landfill will flow to the river.

The existing pumping scheme at the Kraemer quarry would cause a small portion of the leachate from the proposed landfill to flow into the bedrock formation and toward the quarry. Water in the quarry reservoir is currently being pumped to a drainage ditch which flows to the river. The quarry pumping operation serves as a collector for all the water percolating from the landfill area into the bedrock formation.

Since cessation of pumping will eliminate the piezometric pressure drawdown in the Prairie du Chien formation, leachate from the proposed landfill will not enter the water-bearing aquifers when pumping ceases. Any landfill leachate in the rock when pumping ceases will percolate upward to surface soils and will flow laterally to the Minnesota River.

If the water table elevation in the landfill should rise above the piezometric level in the underlying bedrock, the flow of leachate from the landfill will still be toward the river. Because the recharge of the bedrock aquifers occurs over the upland areas above the river valley, the only outlets for the leachate are the river or groundwater wells which lower the bedrock piezometric level below the groundwater table at the landfill site. It has been shown that the Jordan aquifer extending midway beneath the Freeway Landfill is influenced hydraulically by the pumping of Burnsville's water supply wells (refer to Appendix III for further discussion).



GROUNDWATER AND SURFACE PROFILE FROM
MINNESOTA RIVER TO KRAEMER QUARRY

Figure III-7

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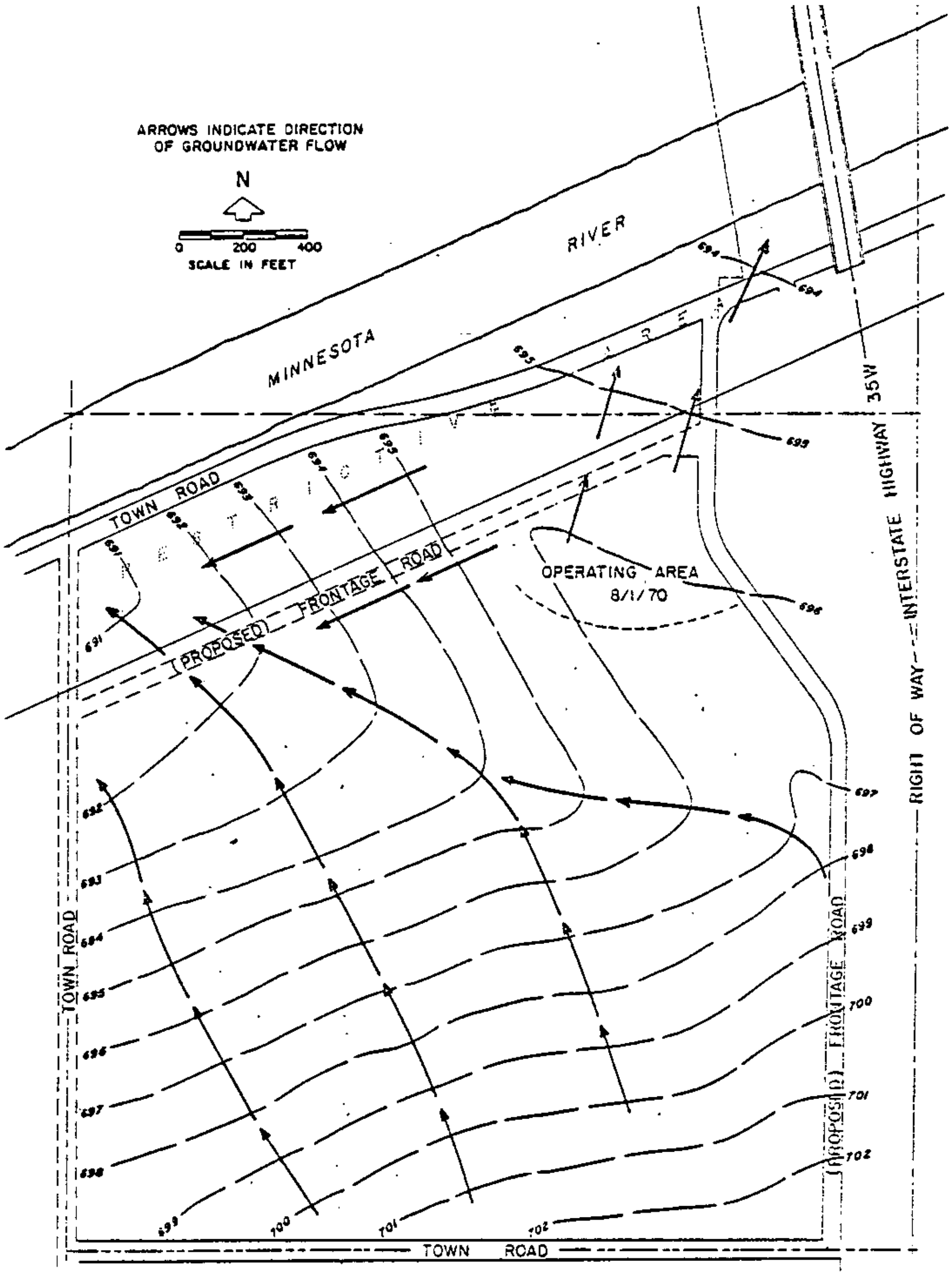


CONTOURS ~~OF PEIZOMETRIC~~ PRESSURE
IN JORDAN AQUIFER

No — water table in Shakopee Formation

Figure III-8

Surface Water Hydrology

Surface waters near the landfill include the Minnesota River and the drainage ditch east of the landfill shown in Figure III-6. In addition, a small depression which is occasionally flooded, has been created northwest of the landfill by excavating the soil for cover material.

This section summarizes the flood hydrology for both the Minnesota River and the eastern drainage ditch. Low flow hydrology is presented for the Minnesota River.

Information defining the surface water hydrology of the Minnesota River past the landfill is based primarily on the U. S. Geological Survey Gage on the Minnesota River at Jordan, Minnesota, and the U.S. Army Corps of Engineer's Port Cargill river gage records. The period of record for the U.S.G.S. gage is 1935 through 1966, and 1944 to present for the Corps of Engineer's gage. The U.S.G.S. gage is located at River Mile 39, approximately 28 miles upstream of the landfill. There are no major tributary streams which significantly influence flood flows between the Jordan gage and the landfill. Low flow in the Minnesota River is influenced by seepage into the river between the Jordan gage and the landfill.

Flood Hydrology for the Minnesota River

The greatest recorded flood on the Minnesota River in the area of the landfill site occurred in April 1965 with an estimated peak discharge of 117,000 cfs (cubic feet per second) and peak stage at approximately Elevation 718.6 at the landfill site. This flood had a recurrence interval of approximately 100 years. Information on the five largest floods on the Minnesota River past the landfill site is presented in Table III-11.

In Minnesota, the regulated floodplain is defined by the limit of flooding from a flood with a one percent chance of occurrence in any given year. This flood is commonly referred to as a flood with a 100-year frequency recurrence interval. The U.S. Geological Survey conducted a statistical analysis of data collected at the Jordan gage to determine the frequency of various flood discharges on the Minnesota River and also carried out a computerized analysis to determine flood stages associated with various flood discharges. The results of the U.S. Geological Survey's hydrologic and hydraulic studies are included in the Flood Insurance Study for the City of Burnsville (FEMA 1972). Floodplain elevations at the landfill associated with various flooding events are summarized in Table III-12.

Encroachments into the floodplain such as fills or buildings reduce the capacity of the floodplain to carry flood water. The decrease in capacity will increase the flood heights which will increase flood hazards in areas upstream of the encroachment. The Flood Insurance Study for the City of Burnsville separated the area inunduated by the 100-year frequency flood into a "floodway" and a "flood fringe." The floodway is made up of the river channel plus any adjacent floodplain

LARGEST RECORDED MINNESOTA RIVER FLOODS PAST FREEWAY SANITARY LANDFILL

Date	Discharge* (cubic feet per sec.)	Recurrence Interval
April, 1965	117,000	101 years
April, 1969	84,600	40 years
April, 1951	64,100	19 years
April, 1952	60,600	16 years
June, 1957	40,800	7 years

* Department of the Interior, U.S. Geological Survey, Water Resources Data Gage 05330000, Minnesota River near Jordan, Minnesota, (period of record 1935-1978).

Table III-11

MINNESOTA RIVER FLOOD LEVELS NEAR BURNSVILLE SANITARY LANDFILL

Recurrence Interval	Discharge (cubic feet per second)	Flood Elevation at Landfill (1929 MSL Datum)
10 year	48,400	708.1
100 year (without floodway)	115,000	713.2
100 year (with floodway)	115,000	713.3

Source: U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Insurance Study, City of Burnsville, Dakota County, Minnesota.

TABLE III-12

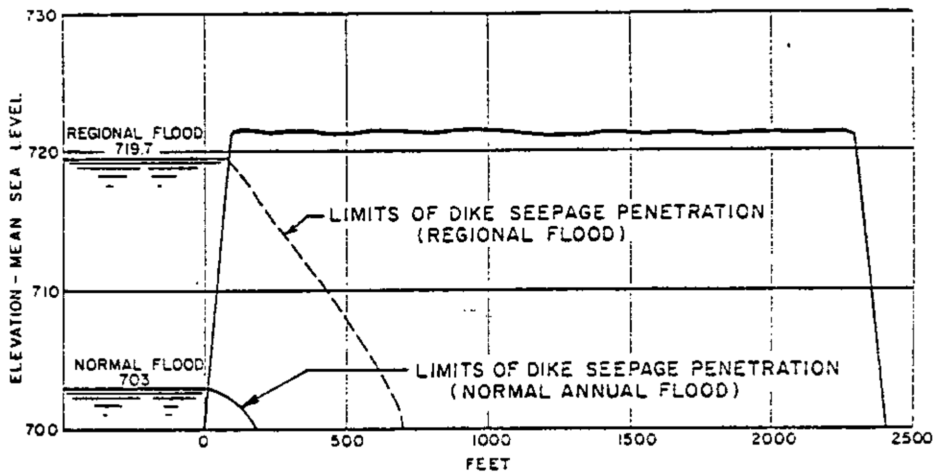
area that must be kept free of encroachment so the 100-year frequency flood can be carried without a significant increase (0.5 feet in any reach) in flood height. The flood fringe makes up the remainder of the floodplain and is the area that can be filled or otherwise encroached upon without causing a substantial increase in flood height. The ordinance adopted after Freeway landfill was in operation, designated the flood fringe-floodway boundary around the landfill (i.e., along the western and northern boundaries). Therefore, the entire landfill area is in the flood fringe. Although placement of refuse in the existing landfill predates the floodplain studies in the area, the existing landfill is technically located in the flood fringe; however, filling has extended well above the flood level.

The face of the landfill is protected from the 100-year frequency flood by dikes built to the height of the 100-year frequency flood. During times of flooding, water can penetrate into the landfill along two general routes, namely, horizontally through the landfill dikes and upward from beneath the landfill. Whether, or to what extent, this penetration does occur depends on the magnitude and shape of the flood hydrograph. The computed penetration of water through the landfill dikes during the regional flood is illustrated in a typical section in Figure III-9. Our calculations show that the penetration is gradual and that the river flood stage is not reflected within the landfill. When the flood stage begins to recede, the flow direction will be reversed and water will flow out of the landfill and into the river. The return flow through the landfill dikes into the river was calculated for the regional flood and is shown in Figure III-10. The maximum return flow during the regional flood is approximately .006 percent of the river discharge. This indicates the river flow has a tremendous diluting effect on the quality of the water entering the river. (Detailed information concerning effects of the landfill on the Minnesota River during flood conditions are available upon request from the Metropolitan Council.)

Flood Hydrology for the Easterly Drainage Ditch -- During periods of significant surface runoff such as occurred on March 30, 1978, flow in the drainageway increases and quality of the water in the drainageway changes significantly for the better. The degree to which runoff and drainage from other sources affects the quality of the drainageway discharge during these periods is unknown.

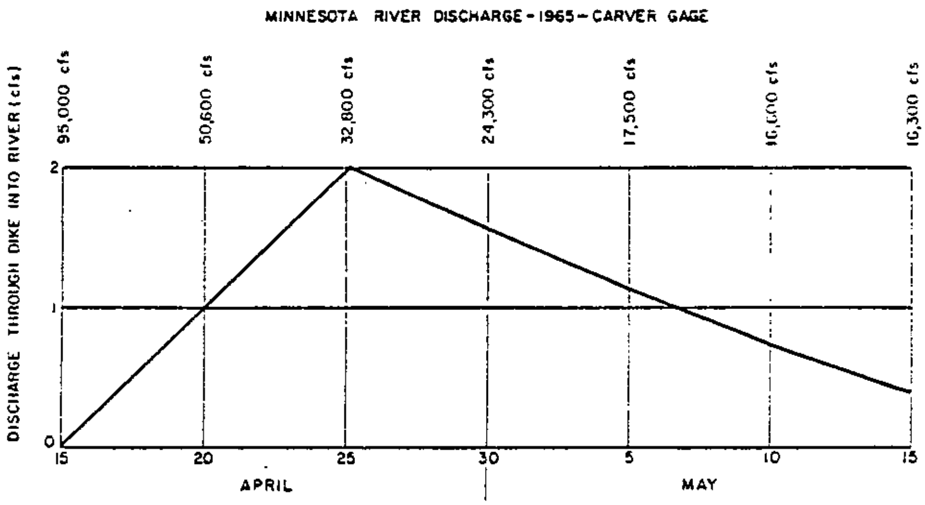
Last summer the drainage ditch had a large amount of standing water even though the river was not at high flood stage. According to the landfill owner, the flap gate was stuck thereby not allowing the water to drain into the Minnesota River. The Minnesota Department of Transportation (MnDOT) is responsible for the culvert and flap gate. It was checked recently and found to be in working order. MnDOT said it was possible there was something stuck in the gate not allowing it to open thereby damming the water into the drainage ditch.

Low-Flow Hydrology -- The U.S. Geological Survey has conducted a statistical analysis of the low flow in the Minnesota River at the gage near Jordan. The results of this analysis indicate that the seven consecutive day low flow with an average recurrence interval of 10 years is 168 cfs and the seven consecutive day low flow with an average recurrence of two years is 350 cfs.



LANDFILL DIKE SEEPAGE PENETRATION DURING FLOOD
GENERALIZED LANDFILL CROSS-SECTION

Figure III-9



DIKE SEEPAGE HYDROGRAPH WITH CORRESPONDING RIVER DISCHARGES
REGIONAL FLOOD

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Figure III-10

The low flow in the Minnesota River between the Jordan gage at River Mile 39 and the landfill site at River Mile 12 is influenced by groundwater seepage to the river. Studies conducted by Barr Engineer-ing Co. in 1964 and 1968 for the Burnsville-Eagan-Bloomington Sanitary District indicate that groundwater seepage to this reach of the river under 10-year frequency low flow conditions is on the order of 47 cfs. Therefore, the seven day duration, 10-year frequency low flow at the landfill site has been assumed to be 215 cfs. The average annual low flow for a seven consecutive day, two year return frequency at the landfill site is estimated to be 450 cfs.

The Minnesota Pollution Control Agency (MPCA) has used 180 cfs as the seven day duration, 10-year frequency low flow for the lower Minnesota River.

Local Water Supply

All water supplies in the area south of the Minnesota River are obtained from wells, either central municipal wells or private wells on the property of the water user. Table III-13 lists the depth, surface elevation, and static water elevation for wells located within one mile of Freeway Sanitary Landfill. Figure III-11 gives the locations of these wells. Wells numbered one through nine (City of Burnsville municipal wells) are cased and grouted into the Jordan aquifer. At the maximum design pumping rates, the limit of the area influenced by the wells is, at its closest point, 500 feet from the landfill. Wells numbered ten through seventeen (private wells) are located north of the Minnesota River. Since the static water level in these wells is 40 to 100 feet above the normal near level Elevation 687, the area of influence of these wells will be limited to the north side of the Minnesota River. Well number eighteen is the water supply well for Freeway Landfill operations, and well number nineteen is a private water supply well for U.S. Salt Company. Well 18 and 19 are drinking wells in the area of influence of land-fill leachate. Well 18 is at a depth of 60 feet which is well under the water table likely to be influenced by leachate. Both wells exceeded standards for total hardness, alkalinity and sulfates when tested in 1979 by the Department of Health. Although these parameters are not typical of leachate contamination, they should be carefully monitored in the future.

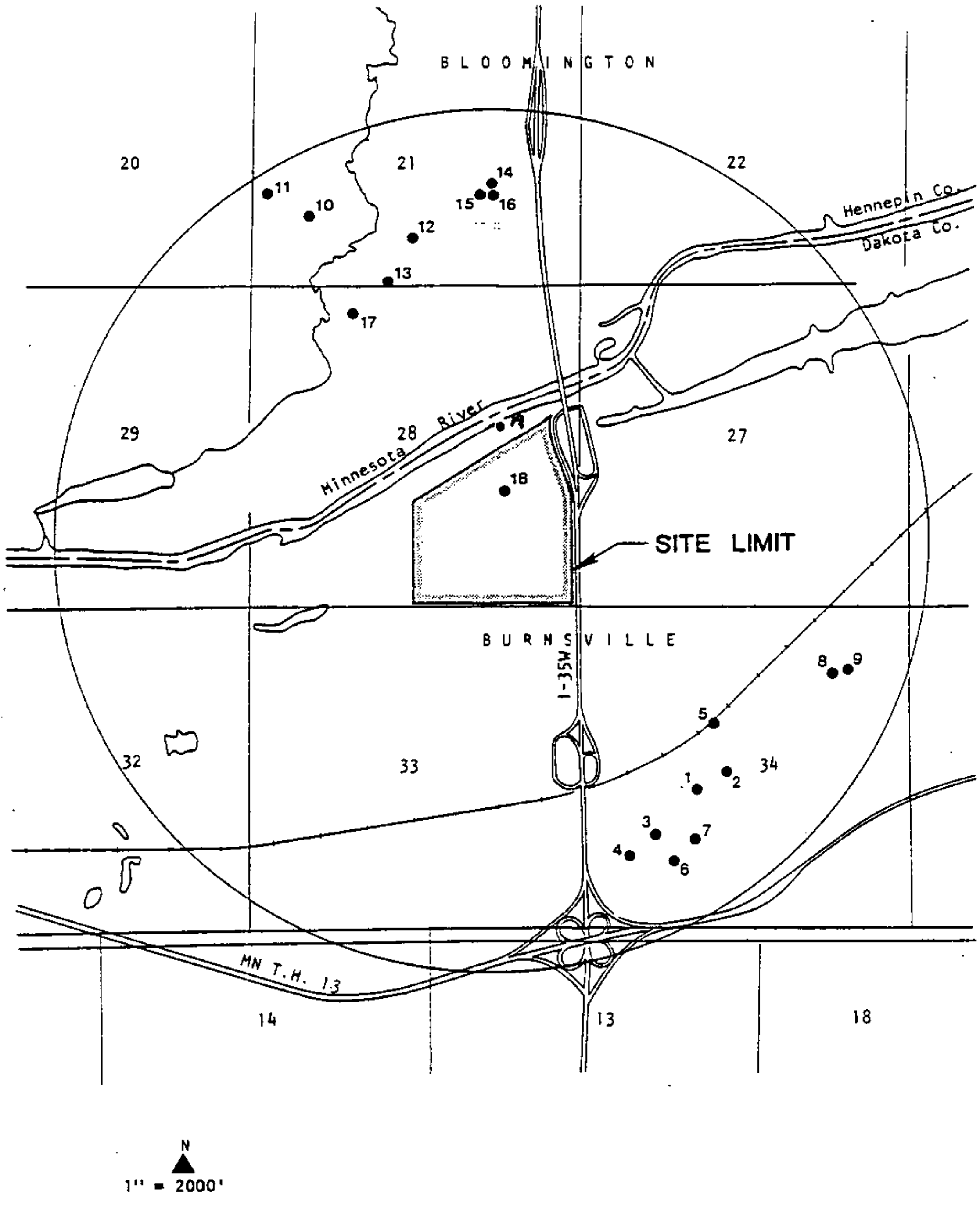
Ground water flow gradients, flow rates, and quality are summarized using information collected from the landfill monitoring program. Subcropping bedrock in the vicinity of the landfill is the Prairie-du-Chien dolomite. The Minnesota River Valley in general and the Minnesota River in particular are discharge areas for ground water in the glacial overburden and for ground water in the underlying Prairie-du-Chien and Jordan aquifers. The two important factors affecting ground water flow in the landfill area are dewatering from the quarry immediately south of the landfill and a natural silty clay levee running along the near channel along the northern boundary of the landfill It has been shown that the Jordan aquifer extending midway beneath the Freeway Landfill is influenced hydraulically by Burnsville's wells. Refer to Appendix III for a further discussion of the landfill's impact of the City's water supply.

Well Number*	Depth(feet)	Surface Elevation	Static Level	Distance to Edge of Landfill (feet)
1	298	760	760	3,900
2	306	760	753	3,900
3	314	781	745	4,100
4	335	786	726	4,300
5	265	725	725	4,100
6	356	834	755	4,700
7	357	830	747	4,600
8	957	- -	- -	4,700
9	383	- -	- -	4,700
10	118	812	790	5,000
11	114	819	791	5,600
12	234	810	755	3,700
13	157	809	734	3,500
14	161	832	752	4,100
15	162	830	- -	4,000
16	154	822	742	4,000
17	245	800	745	3,300
18	60	726	- -	0

* Wells numbered 1 through 9 are Burnsville municipal wells.
Wells numbered 10 through 18 are private wells.

WATER SUPPLY WELLS
FREEWAY LANDFILL VICINITY

Table III-13



LOCATION OF MUNICIPAL AND PRIVATE WATER
SUPPLY WELLS FREEWAY LANDFILL VICINITY

Figure III-11

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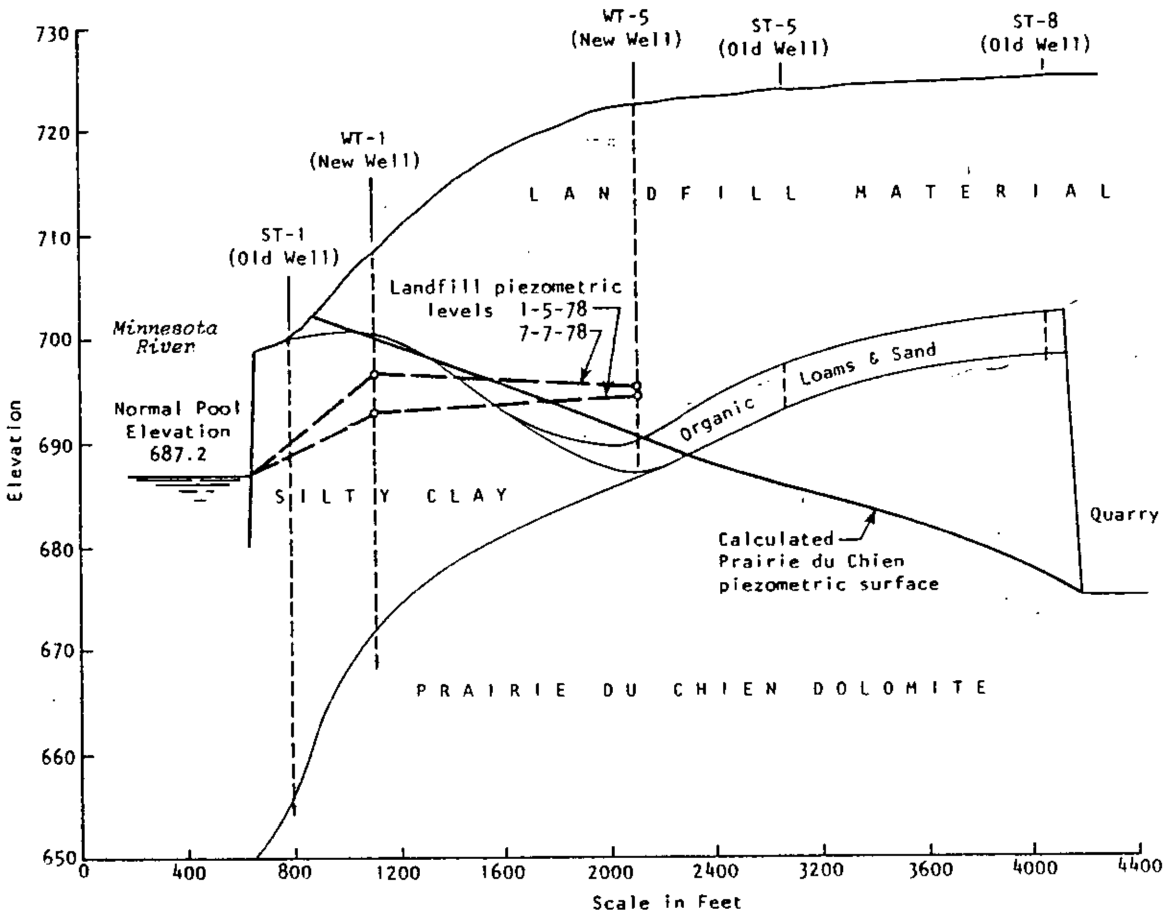
Total ground water inflow to the quarry occurs at a rate of approximately 1.5 million gallons per day. This water is pumped to the Minnesota River west of the western landfill boundary. The dewatering of the quarry results in a drawdown of the piezometric surface in the bedrock beneath the landfill, thus creating a gound water gradient to the quarry from the landfill area. A representation of this gradient is shown in Figure III-12.

The naturally occurring silty clay levee near the northern boundary of the Freeway Landfill and adjacent to the Minnesota River is a relatively impermeable barrier and confines bedrock ground water in this area. The confined area coincides with the southern edge of an alluvial channel eroded into the bedrock. This channel has been filled with fine alluvial sediments. Thus, in moving toward the river, the bedrock surface represents a progressively lower portion of the aquifer. South of the clay levee, the bedrock is overlain by thin organic soils, and flow in the bedrock can be considered to be unconfined in this area.

Flow Patterns -- As shown in Figure III-12, ground water flow within approximately 1,200 feet of the river's edge can be considered confined by the silty clay. The piezometric gradient along the bedrock surface under the landfill area slopes toward the quarry. This does not mean, however, that there is seepage from the river to the quarry since the piezometric pressure in the bedrock surface is higher than the river in the confined portion of the aquifer. Because flow in the bedrock aquifer is generally upward, piezometric levels increase downward into the aquifer. The upward movement of ground water and the close proximity of two discharge points--the Minnesota River and the quarry--create a ground water divide beneath the area covered by the silty clay (Figure III-13).

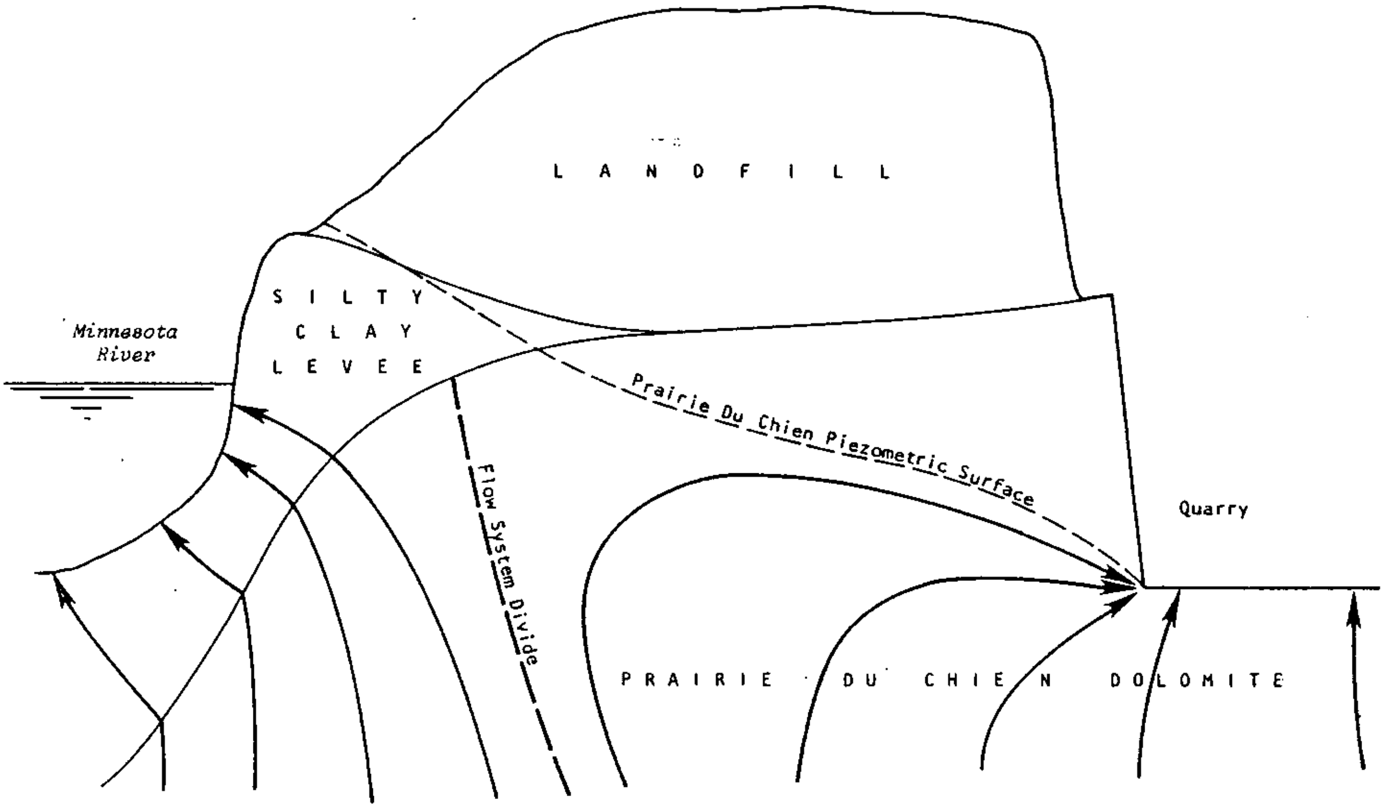
Seepage Rates --The two observation wells (WT-4 and WT-5) placed into the landfill measure the composite head of the water table and the piezometric levels beneath the landfill material. The two ground water surfaces shown in Figure III-12 represent the range of water table fluctuations measured in the landfill material during the period January 5 to July 7, 1978. These ground water levels are less than those in the bedrock aquifer for most of the area overlain by the silty clay. This indicates that any vertical ground water movement must be upward from the bedrock aquifer. Ground water in the overlying areas migrates either to the quarry through the unconfined portion of the bedrock, to the eastern drainageway through the landfill material or underlying alluvium, or to the Minnersota River.

Vertical leakage from the Shakopee dolomite to the Jordan has been identified with 500 feet of the Freeway Landfill under maximum pumping conditions at the Burnsville wells. See Appendix III for a further discussion of the City's wells influence or groundwater gradients.



REPRESENTATIVE CROSS SECTION THROUGH FREEWAY LANDFILL

Figure III-12



THEORETICAL GROUND WATER FLOW SYSTEM DIVIDE
FREEWAY SANITARY LANDFILL

Figure III-13

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Site Specific Water Budget

The water balance for the Freeway Sanitary Landfill has been determined for existing conditions using a method similar to the one used in the report, "Leachate Generation Potential from Landfills in the Twin Cities Metropolitan Area," dated March 1978, prepared by the Metropolitan Council. This method uses average annual precipitation and evaporation, transpiration and runoff losses, to estimate the infiltration into the landfill. The infiltration is an estimate of leachate release once the moisture content of the refuse reaches field capacity. It is generally assumed that refuse has an initial moisture content of approximately 15 percent and a field capacity of approximately 30 percent by weight.

The site specific water balance was determined using average monthly precipitation, evaporation, runoff and transpiration along with the following assumptions:

1. Sufficient precipitation is available to satisfy the land evaporation potential on an average monthly basis.

2. Runoff is based on the assumption that one rainfall event per month will produce runoff for the months of April through October and that snowmelt runoff will occur in March. The amount of runoff is a function of the amount of excess (i.e., precipitation minus land evaportation) monthly precipitation.

3. For vegetated areas, transpiration potential is applied to the amount of water remaining after applying monthly evaporation and runoff losses to the precipitation.

4. The estimated infiltration is equal to the precipitation minus land evaporation, runoff and transpiration.

The cover materials presently used on Freeway Sanitary Landfill consist of a silty clay loam excavated from the area immediately west of the landfill site and therefore water balance calculations would result in a low percolation rate and a low annual volume of leachate production. Results of the Metropolitan Council 1978 study using the water balance method indicate that the average annual percolation at Freeway Landfill will be 2.67 inches, and the time required for maximum leachate production will be 14 years from the beginning of landfill operation. These calculations were based on the assumption that cover material is highly organic peat with some sand from dredging instead of silty clay loam.

The estimated average annual infiltration rate used for water balance calculations for this analysis for the existing permitted area before and after final closure is 5.0 and 3.0 inches per year, respectively. Table III-14 summarizes the site specific water balance for the landfill under existing conditions (before and after final closure). The infiltration rates for vegetated and nonvegetated areas of three and 30 percent slope are also shown in Table III-14. For the current operation, the estimated annual surface runoff is 4.3 inches per year. For turfed areas, the average annual land evaporation and transpiration is 13.9 inches and 9.0 inches, respectively.

SITE SPECIFIC WATER BALANCE
EXISTING LANDFILL

LANDFILL CONDITION	Estimated Average Annual Infiltration Rate
Existing Conditions (During Operation)	5.0"/yr.
Existing Conditions (After Closure)	3.0"/yr.
SUB-AREA CONDITIONS	
Vegetation - Landfill top (Slope Less than 3%).	4.5"/yr.
Vegetation - Landfill Side (Slope of 30%)	2.5"/yr.
No Vegetation - Landfill Top (Slope Less than 3%)	13.3"/yr.
No Vegetation - Landfill Sides (Slope of 30%)	9.3"/yr.

Table III-14

SURFACE WATER QUALITY

State Regulations

The MPCA has established surface water quality standards based on water use classifications for all interstate and intrastate waters in Minnesota. The water use classifications are described and defined in WPC 14 and WPC 15.

All rivers of the state have been assigned one or more water use classifications as listed in WPC 24 and WPC 25. That portion of the Minnesota River of concern with respect to the Freeway area, from Carver Rapids to its confluence with the Mississippi River, has been assigned WPC use classifications 2C and 3B. The regulation that classifies State receiving waters also states that all receiving waters are classified 3C (industrial consumption--cooling and materials transport), 4A and 4B (agriculture and wildlife), 5 (navigation and waste disposal), and 6 (other uses) where such uses are possible. In addition, receiving waters in the 3B classification must be generally comparable to waters classified as 1D (domestic consumption--high degree of treatment) with the exception that the 1D standards for chloride, hardness, pH and fecal coliform need not be met. In summary, classifications applicable to the reach of the river potentially impacted by the existing land fill include: 1D, 2C, 3B, 4A, 4B, 5 and 6. Standards applicable to these classifications are summarized in Table III-15. These standards are applicable at all river flows equal to and greater than the seven day duration, 10-year frequency low flow.

All other surface waters in the Freeway Sanitary Landfill area are included under WPC use classifications 2B, 2C, 3B, 3C, 4A, 4B, 5 and 6 for intrastate waters. This would include the wetland areas near the landfill.

The state solid waste regulations require that the fill and trench areas of a sanitary landfill be at least 1,000 feet from the normal high water mark of a lake, pond, or flowage and at least 300 feet from a stream (SW 6(1)). The Minnesota River is located within 400 feet of the northern boundary of the landfill and, thus, would be subject to this regulation. The landfill is technically in violation of this regulation. However, it should be pointed out that the landfill was in operation prior to the MPCA regulations. By virtue of the fact of the current permit on the landfill, the MPCA has given the landfill a variance to this regulation.

State solid waste regulations also require that sanitary landfills be constructed and cover material graded so as to promote surface water runoff without excessive erosion and that surface water drainage be diverted around and away from the landfill operating area (SW 6(2)). Finally, the solid waste regulations require that a water monitoring program be constructed and operated to determine leachate impacts on surface water and that a leachate collection and treatment system be installed where required to protect surface waters (SW 6(2)).

STANDARDS FOR
MINNESOTA RIVER IN VICINITY OF FREEWAY LANDFILL

Parameter	MPCA Water Quality Standard	Limiting Classification
Copper	10 ug/l	2C
Turbidity	25 NTU	2C
Conductivity	1000 umhos/cm @ 25°C	4A
Chloride	100 mg/l	3B
pH	6.0-8.5	4A
Ammonia	1.5 mg/l as N	2C
Dissolved Oxygen	5 mg/l(1)	2C
Total Dissolved Salts	700 mg/l	4A
Total Alkalinity		4A
Sulfate		4A
Total Hardness	250 mg/l as $CaCO_3$	3B
Sodium	60% of total cations in meq/l	4A
Cadmium	10 ug/l	1D
Lead	50 ug/l	1D
Arsenic	50 ug/l	1D
Selenium	10 ug/l	1D
Fluoride	1.5 mg/l	1D
Phenols	0.1 mg/l	2C
Chromium	0.05 mg/l	2C
Barium	1 mg/l	1D
Boron	0.5 mg/l	4A
Cyanide	0.02 mg/l	2C
Silver	50 ug/l	1D

(1) 4 mg/l during the period December 1 through March 31

Table III - 15

Regulatory Compliance

Minnesota River -- This section estimates the impact of sanitary landfill leachate on Minnesota River water quality at the seven day duration, 10-year frequency low flow and compares the estimated Minnesota River water quality to state water quality standards for this reach of the river.

The quality of the Minnesota River has been monitored for many years. In recent years, a computerized data system has been developed to maintain information in a more organized and accessible form. The State and federal agencies involved in monitoring the quality of the river include the U. S. Geological Survey (USGS), the Metropolitan Waste Control Commission (MWCC) and the MPCA.

Since 1972, the MWCC and the USGS have been cooperating in a program to monitor the quality of the river. The cooperative program was designed to provide information on the mass transfer of water quality constituents through the Twin Cities Metropolitan Area. From 1972 through 1977, this network was made up of the MWCC Water Quality Sampling Program, an MWCC-USGS Cooperative Water Quality Surveillance Program and the MPCA Routine Water Quality Monitoring Program.

The MWCC program consisted of weekly and monthly grab sampling. The samples were analyzed by the MWCC laboratory at the Metropolitan Wastewater Treatment Plant. The MWCC-USGS Cooperative Program consisted of grab sampling and automatic monitoring of the Minnesota River. Analyses were performed at the USGS laboratory and included such parameters as dissolved oxygen, temperature, chloride, phosphorus, hardness, heavy metals, radio-chemical parameters, and biological organisms.

The MPCA's Routine Water Quality Monitoring Program has been operating since 1952. Sampling stations are located throughout the State, and since 1968 have been sampled on a monthly basis. Many of the stations are located below significant point discharges which exert a major influence on water quality. In the fall of 1977, the MPCA discontinued their sampling program on the lower Minnesota River because of a duplication of effort with the USGS and MWCC programs.

The water quality sampling station nearest the Freeway Sanitary Landfill is the MWCC station located at River Mile 14.3 approximately three miles upstream of the landfill. However, only some of the parameters of interest are routinely monitored at this station. The nearest water quality station at which almost all the parameters of interest were monitored is the former MPCA water quality station at River Mile 7, approximately four miles downstream of the landfill.

Various reaches of the major rivers and streams in the State have been classified by the MPCA as either "water quality limited" or "effluent limited." If a reach is classfied as water quality limited, it has been determined that the quality does not meet applicable water quality standards and/or is not expected to meet standards in the future even if secondary treatment of municipal discharges and best practicable treatment of industrial discharges are used. Effluent limited segments are those where it has been determined that water quality standards are being met and where, with secondary or best practicable treatment, water quality standards will be met in the future.

The reach of the Minnesota River past the Freeway Sanitary Landfill is classified as water quality limited indicating that, even with secondary or best practicable levels of treatment, the river is not expected to meet stream standards.

Several parameters exceed water quality standards for the lower Minnesota River on a regular basis. These parameters include:

- Turbidity
- Conductivity
- Ammonia
- Dissolved oxygen
- Copper
- Total dissolved solids
- Bicarbonates (or M-Alkalinity)
- Sulfate
- Hardness
- Temperature

Available data indicate that turbidity exceeded the applicable water quality standards almost half the time at the River Mile 7 monitoring station. Elevated turbidity levels appear to be seasonal in nature with the highest turbidities occurring during the summer months.

Specific conductance exceeded State standards twice during the period 1975-1977 at the River Mile 7 station. The high values occurred during January and February 1977. During this period, the flow in the river was very low and runoff containing deicing chemicals used on streets and roads probably contributed to the elevated specific conductance. This conclusion is supported by the fact that the highest chloride concentrations also occurred during January and Feburary 1977. The low flow condition during January and February, 1977 also resulted in ammonia concentrations which exceeded the stream standards.

Once during the summer of 1974 and once during the summer of 1976 the reported dissolved oxygen concentration in the Minnesota River dipped below the standard.

Seven of the copper concentrations exceeded State stream standards for this section of the river. A major problem with the available copper data is that the stream standard is the same as the detection limit of the technique used in the analysis. Normal analytical variation may have produced many of the apparent violations of the standard.

The total dissolved solids concentration in the river exceeded State standards twice and the alkalinity values exceeded the standard several times. Sulfate and hardness both periodically exceeded water quality standards on a continuing basis. The sulfate standard, however, is based on the production of wild rice and is probably not applicable to this reach of the Minnesota River.

During major rainfall events and during snowmelt in the spring, surface runoff leaves the landfill site. The amount of runoff and its quality is influenced by the slope, vegetal cover, and the rainfall intensity and duration. During the growing season, side slopes and finished areas of the landfill are vegetated soon after completion. Of the 126-acre existing landfill, only about 20 acres are not vegetated. The surface runoff quality, therefore, is generally similar to runoff from open grass areas and from areas of exposed soil.

Given the large size of the watershed tributary to the Minnesota River, it can be concluded that the surface runoff from 105 acres of grassland and 20 acres of exposed soil will have a negligible impact of the quality of the river.

The Minnesota River is governed by State water quality standards, and may potentially be impacted by leachate from the landfill. Based on the ground water flow patterns associated with the area beneath the Freeway Landfill, seepage from the landfill could influence the Minnesota River quality in three general ways: seepage to the eastern drainageway and subsequent discharge to the river, seepage directly to the river either through or over the silty clay levee, ~~and~~ seepage to the quarry and subsequent discharge to the river, and seepage to the proposed new barge slip (McGowan currently excavating the area by quarrying rock and removing top loam for use as landfill cover)

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To assess the impact of leachate from the existing landfill on the river quality two general methods were used. The first method considered each of the three sources of seepage to the river separately. The second method considered the estimated leachate produced from the landfill as one source to the river without regard to drainageway dilution or soil attenuation. A simple dilution model was then employed to predict the change in river quality caused by all the landfill leachatge. The second method probably provides more conservative results. Also the second method was the same used for river impact analysis for Burnsville Sanitary Landfill Expansion (Draft Environmental Impact Statement available from Metropolitan Council) and therefore affords direct comparison and assessment of cumulative impacts from both landfills.

<u>Separate Source Method of River Impact Analysis</u> -- Loadings (pounds/day) from the three sources were computed and used to evaluate the influence of landfill seepage on two Minnesota River flow conditions. The two river flow conditions were:

> flow and quality measured in the river and monitoring wells on November 3, 1977 and flow and quality measured in the drainageway on November 22, 1977.
>
> the 7-day duration, 10-year frequency, low flow (159 cfs 103 mgd) in the river and drainageway flow and quality measured on November 22, 1977.

The assumptions used to estimate the loading from each potential source are discussed in the following paragraphs.

As discussed previously a portion of the seepage from beneath the landfill discharges into the drainageway along the eastern boundary of landfill. This drainageway also carries surface runoff from the tributary watershed which includes a portion of Interstate 35W through this area. Water quality and flow data measured in the drainageway on November 22, 1977 were used to calculate the loading of various parameters (pounds/day) to the river. The discharge rate measured on November 22, 1977 was .015 cfs 6.7 gpm and the quality of the drainageway flow on that date is summarized and available upon request from the Metropolitan Council. During periods with no surface runoff to the drainageway, the flow rate and quality of the flow past Station S-6 was found to be quite constant, and thus the loadings to the river calculated for November 22, 1977 are believed to represent a good measure of loadings to the river from the landfill seepage to the drainageway. During periods of significant surface runoff such as occurred on March 30, 1978, flow in the drainageway increases and quality of the water in the drainageway changes significantly. The degree to which runoff and drainage from other sources affects the quality of the drainageway discharge during these periods is unknown.

The saturated material is generally isolated from the river by an impermeable soil ~~barrier~~ consisting primarily of clays and silty clay materials. The permeability of this material limits seepage to the river from the landfill material to approximately 1×10^{-4} gpm during times when ground water levels are below the top of this barrier. During periods of above average precipitation or snowmelt, groundwater levels may rise above the natural soil barrier. During such a period in July, 1978, the calculated rate of seepage to the river was on the order of 13 gpm.

Water quality data from monitoring Wells WT-1, WT-2, and WT-3 on November 3, 1977 were used to estimate the ground water loading to the river at a seepage rate of 1×10^{-4} gpm. This is an estimate of the loading to the river during a period when ground water levels are below the top of the silty clay levee. Water quality data from monitoring Wells WT-4 and WT-5 on November 3, 1977 along with a seepage rate of 13 gpm were used to estimate loadings to the river associated with periods when ground water levels overtop the buried silty clay levee.

The ground water analysis indicates that ground water beneath the landfill also discharges to the quarry south of the landfill. At the quarry, seepage from beneath the landfill is mixed with seepage into the quarry from other directions and is discharged to the river at a rate of approximately 1.5 million gallons per day. This water is discharged to the river upstream of Station S-10. It was not possible to directly measure the quality of seepage to the quarry. The best that could be done was to measure the quality of the entire quarry discharge. The quality of the quarry dewatering is generally similar to the quality of ground water measured in monitoring wells WT-1, WT-2, and WT-3. The quality of the quarry dewatering measured on November 3, 1977 was used along with a quarry discharge rate of 1.5 million gallons per day to estimate loadings to the river from the quarry. This likely overestimates the loading to the quarry from the landfill since the remaining ground watrer inflow to the quarry undoubtedly contributes measurable concentrations of various parameters.

As discussed in the introductory paragraph to this section of the report, the effects of the loadings to the river from three potential sources were investigated under river flow conditions that occurred November 3, 1977 and under a 7-day duration, 10-year frequency river low flow conditions. Since the quarry dewatering enters the river well upstream of the landfill, the assessment of the impact of quarry dewatering on river quality was separated from the assessment of impacts from the other two sources. The impact of the quarry dewatering discharge on Minnesota River quality is illustrated on Table III-16. November 3, 1977 river flow and quality conditions were used in the analysis. A comparison between the measured river quality and the computed river quality indicates that the quarry discharge has very little effect on river quality and actually slightly improves river quality for many parameters.

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PARAMETER	QUARRY SUMP QUALITY[a] lbs/day	mg/l	MINNESOTA RIVER Upstream Quality lbs/day	mg/l	Calculated Downstream Quality lbs/day	mg/l[b]
BOD (filtered)	<37.5	<3	28,039	4	28,076.5	3.99
COD (filtered)	350.5	28	420,588	60	420,938.5	59.77
Chloride	262.9	21	273,382	39	273,644.9	38.87
Ammonia	<2.5	<0.2	1,122	0.016	1,124.5	0.16
Dissolved Solids[c]	5,032	402	3,112,351	444	3,117,383	443.70
Phenol	0.025	0.002	<14	<0.002	<14	<0.002
Chromium	0.02	0.0016	13.3	0.0019	13.3	0.0019
Copper	0.005	0.0004	11.9	0.0017	11.9	0.0017

a. Based on a quarry sump discharge rate of 1.5 mgd and quarry water quality for November 3, 1978.

b. Based on 25 percent of November 3, 1977 river flow (210 mgd) available for mixing with loading for quarry sump.

c. Based on 0.64 x specific conductance = dissolved solids.

IMPACT OF QUARRY DISCHARGE ON MINNESOTA RIVER
(November 3, 1977 condition)

Table III- 16

As the next step in the analysis, the effect of the discharge from the eastern drainageway and seepage directly to the river on river quality was assessed. The results of these investigations are summarized in Tables III-17 through III-20. Table III-17 is based on eastern drainageway loadings and ground water seepage conditions to the river as they existed November 3, 1977 superimposed on November 3 river conditions. Table III-18 is based on the same drainageway and seepage loadings superimposed on the 7-day duration, 10-year frequency low flow river condition. Table III-19 is based on ground water seepage conditions that likely occurred during July, 1978, namely overtopping of the impervious silty clay levee superimposed on November 3 river conditions. Table III-20 is based on the same loadings superimposed on the 7-day duration, 10-year frequency low flow condition.

Calculations indicate that groundwater and drainageway flows have only a very small impact on the quality of the river even under low flow conditions. The calculated increases in parameter values are generally several orders of magnitude lower than measured variations in water quality in the river. In no case do calculated increases approach levels that could cause the river to exceed MPCA standards established for the river. The impact of landfill seepage on the quality of the Minnesota River is minimal and is masked by the temporal and spacial variations in quality that occur naturally in the river.

Single Source/Dilution Model Method of River Impact Analysis -- The amount of leachate reaching the river was determined by the water balance of the landfill. Average annual leachate production was estimated to be 3.0 inches per year (0.044 cfs from the 126 acres of existing landfill) for the Freeway Landfill.

Information on the quality of leachate was obtained from two sources. The first is Freeway drainageway seep samples. Data obtained from these samples is contained in Table III-21 and was used to help define leachate quality. Not all of the parameters of interest were analyzed in these samples. For parameters not analyzed in the leachate samples, literature values based on median leachate concentrations were used in the analysis. These concentrations are presented in Table III-21. Although leachate attenuation and biodegradation are important processes and likely act to reduce the strength of the leachate reaching the river from the landfill, their effect was assumed to be negligible for purposes of this impact analysis.

The loading of potential pollutants to the river as predicted by the leachate loading model can be expressed as follows:

$$L = C_{LL} \times Q_L \times 5.4$$

PARAMETER	LOADINGS: Ground Water[a] lbs/day	mg/l	Drainageway[b] lbs/day	mg/l	MINNESOTA RIVER[c]: Upstream Quality Measured at S-10 lbs/day	mg/l	Downstream Quality: Measured at S-11 lbs/day	mg/l	Calculated lbs/day	mg/l[e]
BOD	1.8×10^{-5}	15[d]	1.1	14	28,019	4	35,049	5	28,040.1	4.00
COD	1.7×10^{-4}	140[d]	29.5	368	420,588	60	392,549	56	420,617.5	60.01
Chloride	4.7×10^{-5}	39	62.7	783	273,382	39	343,480	49	273,446.7	39.01
Ammonia	1.9×10^{-6}	1.6	2.0	25	1,122	0.16	1,612	0.23	1126	0.16
Dissolved Solids	4.5×10^{-4}	376	251.2	3,136	3,112,351	444	3,497,890	449	3,112,602.2	444.12
Phenol	1.2×10^{-8}	0.01	0.001	0.015	<14	<0.002	105	0.015	<14	<0.0001
Chromium	1.6×10^{-9}	0.003	2×10^{-4}	0.003	13.3	0.0019	13	0.0018	13.3	0.0019
Copper	7.2×10^{-9}	0.006	7.2×10^{-5}	0.0009	11.9	0.0017	13	0.0019	11.9	0.0017
Oil	-	-	0.2	3	<7,010	<1	7,101	1	<7,010	<1

a. Based on average water quality measured for WT-1, WT-2, and WT-3 and a calculated ground water discharge rate of 1×10^{-4} gpm.

b. Based on a drainageway discharge of 6.7 gpm measured on 11/22/77.

c. Based on stream flow of 840 mgd (U.S.G.S.) on November 3, 1977 at Jordan (provisional).

d. Filtered sample.

e. Assumes 25 percent of river flow available for mixing.

IMPACT OF FREEWAY LANDFILL ON MINNESOTA RIVER
(Data for November 3, 1977)
(Ground water levels below buried silty clay levee)

Table III- 17

PARAMETER	LOADING: Ground Water[c] lbs/day	mg/l	Drainageway[d] lbs/day	mg/l	MINNESOTA RIVER: Measured Upstream Quality[e] lbs/day	mg/l	Calculated Downstream Quality lbs/day	mg/l[f]
BOD	1.2×10^{-5}	10[g]	1.4	18	430	0.5	431.4	0.50
COD	8.8×10^{-5}	74[g]	21.9	272	6,876	8	6,897.9	8.02
Chloride	3.1×10^{-5}	26	94.2	1,170	14,612	17	14,706.2	17.26
Ammonia	1.6×10^{-6}	1.3	1.8	23	43	0.05	44.8	0.06
Dissolved Solids	4.7×10^{-4}	388	159	1,984	-	a	159	0.73
Phenol	1.1×10^{-8}	0.009	0.0005	0.006	-	a	0.0005	2.3×10^{-6}
Chromium	3.6×10^{-9}	0.003	0.0006	0.0072	-	a	0.0006	2.8×10^{-6}
Copper	7.2×10^{-9}	0.01	0.0002	0.0029	-	a	0.0002	9.2×10^{-7}
Oil	-	-	<0.08	<1	-	a	<0.08	$<3.7 \times 10^{-4}$

a. Below detection limits of analysis procedure or no available data, concentration of 0 assumed for calculation purposes.

b. 7-day, 10-year low flow for Minnesota River is 103 mgd.

c. Based on average water quality values measured at WT-1, WT-2 and WT-3 for all sampling dates and a calculated ground water discharge of 1×10^{-4} gpm.

d. Based on a discharge rate and water quality measured in drainageway on 11/22/77.

e. Based on lowest recorded concentration in Minnesota River between Jordan and Fort Snelling by MPCA during the period 1972-1977.

f. Assumes 25 percent of river flow (26 mgd) available for mixing.

g. Filtered sample.

IMPACT OF FREEWAY LANDFILL ON MINNESOTA RIVER
(7-day, 10-Year Low Flow Conditions)[b]
(Ground water levels below buried silty clay levee)

Table III-18

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PARAMETER	LOADING: Ground Water[a] lbs/day	mg/l	Drainageway[b] lbs/day	mg/l	MINNESOTA RIVER[c]: Upstream Quality Measured at S-10 lbs/day	mg/l	Downstream Quality Measured at S-11 lbs/day	mg/l	Downstream Quality Calculated lbs/day	mg/l
BOD	24	155[d]	1.1	14	28,039	4	35,049	5	28,064.1	4.01
COD	113	726[d]	29.5	368	420,588	60	392,549	56	420,730.5	60.07
Chloride	125	800	62.7	783	273,382	39	343,480	49	273,569.7	39.10
Ammonia	5	32	7.0	25	1,122	0.16	1,612	0.23	1,129	0.164
Dissolved Solids	481	3,082	251.2	3,136	3,112,351	444	3,497,890	469	3,113,083.2	444.36
Phenol	0.01	0.063	0.001	0.015	<14	<0.002	105	0.015	<14	<0.0002
Chromium	0.001	0.007	0.0002	0.003	13.3	0.0019	13	0.0018	13.3	0.0019
Copper	0.00016	0.001	7.2×10^{-5}	0.0009	11.9	0.0017	13	0.0019	11.9	0.0017
Oil	-	-	0.2	3	<7,010	<1	7,010	1	-	<1

a. Based on average water quality measured for WT-4 and WT-5 on November 3, 1977, and a calculated ground water discharge rate of 13 gpm.

b. Based on a drainageway discharge of 6.7 gpm .60965 mgd as measured on November 22, 1977.

c. Based on stream flow of 840 mgd (U.S.G.S.) at Jordan (provisional) on November 3, 1977.

d. Filtered sample.

IMPACT OF FREEWAY LANDFILL ON MINNESOTA RIVER
UNDER ELEVATED GROUND WATER LEVELS
(Data for November 3, 1977)

Table III-19

PARAMETER	LOADING: Ground Water[c] lbs/day	mg/l	Drainageway[d] lbs/day	mg/l	MINNESOTA RIVER: Measured Upstream Quality[e] lbs/day	mg/l	Calculated Downstream Quality lbs/day	mg/l[f]
BOD	24	155[g]	1.4	18	430	0.5	455.4	0.61
COD	113	726[g]	21.9	272	6,876	8	7,010.9	8.49
Chloride	125	800	94.2	1,170	14,612	17	14,831.2	17.73
Ammonia	5	32	1.8	23	63	0.05	69.8	0.09
Dissolved Solids	481	3,080	159	1,984	-	a	660	2.93
Phenol	0.01	0.063	0.0005	0.006	-	a	0.023	3.6×10^{-4}
Chromium	0.001	0.007	0.0006	0.0072		a	0.0016	7.5×10^{-6}
Copper	0.00016	0.001	0.0002	0.0029	-	a	0.00036	1.6×10^{-6}
Oil	-	-	<0.08	<1	-	a	<0.08	$<1.2 \times 10^{-4}$

a. Below detection limits of analysis procedure or no data available, concentration of 0 assumed for calculation purposes.

b. Calculated 7-day, 10-year low flow for Minnesota River is 103 mgd.

.019mgd

c. Based on average water quality values measured for WT-4 and WT-5 on November 3, 1977, and a calculated ground water discharge of 13 gpm.

d. Based on discharge rate and water quality data measured in drainageway on November 22, 1977.

e. Based on lowest recorded concentration in Minnesota River between Jordan and Fort Snelling by MWCC during the period of 1972-1977.

f. Assumes 25 percent of river flow (26 mgd) available for mixing.

g. Filtered Sample

IMPACT OF FREEWAY LANDFILL ON MINNESOTA RIVER
UNDER ELEVATED GROUND WATER CONDITIONS
(7-day, 10-Year Low Flow Conditions)[b]

Table III-20

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DATA DESCRIBING LANDFILL-LEACHATE QUALITY

Parameter	Literature[1] Concentration	Measured[2] Concentration
Ammonia	82 mg/l as N	77 mg/l as N
Cyanide	0.028 mg/l as CN	-
Oil	24 mg/l	3 mg/l
Phenol	0.77 mg/l	0.30 mg/l
Bicarbonate (Alkalinity)	1225 mg/l as $CaCO_3$	-
Boron	4.7 mg/l	-
Specific Conductance	6100 µmhos/cm @ 25°C.	5500 µmho @ 25 C
pH	6.8	6.9
Chromium	0.05 mg/l	0.033 mg/l
Copper	0.05 mg/l	0.044 mg/l
Arsenic	Not Detectable (0.00 mg/l.	-
Barium	2.25 mg/l	-
Cadmium	0.03 mg/l	-
Chloride	562 mg/l	1620 mg/l
Hardness	1600 mg/l as $CaCO_3$	-
Fluoride	0.4 mg/l	-
Lead	0.10 mg/l	-
Selenium	Not Detectable (0.00 mg/l)	-
Total Dissolved Solids	5346 mg/l	-
Total Organic Carbon	-	-
Turbidity	-	150 NTU
Sodium	357 mg/l	-
Sulfate	153 mg/l as SO_4	-
Silver	0.01 mg/l	-
Zinc	-	-
BOD_5	1500 mg/l	35 mg/l
COD	4490 mg/l	408 mg/l

[1]Median Values from Data in Thomas Clark and Rauf Piskin, Environmental Geology, Vol. 1, page 329, 1977.

[2]Samples collected by Barr Engineering Co. and analyzed by SERCO laboratories. Measured concentrations given are the highest obtained from the drainageway surface water stations since November, 1977.

where

L = loading of the potential pollutant to the Minnesota River from the Freeway Landfill (lbs/day)

C_{LL} = concentration of potential pollutant in landfill leachate (mg/l)

Q_L = rate of leachate production from the landfill (cfs)

The impact of the loading of each potential pollutant on river quality can be calculated using the following formula:

$$C_{DS} = \frac{L + 5.4(Q_R C_{US})}{5.4(Q_R + Q_L)}$$

where

C_{DS} = concentration of potential pollutant in mixing zone of the river downstream of the landfill (mg/l)

L = loading of potential pollutant to the Minnesota River from the Freeway Landfill (lbs/day)

Q_R = flow in the mixing zone of the river (cfs) -- for modeling purposes 25 percent of the river's flow was assumed available for mixing

C_{US} = concentration of potential pollutant in the river upstream of the landfill

Q_L = flow of leachate into the river (cfs)

For the impact analysis, the river quality upstream of the landfill was based on averages from samples taken at River Mile 7, River Mile 3 and River Mile 36 sampling stations. The quality of the river based on the averages is summarized in Table III-22. During the drought of 1976, a flow about equal to the 7-day duration, 10-year frequency low flow occurred during September. Water quality data

ASSUMED BACKGROUND QUALITY OF MINNESOTA RIVER DURING LOW FLOWS

Parameter	Low Flow Quality
Copper	12 ug/l
Turbidity	76.6 NTU
Conductivity	730 μmhos/cm @ 25°C
Chloride	45 mg/l
pH	8.1
Ammonia	0.70 mg/l as N
Total Dissolved Solids	573 mg/l
Total Alkalinity	258 mg/l as $CaCO_3$
Sulfate	123 mg/l as SO_4
Total Hardness	369 mg/l as $CaCO_3$
Sodium	34.3 mg/l
Cadmium	10 ug/l
Lead	11 μg/l
Arsenic	8.6 μg/l
Selenium	2.8 ug/l
Fluoride	0.32 mg/l
Phenols	0.004 mg/l
Chromium	0.007 mg/l
Barium	0.15 mg/l
Boron	0.16 mg/l
Cyanide	0.4 mg/l
Silver	<10 mg/l
BOD_5	5.3 mg/l
COD	42.5 mg/l

Table III-22

25% @ 215 cfs = 53.75 cfs

$Q_o, C_o \longrightarrow Q_f, C_f$

Q_i, C_i — 0.844 cfs

measured on river samples collected in September, 1976, were compared with the average river quality data shown in Table III-22 to check for any obvious differences between the average values and values actually measured during low flow conditions of September, 1976. The river concentrations in Table III-22 are representative concentrations for low flow conditions. Although much of the data were collected downstream of the landfill, it was assumed that it was representative of conditions upstream. This leads to a "worst case" analysis, in that higher concentrations will be predicted downstream of the landfill.

The influence of landfill leachate at the 7-day duration, 10-year frequency low flow was evaluated. The 7-day duration, 10-year frequency low flow for the Minnesota River at the landfill has been estimated to be 215 cfs. The calculated influence of the Freeway Landfill on the quality of the Minnesota River at the 7-day duration, 10-year frequency low flow is summarized in Table III-23.

In most cases, the impact of the existing Freeway Landfill on the quality of the Minnesota River at the 7-day, 10-year low flow are not analytically discernable. The concentration of most parameters in the river upstream of the landfill is essentially the same as it is downstream of the site. The three parameters predicted to result in the greatest increase are BOD, ammonia and chloride. All other parameters result in less than a two percent increase. Even with increases of .06 mg/l (as N) for ammonia (8.6 percent increase), and 1.3 mg/l (as Cl) for chloride (2.9 percent increase), the modeled downstream concentrations are well below the MPCA standards for the River. BOD is predicted to increase 23 percent. However, there is no standard governing this parameter for the River.

In summary, the leachate dilution impact model shows that Minnesota River quality is influenced only minimally by leachate from the existing Freeway Landfill because of attenuation by dilution. The parameters which show the greatest increase are BOD, ammonia, and chlorides in that order. No increases due to landfill leachate cause violations of the MPCA water quality standards.

<u>Other Surface Waters in the Landfill Area</u> -- The easterly drainage ditch which was formerly called Thornton Creek is also subject to State water quality standards. The drainage ditch receives surface runoff from the tributary watershed which includes a portion of Interstate 35W, from the landfill and until recently, it received Kraemer's quarry dewatering effluent. At present the drainage ditch is largely dry. The water in the drainageway exceeds several water quality standards including chloride, ammonia, specific conductance and turbidity on a consistent basis and copper on an occassional basis. It is currently being appraised by the MPCA for reclassification to proposed class 7: limited resource value waters. This class includes surface waters of the state which are of limited value as a water resource and where water quantities are intermittent or less than one cubic foot/sec at the once in 10 year, seven day low flow. These waters shall be protected so as to allow secondary body contact use, to preserve the groundwater for use as a potable water supply, and to protect the aesthetic qualities of the water.

IMPACT OF EXISTING LANDFILL ON MINNESOTA RIVER QUALITY
7 DAY DURATION - 10 YEAR FREQUENCY LOW FLOW

	Minnesota River	Freeway Landfill		Minnesota River	
PARAMETER	UPSTREAM CONCENTRATION	LEACHATE CONCENTRATION	LANDFILL LOADING LBS./DAY	DOWNSTREAM CONCENTRATION	MPCA WATER QUALITY STANDARD
Copper ug/l	12	31[6]	7.4	12.0	10
Turbidity NTU	76.6	150[6]	35.6	76.6	25
Conductivity phos/cm @ 25 deg. C.	730[2]	5500[6]	1307	733.5	1000
Chloride mg/l as Cl	45	1620[6]	384.9	46.3	100
pH	8.1	7.0[6]	--	--	6.5-8.5
Ammonia mg/l as N	0.70	77[6]	18.3	0.76	1.5
Total Dissolved Solids mg/l	573	5346	1270	576.6	700
Total Alkalinity mg/l as $CaCO_3$	258	1225	291	258.6	250
Sulfate mg/l as SO_4	123	1080	257	123.7	10 ← 250?
Total Hardness mg/l as SO_4 $CaCO_3$	368	1600	380	368.8	250
Sodium mg/l as Na	34.3	357	85	34.5	122[4]
Cadmium ug/l as C	10	30	7.1	10.0	10
Lead up/l as Pb	11	100	24	11.1	50
Arsenic ug/l as As	8.6	ND	--	8.6	50
Selenium ug/l as Se	2.8	ND	--	2.8	10
Fluoride mg/l as F	0.32	0.4	.09	0.320	1.5
Phenols ug/l	0.004[4]	.025[6]	.006	0.004	0.1
Chromium mg/l as Cr	0.007	.014[6]	3.3	.007	0.05
Barium mg/l as Ba	0.16	2.25	.53	.162	1
Boron mg/l as B	0.16	3.0[6]	.71	.162	0.5
Cyanide mg/l as CN	0.4	0.028	.007	.40	0.02
Silver ug/l as Ag	<10	10	2.4	10	50
BOD_5 mg/l	5.3	35[6]	356	6.5	--
COD mg/l	42.5	464[6]	110	42.8	--

1. Median values from data in Clark & Piskins, Environmental Geology, Volume 1, 1977, unless other noted.
2. 0.65 x specific conductance - total dissolved solids (mg/l)
3. Turbidity is assumed to be a linear function, this value may be considered to be a loading number, of one NTU is assumed equal to one mg/l.
4. MPCA standard is based on sodium being less than 60% of the total equivalent of cation. To calculate the standard, the hardness was assumed to the other cation source, and all of the hardness was assumed to be calcium ions.
5. Not detectable.
6. Freeway Landfill seepage concentration May 3, 1979.

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TABLE III-23

GROUND WATER QUALITY

State Regulations

The MPCA has established ground water standards that would be applicable to operation of the Freeway Sanitary Landfill. Perhaps the most stringent standard is WPC 22. This standard states that wastes shall be controlled as may be necessary to ensure that to the maximum practicable extent the underground waters of the state are maintained at their natural quality. This standard, then, is essentailly a nondegradation standard. WPC 14 also applies to ground waters. Where differences exist between WPC 14 and WPC 22, the more stringent conditions shall be applied.

Other standards that would apply include those under SW6. SW6 states that solid wastes shall not be deposited in such a manner that material or leachings may cause pollution of underground or surface water. SW6 also states that the proposed separation between the lowest portion of the landfill and the high water table elevation shall be a minimum of five feet. Finally, SW6 provides that a water monitoring program shall be constructed and operated to determine whether or not solid waste or leachate is causing pollution of underground or surface water and that an approved leachate collection and treatment system shall be used where required.

From a practical standpoint, the location of the ground water potentially influenced by the Freeway Landfill limits the potential use of the ground water. The landfill is located adjacent to the Minnesota River and the ground water potentially influenced by landfill leachate discharges naturally to the river. The proximity of the landfill to the river along with the fact that the area between the river and the landfill is zoned as floodway and cannot be developed, precludes any future ground water use between the landfill and the river. The only existing wells in the area of potential leachate influence are the Freeway Landfill truck shed well and U.S. Salt Company well. The water from these wells is used primarily for domestic uses and drinking water.

The limited value of the ground water under the Freeway Landfill has been recognized by the Minnesota Pollution Control Agency. In a February 4, 1980 internal Agency memorandum, the Director of the Water Quality Division indicates that the impact of the Freeway Landfill leachate should be considered as it potentially may influence the quality of the Minnesota River (Schade 1980).

Regulatory Compliance

The quality of ground water in the vicinity of the landfill is monitored on a quarterly basis including four surface stations and five ground water wells. The locations of these wells are shown in Figure III-3. Typical values of monitoring data collected from the ground water stations near the Freeway Landfill are presented in Table III-24.

GROUND WATER QUALITY[1]

Parameter	WELLS ALONG RIVER WT-1 11/3/77	1/5/78	3/30/78	WT-2 11/3/77	1/5/78	3/30/78	WT-3 11/3/77	1/5/78	3/30/78
BOD, 5-day, mg/l	3	<3	7	30	8	13	65	8	4
BOD, 5-day (filtered), mg/l	3	<3	10	30	3	11	12	8	4
Chloride, mg/l as Cl	<1	11	24	74	32	33	3	<1	2
Ammonia, mg/l as N	0.36	0.52	0.8	2.4	1.2	1.2	2.1	0.50	2.6
Specific Conductance, umho @ 25°C (lab)	414	408	528	841	806	795	511	598	558
pH (lab)	7.1	7.8	7.8	7.6	7.5	7.4	7.6	7.7	7.8
Phenol, mg/l	0.008	0.005	0.005	0.012	0.005	0.01	0.015	0.01	<0.002
Total Chromium (filtered), µg/l as Cr	1.5	7.0	1.2	5.5	4.8	3.8	1.2	4.5	1.9
Copper, (filtered), µg/l as Cu	0.9	15	2.8	20	1.4	1.5	<0.2	4.0	0.9
COD, mg/l	88	16	28	128	80	52	3320	40	116
COD (filtered), mg/l	196[3]	36[2]	28	104	54	52	120	28	44
Polychlorinated Biphenyls, µg/l	-	<0.2	-	-	<0.1	-	-	<0.1	

1. Samples collected by Barr Engineering Co. and analyzed by SERCO Laboratories.
2. Near detection limits for parameter, possible influences from filter
3. Appears to be anomalous data

Parameter	WELLS PLACED THROUGH REFUSE WT-4 11/3/77	1/5/78	3/30/78	WT-5 11/3/77	1/5/78	3/30/78	QUARRY SUMP 11/3/77	1/5/78	3/30/78
BOD, 5-day, mg/l	280	60	90	280	15	100	<3	3	<3
BOD, 5-day (filtered), mg/l	265	7	14	45	7	20	<3	<3	<3
Chloride, mg/l as Cl	974	681	5[3]	626	1300	6[3]	21	-	70
Ammonia, mg/l as N	47	26	29	17	4.1	46	<0.2[2]	<0.08	2.3
Specific Conductance, µmho @ 25°C (lab)	4840	3050	3250	4790	4630	4980	-	628	-
pH (lab)	7.0	7.3	7.4	7.0	7.1	7.8	7.8	7.7	8.0
Phenol, mg/l	0.081	0.042	0.03	0.047	0.045	0.03	0.002	0.002	0.002
Total Chromium (filtered), µg/l as Cr	9.2	26	12	4.9	29	9.5	1.6	1.4	3.3
Copper, (filtered), µg/l as Cu	1.0	18	6.0	<0.2	1.6	3.0	0.4	2.2	0.9
COD, mg/l	1733	2810	2820	11200	1280	1420	28	56	20
COD (filtered), mg/l	933	456	424	520	544	444	20	28	20
Polychlorinated Biphenyls, µg/l	-	401	-	-	10.4	-	-	-	-

1. Samples collected by Barr Engineering Co. and analyzed by SERCO Laboratories.
2. Limited sample volume
3. Data appears to be anomalous

LANDFILL GROUND WATER QUALITY

Table III- 24

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Ground water quality in nearby areas not affected by the landfill has not been monitored by the landfill monitoring program. Water quality data are available for the dewatering of the nearby quarry; however, this ground water is indicative of ground water in the Shakopee-Oneota Dolomite and is not necessarily indicative of ground water in the overlying alluvium. Water quality data from the quarry dewatering are summarized in Table III-24.

A comparison of the groundwater monitoring test results with WPC-14 shows that standards were exceeded for copper in Well 1, for copper in Well 2, for chloride and copper in Well 4 and for chloride in Well 5. Leachate that is produced from the Freeway Landfill may percolate through the peat relatively unattenuated, but in some places the existence of clay layers may either cause high attenuation or laterally divert the percolation to the surface, causing leachate springs to occur at the edge of the fill. If leachate enters the bedrock aquifer, it will flow very rapidly through fractures and channels in the dolomite, and discharge into the Minnesota River, where attenuation will occur by dilution.

The location of the site within a floodplain and near a surface of highly permeable bedrock may cause leachate formation by flooding. Although the site has been diked to prevent floodwaters from entering the site, it has been reported that a moderate amount of seepage into the site has occurred through the highly permeable bedrock. Seepage of floodwaters into the solid waste rapidly adds moisture to the base of the landfill and may produce large volumes of leachate. As mentioned in the Site Specific Water Balance section, the estimated leachate production rate is 3.0 inches per year after closure.

As discussed earlier, due to the groundwater flow characteristics the potential extent of landfill leachate on ground water quality is limited to the area between the landfill and the river, between the landfill and the drainage ditch east of the landfill, and immediately south and west of the landfill. The principal impact of the leachate is the effect it has on the quality of the river.

LOCAL WATER SUPPLY QUALITY

State Regulations

As previously discussed, adjacent properties to the Freeway Landfill use individual wells for water supply. The MPCA standards in WPC 14 apply to individual water supply wells. Table III-25 shows WPC 14 standards that apply to domestic consumption. Class A standards apply to drinking water without treatment of any kind while the other classes require various degrees of treatment. Other uses of water from individual supply wells would be covered by the WPC 14 standards shown in Table III-15.

The Minnesota Department of Health (MDOH) has also promulgated standards for drinking water; however, for public water supplies only. There are no MDOH standards for drinking water from individual wells. Table III-26 shows the MDOH maximum contaminant levels for inorganic and organic chemicals contained in public water supplies.

WATER QUALITY STANDARDS IN REGULATIONS WPC 14
OF THE MINNESOTA POLLUTION CONTROL AGENCY
WPC CLASSIFICATION - DOMESTIC CONSUMPTION

Substance or Characteristic	Class A Limit or Range	Class B Limit or Range	Class C Limit or Range	Class D Limit or Range
Total coliform organisms	1 most probable number per 100 milliliters	10 most probable number per 100 milliliters	200 most probable number per 100 milliliters	200 most probable number per 100 milliliters
Turbidity value	5		25	
Color value	15			
Threshold odor number	3			
Methylene blue active substance (MBAS)	0.5 milligram per liter			
Arsenic (As)	0.01 milligrams per liter			0.05 milligram per liter
Chlorides (Cl)	250 milligrams per liter			
Copper (Cu)	1 milligram per liter			
Carbon Chloroform extract	0.2 milligrams per liter			
Cyanides (CN)	0.01 milligrams per liter			0.2 milligrams per liter
Fluorides (F)	1.5 milligrams per liter			1.5 milligrams per liter
Iron (Fe)	0.3 milligrams per liter			
Manganese (Mn)	0.05 milligrams per liter			
Nitrates (NO_3)	45 milligrams per liter			
Phenol	0.001 milligram per liter			
Sulfates (SO_4)	250 milligrams per liter			
Total dissolved solids	500 milligrams per liter			
Zinc (Zn)	5 milligrams per liter			
Barium (Ba)	1 milligram per liter			1 milligram per liter
Cadmium (Cd)	0.01 milligram per liter			0.01 milligram per liter
Chromium (Hexavalent, Cr)	0.05 milligram per liter			0.05 milligram per liter
Lead (Pb)	0.05 milligram per liter			0.05 milligram per liter
Selenium (Se)	0.01 milligram per liter			0.01 milligram per liter
Silver (Ag)	0.05 milligram per liter			0.05 milligram per liter
Radioactive material	Not to exceed the lowest concentrations permitted to be discharged to an uncontrolled environment as prescribed by the appropriate authority having control over their use.			Not to exceed the lowest concentrations permitted to be discharged to an uncontrolled environment as prescribed by the appropriate authority having control over their use.

Table III - 25

1978 PUBLIC WATER SUPPLY STANDARDS
MINNESOTA DEPARTMENT OF HEALTH

Maximum Contaminant Levels for Inorganic and Organic Chemicals

Inorganic Chemicals	mg/l
Arsenic	0.05
Barium	1.0
Cadmium	1.010
Chromium	0.05
Fluoride	2.4
Lead	0.05
Mercury	0.002
Nitrate	10
Selenium	0.01
Silver	0.05
Organic Chemicals	
Endrin	0.0002
Lindane	0.004
Methoxychlor	0.1
Toxaphene	0.005
Chlorophenoxys	0.1
Silvex	0.01

Table III - 26

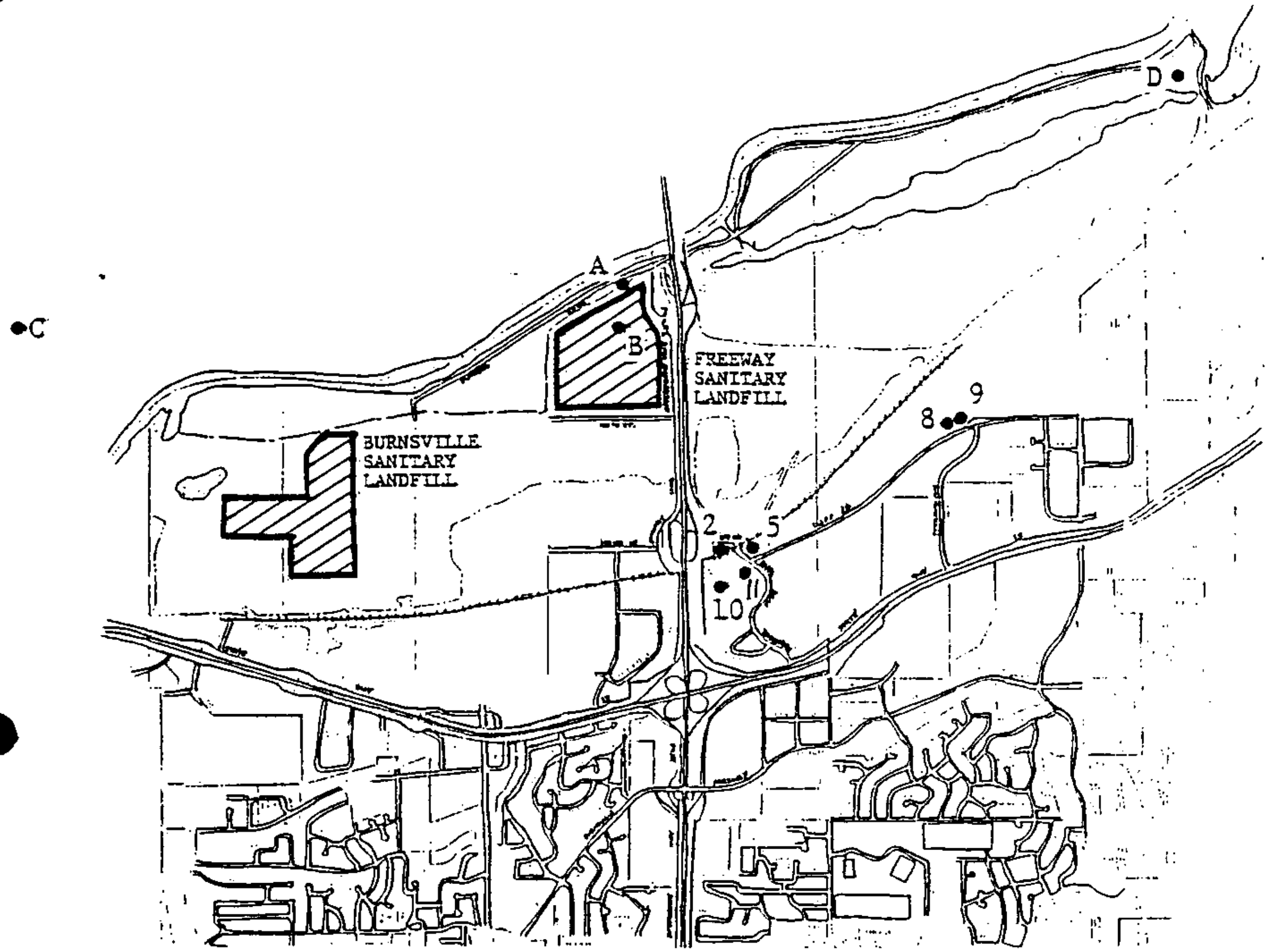
Regulatory Compliance

Figure III-14 shows the approximate location of a number of wells that have been sampled recently that are located in the Burnsville Landfill area. As can be seen, the parameters (Table III-27) tested met most of the applicable standards contained in Table-25 and all of the applicable standards contained in Table III-26. Some of the wells exceeded WPC 14 standards for iron and manganese. The Portland Cement and U. S. Salt company wells exceeded standards for phenols.

None of the parameters measured, including those exceeding standards, would indicate the presence of leachate in the ground water system. Practically all of the parameters measured were considerably below or below typical low value ranges for leachate. Notwithstanding, these wells should be periodically tested in the future.

Refer to Appendix III for a discussion of the landfill's impact on Burnsville's water supply well field.

LOCATION OF MUNICIPAL WATER SUPPLY WELLS
TESTED BY MDoH



A U.S. Salt Well
B Freeway Landfill Truck Shed Well
C Minnesota Masonic Home Well
D NSP Black Dog Plant Well
2 Burnsville Municipal Well
5 Burnsville Municipal Well
8 Burnsville Municipal Well
9 Burnsville Municipal Well
10 Burnsville Municipal Well
11 U.S. Portland Cement Co.

Analytical Data - Various Water Supply Wells, Burnsville Area 1979

Private Wells in Burnsville & Bloomington	NSP Blackdog Plant. Wellwater before Demineral-ization	US Portland Cement, Well. S.T.	Freeway Landfill Truck Shed S.T.	US Salt Well	Minnesota Masonic Home	Well #10 Municipal Well	Well #9 Municipal Well	Well # 2,5,8,11 Municipal Wells
Sample Number	27667	3943	28084	28083	3105	8096	8097	8098, 8099 8100, 8101
Date	6/11/79	8/2/79	7/3/79	7/3/79	9/20/77	12/6/79	12/6/79	12/5/79
Coliform Group Organisms MPN/100 ml	<2.2	<2.2	<2.2	<2.2	0	0	0	0
Total Solids mg/l	240	320	300	290		300	290	
Total Hardness as $CaCO_3$ mg/l	290	290	279	264		270	260	
Alkalinity as $CaCO_3$	290	300	270	270		280	270	
pH	7.7	7.7	7.7	7.7		7.5	7.4	
Iron mg/l	.09	1.1	.08	.65		.25	.38	
Manganese mg/l	.08	.06	.48	.03		.06	.04	
Chloride mg/l	.68	1.4	.08	1.1		.19	.08	
Sulfate mg/l	15	7.3	11.	12.		19	21	
Fluoride		.10	.22	.22	.19	.27	.25	
Calcium as $CaCO_3$ mg/l	170	190	180	170		170	170	
Sodium mg/l	2.7	4.	4.1	4.0		3.1	3.8	
Potassium mg/l	1.6	2	2.1	2.0		2.5	4.0	
Specific Conductance @ 25 µmho/cm	490	540	500	480		500	500	
Phenols µg/l	<2.0	3.0	<2.0	2.5				
Total Kjeldahl Nitrogen mg/l	<.4	<.4	<.4	<.4	<.5	<.4	<.4	
Manganese as $CaCO_3$ mg/l	130	100	99	94				
Arsenic µg/l	<50	<50			<50			
Barium µg/l	<1000	<1000			<1000			
Chromium µg/l	<50	<50			<50			
Cadmium µg/l	<10	<10			<10			
Lead µg/l	<50	<.1			<50			
Mercury µg/l	.20	<.1			<.1			
Selenium µg/l	<10	<10			<10			
Silver µg/l	<50	<50			<50			
Ammonia mg/l		.34						
Total Organic Carbon mg/l	.14	1.6	<1.0	2.9				

Table III - 27

TERRESTRIAL AND AQUATIC ECOLOGY

VEGETATION

The landfill is located in the Lower Minnesota River Valley. The River Valley is classified as a northern floodplain forest plant community. Located in a prairie-forest transition zone, the valley is influenced by the maple basswood forest and the oak savannah community.

The undeveloped area to the west of the landfill is open meadowland with some wetland marshy areas. To the south is a dolomite quarry owned by Edward Kraemer and Sons Inc. surrounded by meadowland areas and occasional large stands of mixed trees. I-35W lies along the eastern boundary of the landfill shielded to some extent by a strip of aspen, cottonwood and willow mostly over 20 feet in height. A small creek runs along this boundary draining into the Minnesota River. The Minnesota River lies 400 feet directly north of the landfill. The area between the landfill and the river is characterized by dense cottonwood, aspen, and willow stands.

Vegetation surveys of the landfill and adjacent land were conducted on February 24, and May 1, 1980 by Council staff. The objective of these surveys was to identify the major plant communities as characterized by dominant or conspicuous species found on and adjacent to the landfill in order to determine vegetation and habitat impacts.

Figure III-15 shows the location of various vegetative cover types identified in the landfill area. Four general cover types are present on the landfill: sparse stands of mixed trees, intermediate shrubs, grassland and barren graded soil. Wetlands are located in various areas immediately surrounding the landfill.

Sparse-Mixed Trees

Infrequent stands of mixed trees are found on the Freeway Landfill, dominated by quaking aspen (Populus tremuloides), cottonwood (Populus deltoides) and willow (Salix sp.). The majority of these trees are on the eastern landfill border adjacent to the creek.

Intermediate Shrubs and Forbs

Intermediate shrubs and forbs are scattered throughout the landfill. Dominant species are indicative of disturbed areas such as young poplar (Populus sp.), mullein (Verbascum so.), prickly ash (Zan thoxylum americanum), and dogwood (Cornus sp.). Forbs sighted on the landfill include: sunflower (Helianthus giganteus), goldenrod (Solidago sp.), Canada Thistle (Cirsium arvense) and evening primrose (Oenothera biennis).

Grassland

Grassland areas which exist on the landfill as vegetative cover are a variety of grasses and herbacious species such as brome grass (Bromus sp.), field clover (Petalosternum sp.), dock (Rumex sp.), canary reed grass (Phaluns arundinacae), cocklebur (Xanthium chinense), burdock (Artium minus), gumweed (Grindelia squarrosa), shepard's purse (Capsella bursa-pastoris), mint (Labiatae sp.) and moss.

VEGETATIVE COVER TYPES ON FREEWAY SANITARY LANDFILL

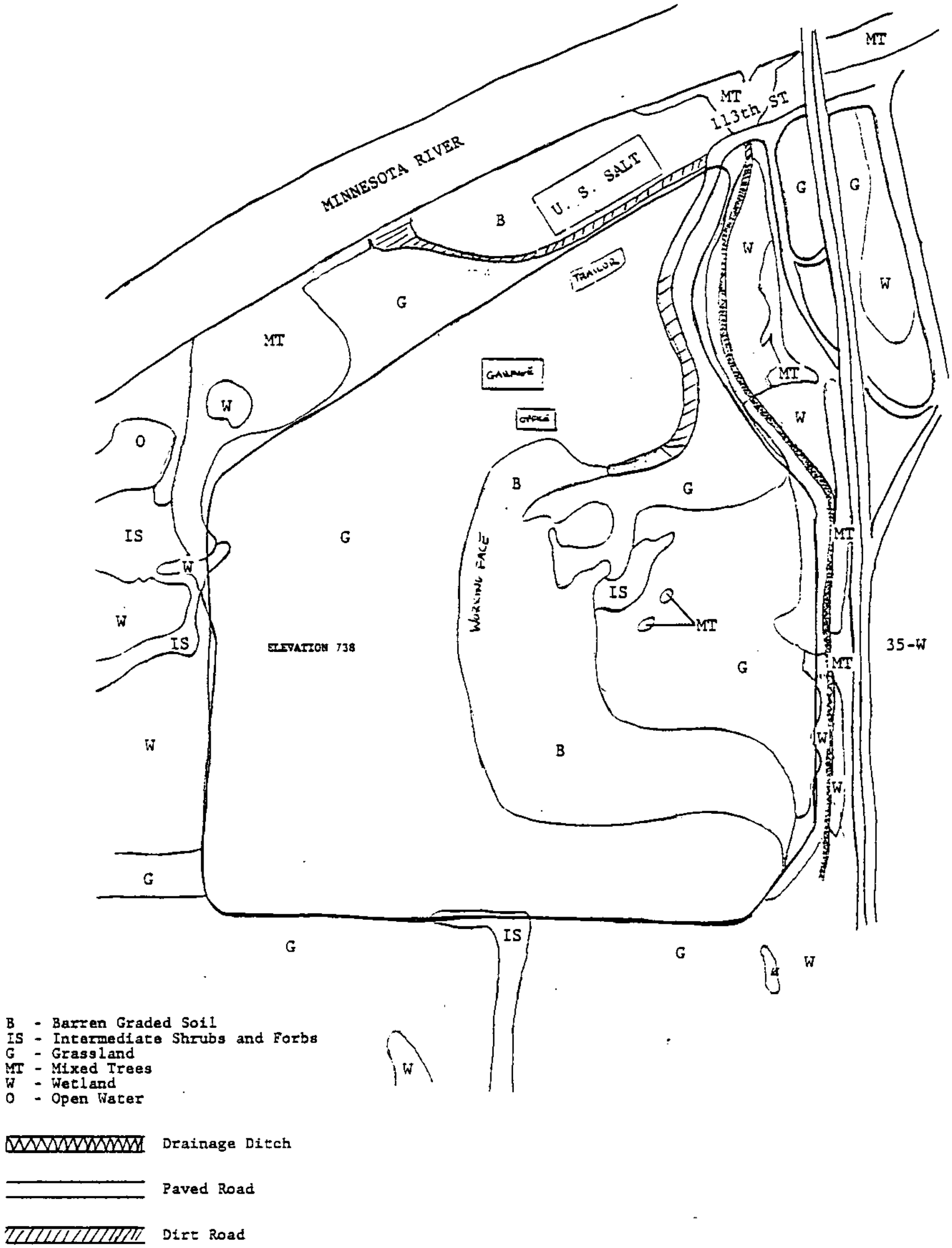


Figure III-15

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Most of the filled areas of the landfill have not been seeded but have regenerated naturally with pioneer species of grasses and short dry forbs such as those listed above. The areas that have been seeded are very similar in species type and quantity to the unseeded areas.

Barren-Graded Soil

The remainder of the landfill area has no vegetation cover due to excavation operations where the soil is scraped for daily cover material, and due to the landfilling procedures at the working area of the landfill.

Wetland

Wetland areas exist on the eastern and western borders of the landfill. These areas are characterized by typical regional wetland species. Shrub-carr, wet meadow, and emergent aquatic vegetation are found in this type of area, including such species as dogwood (*Cornus sp.*), willow (*Salix sp.*), cattail (*Typha latifolia*), reed grass (*Phragmites sp.*), and sedge (*Carex sp.*). The landfill owner states that there are no spots on the presently permitted landfill that have standing water year round.

WILDLIFE

Wildlife species which are likely to be found within the landfill area would include those species commonly associated with the previously described plant communities. Figure III-15 shows the location of the general plant communities on and near the landfill. The following species of mammals, birds, amphibians and reptiles were actually sited on the landfill: rabbit (*Sylvilagus floridanus*), squirrel (*Sciurus carolinensis*), deer (*Odocoileus virginiancus*), racoon (*Procyon lotor*), red tail hawk (*Buteo lineatus*), rough-legged hawk)*Buteo lagopus*), common crow (*Corus brachyrhynchos*), killdeer (*Charadus vociferous*), pheasant (*Phasianus colchicus*) and snapping turtle (*Chelydra serpentina*). This survey was not an extensive one and is intended to indicate the type of animals that populate the landfill area. For an exhaustive list of animal species found in the Lower Minnesota River Basis, see Warner, 1979, *Wildlife Inventory of the Lower Minnesota River Valley*. While not specifically identified, insects at the landfill are a primary unit in the site's ecosystem as a basic link in the food web.

AQUATIC ECOLOGY

Minnesota River

The major emphasis aquatic ecology systems and impact analysis was on the Minnesota River. All available information collected to data on the various biological communities within the river was reviewed to provide a description of the current status of population diversity, composition and abundance. Summaries of the results of this literature review describing plankton, phyton, benthos and fisheries populations within the lower Minnesota River are available from the Council.

The effects of leachate pollution from the presently permitted landfill on the aquatic ecology of the Minnesota River will probably be minimal because of diluted concentrations. Most fish and other mobile organisms are able to avoid or escape elevated levels of pollution from point source discharges. The aquatic communities that have the greatest potential for adverse impact are the phyton and benthic organisms. Any rooted plants or sensitive benthos in the area of leachate discharge may be susceptible to damage. However, no aquatic plant or animal life of these types were identified in the area of the landfill. Most sensitive organisms have already been eliminated or reduced in this stretch of the river due to high turbidity, nutrient enrichment, fluctuating water levels, scouring action of moving bottom materials and depressed dissolved oxygen concentrations. Additional stress on aquatic populations due to leachate from the existing landfill will be relatively minor in comparison.

Other Surface Waters

The only other surface water bodies potentially impacted by the landfill are the easterly drainage ditch (formerly Thornton Creek) and the small adjacent wetlands. Although once a small trout stream in the late 1950s and early 1960s, this "creek" is presently dry and most likely contains no fish life when flowing. Its present use as a drainage ditch receiving runoff from the City of Burnsville, I-35W and the landfill, affects its water quality and limits its resource value. The easterly drainage ditch receives direct leachate seepage from the older portion of Freeway landfill and currently exceeds several water quality standards. MPCA has recommended that the drainage ditch be reclassified to proposed class 7: limited resource value waters (see Water Quality discussion).

WETLAND

In general, wetlands play a vital role in the retention and release of water. During periods of flooding, wetlands act as storage basins by impounding water in open ponds and storing water in their organic soils. Wetlands have many valuable ecological functions, including wildlife inhabitation, water storage and water recharge potential, and pollutant filtration capability.

There are no wetlands located on the working areas of the landfill. There are wetland areas that border the landfill on the east and west. These areas are classified as Type 2 inland fresh meadow by the U.S.D.A Soil Conservation Service. The soil in these wetlands is usually without standing water during most of the growing season but is probably waterlogged within at least a few inches of its surface. Representative plants of inland fresh meadow include corex, rushes, redtop, reedgrasses, mannagrasses, prairie cordgrass, and mints.

RARE AND ENDANGERED SPECIES

Minnesota has enacted a law for the protection of threatened and endangered species (M.S.A. 97.488); and state listings of regulated species are presently being compiled. According to DNR records, there are no rare or endangered species in the landfill area, with the exception of some bald eagle or peregrine falcon sitings in the Minnesota River Basin area.

There are no endangered species of fish in the lower Minnesota River. The Higgin's Eye mussel is recognized as an endangered species by the federal government and did occur in the lower Minnesota River in the late 1940s. The Minnesota River, from Shakopee to the mouth, is presently devoid of mussel life according to the U. S. Fish and Wildlife Service. The recent Minnesota River has been attributed to organic loadings and the use of biacides. The Minnesota River discharges into the Mississippi River and consequently adversely affects the Higgin's Eye located downstream in the Mississippi River.

SOCIO-ECONOMICS

LAND USE, ZONING

Land Use

The landfill is located in the City of Burnsville. It is located approximately 1.5 miles east of the City of Savage. Directly north, approximately 400 feet, is the Minnesota River.

Figure III-16 shows the land use surrounding the landfill area. Directly north is United States Salt, a commercial business that sells salt. Further north, across the Minnesota River, is the Minnesota Valley National Wildlife Refuge and Recreation area. Located within the Minnesota Valley National Wildlife Refuge and Recreation Area, across from the landfill is Bloomington's Diseased Tree Utilization and Disposal Facility. The operation processes diseased elm trees into chips and lumber; they also burn nonusable material. The eastern edge of the landfill is bounded by I-35W. Further east is undeveloped, open land. Directly south and southwest of the landfill is a dolomite quarry operated by Edward Kraemer and Sons, a mining and processing firm. Further south are several commercial and retail establishments including the following: Commercial Asphalt, Black Dog Volkswagon, Knox Lumber, and Levitz Furniture. Further southwest is the Burnsville Sanitary Landfill and along Highway 13, east of County Road 5, are a variety of commercial enterprises. Southeast of the landfill are All State U Lock Storage and South Side Dodge. Directly west is open, undeveloped land.

Zoning

Figure III-17 shows zoning for the areas adjacent to and in the general area of the landfill. As can be seen, land immediately surrounding the landfill is zoned for general industrial use. Other zoning in the landfill area includes areas designated for such uses as limited industrial, general business, residential, commercial recreation, and institutional.

Regional Development Framework Plan

The Council has adopted a Development Framework plan to guide present and future decision making in the seven county region. This plan designates general areas for future urban and rural services and provides standards for making decisions with respect to these services. The Pine Bend Sanitary Landfill EIS describes the various urban and rural use classifications contained in the plan.

The Burnsville area, including the Freeway Sanitary Landfill, is located within the Metropolitan Urban Service Area. This area is provided with metropolitan services including highways, transit, and interceptor sewers. Burnsville is considered a developing suburban community according to the Council's Development Framework.

GENERALIZED LAND USE BURNSVILLE AREA

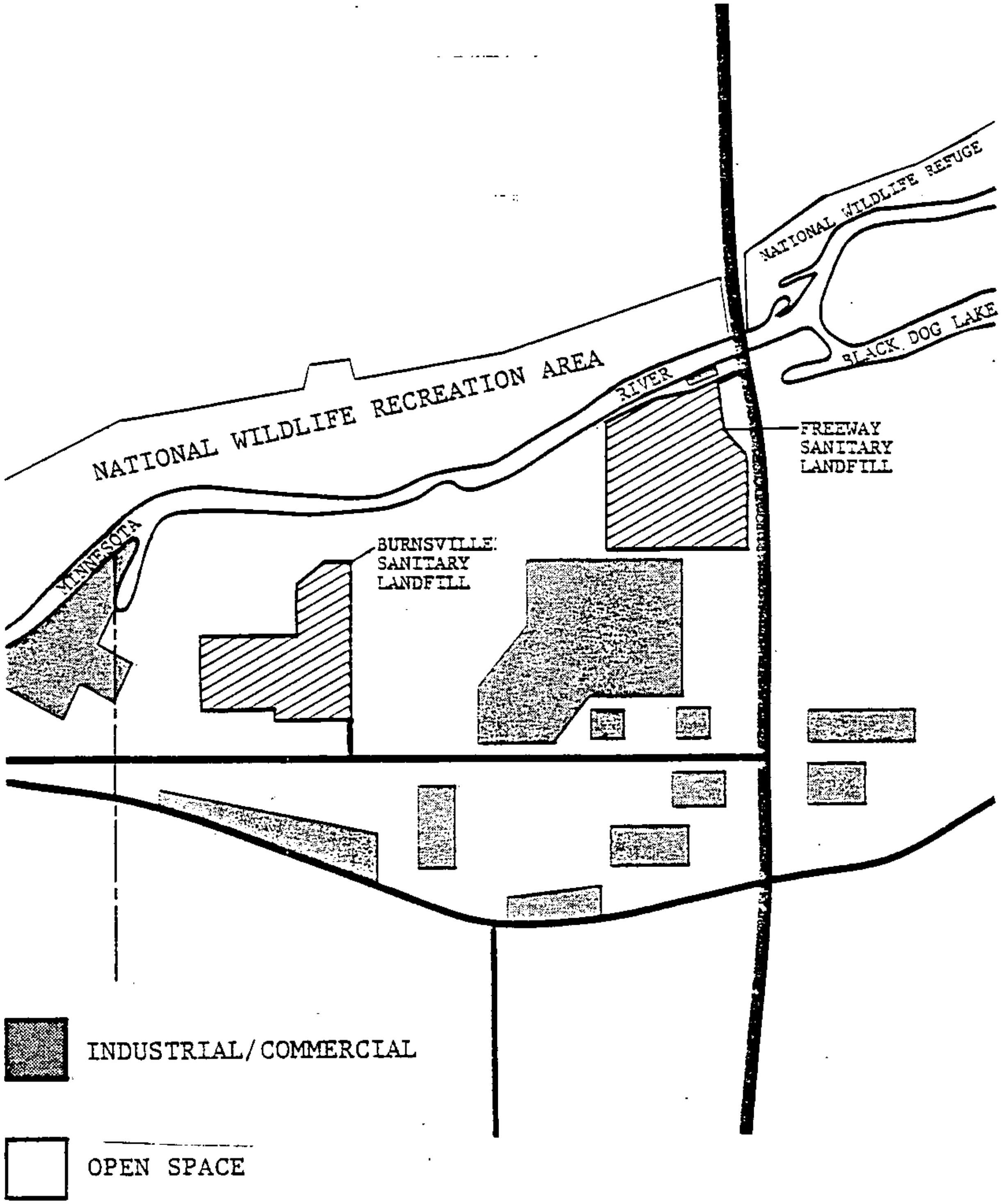

Figure III-16

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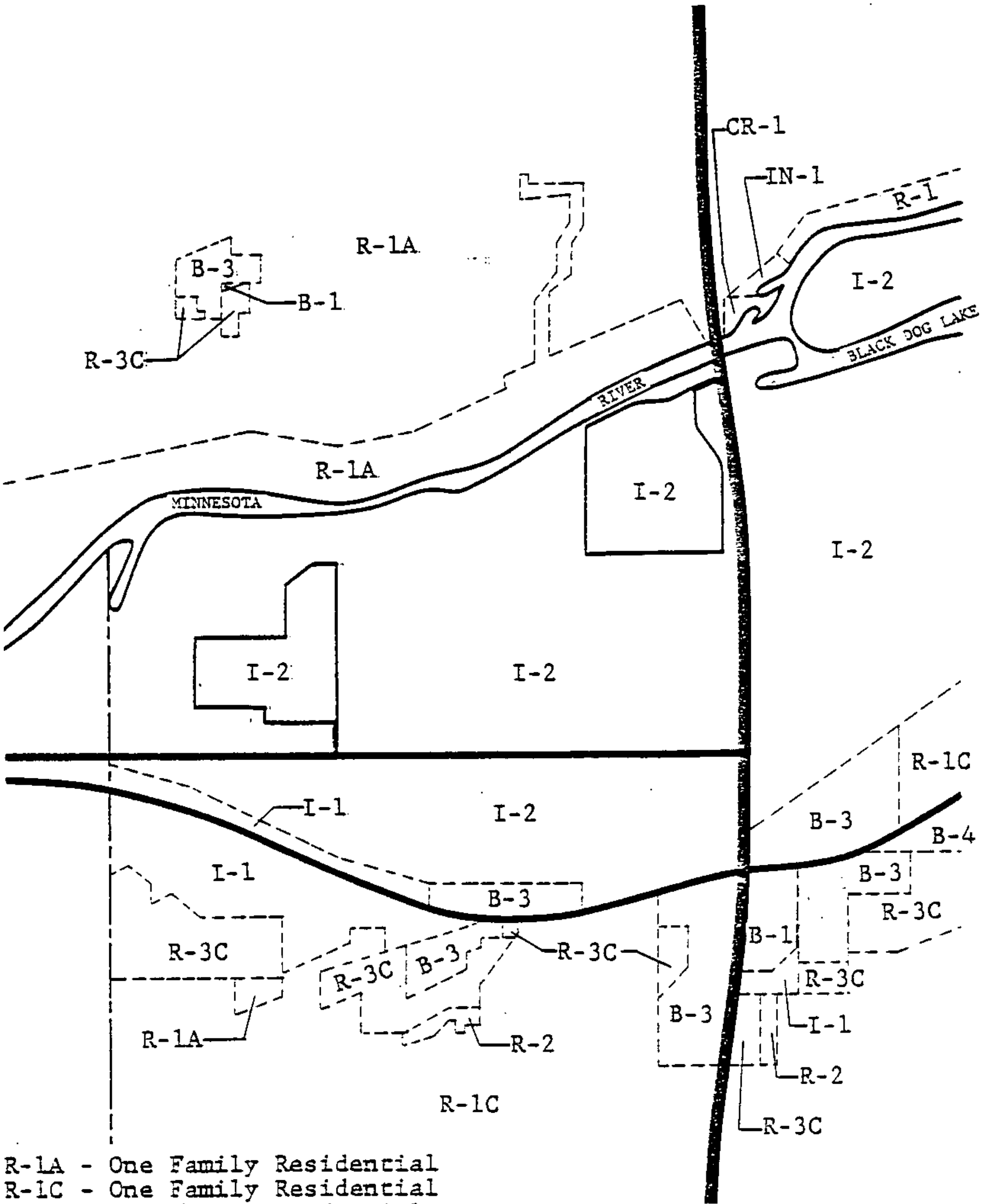
ZONING MAP

BURNSVILLE —— BLOOMINGTON



R-1A - One Family Residential
R-1C - One Family Residential
R-2 - Two Family Residential
R-3C - Multiple Residential
B-1 - Limited Business
B-3 - General Business
B-4 - Shopping Business
I-1 - Limited Industrial
I-2 - General Industrial
CR-1 - Commercial Recreation
IN-1 - Institutional

Figure III-17

PUBLIC FACILITIES AND SERVICES

Fire Services

There are two fire stations in Burnsville that could respond in the event of a fire at the landfill. One is located north of County Road 42, just east of Burnhaven Drive; the other is on Cliff Road, just east of the intersection with Portland Avenue.

There are also six fire stations in Bloomington that could respond to a fire at the landfill.

Storm Sewer Services

The City of Burnsville adopted an overall drainage plan in the early stages of the community's development. By planning ahead, the direction of drainage was established throughout the entire City which determined the direction in which all streets and storm sewers should direct storm water. The system has been in place for several years and is performing satisfactorily.

The landfill area, however, is not serviced by a storm sewer system. The natural drainage pattern within the City has been disturbed to some extent by man's improvements. Generally, the City's natural drainage pattern can be approximately equated to the present drainage pattern.

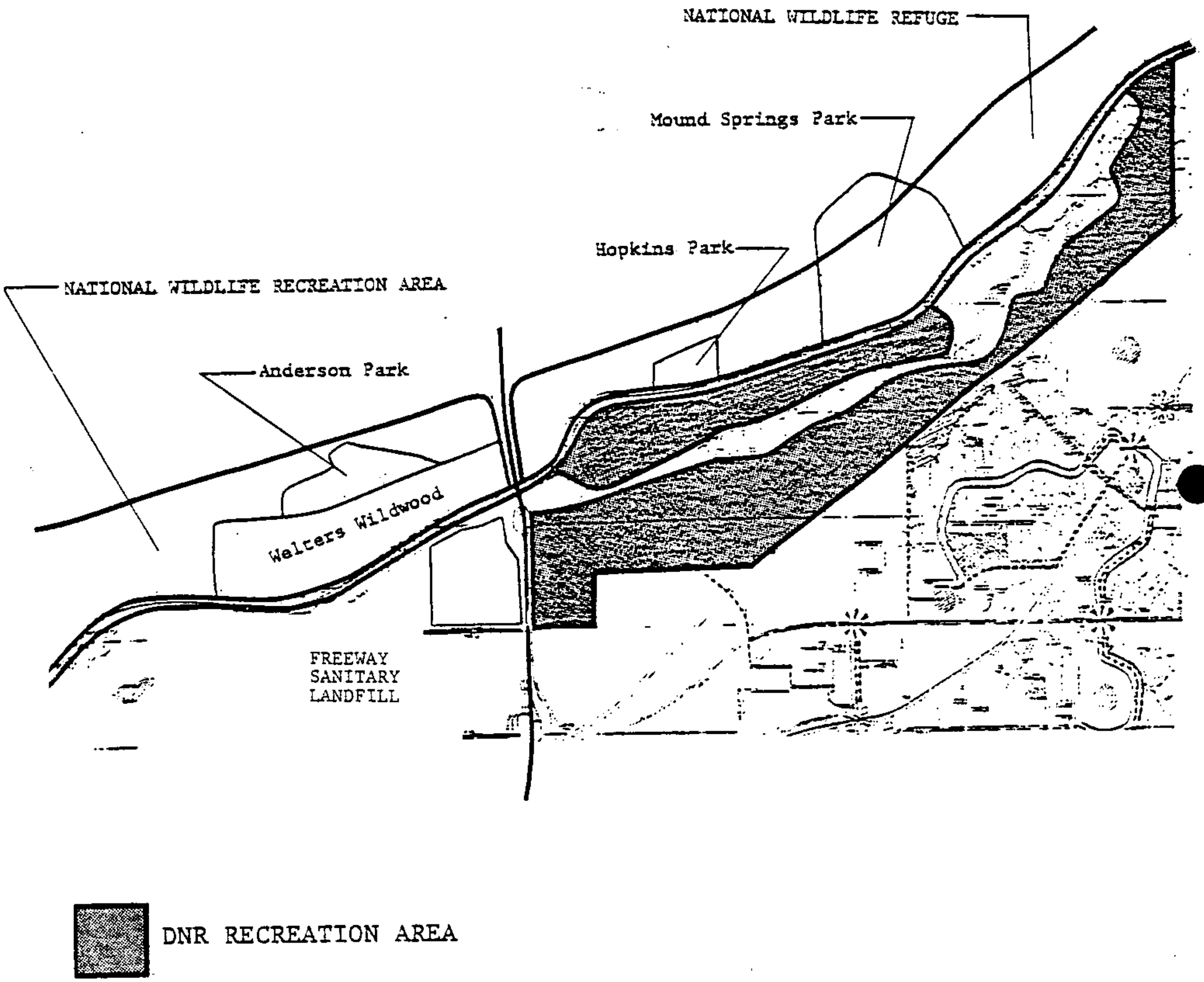
Park and Recreation Open Space Facilities

Currently, there are 26 developed park facilities in Burnsville. The closest city parkland to the landfill consists of approximately 1330 acres of the Minnesota River Valley Floor east of I-35W and west of NSP's Black Dog Power Plant (see shaded portion of Figure III-18). The U. S. Department of Fisheries and Wildlife is currently in the process of acquiring fee title and easements for this area which will become a portion of the Minnesota Valley National Wildlife Refuge and Recreation Area.

In 1976, a law was passed which established the Minnesota Valley National Wildlife Refuge and the National Recreation Area. This enabling legislation allowed the U. S. Fish and Wildlife Service, the State of Minnesota, counties and municipalities to protect and preserve approximately 17,500 acres of the Minnesota River floodplain from Fort Snelling State Park to Jordan, Minnesota. It will be a nature oriented outdoor recreational facility providing valuable habitat for both migratory birds and residential wildlife.

Bloomington has four city parks located along the Minnesota River: Welters Wildwood, Anderson Park, Hopkins Park, and Mounds Springs Park. Welters Wildwood and Anderson Park are city-owned parks located within the National Wildlife Recreation Area across from the Burnsville and Freeway Sanitary Landfills. Hopkins and Mound Springs Parks are presently owned by Bloomington and are located within the National Wildlife Refuge.

EXISTING PARKLAND NEAR FREEWAY SANITARY LANDFILL



4520199

Figure III - 18

Easements or title to all land within the Bloomington portion of the Minnesota River Floodplain are expected to be acquired for the wildlife refuge and recreation area. Mound Springs Park is the only developed park. Developed recreation facilities include 2.7 miles of pedestrian paths, limited parking area, 17 permanent picnic tables and eight picnic grills. The park is also one of the three day camp sites in the City's recreation program. Within Welters Wildwood is a hiking and cross-country skiing trail, unofficially referred to as Nine-Mile Creek Trail. Welters Wildwood, Anderson Park, and Hopkins Park are undeveloped, natural areas.

The Minnesota Department of Natural Resources has plans to develop a continous recreational trail system, the Minnesota Valley State Trail, between Fort Snelling State Park and LeSueur, Minnesota. The trail system, approved by the 1969 Minnesota Legislature, consists of a series of state parks and waysides joined by municipal, private and industrial lands. Camping and access areas along the route will accommodate canoeists and other boaters on the rivers. The State is pursuing the possibility of developing the Minnesota Valley State Trail on both sides of the Minnesota River. The south trail is likely to be open to hikers, horsemen, skiers, and snowmobilers. The trail on the north side of the river will probably be restricted to hikers, skiers, and bicyclists. Currently only minor links in the trail system have been completed and no state trails are in the vicinity of the landfill.

COMMERCIAL AND RECREATIONAL USE OF THE MINNESOTA RIVER

The lower Minnesota River is one of the major waterways in the Upper Midwest. The river is used for navigation, recreation, industrial water supply, and assimilation of stormwater and industrial and municipal wastewater effluents. The major transportation use of the river is commercial barge traffic. The average shipping season on the Minnesota River is approximately 239 days from mid-March through mid-November. During the 1976 shipping season there were 874 vessel round trips. The approximate barge traffic is 2500 barges. The peak of the shipping season occurs in June. This peak month accounts for 15 percent of the barge activity on the lower Minnesota River. The Corp of Engineers projects that commercial barge traffic will double by the year 2000 to 6,600,000 tons. Water taken from the river is used for sewage treatment or cooling for industrial purposes. Four waste treatment facilities and eight industrial facilities located between Shakopee and Fort Snelling return water to the Minnesota River.

Recreational uses of the Minnesota River include boating, canoeing and fishing. The following rough fish comprise approximately 93 percent of all the fish caught in the vicinity of the landfill: Carp, Gizzard Shad and River Carpsucker. Game fish account for the remaining seven percent which are comprised of Smallmouth Bass, Walleye, and Sauger. The majority of the future recreational use of the Minnesota River in the landfill's vicinity will probably occur east of I-35W adjacent to the National Wildlife Refuge Area.

Two main uses of the Minnesota River are commercial and recreation. Recreation is the least important of the two uses. Barges are occasionally moored along the south side of the Minnesota River by the Freeway Sanitary Landfill. The state is pursuing the possibility of using land adjacent to the river and landfill for recreation purposes.

TRANSPORTATION

General

The landfill wasteshed covers approximately nine hundred square miles and includes portions of Dakota, Hennepin, Ramsey and Scott Counties. Twenty-eight municipalities, two townships and the Fort Snelling area deposit refuse to varying degrees, at the landfill. As shown in Figure III-19, this landfill's wasteshed extends from Minneapolis' north boundary southward to Lakeville in Dakota County and from St. Paul's east boundary westward to Hopkins in Hennepin County. Approximately 60 percent of the refuse annually deposited at the landfill is generated within the Central Cities with Minneapolis contributing 45 percent and St. Paul 15 percent. An additional 20 percent of deposited refuse is generated in its first-tier suburbs located west and south of Minneapolis including the Fort Snelling area. The remaining 20 percent originates from western Dakota County and eastern Scott County municipalities and townships.

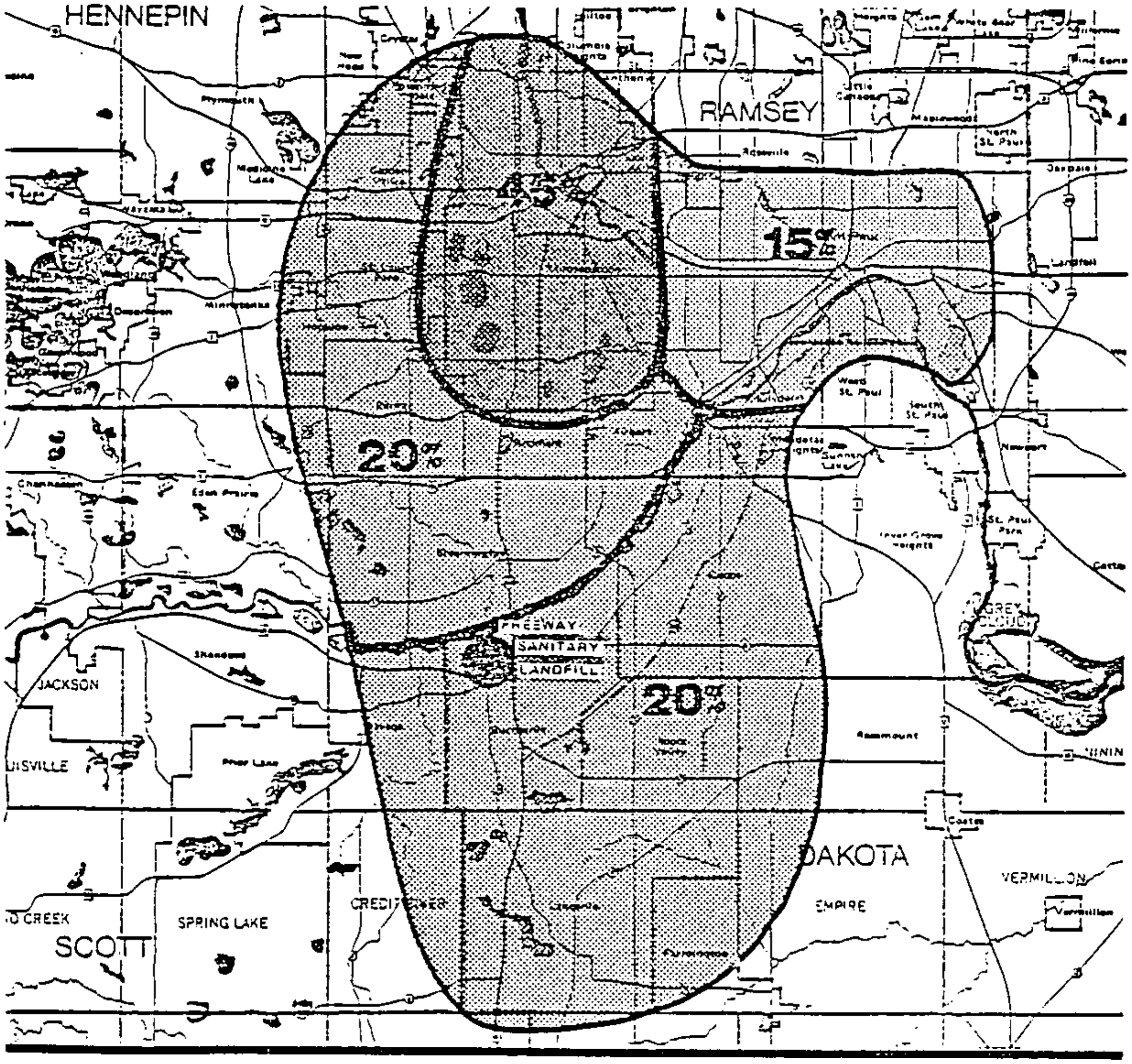
Principal Haul Routes

The total refuse deposited at the landfill is estimated to be 170,000 tons per year. The principal haul routes to landfill exhibit a north-south orientation. Figure III-20 shows these locations and estimated relative importance of these haul routes. From the north the principal haul route extends from downtown Minneapolis southward on I-35W to the landfill located adjacent to this freeway and immediately south of the Minnesota River. This route carries up to eighty percent of the refuse annually deposited at the landfill. From the south the principal haul route extends from Lakeville northward on I-35W to the landfill. This route carries up to 20 percent of the refuse annually deposited at the landfill.

Important Secondary Haul Routes

In addition to the principal haul routes six important secondary haul routes have been identified (see Figure III-20). The most important of these six routes is Interstate 94 between downtown St. Paul and downtown Minneapolis which carries approximately 15 percent of this landfill's annually deposited refuse. The other routes are I-494 east and west of I-35W, the Crosstown Freeway (TH 62) also east and west of I-35W, and TH 100 from TH 55 in Golden Valley to Crosstown Freeway in Edina. These five routes carry a total of approximately 21 percent of the total annual deposited refuse at the landfill. The existing functional classification of both principal and important secondary haul routes is shown in Figure III-21.

FREEWAY SANITARY LANDFILL WASTESHED, 1980



% — Estimated Relative Contribution of Designated Wasteshed to Total Refuse Deposited at Freeway Sanitary Landfill (170,000 tons/year)

Primary Source Area

Secondary Source Area

Tertiary Source Area

Source: Richard B. McGowan Co./Metropolitan Council

Figure III -19

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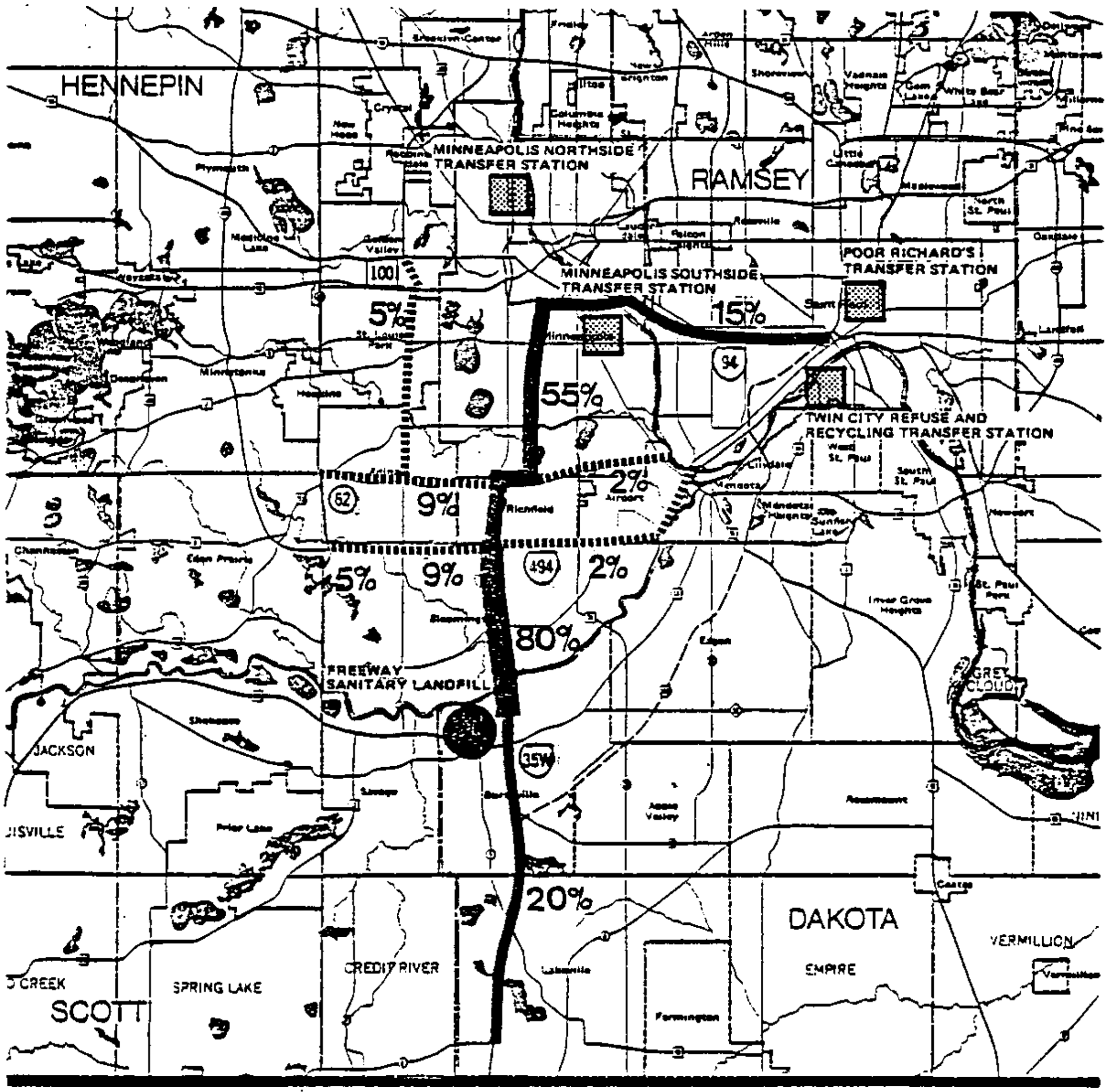
PRINCIPAL AND IMPORTANT SECONDARY HAUL ROUTES TO FREEWAY SANITARY LANDFILL



Principal Haul Route
Important Secondary Haul Route
(Haul Routes Show Percentage of Annual Total Refuse Deposited at Freeway Sanitary Landfill)

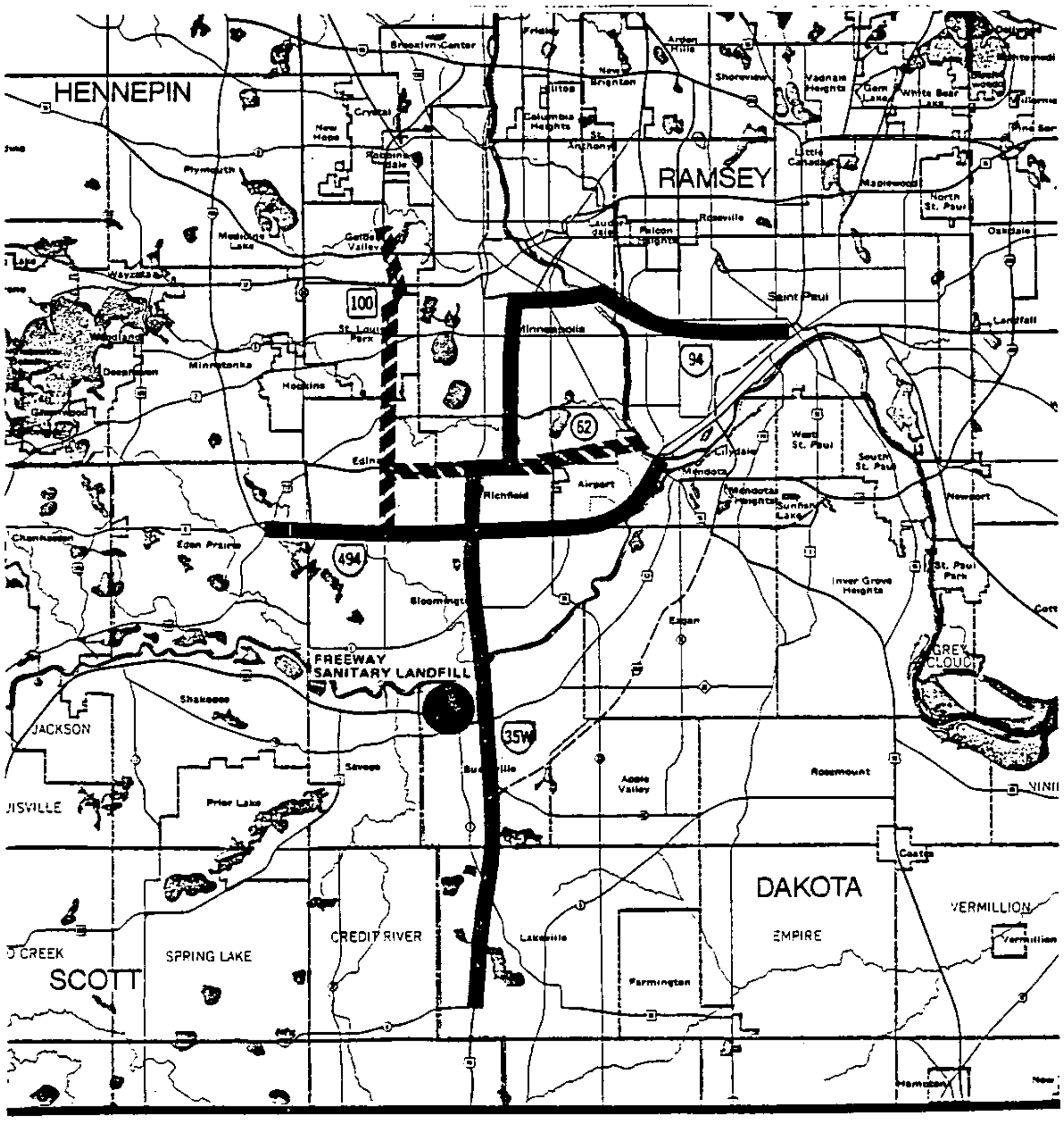
% - Estimated Percentage of Annual Total Refuse Deposited at Freeway Sanitary Landfill by Principal and Important Secondary Haul Routes

Source: Richard B. McGowan Co./Metropolitan Council

Figure III - 20

4520195

FUNCTIONAL CLASSIFICATION OF
PRINCIPAL AND IMPORTANT SECONDARY
HAUL ROUTES TO FREEWAY SANITARY LANDFILL



Source: Metropolitan Council

Principal Arterial

Intermediate Arterial

Figure III - 21

4520194

Existing Traffic Volumes in the Vicinity of Freeway Sanitary Landfill

Approximately 71,500 average daily vehicle trips (ADT) occur on I-35W at the 113th Street interchange, of which 4,500 of these vehicles are trucks. 113th Street, a two-lane bituminus surface is the only access to the landfill. Figure III-22 shows the average daily vehicle and truck trips on I-35W in the vicinity of the landfill. The present 75 average daily truck trips generated by the landfill represent less than one percent of ADT and approximately three percent of total truck trips on I-35W at the 113th street interchange.

Types of Trucks Hauling to Freeway Sanitary Landfill

Four types of trucks are used to haul refuse to the landfill. Their identification and capacities are given in Table III-27. Packer and dump trucks account for approximately 70 percent of total daily truck trips. The remaining 30 percent of daily truck trips are made by roll-offs and tandems.

Table III-27
TYPES AND CAPACITIES OF HAUL TRUCKS TO FREEWAY SANITARY LANDFILL

Type	Capacity (in cubic yards)	Percent of Average Total Daily Truck Trips
Open-top semi	100	--
Roll-off	10-40	10
Tandem	25-35	20
Front-end loader	25-35	--
Packer	17-18	40
Dump	5-15	30

Source: Richard B. McGowan Company

Identified Issues Relating to Refuse Hauling to Freeway Sanitary Landfill

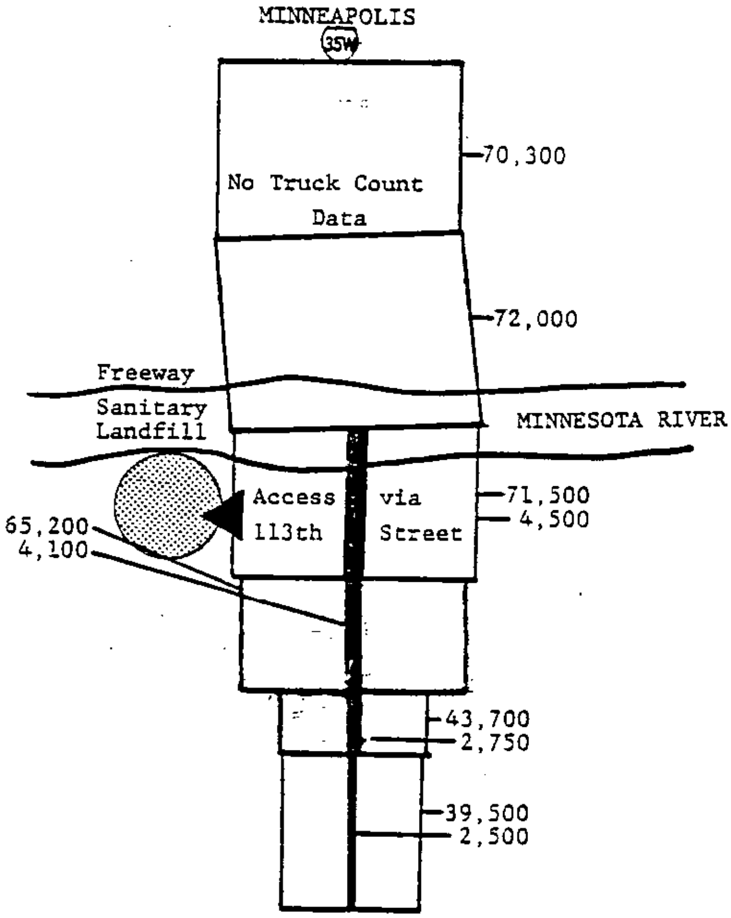
A telephone survey of municipalities located on principal haul routes to the landfill was conducted to identify issues relating to the hauling of refuse through their communities. The two major issues that have been identified are:

1. Traffic operational deficiency at the I-35W/113th Street interchange.

2. Litter about the I-35W/113th Street interchange.

Table III-28 summarizes the findings of this telephone survey.

AVERAGE DAILY TOTAL VEHICLE AND TRUCK TRIPS IN VICINITY OF FREEWAY SANITARY LANDFILL, 1978



Source: MnDOT

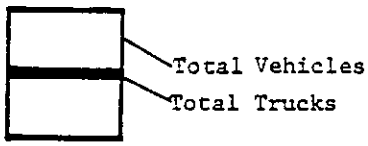


Figure III - 22

Table III-28
IDENTIFIED ISSUES RELATING TO REFUSE HAULING TO FREEWAY SANITARY LANDFILL

Municipality	Issue	Interviewee
Minneapolis	None	Roger Stolsom Department of Public Works
Bloomington	None	Russell Langseth Director of Public Works
Richfield	None	Thomas Morgan Public Safety Director
Burnsville	Traffic operational deficiency at I-35W/113th St. Interchange (short, steep-gradient access weaving lane) Litter about I-35W/113th Street Interchange (probable cause: sharply curved egress ramp)	Charles Siggerud City Engineer
Lakeville	None	James Robinette Director of Public Works

Transportation-related emissions and noise from vehicles using and opeating within the landfill are not considered to be significant problems due to the relatively few vehicles involved, the extended spacing of trips (approximately 15 "in/out" trips per hour. Minor adverse air quality and noise impacts are possible on wildlife habitat on and adjoining the Minnesota River in the vicinity of the landfill. These adverse air and noise impacts are discussed in detail under the respective chapter headings.

Regional access to the landfill could be periodically interrupted due to 100-year floods on the Minnesota River. However, the chance of a 100-year flood occurring on the stretch of the Minnesota River during the five-year extension of the use of the landfill is minor.

COLLECTION AND MANAGEMENT SYSTEM COSTS

Service Area Determination

Figure III-19 of the transportation section shows the approximate service area or "wasteshed" for the landfill. Within this area, at least a portion of the solid waste generated is disposed of at the landfill. Solid waste generated outside of this area would be disposed of generally at other landfill facilities. The service area determination is based on conversations with the landfill manager, private haulers and transfer station operators.

The Metropolitan Area relies on 11 sanitary landfills for disposal of its solid waste. Service area configurations for these landfills are based on decisions to use any one of a number of these sites by collection firms, individual haulers and municipal collection departments. These decisions are the result of a number of interdependent variables, the basis of which cannot easily be determined or generalized. Moreover, oncce a particular landfill has been selected as the final disposal place, that decision will ultimately be reflected in generator collection charges.

Some of the variables that will result in a decision to use a particular landfill include haul distance, fuel costs, disposal or tipping charges, condition and restrictions of access roads, operating hours, location of competing disposal facilities, governmental regulations and the landfill owner's individual management policies.

HISTORIC/ARCHAEOLOGICAL

Upon reviewing the landfill location, the Minnesota Historical Society concluded the site contains no historic, architectural, cultural or archaeological significance. There are no sites in the area which are on the National Register or eligible for inclusion on the National Register. However, in 1836 a Sioux Indian village, named Penichon's Village was located on the present site of the landfill.

AESTHETICS

General

Aesthetic concerns are generally more related to the collection of solid waste rather than its disposal, simply because solid waste disposal sites are usually located in out of the way, remote locations. However, where disposal sites are located near communities, residential areas, or heavily traveled roads, visual appearance will often affect human emotional reactions more so than perhaps other impacts that might be associated with a particular site. Other miscellaneous environmental effects associated with the aesthetics of a site include fugitive dust, litter, noise and odors.

Visual

Metropolitan Council staff visited several homes overlooking the Minnesota River Valley in Bloomington. The purpose was to determine whether the landfill was visible and if any adverse environmental effects were noticeable from the landfill. Residents did state that on hot, windy days an odor could be detected emanating from one or both of the landfills (see Air Quality, Section III). Some residents have a partial view of the landfill, however, the majority do not. Most residents did not find the landfill objectionable from a visual point of view.

Council staff also walked along the north side of the Minnesota River to determine the visual impacts of the landfill from this area. No view of the landfill was possible due to extensive vegatative growth along the south bank of the river. A limited view of the landfill is possible while driving along Highway 13 north of the landfill area.

The existing landfill operation is readily seen while driving along I-35W. Vegetative growth along the eastern portion of the landfill partially obstructs the view. A screening berm upon completion will initally block the view of the operation until the elevation of the fill area exceeds the elevation of the screening berm.

For a discussion of impacts from fugitive dust, litter, noise odors, refer to Air Quality, Sections III, IV and V.

IV. ENVIRONMENTAL IMPACTS OF THE PROPOSED ACTION

METEOROLOGY/CLIMATOLOGY, AIR QUALITY AND NOISE

METOROLOGY/CLIMATOLOGY

Primary Impacts

The construction and operation of the vertical expansion area at the landfill will have no effect on the large scale (macro-climate) meterological processes (i.e., prevailing winds, air masses, semi-permanent pressure centers) which basically determine the climate of the Minneapolis-St. Paul vicinity. Local factors, however, can affect the climate on a small scale (micro-climate). The construction and operation of the expansion area could have a small but essentially undetectable impact on the micro-climate since virtually all human activity influences the micro-climate to a certain degree. Routine maintenance, closure and post-expansion will have no significant impact on the existing climate of the area.

Direct or Indirect Effects That Cannot Be Avoided

The construction, operation, maintenance, closure and post-closure activities associated with the proposed expansion will have no direct or indirect effects on meteorology/climatology.

Irreversible and Irretrievable Commitment of Resources

No irreversible or irretrievable commitment of resources associated with meteorology/climatology will result from the construction, operation, maintenance, closure and post-closure activities of the proposed expansion area.

Relationship Between Local Short-Term Uses of Man's Environment and Maintenance and Enhancement of Long-Term Productivity

The construction, operation, maintenance, closure and post-closure activities associated with the proposed expansion will have no impact on short-term uses of man's environment and the relationship between maintenance and enhancement of long-term productivity.

Cumulative Impacts

The construction, operation, maintenance, closure and post-closure activities associated with the proposed expansion will have no cumulative impacts.

AIR QUALITY

Primary Impacts

Fugitive Dust -- The construction, operation, maintenance, closure and post-closure activities associated with the proposed expansion will generate fugitive dust. Increasing the elevation of the facility will increase the potential for fugitive dust emission problems. Activities such as landclearing, excavation, grading, stockpiling, moving heavy equipment over unpaved areas, the transport of cover materials and the movement and unloading of refuse trucks will generate fugitive dust. The construction of the screening berm will also generate fugitive dust.

The dust impacts from the new expansion should not vary significantly in magnitude from those resulting from the existing landfill if proper control measures are adhered to.

No significant adverse dust impacts are expected given proper operation of the facility. Special consideration to fugitive dust emission control will have to be considered during operational activities in open areas and as the landfll expansion nears final elevation.

Methane Gas -- The proposed expansion area has the potential for adverse methane gas impacts. Since an additional 1.2 million tons of refuse are being proposed for the disposal in the expansion areas, the increase in methane production will correspond accordingly. Based on lysimeter and full-scale landfill tests it appears that typical generation rates of .2 to .75 std. cu. ft. of methane/lb. can be expected from the landfill. Given that generation rate, an approximate gross production of 1.2 billion cu. ft. of methane gas can be expected from the landfill including the proposed expansion area. If structures are placed on the former fill area or near the perimeter of the landfill, there exists the potential for gas to accumulate in these structures to explosive concentrations.

Proper operation of the landfill should, however, minimize potential methane impacts to satisfactory levels. Methane gas that is produced within the landfill will be vented through the cover material and at the landfill perimeter, ultimately dissipating at harmless concentrations into the atmosphere. The existing landfill has not demonstrated methane gas problems. Care with respect to methane should be taken when considering the long-term use of the site.

Odors -- The proposed new expansion area has the potential for adverse odor impacts. However, proper design and operation of the landfill should minimize odor impacts to satisfactory levels. The existing landfill has demonstrated odor problems.

Other Air Pollutants -- The operation of equipment and the movement of refuse trucks into the expansion area will cause low levels of carbon monoxide, nitrogen oxides, sulfur oxides, and hydrocarbons to be emitted to the ambient air. However, these activities should not cause significant adverse impacts other than that occurring at the existing landfill. The proposed expansion will not increase the number of vehicular trips to the landfill or the operation of on-site equipment.

Direct or Indirect Effects That Cannot Be Avoided

No significant direct or indirect effects associated with the proposed expansion are anticipated to occur in the area of air quality.

Fugitive Dust -- Fugitive emissions from a landfill are an effect that cannot be avoided. However, state-of-the-art engineered operational procedures, can minimize a large percentage of the fugitive emissions.

Construction-related activities associated with the proposed expansion such as landclearing, excavation, grading, stockpiling, moving heavy equipment over unpaved areas and the transport of fill material will unavoidably generate fugitive dust for relatively short periods of time. However, dust impacts from construction activities will be minimal.

Routine operational and maintenance activities associated with the proposed expansion area will also generate fugitive dust in similar quantities to that produced by the existing landfill. Such activites in the past have not produced any serious fugitive dust problems. Therefore, no significant impact on the existing environment by these activities will result from fugitive dust emissions. Special care should be considered with respect to fugitive dust control when operating in open areas and as the landfill nears its final elevation.

No significant adverse impacts regarding transportation-related emissions will occur since the proposed expansion will not generate any increase in vehicular traffic to the site.

Some fugitive dust will be generated by activities associated with closure of the landfill including the proposed expansion area. However, these impacts will be minimal given proper control procedures. In the long run, dust emissions from the landfill will be reduced by revegetation.

Methane Gas -- The potential for adverse methane gas impacts will be increased by the proposed expansion area. The impact that methane gas generation has had on the environment at other landfills has generally been minimal. In some instances, methane gas has killed vegetation and trees at landfill sites. What appears to have happened in those instances is that methane has vented through fissures and eroded portions of the cover material in concentrations high enough to be toxic to vegetation. Operational practices employed at the landfill should prevent such impacts from occurring at the site. Care, however, should be taken when considering the long-term use of the site.

Odors -- The potential for adverse odor impacts will be increased by the proposed expansion. However, no significant adverse impacts are anticipated. The placement of cover material should minimize the emission of odorants into the air to satisfactory levels.

Other Air Pollutants -- Low levels of carbon monoxide, nitrogen oxides, sulfur oxides, and hydrocarbons will be emitted into the air by construction and operational activities associated with the proposed expansion area. The impacts from these pollutants should be negligible.

Irreversible and Irretrievable Commitment of Resources

No irreversible or irretrievable commitment of air resources will result from the activities associated with the proposed expansion area.

Relationship Between Local Short-Term Uses of Man's Environment and Maintenance and Enhancement of Long-Term Productivity

The short-term impacts due to construction of the proposed expansion area will involve potential fugitive dust and transportation-related emissions. No significant adverse air quality impacts on the maintenance and enhancement of the long-term productivity of the existing environment will result from the construction activities.

Short-term impacts due to operation of the proposed expansion areas involve potential fugitive dust emissions, odor and methane emissions, and transportation-related emissions. Air quality impacts on the maintenance and enhancement of the long-term productivity of the existing environment from these operations will be minimal.

Short-term impacts due to closure and post-closure activities of the proposed expansion area involve potential fugitive dust and transportation-related emissions. Adverse air quality impacts on the maintenance and enhancement of the long-term productivity of the existing environment from these operations will be minimal. Revegetation will actually reduce dust emission from the landfill in the long-term. If buildings are constructed on the site or near the perimeter at the landfill, there is the potential for gas accumulation in these structures in explosive concentrations. It may be necessary prior to closure of the facility to install a gas control system or a monitoring system to evaluate future on-site and perimeter control measures.

Cumulative Impacts

Fugitive Dust -- Fugitive dust will be generated by construction activities. However, construction activities will be performed in stages and will only be an intermittent source of dust. Consequently, no cumulative impacts are expected to occur.

Methane Gas -- The potential for cumulative impacts of methane will increase with the expansion of the landfill. However, the total cumulative effects are not expected to be significant. Particular consideration should be given during the closure period at the facility, to future requirements for methane control.

Other Air Pollutants -- Cumulative impacts are not expected to result from the emission of other air pollutants by the proposed expansion area.

NOISE

Primary Impacts

The construction, operation and closure of the proposed expansion area are activities that will produce noise. Noise will be generated by equipment used at the proposed expansion area for hauling, compacting and covering the refuse. The level of noise generated, however, by activities at the proposed expansion area should not be any greater than that of the current landfill operation.

The closest sensitive receptor (home) to the proposed expansion area is located approximately 2,900 feet from the southern border of the proposed expansion area. As a general rule, sound from an essentially localized source spreads out uniformly as it travels away from the source, and the sound level drops off at the rate of 6 dBA for each doubling of distance. Assuming that a bulldozer producing 88 dBA measured at 50 feet is operated at the proposed expansion area for an hour, noise levels at the receptor would be approximately 53 dBA. This is within the MPCA NAC-1 daytime hourly noise standard of 65 dBA. The preceding analysis does not take into account topographical variations which would further reduce noise at the receptor.

Activities associated with the proposed expansion areas will not affect nighttime noise levels since the landfill is not operational during the night.

Direct or Indirect Effects That Cannot Be Avoided

The generation of noise from the operation of a landfill is an effect that cannot be avoided. However, proper operation of the proposed expansion area should reduce noise impacts to satisfactory levels. There have been no adverse noise impacts associated with the existing landfill operation.

Irreversible and Irretrievable Commitments of Resources

No irreversible or irretrievable commitments of resources with regards to noise generating activities will occur from the proposed expansion area.

Relationship Between Local Short-Term Uses of Man's Environment and Maintenance and Enhancement of Long-Term Productivity

Short-term impacts due to construction, operation and closure of the proposed expansion area will involve potential noise emissions. The major long-term benefit of the proposed action will be to provide an environmentally acceptable outlet for the regional disposal of solid waste.

Cumulative Impacts

Cumulative noise impacts are not expected to result from the proposed expansion area.

WATER QUALITY

GROUNDWATER QUALITY

Primary Impacts

The average annual rate that leachate will be generated from the proposed expansion is estimated to be the same as for existing conditions in Section III, 5.0 inches per year during operation and 3.0 inches per year after closure (see Table III-14). The proposed action is a vertical expansion only. If operating procedures, final contours, cover and vegetation are not changed from the presently operating landfill, the infiltration rate into the landfill should not change significantly. Since annual leachate production is mainly dependent on the infiltration rate and the size of the infiltration area of the landfill and these two factors remain the same for the expansion, the leachate production rate should remain about the same.

The construction, operation, closure or post-closure of the proposed expansion should have no significant impact on the immediate groundwater hydrology of the landfill site. Groundwater gradients may, however, be influenced by nearby local water supply wells and extend the area of groundwater impact (see Appendix III).

The primary groundwater impact from the proposed expansion will be the increased length of time in which leachate will be produced and increased production of the total quantity of leachate produced over time. Theoretically, an increase in the amount of material leachable would proportionately increase the total volume of leachate eventually generated at the site. The total volume of leachate eventually produced at the site, therefore, should increase by about 95 percent, the percentage increase in capacity of the site. The leachate production rate should not increase significantly because of the vertical expansion, therefore the area where groundwater is potentially influenced by leachate should not increase significantly from the area of influence of the existing landfill. Refuse in the existing landfill probably has not reached field capacity. The proposed expansion should delay the time until the entire landfill reaches field capacity from approximately 1985 to 1999.

It is uncertain whether or not any of the leachate constituent parameters will increase in concentration due to the expansion. It is known that leachate strength generally decreases in time after refuse is buried and after decomposition has begun. However, specific predictions as to the exact time when concentrations are at a maximum are very difficult to obtain without more accurate field monitoring data. Therefore, the cumulative effect on leachate strength of placing new refuse within the vertical expansion on top of existing and presently decomposing material is virtually unpredictable.

Direct or Indirect Effects Which Cannot be Avoided

The area potentially impacted by the existing landfill is essentially the same as the area potentially impacted by the proposed expansion under the same assumptions. The landfill will produce leachate which will affect immediate local groundwater quality unless leachate is completely cut off by an impervious seal and leachate is collected over the entire landfill site. Groundwater gradients may, hwoever, be influenced by nearby local water supply wells and extend the area of groundwater impact (see Appendix III).

Irreversible and Irretrievable Commitment of Resources

The presence of the landfill and the floodway zoning ordinance restricts any further use of the ground water in the vicinity of the landfill (see discussion in Local Water Supply Quality). Although the expansion will extend the period of time the entire landfill will produce measurable leachate, this will not occur indefinitely. The length of this period of potential ground water contamination is unknown. Groundwater gradients may be influenced by nearby local water supply wells and extend the area of groundwater impact. Should this occur, water resources in the area affected would be precluded from domestic supplies.

Relationship Between Local Short-Term Uses of Man's Environment and Maintenance and Enhancement of Long-Term Productivity

The proposed action will not significantly change the impact of the existing landfill on groundwater quality other than to extend the period of time in which the landfill will produce measurable leachate. Groundwater gradients may, however, be influenced by nearby local water supply wells and extend the area of groundwater impact. The expansion will allow the landfill to operate for an additional three to six years while providing a method of disposal for the Region's refuse.

Cumulative Impacts

It is uncertain whether or not the expansion will change the concentrations of the constituent parameters of the leachate produced from the existing landfill. The results of the impact analysis showed no indications that the expansion would significantly increase the production rate of the leachate produced.

SURFACE WATER QUALITY

Primary Impacts

The construction, operation, closure or post-closure of the proposed expansion will not significantly impact the flood hydrology or low flow hydrology of the Minnesota River, or the hydrology of the drainage ditch east of the landfill. The vertical expansion is well above the 100-year frequency flood level and will not affect flooding on the Minnesota River.

The only significant primary impact from the expansion on quality of the Minnesota River should be prolonging the period of time in which the landfill will be producing measurable amounts of leachate. The ground water influenced by the leachate from the landfill will ultimately discharge into the river. Tables III-17 through III-20 and III-23 quantify the impact of the present landfill on the Minnesota River. The expansion should not add to the production rate of leachate. It is uncertain whether the expansion will change the concentrations since there presently is no method available to accurately quantify the effects of the expansion on these leachate concentrations.

Leachate contamination is presently significant in the eastern drainageway and water quality standards are being exceeded. Concentrations in the drainageway will probably not change significantly due to the expansion of the landfill. MPCA is considering reclassification of the drainageway to the proposed class 7: limited resource value.

Direct or Indirect Effects That Cannot be Avoided

As a result of the proposed expansion the landfill will discharge leachate over a longer period of time, extending any potential contamination hazard to the Minnesota River. The steady-state discharge of leachate to the river should not occur for a number of years, at least until after the landfill has reached field capacity. Given attenuation of the leachate by dilution in the river, the effect of leachate on the river will be negligible.

The river drainageway, and nearby wetlands will receive additional sediment as a result of filling the expansion, a direct effect that cannot be avoided. Sanitary landfilling by its very nature is a construction activity; surface runoff, particularly over fill areas yet to receive final cover and attain vegetative growth, will carry minor amounts of suspended solids to nearby receiving areas. Implementation of current operational procedures while filling the expansion should be sufficient to mitigate major erosion of these areas and sediment discharge to the pond areas. Although minor increases of sedimentation of the River and wetlands will occur as a result of the proposed actions, the net effect should be negligible.

Irreversible and Irretrievable Commitment of Resources

Minor leachate seeps and erosion of the landfill surface may degrade the drainageway and nearby wetlands to some degree. These areas may further degrade from operations associated with the filling of the expansion area. The net effect, however, of the proposed actions should be negligible since the drainageway and wetlands are not within the area of proposed construction.

No other significant irreversible or irretrievable commitments of surface water resources are associated with the proposed filling and construction activities.

Relationship Between Local Short-Term Uses of Man's Environment and Maintenance and Enhancement of Long-Term Productivity

The long-term use of the nearby wetlands may be impacted by the filling activities of the expansion operation. Depending on their use, the wetlands should be carefully monitored after closure of the landfill. Particular attention should be given to leachate seeps that might occur and flow to these areas since the wetlands are very sensitive and can be used as secondary indicators of leachate contamination of surface and discharging groundwaters.

Significant long-term impacts on the Minnesota River should not result from the expansion. However, the proposed expansion should delay the time it takes the entire landfill to reach field capacity and thereby prolong the period of potential pollution. Although there are no indications that production rate or concentration of leachate will increase significantly due to the expansion, the total amount of leachate over time will increase with the expansion.

These negative impacts must be balanced with the advantage of the additional 1,860 acre-feet of disposal capacity provided by the expansion.

Cumulative Impacts

There should be no or very minor cumulative impacts on the water quality of the Minnesota River from the expansion of the existing landfill by itself. Table IV-1 shows the estimated cumulative impact of both Freeway and Burnsville landfills assuming that both expansions are approved. The combined effect of the landfills with expansions increases ammonia concentration in the river by 43 percent, Boron by 38 percent, BOD by 19 percent, barium by 19 percent and phenols by 13 percent. Other parameters are affected by less than 10 percent. Although the combined effects of the landfills significantly increase some parameters they never drive them over water quality standards.

There are no other cumulative impacts on surface water resources resulting from activities associated with the proposed expansion.

LOCAL WATER SUPPLY QUALITY

Primary Impacts

The area of groundwater impacted by leachate from the landfill is currently influenced by two factors. The area between the landfill and the river is designated as floodway. No development in the floodway is allowed and therefore no future wells will be placed in this area. Commercial and industrial areas to the south are served by municipal water supplies which are taken from deep wells located between Cliff Road and Burnsville Parkway east of I-35W and within the downtown area of Savage. The Savage area wells are upgradient and outside the landfill's area of groundwater impact and no impact from the landfill's expansion should occur. Distance alone appears to be a sufficient mitigating measure to any effect of drawdown from these wells. Moreover, the existence and operation of the Kraemer

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Table IV-I

CUMULATIVE IMPACT OF FREEWAY AND BURNSVILLE LANDFILLS WITH THEIR EXPANSIONS

7-Day Duration - 10-Year Frequency Low Flow

PARAMETER	Minnesota River UPSTREAM CONT.	Freeway Landfill LEACHATE CONT.	Freeway Landfill LANDFILL LOADING TO RIVER CFSxCONC	Burnsville Landfill LEACHATE CONT.[1]	Burnsville Landfill LANDFILL LOADING TO RIVER CFSxCONC	TOTAL LOADING TO RIVER FROM FREEWAY & BRNSVLE.	DOWNSTREAM CONT.	Minnesota River % INCREASE DUE TO LANDFILLS	Minnesota River MPCA WATER QUALITY STANDARD
Copper mg/l as CU	12	31[7]	1.36	50	1.85	3.21	12.04	.33	10
Turbidity NTU	76.6	150[7]	6.6	130[6]	4.81	11.4	76.7	.13	25
Conductivity umhos/cm @25 deg. C.	730[2]	5500[7]	242.0	6100[2]	225.7	467.7	737.6	1.0	1000
Chloride mg/l as Cl	45	1620[7]	71.3	1610[6]	59.6	130.9	47.4	5.3	100
PH	8.1	7.0[7]	-	6.0[6]	-	-	-	-	6.5-8.5
Ammonia mg/l as N	0.70	77[7]	3.4	350[6]	13.0	16.4	1.00	43	1.5
Total Dissolved Solids mg/l	573	5346	235.2	5346	197.8	433	580	1.2	700
Total Alkalinity mg/l as $CaCO_3$	258	1225	53.9	1225	45.3	99.2	276.5	7.2	305
Sulfate mg/l as SO_4	123	1153	50.7	1080[6]	40.0	90.7	124.5	1.2	10
Total Hardness mg/l as $CaCO_3$	368	1600	70.4	1600	59.2	129.6	369.9	.52	250
Sodium mg/l as Na	34.3	357	15.7	357	13.2	28.9	34.8	1.5	122[4]
Cadmium mg/l as Cd	10	30	1.32	30	1.1	2.4	10	0	10
Lead mg/l as Pb	11	100	4.4	100	3.7	8.1	11.1	.9	50
Arsenic mg/l as As	8.6	ND[5]	-	ND[5]	-	-	-	-	50
Selenium mg/l as Se	2.8	ND[5]	-	ND[5]	-	-	-	-	10
Fluoride mg/l as F	0.32	.4	.018	0.4	.015	.033	.32	0	1.5
Phenols mg/l	0.004	.025	.0011	0.77	.028	.029	.0045	12.50	0.1
Chromium mg/l as Cr	0.007	.05	.0022	0.05	.0019	.0041	.0071	1.4	0.05
Barium mg/l as Ba	0.16	2.25	.099	2.25	.083	.182	.163	1.8	1
Boron mg/l as B	0.16	4.7	.21	3.0[6]	.111	.32	.166	3.8	0.5
Cyanide mg/l as CN	0.4	.028	.0012	0.028	.0010	.002	.4	-	0.02
Silver mg/l as Ag	<10	10	.44	10	.37	.81	10	-	50
BOD, mg/l	5.3	35[7]	1.54	1500	55.5	57.0	6.3	18.9	-
COD, mg/l	42.5	464[7]	20.4	4490	166.1	186.5	45.9	8.0	-

1. Median values from data in Clark & Piskins, Environmental Geology, Volume 1, 1977, unless otherwise noted.
2. 0.65 x specific conductance = total dissolved solids (mg/l).
3. Turbidity is assumed to be a linear function, this value may be considered to be a loading number if one NTU is assumed to equal one mg/l.
4. MPCA standard is based on sodium being less than 60% of the total equivalents of cations. To calculate the standard, the hardness was assumed to be the other major cation source, and all of the hardness was assumed to be calcium ions.
5. Not detectable
6. Burnsville Landfill seepage concentration May 3, 1979.
7. Freeway Landfill seepage measurement.

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quarry dewatering facility provides a barrier or intercept to any potential groundwater movement between the landfill and the Savage area wells.

Appendix III discusses the effects of drawdown and groundwater reversal from Burnsville's water supply well field. The mathematical model developed for the analysis shows the Jordan aquifer extending midway beneath the Freeway Landfill to be influenced hydraulically by the city's wells. The model further identified the limits of leakage from the Shakopee into the Jordan to be about 500 feet south of the landfill. The mathematical model is, however, semi-empirical in nature and the effects of drawdown toward the Freeway Landfill are at best predictive and not based on observed conditions. In addition, the extent and magnitude of horizontal flow into the Shakopee formation has not been determined. Horizontal flow in the Shakopee towards the large zone may exist and may allow the rapid and extensive contaminant transport to the area where leakage occurs in the Jordan.

As discussed in Section III Water Quality, two wells within the area potentially influenced by leachate from Freeway Landfill are the U.S. Salt Company and Freeway Landfill wells. However, as long as the pumping rates from these two wells do not increase and no additional wells are located in the immediate area, they should continue to remain free of leachate influence based on the groundwater flow characteristics underneath the landfill. Section V recommends expanding the monitoring of these water supply wells.

The potential does exist for impacting water supply wells if additional wells of sufficiently high capacity are placed close enough to the landfill. The likelihood for placing such wells is limited since the major portion of the area is in the floodway, the area to the south is served by municipal water supply systems.

Direct or Indirect Effects Which Cannot be Avoided

The vertical expansion will increase the time frame in which leachate contamination from the landfill will be a potential hazard and the total quantity of leachate produced over time. The quality of leachate, however, may not be affected. The landfill area has been identified to be influenced hydraulically by Burnsvill'e wells.

Irreversible and Irretrievable Commitment of Resources

The landfill has been identified to be influenced hydraulically by Burnsville's wells.

Relationship Between Local Short-Term Uses of Man's Environment and Maintenance and Enhancement of Long-Term Productivity

The impact on the long-term use of immediate groundwater resources to the south ofthe landfill has not been determined (refer to Appendix III).

Cumulative Impacts

If future high capacity water supply wells are located near the landfill they could be adversely impacted.

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TERRESTRIAL AND AQUATIC ECOLOGY

VEGETATION AND WILDLIFE

Primary Impacts

Construction activities associated with the proposed vertical expansion include the construction of a screening berm along the eastern edge of the landfill. Construction of the screening berm will remove vegetative cover along the eastern border of the landfill. No further vegetation will be removed from the landfill except areas that are already presently permitted for future filling.

Various wildlife populations are likely supported by vegetative cover on existing permitted areas of the landfill and the adjacent surrounding area. The creek bed area adjacent to the eastern boundary of the landfill and the willow/cottonwood shrubs and trees which have not been disturbed on the existing permitted areas of the landfill, are habitats and food sources for cottontail rabbits and rodents, and nesting area for songbird species. These and other species utilizing these areas will be displaced during the construc-tion of the screening berm and the filling of the remaining permitted areas of the landfill including the vertical expansion area. The area between the eastern boundary of the landfill and I-35W is not very wide, it is therefore likely that most of the present wildlife inhabiting the area will be pushed out or severelyrestricted. As filling moves closer to the eastern boundary, the movements of deer, fox and other mammals will be restricted, primarily during daylight hours. The proposed vertical expansion by itself will have no greater affect on wildlife than filling the remaining permitted areas of the landfill except that it will extend the time period before the habitat is restored so that it can support wildlife again.

The indigenous vegetation and associated wildlife species located on the landfill and adjacent area are not unique to these areas. The total individual members of the affected populations are very small in comparison to the total available areawide resources. In effect, the proposed vertical expansion and berm area construction activities will not result in significant direct impacts on terrestrial populations.

The operating phase of the landfill with respect to the proposed expansion area will consist of, for each successive work area, actual waste placement, cover placement, and environmental control operations (i.e., litter control, dust control, etc.). Day-to-day operations will affect a larger area than the active face area due to refuse truck and landfill equipment traffic on the access points. Wildlife populations, which have presumably adjusted to existing landfill activities, will not be additionally affected by the expansion area operations.

The closure phase of the expansion area will consist of, for each successive work area, final cover placement and revegetation activities. Since the closure period is relatively brief, such activities have only very minimal impacts on terrestrial vegetation

The closure phase of the expansion area will consist of, for each successive work area, final cover placement and revegetation activities. Since the closure period is relatively brief, such activities have only very minimal impacts on terrestrial vegetation and wildlife.

The potential, however, exists for more substantive impacts on terrestrial populations, and particularly terrestrial flora, due to biological processes inherent at a landfill site during the post-closure period. Specifically, decomposition of landfilled organic materials results in or contributes to leachate generation and methane gas production. For surface oriented flora and fauna, leachate generation would not be expected to have significant impacts. Methane gas production, on the other hand, has resulted in numerous cases in the creation of anoxic root zone conditions resulting in slow growth or die-off of associated plant species. Potential impacts are generally unpredictable in practice, as well as, generally localized in extent. Given the site topography (elevated), type of cover soil (relatively impermeable) and site history (no evidence of methane problems) no substantial impacts are expected either on or off-site. Should substantial vegetative stresses develop, a number of mitigative measures are available (see Section V).

As discussed in the Water Quality section, the proposed expansion will probably delay the time it takes the entire closed landfill to reach field capacity thereby extending the period of any potential vegetative damage. It is unknown whether or not leachate concentrations will increase due to the expansion.

Direct or Indirect Effects That Cannot be Avoided

The existing landfill is already presently permitted to remove all vegetation that would be affected by the vertical expansion, therefore, no further direct or indirect impacts on vegetation and wildlife are predicted from this activity. Construction of the screening berm will remove a minor amount of vegetative growth along the eastern boundary of the landfill, a direct effect that cannot be avoided. The subsequent impact of this activity, however, on vegetation and wildlife will be negligible.

Irreversible and Irretrievable Commitments of Resources

No irreversible or irretrievable commitment of vegetative and wildlife resources is implicated in the vertical expansion of the landfill.

Relationship Between Local Short-Term Uses of Man's Environment and Maintenance and Enhancement of Long-Term Productivity

The primary short-term impacts associated with the vertical expansion are negligible since most primary impacts on vegetation and wildlife have occurred from filling the existing landfill. In the long-term, revegetation of the site would occur. However, normal plant successional growth patterns could potentially be modified due to the combined earth/decomposing waste substrata available for plant growth.

Operation of the proposed landfill expansion area eliminates no new acreage from natural ecological production. It does, however, extend the time period before the habitat is restored so that it can support vegetation and wildlife again. Operation should result in the secure disposal of an additional 1,860 acre feet of refuse over a four- to six-year period.

No significant short-term impacts are expected due to closure and post-closure activities of the vertical expansion. Long-term use for the 126-acre landfill is designated as general and limited industrial area.

Cumulative Impacts

No significant cumulative impacts on vegetative and wildlife resources are expected from the activities of filling of vertical expansion area and the construction of the screening beam.

AQUATIC ECOLOGY

Primary Impacts

As discussed in the Water Quality section, the proposed expansion will probably delay the time it takes the entire closed landfill to reach field capacity thereby extending the period of any potential aquatic ecology impacts. It is unknown whether or not the expansion will cause increases in leachate concentration, or if it occurs, for what specific parameters.

The water body of primary concern is the Minnesota River. Most fish and other mobile organisms in the river should be able to avoid the area near the drainage ditch discharge and thereby escape any potentially harmful effects of elevated levels of the leachate constituents. Attached and rooted phyton and sensitive benthos were not identified near the shoreline in the area of leachate influence and therefore there should be no primary impacts on these organisms.

The only other water body potentially affected is the drainage ditch. The primary impact of the expansion would be limited to the extension of the period of leaching from the landfill. There is no indication of a change in the extent of the landfill's impact on the drainage ditch due to the expansion with respect to production rate or quality of leachate.

Direct or Indirect Effects Which Cannot Be Avoided

The most significant effect of the expansion on aquatic ecology is leachate contamination of the River. Although the period of threat from leachate contamination may be extended, there is no indication that the expansion will change the production rate or quality of leachate.

Irreversible and Irretrievable Commitments of Resources

There are no irreversible commitments of resources since any river system has the potential to recover from point source inputs, especially considering the uncertainty of increased loadings from the expansion and the finite nature of the landfill's field capacity.

Relationship Between Local Short-Term Uses of Man's Environment and Maintenance and Enhancement of Long-Term Productivity

There will be a certain minimal risk to the long-term aquatic ecology of the river associated with the expansion. This continued leachate pollution into the river will only slightly hamper the general effort to improve the river's water quality. The beneficial aspects of a means of disposal of municipal solid waste is also a long-term advantage of the expansion.

Cumlulative Impacts

Any impacts on organisms in the river resulting from the proposed expansion would be in addition to those impacts currently experienced due to leachate from the permitted landfill. Also any impacts of the expansion would be in addition to impacts caused by other pollution sources along the river.

WETLANDS

Primary Impacts

There is potential for soil erosion from the activities of the proposed actions, with sediment potentially entering adjacent off-site wetlands. Leachate and landfill gas production will occur during operation, closure and post closure activities associated with the proposed expansion area. Gas migration cannot occur through saturated soil and, as such, there would be no expected impact on the wetlands via horizontal or vertical gas migration. Although leachate production may occur for a number of years, adequate final cover should substantially reduce the production of leachate.

Direct of Indirect Effects That Cannot be Avoided

The generation of leachate and methane gas is inevitable; however, the impact of leachate and gas on off-site wetlands will be limited due to the distance and landfill design. No significant adverse impacts are expected.

Irreversible and Irretrievable Commitments of Resources

No additional wetland resources will be irrevocably committed because expansion area activities will not occur in the wetlands, and mitigative measures to control sedimentation will be employed.

Relationship Between Local Short-Term Uses of Man's Environment and Maintenance and Enhancement of Long-Term Productivity

In the short-term, the off-site wetlands will be minimally stressed by activities of the proposed expansion and berm areas. In the long-term, the proposed action will provide the Metropolitan Area with a continued outlet for the disposal municipal solid wastes.

The use of appropriate mitigative measures will limit short-term and long-term impacts on the wetlands. No significant adverse impacts are expected.

Cumulative Impacts

Current surface water runoff will remain the same with the proposed expansion. Hills of refuse will be constructed with faily steep slopes. The surface runoff is directed to adjacent drainage ditches which then flow into the Minnesota River north of the site.

The present condition of the off-site wetland area as a viable functioning upland wetland ecosystem would be affected by expansion of the existing landfill. However, the apparent lack of significant impacts of this area by the existing landfill and the environmental controls currently used and proposed for the expansion and berm areas suggest that additional impacts would not be significant.

RARE AND ENDANGERED SPECIES

Primary Impacts

No significant impacts on rare or endangered species will occur on-site or the surrounding area as no bald eagles have been sited on or close to the landfill area. The food chain within the River will not be substantially impacted by any leachate constituents due to the dilution factor of the River water volumes.

Direct or Indirect Effects That Cannot be Avoided

There are no bald eagles and peregrine falcons or rare or endangered species associated directly with the landfill area; therefore, no impacts on such populations will occur.

Irreversible and Irretrievable Commitments of Resources

No bald eagles and peregrine falcons or rare or endangered species are associated with the landfill area; therefore, no commitments of such resources will be involved with the proposed actions.

Relationship Between Local Short-Term Uses of Man's Environment and Maintenance and Enhancement of Long-Term Productivity

No significant adverse impacts on neighboring populations of rare, endangered, or "unusual" species are expected.

Cumulative Impacts

No cumulative impacts on rare or endangered species are predicted.

SOCIO-ECONOMICS

LAND USE, ZONING

Primary Impacts

A significant impact of the proposed action on future land use is the delay of Freeway's plan to utilize the land for other purposes such as general industrial purposes. If the expansion is granted, the City will have to delay any development by approximately three to six years. The proposed actions are consistent with present land use and zoning for the area.

The only potential significant impact of the landfill on the Minnesota Valley National Wildlife Refuge and Recreation Area would be increased water quality degradation caused by leachate contamination. Analysis of the existing landfill conditions indicates that dilution in the river will be sufficient to reduce any significant threat of leachate pollution even during low flow conditions.

For a further discussion, see Surface Water Quality, Section III.

Direct or Indirect Effects that Cannot be Avoided

The only direct or indirect effect of the expansion on land use will be the delay in developing the land for other purposes.

Irreversible and Irretrievable Commitment of Resources

No irreversible or irretrievable commitment of resources relating to land use or zoning will result from the proposed action.

Relationship Between Local Short-Term Uses of Man's Environment and Maintenance and Enhancement of Long-Term Productivity

The filling of the proposed vertical expansion area will have no significant impact on the short-term uses of man's environment. Upon the landfill's closure, the landfill will be used for commercial and general industrial purposes which will enhance the long-term productivity of the area.

Cumulative Impacts

The proposed action will not result in any cumulative impacts that are related to land use or zoning in the area.

PUBLIC FACILITIES AND SERVICES

Primary Impacts

There are no significant primary impacts related to public facilities that will result from the filling of the vertical expansion area at the landfill.

The only potential significant impact of the landfill on the Minnesota Valley National Wildlife Refuge and Recreation Area would be increased water quality degradation caused by leachate contamination.

Analysis of the existing landfill conditions indicates that dilution in the river will be sufficient to reduce any significant threat of leachate pollution even during low flow conditions.

For a further discussion, see Surface Water Quality, Section III.

Direct or Indirect Effects that Cannot be Avoided

There are no significant direct or indirect effects relating to public facilities that will result from the expansion of the landfill.

Irreversible and Irretrievable Commitment of Resources

There are no irreversible or irretrievable commitment of resources related to public facilities that will result from the expansion of the landfill.

Relationship Between Local Short-Term Uses of Man's Environment and Maintenance and Enhancement of Long-Term Productivity

The proposed expansion of the landfill would have the short-term benefits of the secure disposal of an additional 5.0 million cubic yards of municipal refuse and thereby eliminate the need for alternative disposal methods.

Cumulative Impacts

The proposed action will not result in any cumulative impacts that are related to public facilities in the area.

TRANSPORTATION

Primary Impacts

The proposed expansion of the landfill will result in extending the use span of this landfill rather than to accommodate greater annual volumes of refuse. Also, the existing wasteshed boundaries of this landfill are not anticipated to change significantly as the result of the proposed action. Consequently, transportation-related impacts associated with the proposed action will reflect existing rather than new additional impacts. The existing impacts have been identified as a traffic operational deficiency at and either about the I-35W/113th St. interchange.

Direct or Indirect Effects that Cannot be Avoided

The proposed action will extend the use of the established haul routes by approximately five years.

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Irreversible and Irretrievable Commitment of Resources

Irreversible and irretrievable commitment of resources associated with the hauling of refuse to the landfill will be petroleum consumed for transport.

Relationship Between Local Short-Term Uses of Man's Environment and Maintenance and Enhancement of Long-Term Productivity

The five-year extended use of the established haul routes will have no significant impact on short-term uses of man's environment and the relationship between maintenance and enhancement of long-term productivity.

Cumulative Impacts

The five-year extended use of the designated haul routes resulting from the proposed acction will have no significant cumulative impacts.

COLLECTION AND MANAGEMENT SYSTEM COSTS

Primary Impacts

Filling of the proposed expansion area will extend the life of the landfill by about three to six years. Area haulers who normally use this site can continue to do so for the additional time period. Area customers serviced by haulers using the landfill will continue to be charged collection fees based in part on the disposal charges set at Freeway. Disposal charges presently at the landfill are higher than surrounding competing landfills.

Filling of the proposed expansion area will also extend the time frame for the need to develop new landfills in the Region. Hennepin County (1979) found, for example, that it will cost between $3.5 and $4 million to develop a 120-area parcel that could handle 500 tons of refuse per day. When legal, administrative and engineering expenses are added, landfill development costs could reach $4.2 and $5.6 million. Landfill development costs are reflected in disposal charges and ultimately in generator collection rates. Minimal development is necessary to use the Freeway expan-sion area; filling of this area will, therefore, help to maintain present collection rates in the Region by avoiding costs of developing new land disposal areas.

There are no adverse primary impacts on collection and management system costs that can be attributed to filling the proposed expansion area.

Direct or Indirect Effects that Cannot be Avoided

Filling of the proposed expansion area will extend the life of the landfill and subsequntly provide additional capacity for area haulers. This will, in turn, lessen the need and expense for new landfills and changes in routing and additional fuel costs for area haulers. Filling of the proposed expansion area will, therefore, help meet future regional land disposal capacity needs and help keep collection rates down.

There are no adverse direct or indirect effects on collection and management system costs that can be attributed to the proposed action.

Irreversible and Irretrievable Commitment of Resources

There are no irreversible or irretrievable commitment of resources with respect to collection and management system costs that can be attributed to the proposed action.

Relationship Between Local Short-Term Uses of Man's Environment and Maintenance and Enhancement of Long-Term Productivity

The proposed action will not result in any impacts on collection and management system costs that would adversely affect either short-term or long-term uses of the site for land disposal or the long-term productivity of the surrounding environment.

Cumulative Impacts

The most significant cumulative impact of continued disposal at the landfill as a result of using the expansion area, is the extension of the Metropolitan Area's landfill capacity. The expansion will add about nine months of life to the metropolitan disposal system. Filling the expansion area will, therefore, lessen the need to develop new landfills sooner and help to maintain present land disposal charges and collection rates.

HISTORICAL/ARCHAEOLOGICAL

Primary Impacts

No historical or archaeological impacts are associated with the present site. The proposed action is contained within the perimeter of the landfill property. Therefore, no historical or archaeological impacts will be associated with the expansion of the present site.

Direct or Indirect Effects that Cannot be Avoided

The present site contains no historical or archaeological significance, therefore, no historical or archaeological impacts will occur due to the proposed action.

Irreversible and Irretrievable Commitment of Resources

No irreversible and irretrievable commitment of resources with respect to historical and archaeological impacts of the facility will occur as a result of the proposed action.

Relationship Between Local Short-Term Uses of Man's Environment and Maintenance and Enhancement of Long-Term Productivity

There are no historical and archaeological impacts associated with the proposed action that will adversely affect the maintenance and enhancement of the long-term productivity of the area.

Cumulative Impacts

No cumulative impacts relating to historical and archaeological significance are predicted.

AESTHETICS

Primary Impacts

Filling of the proposed expansion area will result in the landfill operating about three to six years longer. Nearby homes that look directly upon the landfill will be exposed to the operation of the facility for these additional years and any subsequent visual impacts. Such impacts will be greater than those already present since the final vertical elevation of the expansion will create an isolated mound. The landfill will be more visible from the surrounding area, especially I-35W and Highway 13. The landfill visually will not be compatible with the surrounding topography.

Direct or Indirect Effects that Cannot Be Avoided

Visual impacts from operation of the landfill will occur for a longer time period as a result of the filling of the expansion area, a direct effect that cannot be avoided. The expanded landfill will be much more visible from the surrounding area, especially from I-35W and Highway 13.

Irreversible and Irretrievable Commitment of Resources

No irreversible and irretrievable commitment of resources with respect to visual impacts of the facility will occur as a result of the proposed action.

Relationship Between Local Short-Term Uses of Man's Environment and Maintenance and Enhancement of Long-Term Productivity

There are no significant aesthetic impacts associated with the proposed action that will adversely affect the maintenance and enhancement of the long-term productivity of the existing surrounding environment. As portions of the landfill reach final fill elevations they will receive final cover material and be seeded for vegetation purposes. This should help to lessen the adverse visual impacts associated with operation of the facility.

Cumulative Impacts

Cumulative impacts are possible for those homes that overlook both the Burnsville and Freeway Landfills. Approving expansions to both landfills will expose the operation of both facilities to some area receptors for a longer time period. The Freeway Landfill will be more visible from I-35W and Highway 13.

V. MITIGATION MEASURES TO REDUCE OR MINIMIZE SIGNIFICANT ADVERSE EFFECTS

METEOROLOGY/CLIMATOLOGY, AIR QUALITY AND NOISE

METEOROLOGY/CLIMATOLOGY

The activities associated with the construction, operation and closure of the proposed expansion areas will not produce any significant adverse effects on the existing climate. Consequently, no mitigative measures are necessary.

AIR QUALITY

As noted in Section IV, the construction, operation and closure of the proposed expansion area will result in minimal production of fugitive dust, odors, and methane gas. In addition, the construction of the screening berm will produce a minimal amount of fugitive dust.

Current operational procedures used at the existing landfill should be sufficient to handle most of the air emission problems associated with the proposed expansion areas. In addition, the surrounding topographic and land use features of the area should provide adequate protection from adverse impacts on local receptors.

It was found that there is a potential for adverse impacts from methane gas after closure of the landfill, if gas should accumulate in new structures on the property because of the additional gas production in the proposed expansion areas. It may be necessary, prior to closure of the facilities to install a gas monitoring system to evaluate any future requirements for on-site and perimeter gas control measures. Such a monitoring program will also help determine future use of the property and whether new structures should be placed on the property.

Odors emanating from the landfill have been noticed by residents directly across the river. The application of proper amounts of daily cover material are sufficient to deal with this.

The following are other mitigative measures that might be undertaken to further reduce potential impacts from air pollutants, especially blowing litter and dust problems that might occur as a result of the expansion.

- Provision of dust control via surface paving
- Reduction of dust generation via prompt revegetation
- Utilization of dust retardants and/or water to minimize dust from temporary dirt roads or other exposed areas
- Stepped-up enforcement by the MLPA
- Limiting the size of the working face

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- Provision of temporary fencing

- Provision of regular maintenance operations

Methane gas is presently naturally vented through the existing cover material at the site. If leachate controls, such as a tighter cover material, are implemented at the site, methane buildup could become a problem. In such instances, the following mitigative measures could be employed:

1) Utilization off permeable trenches to vent gas to the atmosphere. These can be used in combination with impermeable barriers.

2) Utilization of a gas collection system involving either individual well points or a combined well point grid system and utilizing either an induced exhaust or recharge system.

3) Development of a methane monitoring program at regularly-spaced intervals around the landfill perimeter and at any buildings or other enclosed structures on or immediately adjacent to the landfill site. Such sampling should be done on at least a quarterly basis, with more frequent monitoring performed when indicated, forr example, during periods of frozen cover.

NOISE

As noted in Section IV, the construction, operation, and closure of the proposed expansion area will not produce any adverse noise impacts. Consequently, no mitigative measures are necessary.

WATER QUALITY

GROUNDWATER QUALITY

Groundwater monitoring since 1971 has shown some degradation of groundwater immediately underneath the landfill. However, ultimate discharge of ground water is to the Minnesota River, which has not shown measurable contamination that can be attributed to Freeway Landfill.

A liner and leachate collection system could be installed under the proposed expansion area of the landfill, however, the benefits to the Minnesota River would most likely be minimal.

The expansion of the landfill will result in the production and generation of more leachate by the facility. One or more of the following leachate controls could be employed to minimize these groundwater impacts and provide a second level of protection at the facility.

1) Improving surface water runoff to minimize infiltration of precipitation into the landfill and, thus, reduce the consequent generation of leachate. Such controls include grading of the final surface of the landfill to encourage runoff and prevent pooling and infiltration, providing prompt surface compaction of all disturbed soil surfaces, and providing prompt initiation of seeding and revegetation procedures.

2) Modifying the daily and final cover approach. Thicker, less permeable, or more frequent cover applications would result in decreased leachate generation. Less permeable cover can be achieved in a number of ways including using additional compaction, increasing surface slope and blending in other less permeable soils.

3) Utilizing a thicker or less permeable final cover consisting of clay overlain by six inches of sandy loam topsoil to promote vegetative growth.

4) Increasing the emphasis on site maintenance primarily oriented towards maintaining cover integrity, including periodic regrading and reseeding of slopes.

5) Installing a membrane or other constructed liner to prevent the downward migration of leachate, and thus lessen the possibility of leachate contamination of groundwater. Liners may be constructed from a variety of materials, including synthetic materials and natural clay materials or specified clays such as montmorillonite, illite and lcaolinite.

6) Impermeable vertical barriers could potentially reduce migration of leachate and could be used in conjunction with liner systems. A variety of materials, including specialized clays, polymers, membranes, volclay panels and sheet piling have been used to construct impermeable barriers.

7) Leachate collection and treatment systems may be employed to collect and treat leachate to remove potential contaminants. Collection systems include pipe grids, well points, permeable and impermeable trenches and pump systems. Treatment methodologies include various physical, biological and chemical methodologies and potentially, recirculation.

8) Developing a more detailed surface water and groundwater sampling program to indicate potential leachate contamination.

9) Increasing MPCA's inspection and enforcement activities.

10) Utilization of a more stringent closure plan consisting of thicker or more impermeable final cover and development of a more definitive post-closure plan.

SURFACE WATER QUALITY

Surface water monitoring has shown seasonal degradation of water quality in the drainage ditch east of the landfill. Analysis of the impact of expansion on the surface water quality revealed no measurable change in leachate parameters.

A leachate treatment system could be installed at the end of the drainage ditch just before the river. However, the benefits to the Minnesota River would most likely be minimal and the additional cost to the project would be prohibitive.

A method of mitigating the surface toe seeps is to promote better surface runoff conditions and to minimize percolation. This procedure is already being implemented at the landfill and should continue.

LOCAL WATER SUPPLY QUALITY

The two private wells located within the area potentially influenced by leachate, U.S. Salt and Freeway landfill truck shed, were installed below the level where groundwater is influenced by leachate. Nonetheless, a stepped up monitoring program for these two wells is recommended as a mitigative measure. They should be sampled on an annual basis and results reported in conjunction with the landfill monitoring data.

Although development is prohibited within the area of potential leachate influence between the landfill and the Minnesota River due to floodway designation, no future wells should be allowed in the immediate vicinity to prevent any potential drawdown effect in the area of the landfill.

The drawdown of the City of Burnsville's wells is close to the identified zones of leachate influence for the existing and expanded landfill. Secondary levels and protection could be provided to minimize the potential for impacts. Levels of controls that could be employed include those discussed above under groundwater and the following:

1) Installation of monitoring wells immediately south of the landfill and stepped-up monitoring of the City's wells;

2) Reducing the pumpage rate of the City's wells;

3) Installation of one or more groundwater control wells or barrier wells to control and influence the movement of groundwater in the vicinity of the landfill.

The operation of the dewatering well at the quarry provides a secondary level of protection by intercepting groundwater movement between the landfill area and the City of Burnsville's water supply well field area. Continued operation of this facility could provide a long-term secondary mitigation of any potential groundwatr impacts in the vicinity of the well field.

TERRESTRIAL AND AQUATIC ECOLOGY

CONSTRUCTION

The two major impacts associated with the construction phase of the vertical expansion and screening berm are sedimentation that would occur in surface water runoff and removal of vegetation. Sanitary landfilling is by its very nature a construction activity and these impacts would be difficult to avoid. The construction activities of the proposed actions should, however, avoid equipment encroachment on nonlandfill acres.

OPERATION

Impacts associated with operation of the proposed vertical expansion area would include impacts on vegetation and wildlife as caused by surface runoff, leachate production and methane gas migration. A potential mitigative measure might include utilization of surface runoff controls to minimize direct surface runoff drainage into the wetland areas and to lessen infiltration at the site and subsequently quently reduce the rate of the production of leachate and methane gas (i.e., berms, ponding, routing of runoff away from wetland areas, proper cover placement, grading and seeding practices).

Freeway operations have recently been upgraded to include daily cover. This practice should be continued as a mitigating measure to reduce leaching potential from the existing fill area and the expansion. An additional potential mitigative measure might include utilization of a leachate treatment system at the end of the easterly drainage ditch before discharging to the river. Aquatic impacts due to proposed expansion should be negligible and therefore the benefit of this costly treatment system on aquatic ecology may not be noticible.

CLOSURE AND POST-CLOSURE

Impacts associated with the final phases of landfill operation are essentially identical to those experienced during the operational phase. Additional mitigative measures which could be implemented include:

1. Utilization of a final cover consisting of two feet of clay overlain by six inches of sandy loam topsoil to promote vegetative growth. Additional effects relating to maintaining appropriate vegetative growth conditions such as liming, fertilization, watering, insect control could be considered.

2. Selection of a variety of plant species noted for potential adaptability to landfill conditions.

SOCIO-ECONOMICS

LAND USE, ZONING

The activities associated with the construction, operation and closure of the proposed expansion area will not produce any significant adverse effects on the existing land use or zoning. The expansion will, however, delay use of the facility for other purposes. Under the new Waste Management Act of 1980, municipalities can now tax solid waste land disposal facilities. They are no longer exempt as pollution control facilities. Burnsville, therefore, can now realize the landfill as a source of revenue.

PUBLIC FACILITIES

The proposed action will have no impact on public facilities in the landfill area. No mitigative measures are, therefore, necessary.

TRANSPORTATION

Only one (i.e., Burnsville) of the five municipalities that are most directly affected from the hauling of refuse to the Freeway Sanitary Landfill has identified existing adverse effects that might be continued under the proposed action. These adverse effects and suggested mitigative measures are given in Table V-1.

COLLECTION AND MANAGEMENT SYSTEM COSTS

The proposed action will have no adverse effects on collection and management system costs in the Metropolitan Area. No mitigative measures are, therefore, recommended.

HISTORICAL/ARCHAEOLOGICAL

Since the present site contains no historical or archaeological significance, the activities associated with the construction, operation and closure of the proposed expansion area cannot have any influence on historical or archaeological considerations. Therefore, no mitigative measures are necessary.

AESTHETICS

The proposed action will result in greater adverse visual impacts to off-site receptors than those that have occurred with previously filled areas of the landfill.

A suggested mitigative measure would be to seed portions of the landfill as soon as possible in order to facilitate vegetative growth. Screening, such as the planting of high growth shrubs should also be investigated.

Table V-1.
IDENTIFIED ADVERSE EFFECTS AND MITIGATIVE MEASURES
RELATING TO THE HAULING OF REFUSE TO FREEWAY SANITARY LANDFILL

Identified Adverse Effect	Suggested Mitigative Measure
Traffic operational deficiency at the I-35W/113th Street interchange causing a safety hazard for trucks entering the north traffic flow on I-35W.	Recommend to the Minnesota Department of Transportation to review their study of the traffic operations and safety factors at the I-35W/113th Street interchange and develop, as appropriate, an interim plan to improve deficiencies and safety hazards at this interchange.
Litter about the I-35W/113th Street interchange resulting from improperly covered haul trucks manuevering the sharply curved southbound egress ramp.	Appropriate citation for inadequately covered refuse truck.

VI. ALTERNATIVES TO PROPOSED ACTION

BACKGROUND INFORMATION

The following alternatives analyses are based on estimated closing dates of the existing sanitary landfills derived by projecting the continuing use rates and remaining capacities. These projections must necessarily be based on a set of data and assumptions. Because of the number of variables involved in the Regional landfill system during the next 10 years, the resulting closing dates are predictions to be used for general planning purposes only and are subject to change.

Table VI-1 summarizes the base data for the regional landfill system, including the predicted closing dates. The following assumptions were used in this analysis:

1. Presently remaining and expansion volumes, as given in acre-feet as of January 1980 reflect the remaining air space volume only. Cubic yard conversions are based on the definition of acre-feet: 1613 cubic yards (CY) per acre-foot (AF).

2. Presently remaining volume for Burnsville Sanitary Landfill is based on the recent stipulation agreement with the Minnesota Pollution Control Agency. This agreement essentially trades side-slope space for vertical space allowing 700,000 CY (434 AF) to be used on top of the existing refuse. Added to the previously existing space of 600,000 CY (372 AF) brings the total existing volume of Burnsville Sanitary Landfill to 1.3 million CY (806 AF).

3. 1980 use rates are calculated by using the best available receiving rate data (County and MPCA recorded data and/or landfill operators) and then converting to acre-feet using the conversion constant of 672 tons received through the gate per acre-foot in place in the landfill.

4. Use rates are assumed to increase somewhere within a range of 0.0 to 1.3 percent per year. Reported closing dates reflect the median use rate increase of 0.65 percent per year.

5. The closing dates reflect projections based on the interrelated nature of solid waste flow within the regional landfill system. When the first landfill closes, the landfill's last use rate (AF/Yr) is dispersed evenly between the remaining "neighboring" landfills depending on relative proximity.

6. A subregional scenario was used to predict effects of other landfills' closing on Freeway Sanitary Landfill. Louisville, Flying Cloud, Burnsville and Pine Bend were determined to have the greatest impact on Freeway's use rate due to proximity and overlapping wastesheds. Therefore, the use rates of these neighboring landfills were dispersed among the remaining landfills when closed.

Table VI-1

Base Data For Regional Landfill System

Volumes in Acre-Feet

Landfill	(A) Presently Remaining Volume (As of 1/80)	(B) Expansion Volume	Total Available Volume (A : B)	1980 Use Rate
Pine Bend	5952	2790	8742	792
Freeway	951	1860	2811	158
Burnsville	806	2418	3224	237
Flying Cloud	1046	0	1046	607
Louisville	1500	496	1996	79
Dakhue	333	0	333	27
Woodlake	67	1550	1617	150
Anoka Municipal	786	0	786	340
Oak Grove	211	0	211	174
East Bethel	807	0	807	11
WDE	245	0	245	40
7-County Region Total	12,704	9,114	21,818	2,611

Results of this analysis are as follows. If all landfills, including Freeway, are granted expansions, then Freeway will close in 1989. If Freeway is not granted the expansion, it will close in late 1983, aproximately six years earlier. Figure VI-1 represents this subregional system in reference to Freeway landfill. The shaded area illustrates different projected closing dates depending on whether neighboring landfill expansions are granted or not granted.

NO ACTION ALTERNATIVE

SOCIO-ECONOMIC IMPACTS

If the proposed expansion to the landfill is not granted, three elements of the regional solid waste management system would be affected directly: refuse haulers, neighboring landfills, and county and regional government charged with siting new landfills. The general population served will be affected either directly or indirectly through secondary effects of changes in the solid waste management system. Finally, the City of Burnsville would also be affected by an earlier closing date.

As noted earlier, if Freeway is not granted the expansion, it will close in mid or late 1983. The haulers using Freeway will then have to dump their loads at other landfills which are still open. This may result in increased nonproductive driving time for some haulers. Both labor and fuel costs for these haulers may increase resulting in increased collection fees to the residents. Also new haul routes may have to be established resulting in increased wear and nuisance problems (e.g., litter, noise, fugitive dust, etc.).

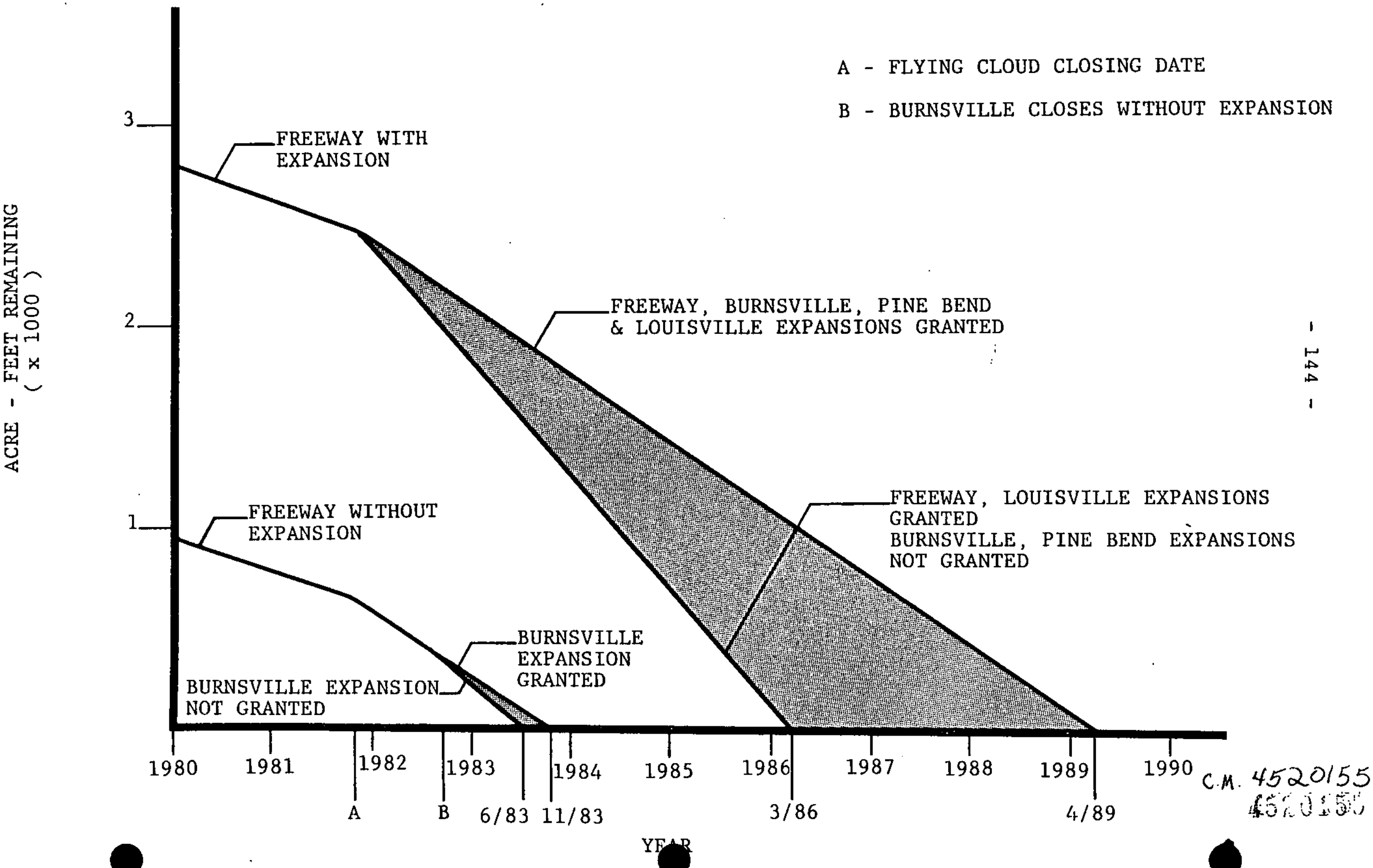
The increased receiving rates at other landfills may result in increased operational expenses in order to handle the additional volume. This may result in higher disposal charges which may, in turn, result in higher collection fees to residents.

The proposed expansion represents 1860 acre-feet of new landfill capacity. If not granted, it is reasonable to consider this capacity as part of that required by any new landfill serving the area. Developing a new landfill involves three phases or elements of work. These are preliminary planning, siting and site preparation, and operation. Generally the first two phases include assessment of need, alternatives analysis, site inventory, site selection and acquisition, environmental impact statement, hearings, permit applications, and construction and site preparation. Operation is an immediate occurrence following the first two phases.

The first phase in the development of a new site will be landfill base preparation which will involve grubbing, excavation and overburden material, grading, and the emplacement of lining material. Leachate collection and treatment system costs will vary depending on site conditions. Additional costs may include sedimentation basins and drainage facilities. To prevent scavenging, vandalism, and unauthorized dumping, a 10-foot high, heavy gauge, chain-link fence is usually erected. Additional cost factors include the construction of an access road, buildings for site personnel and equipment storage, landfill equipment and monitoring facilities.

Figure VI-I

FREEWAY DISPOSAL CAPACITY PROJECTION



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If the entire site (using an example of 120 acres) is developed initially, the estimated total construction costs would be about $3,500,000 to $4,000,000. Contingencies, legal, administrative and engineering costs can increase this amount by 20 to 40 percent, depending upon the complexities of the project. Thus, total estimated construction cost would approximate $4,200,000 to $5,600,000 to fully develop the site. Annual operation and maintenance costs, cover material, and site closure are not included in the above example.

If the expansion is not granted, a new landfill facility will have to be sited at least nine months sooner. The planning, development and operation phases of landfill siting and construction for a new facility to serve the Region would have to be accelerated accordingly. The proposed expansion of the landfill represents about four percent of the Region's landfill capacity needs without any expansions through the year 2000.

ENVIRONMENTAL IMPACTS

The expansion represents 1860 acre-feet of additional refuse material. This added quantity of refuse will increase the total leaching potential of the landfill. The amount of leachate any landfill generates is a direct function of the amount of refuse buried (see Water Quality Section). If the expansion is not granted, the leaching potential would not be increased when considering the volume of refuse only.

SITE SPECIFIC DESIGN ALTERNATIVES

SURFACE WATER RUNOFF CONTROL

The landfill boundaries remain fixed under the proposed vertical expansion by the Freeway Landfill owner, Richard B. McGowan Company. Final grades on the entire fill area are sloped to provide surface runoff from the higher final elevations of the landfill, but at the same time control of erosion on the surfaces is achieved by using less than maximum allowable slopes. Additional or alternative surface runoff controls to those in the proposed site development plans may not be necessary.

LEACHATE CONTROL

A hydrogeologic investigation of the Freeway Landfill site revealed that percolation from the landfill in the form of leachate under natural conditions will not recharge the aquifers in the Jordan sandstone underlying the Shakopee-Oneota formation that is the bedrock beneath the landfill. The piezometric pressure levels in the Jordan and Shakopee-Oneota aquifers are great enough to exclude percolation from the landfill area; under natural conditions there is a northerly flow of ground water in the soil above bedrock that discharges into the Minnesota River. Any percolation that might be collecting in the quarry on the south boundary of landfill is pumped to the river. Groundwater gradients may, however, be influenced by nearby water supply wells.

A liner does not exist beneath the refuse deposited at the site since the landfill opened in 1971. Richard B. McGowan Company has not proposed a liner installation in conjunction with the current proposal to expand vertically. In view of the negligible effects observed upon the Minnesota River of the seepage that has occurred from the existing landfill and the minimal potential for increase in detrimental effects on the river due to a vertical expansion of the landfill, a requirement for leachate control by means of a liner would not be reasonable. Through proper operations, i.e. daily cover, runoff provision (maintaining proper drainage so as to reduce rainfall ponding and penetration) and vegetative cover on both intermediate and final slopes, the effects of leachate can be mitigated and no noticeable decrease in water quality will occur in the Minnesota River.

A leachate treatment system will vary depending on site conditions which influence flows and pollutant loadings. Capital costs for both collection and treatment facilities can vary considerably. For treatment of low strength to high strength pollutant loadings, costs have been estimated to vary between $85,000 and $600,000 respectively. The alternative to no liner and leachate control is continued monitoring of both ground water and surface water for possible effects during the active filling period and postmonitoring for a period following final closure of the landfill. Other site-design alternatives are discussed in Section V.

GAS CONTROL

The existing Freeway Sanitary Landfill has no special gas control system installed, nor does the proposal for vertical expansion contain a provision for such control. The landfill to date has had no problems with gas accumulation or landfill gas odors beyond the landfill site and no such problems are anticipated with the vertical expansion. The landfill's operational practices should minimize any gas hazard since the amount of water in contact with the buried refuse is kept to a minimum. A slow rate of decomposition will reduce the possibility of explosive concentrations being reached. Also, no occupied buildings are adjacent to the landfill which might be subjected to lateral movement of gas from within the landfilled refuse. Therefore, no new gas control alternatives would be deemed reasonable.

Freeway Sanitary Landfill has not proposed installation of a methane gas recovery system. Such a system, if deemed economically feasible, could provide an energy resource from a waste source and supply methane gas to industrial facilities located nearby for an appreciable period of time. Other site-design alternatives are discussed in Section V.

SHREDDING AND BALING

Shredding and baling, as volume-reduction techniques, also have additional benefits for potential reduction of leachate contamination. By increasing the density of the refuse material, the moisture absorption process may be slowed cosiderably. Infiltration within shredfills is usually decreased due to reduced permeability of the refuse. However, there is at least a potential for increased infiltration within balefills through voids between stacks. Although the volume of leachate may increase, preliminary research has indicated balefills result in reduced leachate concentrations relative to a standard landfill. A secondary benefit from shredding includes the possibility for recovery of certain materials before landfilling.

WASTE REDUCTION

SUMMARY

Although a maximum of 15 percent of the total waste stream could potentially be reduced through full implementation of a comprehensive waste reduction program, a more realistic estimate of the impact of such a program is around four to five percent reduction of the waste stream.

MATERIALS RECOVERY

Although materials recovery is not a permanent alternative for all of the waste that will potentially be buried in the landfill expansion, materials recovery is definately a viable alternative to immediate expansion. Additionally, materials constitute a long-term alternative for approximately 33 percent of the waste to be disposed in the expansion. It is also apparent from the beneficial environmental impacts that a material recovery program should be strongly considered in conjunction with the proposed landfill expansion.

Encompassed within the analysis of materials recovery alternatives to the proposed action is a more general consideration of alternatives to land disposal of specific materials. Some of the methods analyzed for implementing a materials recovery program probably fall outside the scope of the permitting process for the landfill expansion.

SYSTEM TYPES

Recycling Centers

This type of material recovery system is presently widespread throughout the Metropolitan Area. Recycling centers are either operated as drop-off depositories, taking in one or more types of recyclable material, or as redemption centers where cash is paid for the more valuable materials such as aluminum or corrugated cardboard. Typically the neighborhood drop-off centers are organized and operated by non-profit civic or church groups. Redemption centers are combined with existing metal salvaging facilities, private hauling firms or actual secondary materials markets and are operated as profit-making businesses. Recently there has been an emergence of new aluminum redemption facilities in the Region due to the increasing market price and intent of the beverage container industry to provide an alternative to potential mandatory deposit legislation.

There are currently 135 recycling centers in the Region as listed in the Metropolitan Council's May 1980 edition of the "Recycle It!" directory. Approximately 70 percent of these are operated by non-profit organizations. There is no reliable data concerning the total quantity of materials processed by these facilities. However, it is reasonable to assume that the vast majority of materials recycled from municipal waste in the Region are handled by recycling centers. The balance is accounted for by personal reuse, used furniture and clothes exchanges, and other similar recycling systems.

Source Separation

Source separation is defined as the separating of materials for individual storage at the source of generation for later pick-up and processing or reuse. Source separation is a very meritorious materials recovery system because of its inherent flexibility and cost-effectiveness. It differs from most other forms of solid waste processing in that it is decentralized and relies heavily on the continuous participation of the individual generator.

There are many types of source separation including: office paper recycling programs, mandatory or voluntary "curb-side" pick-up of recyclables complementing mixed municipal refuse collection, leaf pick-up (see composting) and other commercial and industrial programs aimed at specific materials. There are currently several aggressive but relatively limited source separation programs in the Region. Several paper processing firms have on-going office paper recycling campaigns aimed at capturing the higher quality white office bond grade material. Four non-profit recycling centers also provide curb-side pick-up service for recyclables on a voluntary basis. One independent hauler has combined his refuse removal service with a newspaper pick-up service for his customers and may expand to include other materials in the near future. One independent scrap processor/redemption center provides a curb-side pick-up service for all recyclable materials in five neighborhoods in Minneapolis on a voluntary basis.

Picking

Picking is the process of removing valuable materials from the mixed waste stream for later sale or reuse. Picking is typically an unstructured materials recovery system that can occur at any point along the collection and disposal route. Frequency of picking activities and recovery rates directly correspond to the materials market prices.

Picking is a common practice throughout the collection and disposal industry. However, organized programs are rare because of the cost of labor and complex and fragmented structure of the Region's solid waste management system. Picking is often used in combination with mechanical separation technologies at the front end of refuse-to-energy facilities. Some transfer stations and landfills currently pick out materials on a more random basis. In California, large scale picking crews are employed at sanitary landfills as mixed refuse is dumped. Valuable items are retrieved using a conveyor system before the refuse is buried.

Mechanical Separation

Mechanical separation methods capable of segregating solid waste into valuable components have developed based on techniques used in mining and paper industries. Although still somewhat experimental, there are two basic approaches to mechanical material separation: wet processing and dry processing. Both approaches utilize a series process that begins with size reduction using a shredder (see SITE SPECIFIC DESIGN ALTERNATIVES: Shredding and Bailing), then classifies the stream into light and heavy fractions, and final processing to recover marketable materials using magnetic separators and other equipment. Mechanical separation often precedes incineration within refuse-to-energy facilities. Ferrous-aluminum magnetic separators are used throughout the Region at larger scale recycling centers and scrap metal processors, and at material market facilities. In general, only ferrous metal recovery is currently technically and economically feasible in terms of a mechanical separation technology.

Biological Treatment and Recovery

Research and demonstrations of anearobic and aerobic treatment of solid waste have increased substantially in the last five years. Anearobic treatment produces methane gas and humus. Aerobic treatment produces a sterilized humus or compost. These biological treatment methods can reduce the weight of solid waste by 50 percent. Aerobic treatment or composting can be applied to several different kinds of solid waste including leaf waste, source separated organics such as food waste, and mixed waste. The cost of curbside leaf collection and composting through the windrow method can vary between $4.75 to $7.35 per ton. Since collection and land disposal costs in the Twin Cities vary between $20.00 and $35.00 per ton, leaf composting has a substantial net benefit to society.

Source separated organics can be collected from citizens that separate solid wastes and nonrecyclable paper from other components of solid waste. Source separated organics provide an excellent feed stock for composting since the material is relatively free of glass, metal and plastics which reduce the value of the final compost product. Approximately 8,000 people in Portland, Oregon currently participate in such a program. Residents place food waste and other organics in plastic pails with sealable tops. The pails are then taken to a site where the organics are composted. When the compost is ready, area citizens use the compost for gardening. In August, 1980, a similar program may begin in neighborhoods of Columbia Heights, Minnesota.

Composting of mixed waste is also feasible as an alternative to the land disposal. Altoona, Pennsylvania and about ten other cities in the United States currently compost mixed waste. Mixed waste includes not only food wastes and yard wastes but undesirable materials such as glass, metal and plastic. Mixed waste and source separated organics are both suitable for composting with sewage sludge. Solid waste is a good bulking agent for sludge and the sludge enhances the overall nutrient value of compost.

There are several examples of successful composting operations currently in progress within the Region. Hennepin County and St. Paul operate leaf composting sites as a free service to the public. Leaves and lawn trimmings are deposited in the fall and compost mulch is available for pick-up in the spring. The City of Roseville provides free leaf, curb-side pick-up service for their residents using specialized vacuum trucks. Their municipal composting site is also available for drop-off and pick-up similar to the St. Paul and Hennepin operations. The Metropolitan Waste Contral Commission has also been windrowing filter cake sewage sludge from their Metro plant and reports excellent success and more than adequate market demand for the compost product. In general, composting has excellent potential as an alternative to landfilling organic wastes. Yard waste typically represents 14 percent of the total waste stream by volume, and food waste 15 percent and wood and paper up to 45 percent by weight.

Existing sytems for biological treatment and recovery of solid waste include the following technologies:

Windrowing -- A biological process of composting on aerobic decomposition through frequent turning of the long rows of organic material. Windrow turning can be accomplished through a variety of methods utilizing special machinery.

Aerobic Chambers -- A variety of aerobic chambers are used throughout Europe to compost solid waste. While this compost technology is more capital intensive than windrowing, aerobic chambers speed up material processing because moisture, oxygen and temperature levels can be controlled. Two of the most notable processes are the Dano drum process developed in Europe and the Metro Process developed in Texas.

Clay Digester -- This technology requires shredding of all solid waste. The shredded wastes are placed in a clay lined cell that is designed to hold one year's worth of waste. The bottom of the cell is sloped to one end so that leachate can be easily collected. A clay cap is placed on the waste to prevent oxygen from entering the cell. Perforated paper is placed in the cells and pumps are used to extract methane and carbon dioxide from the waste material. Water pipes are also placed in the cell to increase moisture content and increase methane yield. After ten years of methane recovery, the material in the cell could be aerated an then distributed as a humus. With such a management practice, cells could be reused and would provide an alternative to landfill expansions.

Landfill Methane Recovery -- This technology is similar to the clay digester except that shredding and landfill design are not as important. Seven landfills in the United States are currently recovering methane. Landfill methane recovery is not an alternative to landfill expansion unless shredding is employed or if humus is recovered from the landfill.

Tree Waste Utilization

The disposal of diseased shade tree waste in the Region has historically been an additional burden on the landfills. In the past two to three years, however, landfill operators have purposely raised the drop charge for tree waste to the point that it is now prohibitively expensive. Also, the recovery rate of this valuable wood resource has increased through the use of tree chippers and sawmills and firewood production. Still, small amounts of wood waste are being landfilled which could be potentially utilized.

CURRENT MARKET CONDITIONS

The condition of the secondary materials markets vary depending on the specific material, its demand and other related factors such as current stability of the overall economy. Newsprint and ferrous markets have been subject to substantial fluctuations while aluminum, copper, brass, glass, office paper and corrugated markets, especially in this Region, are relatively stable.

There are some indications that at least some of the materials markets have begun to stabilize. There are, however, some contrary indications that the current recession is causing a slight decline in even the supposedly stable market prices such as aluminum. Energy economics and demand for virgin materials have profound influences on secondary materials markets. Secondary materials processing enjoys the advantage of significantly higher efficiencies over processing raw materials. Geographic location of markets plays a key role in materials recovery economics because of limiting transportation costs.

The following summaries describe current materials market conditions in the Twin Cities area.

Waste Paper

The newsprint market has had a poor record of extreme price fluctuations. Many recycling programs died out after the market peak and subsequent drop in 1974 due to economic recession. Since then, many new paper recovery efforts have been established and have been operating somewhat more consistently. The cellulose insulation industry has been very active after a slump from two years ago due to bad publicity concerning fire hazards, although the present building slowdown is having some effect. Also, the U.S. Department of Agriculture projects that wood fiber demand within the next five years will exceed timber production. Regional demand for waste paper from a new newsprint mill in Ontario may also be favorably influencing the Twin Cities market. So, even though the current newsprint market in this Region is unstable with only moderate demand, there are indications for improvement, especially if a new newsprint mill were to locate in this area.

The Region's corrugated and office paper markets are excellent. Hoerner Waldorf, Division of Champion International, estimated that 70 percent of the corrugated generated in the Metro Area is presently being recovered. Also, the demand for office paper from the Wisconsin mills is far in excess of what the midwest region generates.

Glass

Market prices for waste glass on a national level have remained relatively stable since 1970. In the Twin Cities, the two large glass manufacturing firms provide excellent market conditions for cullet. Midland and Brockway Glass Companies could essentially double their processing volumes without adding new capacity.

Aluminum

Aluminum prices have also remained stable since 1970 and have recently shown slight increases. Aluminum markets in the Twin City area are considered to be excellent.

Ferrous

Ferrous markets in the Region are generally good but subject to price fluctuations. Little data is available on the market capacity.

Compost

Compost a secondary material is form of a soil enhancer and fertilizer-like material. It serves as a carbon source to plants and supplies moderate quantities of nitrogen, phosphorous and potassium. The existing compost markets include mines, nurseries, golf courses, sod farms, forestry and recreational areas, state parks, flower growers, county fairs, highway departments, and general contractors. At the present time, composted materials are not available to satisfy market demand. Market demand is now being satisfied by a somewhat nonrenewable black dirt resource. A recent MPCA study has identified over 250 individual markets in the seven county area.

Other Materials

Currently the market situation for tree waste products is very good and improving. Wood chip boilers and pelletizing plants provide a more than adequate demand.

The market for tires is uncertain. Experiments are continuing to determine the suitability of shredded tires as an alternate fuel.

There is presently a few markets available for waste plastics.

ENVIRONMENTAL IMPACTS FROM INCREASED MATERIALS RECOVERY

When recyclable resources such as aluminum, glass, ferrous, and paper are buried rather than used by primary industries, virgin raw materials are refined and processed to replace the buried secondary materials. Material recycling processes reduce environmental impacts more than virgin material manufacturing processes because recycling generally uses less energy and less raw materials while generating less solid waste, air pollution and water pollution.

SECONDARY IMPACTS OF INCREASED MATERIALS RECOVERY

In addition to environmental benefits realized by these material recovery systems, there are several secondary benefits to the community. These benefits include conserved materials resources, conserved energy, increased public awareness of solid waste management problems and a potential increase in employment. The most important benefit may indeed be saved landfill space.

METHODS OF IMPLEMENTING SOURCE SEPARATION PROGRAMS

There are several various methods by which source separation and recycling programs can be implemented. The results of the materials recovery analysis clearly indicate that source separation provides an existing reasonable and prudent alternative to land disposal of recoverable materials. However, some of the methods analyzed for implementing a materials recovery program probably fall outside the scope of the permitting process for the landfill expansion.

This section of the materials recovery alternative analysis provides an exhaustive list of potential implementation mechanisms. Once the criteria for permit conditions and recommendations are established during the permit review process, the following discussion can provide a list of potential implementation mechanisms to be evaluated.

Differential Disposal Rates Charged at the Landfill Gate

Freeway Sanitary Landfill, in cooperation with the government sector could establish a differential disposal rate schedule that would adjust the individual hauler's tipping fee according to the level of source separation service provided to his/her customers. Lower drop charges would apply to those haulers who participate in some form of source separation program. It is possible that each county could be required to periodically assess the recycling efforts by haulers within their county. This assessment would be published and submitted to Freeway landfill who would adjust the drop fees accordingly.

This method of financial incentive would directly support source separation. Implementation could be phased in over the next two to three years and also allowing time for a shakedown period.

Legislative Mandate

The state, regional, county or municipal level of government could adopt a policy or law that would require all recyclable materials which have established markets to be recovered through source separation programs. Mandatory source separation would have to be phased in over a period of time to allow the haulers and other businesses to develop their service. Materials covered under this method would have to be restricted to marketable materials.

Mandatory source separation programs across the country have shown much higher participation rates than voluntary programs.

Direct Subsidies

The government could directly subsidize materials recovery organizations through a grant annd loan program. This subsidy would best be administered at the state, regional, or county level. The potential sources of revenue for the subsidy program include the following:

General Revenue -- Appropriations from the state's general fund or from the Metropolitan Council's newly established leading authority.

Waste Charge -- Direct tax on all landfills.

Manufacture's Production Charge -- Tax applied to any industry manufacturing products which are ultimately landfilled.

Pollution Enforcement Fines -- Revenue from air, land and water pollution fines returned to a non-polluting recycling program within the affected community.

Secondary Materials Price Support

The state or federal government could supplement the revenue recylcers receive from markets through direct price supports similar to milk supports.

Handicapped Labor and Employment Subsidies

Human services could be emphasized as the funding priority while assisting recycling efforts at the same time. Handicapped workers, sheltered workshops, and youth employment programs could be provided with additional subsidies to stimulate recycling programs.

Increased Public Education

All governmental units could be required to step up their public education programs in support of existing and potential recycling efforts. The objective would be to increase recovery rates through more public participation on a voluntary basis.

Ban on Land Disposal of All Recoverable Materials

If methods and markets exist for recovery of materials being landfilled, these specific materials could be banned from all landfills. One specific type of material that would most easily be banned from landfills is yard waste. There are presently several alternative methods of disposal including composting, mulching of grass rather than collecting it in bags, and chipping of brush and tree trimmings. This type of ban has been considred in various parts of the country and could potentially result in a seven to fourteen percent savings in landfill space.

VII. THE IMPACT ON STATE GOVERNMENT OF ANY FEDERAL CONTROLS ASSOCIATED WITH THE PROPOSED ACTION

GENERAL STATEMENT

Minnesota and federal laws and regulations relating to the landfill expansion interact in many areas. However, there do not appear to be any significant areas of conflict between the two sets of laws and regulations.

FEDERAL VERSUS MINNESOTA ENVIRONMENTAL IMPACT STATEMENT

The federal agency most directly involved with sanitary landfills is the U.S. EPA. The National Environmental Policy Act PL 91-190 requires that for any

> "...major federal actions significantly affecting the quality of the human environment, a detailed statement...on the environmental impact of the proposed action..."

be prepared.

The landfill expansion is not a federal project nor does it involve federal funding of any type. Therefore, the EPA will not draft a federal EIS regarding the proposed action.

EFFECTS OF FEDERAL AIR, WATER, SOLID WASTE AND NOISE POLLUTION AND REGULATIONS UPON COMPARABLE MINNESOTA LAWS AND REGULATIONS

The federal authority over air, water and noise pollution derives primarily from the commerce clause of the U. S. Constituion. In theory, this power is limited to activites affecting commerce among the states. In practice, however, the power touches nearly every aspect of the U.S. economy including the externalities of environmental contaminants. The federal authority over air, water and noise pollution is not, however, plenary. Minnesota's authority to regulate air, water and noise pollution derives from the Minnesota Constitution and from the powers reserved to all states by Amendment X of the U.S Constitution.

AIR QUALITY LAWS AND REGULATIONS

The EPA's authority over air pollution generally takes the form of approval and supervisory control. The EPA ambient air quality standards (AAQS) and emission regulations set maximum levels which are to be met nationwide within certain time limits. The states retain the authority to establish regulations more restictive, but they cannot cause the relaxation of the federal regulations.

The initial efforts of the EPA under the Clean Air Act Amendments of 1970 were directed toward establishment of the AAQS. Many regions of the Country, and, more specifically, the Twin Cities Metropolitan Area, are not yet in compliance with the AAQS. In Minnesota, the AAQSs and most other air pollution control programs are implemented and enforced by the MPCA. Therefore, noncompliance is a problem primarily to be corrected by MPCA action. For example, the EPA has had no direct involvement in the formulation of the Air Quality

Agreements between the MPCA and companies with emission sources which do not meet the allowable emission levels.

In severe cases of air pollution where state control schemes are ineffective, the EPA can assume direct control, place the major emitters on compliance schedules and monitor the progress. This has not been done in Minnesota.

The program for the regulation of emissions from new stationary sources, such as the emissions from the alternative of burning solid waste in a resource recovery facility, was implemented pursuant to the Clean Air Act to bring air pollution within the concentrations established by the AAQS. The EPA has promulgated emission regulations, New Source Performance Standards (NSPS), for 19 categories of stationary sources. The MPCA has adopted most of these verbatim. Consequently, the NSPS which apply to some of the alternatives to the proposed project will be enforced by the MPCA and will require no federal involvement. The MPCA prohibits open burning as do federal regulations. The emissions from fugitive dust and vehicle traffic do not fall under the NSPS rules as a major source. Therefore, federal rules do not apply to emissions resulting from the proposed action.

As a result of a recent lawsuit, the EPA is now required to ensure that air, which is currently less polluted than the levels established by the AAQS, remains at that "pristine" level of purity. The Prevention of Significant Deterioration (PSD) program has been adopted and delegated to the MPCA. The PSD regulations create the requirement that implementation of the alternative of combustion of solid waste at a resource recovery facility would require submittal of information to the MPCA from which the EPA can determine whether the emissions will significantly deteriorate the air quality in the vicinity of the resource recovery facility. Based on the information, the EPA would grant or deny the PSD permit for a resource recovery facility.

WATER QUALITY LAWS AND REGULATIONS

Minnesota agencies have had water pollution control powers over a longer period of time than have federal agencies. The Federal Water Pollution Control Act (FWPCA) of 1972 has, however, established a uniform, nationwide scheme within which the MPCA programs now operate. Once again, the MPCA administers the program while the EPA retains approval and supervisory control.

The FWPCA established a 1983 goal of swimmable and fishable waters and a 1985 goal of zero discharge. The MPCA has encoded these goals into water quality standards which limit the concentrations or ranges of various compounds or characteristics. The EPA has little involvement in this program, except to review MPCA water quality inventory reports (MPCA 1976) and other indications of progress toward the FWPCA goals.

The principal mechanism used to achieve the water quality goals is to reduce the discharge of pollutants by new and existing point sources. This program, called the National Pollutant Discharge Elimination System (NPDES), is administered in Minnesota by the

MPCA. The program establishes the requirement of an NPDES permit for every major source of polluted effluents. The NPDES permits are issued by the MPCA, with the EPA retaining a veto authority over each permit. There is no point source discharge proposed at the ~~Burnville~~ Freeway Landfill. The discharge of wastes into groundwater are controlled by Minnesota Rule WPC 22.

SOLID WASTE LAWS AND REGULATIONS

Federal rules promulgated under the Resource Conservation and Recovery Act of 1976 (RCRA) relate to the classification of solid waste disposal systems. The criteria require that solid waste disposal systems that are determined to be open dumps are subject to closure or upgrading. A specific site can be determined to be an open dump based on several criteria, the most significant being groundwater considerations. The criteria specify that the facility or solid waste disposal practices shall not contaminate underground drinking water sources beyond the solid waste boundary or beyond a boundary established by the state (MPCA). Provisions of WPC 22 are at least as stringent as the federal criteria, thus the state rule is controlling.

The landfill was given a "2" rating under the state open dump survey that was completed in December 1980. The MPCA examined past monitoring and operational reports and inspections of the landfill, and on the basis of these reports, determined that the landfill is a high priority site with a high pollution potential in accordance with the federal land disposal criteria. The MPCA identified the following problem areas at the site in determining its rating of the landfill: operational deficiencies over the past few years, including daily cover deficiencies; confirmed leachate at the landfill; location of the landfill in a floodplain; violation of federal surface waters criteria; and potential problems with disease vectors because of operational deficiencies.

NOISE CONTROL LAWS AND REGULATIONS

Noise emitted by stationary sources is a transient phenomenon which seldom causes interstate problems. Consequently, the federal government's role in controlling noise is limited to noise emissions from transportation-related sources and from new products moved through interstate commerce. EPA has also recently published rules for the allowable level of noise from solid waste collection vehicles. These rules should lessen the noise impacts from the operation of collection vehicles at the site.

The noise levels allowable at receptors adjacent to transportation-related sources of noise are more stringent in state rules than in federal rules. Therefore, the authority over noise emitted from transportation-related sources of the proposed action and its alternatives are under the regulation of the state.

VIII. MULTISTATE RESPONSIBILITIES ASSOCIATED WITH THE PROPOSED ACTION

GENERAL STATEMENT

The landfill and the proposed expansion and construction areas lie well within Minnesota borders, and because of this, there are no formal multistate responsibilities associated with the proposed actions. There are, however, many multistate implications, as discussed below.

ENERGY

The fuel consumed in filling the proposed expansion area will come from outside the state since Minnesota is an importer of energy products. Current energy requirements to operate the landfill would continue with implementation of the proposed actions.

WATER QUALITY

All leachate seepage entering the groundwater system will eventually reach the Minnesota River and impact it accordingly. The Minnesota River is an intrastate water body connecting with the Mississippi River which is used as a water supply, fishery and for recreation by other states. As previously shown, the impact of leachate seepage into the river from the landfill, and that resulting from filling the proposed expansion area, will be negligible. There would, therefore, be no impact on the quality of the river in other states. However, the cumulative impacts of leachate from landfills and other sources of pollution in the Metropolitan Area will have a significant impacts on the quality of the river in other states.

IX. IMPACTS ON COUNTY PLANNING

AUTHORITY

In 1976, the Minnesota legislature enacted the Metropolitan Solid Waste Act. This act significantly increased the responsibilities of the seven metropolitan counties and the Council for solid waste management. The law required the Council to prepare a policy plan and the seven counties to implement that plan through the preparation of their own plans. Once the county plans are completed and approved by the Council, they will provide the framework for the Council's approval of future solid waste facilities.

In Feburary 1979, the Council adopted a new regional solid waste policy plan, meeting its responsibilities under the 1976 Act. The seven metropolitan counties are presently preparing master plans that implement the Council's plan. The counties have, through the Metropolitan Inter-County Assocation, hired a consultant to prepare background information for their plans and as a resource to inform and educate public officials and the interested public. The county master plans will not however, be completed until the end of 1980.

COUNTY MASTER PLAN CONTENT REQUIREMENTS

Each county master plan, as per requirements of the Council's solid waste plan, must contain, among other elements:

1) A statement of goals and objectives for solid waste management in the county, including quantities and composition of solid waste or be managed from 1979 to 2000;

2) A description of existing or proposed waste facilities together with schedules regarding the extent to which such facilities will implement the Council's plan;

3) An implementation program that identifies public programs, fiscal devices and other specific actions planned to implement the master plan; and

4) The feasibility of initiating waste reduction and source separation recycling programs. In addition, the counties are required to identify and acquire land disposal areas with sufficient capacities to satisfy regional land disposal needs for the next 20 years.

The solid waste planning undertaken by the counties has recently been strengthened with the recent passage of the Metropolitan Solid Waste Act of 1980. This act provides the counties with new authorities, including local zoning override, in order to further the planning ad development of new solid waste disposal facilities (see Section X, Metropolitan Solid Waste Act of 1980).

COMPLIANCE WITH COUNTY MASTER PLANS

As previously mentioned, the county master plans are in the process of being prepared. Several land disposal, waste recovery and waste reduction scenarios have been developed by the counties as background information for their plans and these scenarios were used for discussion purposes in the alternatives analysis section (Section VI) of the EIS. However, until these plans are completed and approved by the Council, their compatibility with the proposals at the Freeway landfill cannot be determined.

Perhaps most important, once completed and adopted by county boards, the master plans will represent a number of policy positions that the counties have taken with respect to the future land dipsosal and recovery of solid waste. Expanding the landfill will represent an increase in remaining disposal capacity in Dakota County, a county that is already disposing of about 50 percent of the solid waste enerated in the Region. Quite clearly, decisions with respect to expanding the landfill must not preclude, or adversely affect, the county planning and decision-making process, particularly Dakota County.

X. IMPACTS ON REGIONAL PLAN

METROPOLITAN SOLID WASTE PLAN

COMPLIANCE WITH REGIONAL PLAN

The following discussion concerns the proposed action's compliance with the policy framework and pertinent review criteria contained in the Council's regional solid waste policy plan.

The following discussion is intended as a quick check against the criteria in the Council's plan to look for any obvious major policy conflicts. A more thorough evaluation of the Council's policies and criteria will be conducted as part of the permitting process. The Council will use the EIS as part of the informational resources to determine compliance with the Regional plan.

Policy Framework

The Council's solid waste plan states that the siting and development of new landfills and increasing the capacity of existing sites must begin soon to meet the Region's disposal needs. The proposed filling of the expansion area at the landfill is certainly consistent with this objective. The proposal, however, must be balanced against the availability of present or future waste recovery or reduction methods for the Region's solid waste stream. The extent to which these technologies and reduce waste that would be going to the site is largely unknown at this time. Further work is necessary, which will be accomplished over the next couple of years as required by the new Metropolitan Solid Waste Act of 1980.

Review Criteria

Criterion 2c -- This criterion states that the development of proposed solid waste management facilities should be compatible with the Region's growth forecasts, the need to replace existing facilities and county schedules for implementing new waste facilities.

The proposed expansion of the Freeway Landfill will add to the life of the metropolitan land disposal system. The proposed expansion is consistent with the Council's determination that the siting of new landfills and expansion of existing landfills needs to be undertaken soon. However, the seven metropolitan counties are in the process of developing their solid waste master plans. These plans, along with the work required under the new Metropolitan Solid Waste Act, will provide development schedules for new land disposal, recovery and waste reduction facilities in the Region. Until this work is completed, it is difficult to determine the compatibility of the proposed expansion with other major planning efforts as required by this criterion.

Criterion 4b -- This criterion states that sites should be accessible year round by highways that have adequate capacity. In addition, this criterion states that roads used for hauling must meet safety standards of the governmental units having jurisdiction over them and that access to the site should not depend on the use of local and collector streets through residential areas.

Access to the Freeway Landfill is good.

Solid waste is brought to the disposal site by commercial haulers or private individuals along the roads shown in Figure II-1. The primary haul route is I-35W with access to the landfill from 113th Street South. Access to the landfill site is provided by an all weather, blacktopped entrance road.

Access to the landfill will not change with implementation of the expansion.

Access to the landfill does not depend on the use of local and collector streets through residential areas.

Criterion 4d -- This criterion states that, where possible, sites should be visually compatible with adjacent property or development. This criterion further states that residential and other nonindustrial land uses are considered compatible only if there are barriers to reduce noise and obscure public view.

The landfill, including the expansion area, is compatible with the adjacent land uses in the Area. The property surrounding the landfill is zoned for general industrial uses (see Section III, Socio-Economics).

Filling of the proposed expansion area will result in the landfill operating 4-6 years longer. A few nearby homes (in the Bloomington area) that look directly upon the landfill will be exposed to the operation of the facility for these additional years and any subsequent visual impacts. Such impacts will be greater than those already present since the final vertical elevation of the expansions will create an isolated mound virtually level with the opposing bluff in Bloomington.

Filling of the expansion area will make the site more visible from I-35W. There is presently limited view of the site from I-35W.

Criterion 5a -- This criterion states that the site selection process for land disposal facilities should include an evaluation of the site's capacity to assimilate waste and its constitutents.

Groundwater monitoring has shown some degradation of groundwater immediately underneath the landfill. However, ultimate discharge of groundwater is to the Minnesota River, which has not shown measurable contamination that can be attributed to the landfill. Dilution within the river appears sufficient to mitigate any potential adverse impacts from leachate produced by the landfill. There is, however, concern over the landfill's impact on local water supply wells (see Water Quality, Sections IV and V).

Criterion 5b -- This criterion provides that applicants should ensure that environmental monitoring will be conducted when the facility is operating, and should include evaluations of air and water quality.

Five piezometers have been installed to monitor possible impacts by the landfill including subsequent surface water impacts (see Figure

II-6 for locations). The monitoring plan includes quarterly sampling of four surface stations and the five ground water wells for the following parameters: COD (filtered and total), BOD (filtered and total), chloride, specific conductance, pH, copper and total chromium. The landfill operator proposes that this monitoring system will remain in operation during and subsequent to the filling of the landfill including the proposed expansion. Further monitoring may be necessary to provide a secondary mitigation of groundwater impacts on local water supply wells.

Operation of the landfill has not resulted in any reported air quality problems at the facility itself or the surrounding area. There appears to be adequate measures to contain fugitive dust and other emissions generated by operations of the landfill (see Air Quality, Section III). Environmental monitoring for air quality related problems doesn't appear necessary at the site.

Criterion 5g -- This criterion states that the grounds of solid waste facilities should be landscaped wherever possible. The criterion further states that those areas where waste is dumped or salvaged should be screened from public view and routine measures should be instituted to control dust, blowing litter, odors and other potential nuisances.

The landfill has been cited a number of times by the MPCA for litter violations. Moreover, odors from the landfill have been noticed by residents across the river on the opposing bluff. The landfill has had a history of violating daily cover requirements which could be contributing to the odor problems.

Litter control consists of having attendents picking up paper and other debris which may be scattered on the site. Litter control fences are also used to prevent wind-blown material from leaving the site.

Refer to Criterion 4d for a discussion on visual impacts.

Criterion 6c -- This criterion states that proposed solid waste management facilities should have controlled access to prevent entry or unauthorized disposal during nonoperational hours.

Security at the site is provided by an attendant who is on duty during the operating hours of the landfill. The attendant limits access to the site and provides directions for unloading vehicles. In addition, an employee of the landfill lives in a house-trailer located at the site's entrance. This employee provides security during the nonoperating hours of the landfill. The landfill, however, is not fenced and off-road access is possible.

METROPOLITAN SOLID WASTE ACT OF 1980

PURPOSE

This new law sets forth a major land disposal siting process in the Metropolitan Area. It is an unusual siting process, in that it places heavy emphasis on reducing the need for land disposal in the Region. Important policy decisions are required under the law by a number of participants that may affect all or a portion of the solid waste going to ~~Burnsville,~~ Freeway given its expansion.

SITING PROCESS

Each of the seven metropolitan counties is required by June 1, 1981 to identify four eligible land disposal sites that will handle municipal solid waste. These sites are then reviewed and approved by the Metropolitan Council and adopted as part of a metropolitan inventory of eligible land disposal sites. The Council and counties will then undertake an abatement process to reduce the need for land disposal in the Metropolitan Area. Technologies and processes will be identified to recover and reduce the amount of solid waste generated in the Region. The timeframe for the implementation of these abatement strategies will also be determined. Once this process is completed, the final selection of needed landfill sites will take place. Land disposal sites will be acquired in fee for those scheduled for development as a facility through the year 1990; development rights will be acquired for those sites scheduled for development from 1991 through the year 2000. The entire site selection process is required by law to be completed by 1983.

THE NEW ACT AND EXPANSION OF THE FREEWAY LANDFILL

Expanding the landfill will certainly reduce the need for land disposal space that would require to be identifed under the new law. Moreover, expansion of an existing landfill is socially and economically much more acceptable than the difficult, time consuming, expensive and controversial process of finding a new site. Expanding the landfill, therefore will lessen the apprehension and tension associated with what is becoming a major public issue in the Metropolitan Area, the disposal of refuse.

It is important to point out, however, that expansion of the landfill will satisfy only a fraction of the Metropolitan Area's future land disposal needs. Expansion of this site alone will not contribute greatly to the future land disposal needs of the Region.

A major portion of the new law requires the identification of a schedule for abating the land disposal of solid waste in the Metropolitan Area. This scheudle of achievable abatement procedures is required to be implemented by the metropolitan counties as per direction provided by Council land disposal abatement plan. This process is crucial with respect to the Freeway Landfill and should provide the necessary information to determine approximately what portion of the solid waste going to Freeway can be recovered or reduced.

Presently, the landfill has a remaining permitted capacity of about 951 acre-feet, or about two years of life at the facility. Given the expansion, the landfill will have a remaining capacity of about 2,800 acre-feet, or six to nine years of life. Both of these timeframes extend a number of years beyond completion of the metropolitan landfill siting-abatement process required under the new solid waste law. It is possible that a decision could be made to delay expansion of the site until the landfill siting-abatement process is completed; or perhaps a time limit is imposed on the permit or a trade-off made with respect to other permitted areas of the landfill until the siting abatement process is completed. It is important that decisions, with respect to expansion of the landfill, take into account information that will be gained in the future concerning the reduction and recovery of waste going to the site.

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I

APPENDIX I

LEGAL DESCRIPTION OF FREEWAY LANDFILL

4520125

LEGAL DESCRIPTION OF FREEWAY LANDFILL

South 400 feet of Government Lot 7 in Section 28, Township 27, Range 24, except the West 450 feet thereof, subject to an easement for road purposes of a track of land 2 rods in width, the north line of said track being parallel to and 400 feet north of the south line of said lot 7.

Government Lot 7, except that part line both north of road and west of the East 780 feet thereof, and also except the South 400 feet line east of the West 450 feet thereof, and except that part taken for highway purposes, all in Section 28, Township 27, Range 24.

Southeast Quarter of the Southeast Quarter (S.E. 1/4 of S.E. 1/4) of Section 28, Township 27, Range 24, according to Government survey.

Southwest Quarter of Southeast Quarter (S.W. 1/4 of S.E. 1/4) of Section 28, Township 27, Range 24, according to Government survey.

II

APPENDIX II

ENFORCEMENT CHRONOLOGY

MPCA and Dakota County Site Inspections

This chronology deals only with site inspections and enforcement related issues. It does not deal with those matters related to permit issuance. It is important to point out that in the early inspections conducted at this site it is difficult to determine if the inspector considered the problems listed on his inspection sheetviolations of operation procedures, or just "noteworthy," since the present-day inspection reports were not in use.

<u>November 16, 1971</u>

monitoring wells must be installed
need to extend dike
monthly reporting
construct toxic and hazardous waste facilities

<u>December 8, 1971</u>

no violations noted

<u>February 8, 1972</u>

working face too large

<u>February 18, 1972</u>

burning

<u>March 7, 1972</u>

burning

<u>March 17, 1972</u>

litter
access road

<u>April 27, 1972</u>

no violations noted

<u>May 3, 1972</u>

no violations noted

<u>May 19, 1972</u>

no violations noted

<u>June 6, 1972</u>

working face too large
daily cover

July 10, 1972

no violations noted

September 22, 1972

burning
working face too large
daily cover

October 6, 1972

burning
working face too large
daily cover

October 10, 1972

daily cover
demolition area not maintained

October 16, 1972

no violations

November 28, 1972

daily cover
working face too large
demolition area not maintained
litter control
water monitoring system

March 13, 1973

daily cover
working face too large
spreading and compaction

April 23, 1973

daily cover
working face too large
litter control
intermediate cover

June 6, 1973

working face
intermediate cover
demolition area not maintained

August 16, 1973

leachate
dumping into stream (property separation)
surface drainage

September 6, 1973

daily cover
working face too large
intermediate cover
dumping into stream (property separation)
site maintenance (does not correlate to any present Minn. Rule SW-6(2) violation)

October 30, 1973

daily cover
working face
litter
intermediate cover
water monitoring system
filling into stream (property separation)
site maintenance (does not correlate to any present Minn. Rule SW-6(2) violation)

November 13, 1973

daily cover
intermediate cover

December 7, 1973

water monitoring system
demolition area not maintained

February 8, 1974

litter

February 15, 1974

water monitoring system

March 27, 1974

daily cover
salvaging

May 28, 1974

litter
intermediate cover

June 21, 1974

daily cover

July 12, 1974

working face too large
demolition area not maintained

July 16, 1974

working face
intermediate cover

<u>July 31, 1974</u>

water monitoring system

<u>September 17, 1974</u>

working face

<u>October 1, 1974</u> (Dakota County inspection)

prohibited waste (raw sewage sludge or septic tank pumpings)

<u>October 7, 1974</u>

daily cover
final cover
litter control

From this period on inspection letters properly reference violations and it is quite apparent when the inspector considered the noted problem a violation of Minn. Rule SW-6 or county ordinance.

<u>January 15, 1975</u>

no violations

<u>February 26, 1975</u>

litter
surface drainage
prohibited waste (truckloads of snow on working face)

<u>March 31, 1975</u>

daily cover
litter control
water monitoring system

<u>May 2, 1975</u>

water monitoring system

<u>June 13, 1975</u>

litter control
water monitoring system (must resample)

<u>July 3, 1975</u>

no violations

July 21, 1975

water monitoring system (must resample)

July 30, 1975

water monitoring system
salvaging

September 22, 1975

working face too large
no monthly reports

October 3, 1975

burning
working face too large
daily cover
grading
prohibited waste in demolition area

October 9, 1975

working face too large
monthly operational reports

November 4, 1975 (Dakota County inspection)

litter
dust control

November 5, 1975

must repair gate on culvert

December 29, 1975 (Dakota County inspection)

screening

January 12, 1976

daily cover
water monitoring system

February 24, 1976 (Dakota County inspection)

litter
final cover

March 18, 1976

prohibited waste (3M tile plant on Lexington Avenue approximately 1,800 gallons of cutting water fluid every 10 days)

April 13, 1976

litter
working face too large
leachate

<u>April 26, 1976</u> (Dakota County inspection)

leachate
litter
working face too large

<u>May 26, 1976</u>

litter
leachate
prohibited waste (35 barrels of paint sludge, thinner and other unidentified chemical waste present; later returned to Graves Construction for proper disposal)

<u>May 27, 1976</u> (Dakota County inspection)

litter
prohibited wastes were removed

<u>June 10, 1976</u> (Dakota County inspection)

leachate

<u>July 14, 1976</u> (Dakota County inspection)

property line separation
working face too large

<u>August 20, 1976</u> (Dakota County inspection)

litter control
working face too large
property line separation

<u>September 3, 1976</u>

litter

<u>September 22, 1976</u> (Dakota County inspection)

leachate
final cover

<u>October 14, 1976</u>

water monitoring system
leachate

<u>October 15, 1976</u> (Dakota County inspection)

litter

<u>November 4, 1976</u> (Dakota County inspection)

prohibited waste (8 yds^3 ink sludge)

<u>November 26, 1976</u> (Dakota County inspection)

working face too large

<u>December 29, 1976</u> (Dakota County inspection)

leachate
litter control

<u>January 12, 1977</u> (Dakota County inspection)

litter
leachate

<u>February 11, 1977</u>

litter
screening
vegetation
water monitoring system
leachate
excavating to bedrock

<u>April 15, 1977</u> (Dakota County inspection)

final cover
vegetation
litter

<u>May 8, 1977</u> (Dakota County inspection)

litter
leachate
top surfaces need to be surveyed
excavating to bedrock
water monitoring system
prohibited waste in demolition area

<u>June 11, 1977</u>

working face too large
leachate
plan compliance

<u>July 1, 1977</u>

stipulation agreement presented to Freeway to address leachate problem; not signed

<u>July 11, 1977</u> (Dakota County inspection)

working face too large
leachate
plan compliance

<u>August 4, 1977</u>

final cover
water monitoring system
leachate
prohibited garbage in demolition area

<u>September 26, 1977</u>

working face too large
surface drainage

<u>October 3, 1977</u> (Dakota County inspection)

working face
site drainage

<u>October 21, 1977</u>

working face
litter
leachate

<u>December 23, 1977</u> (Dakota County inspection)

excavating to bedrock
prohibited waste (2-55 gallon drums turpentine from D.J. Kranz Company)

<u>January 3, 1978</u>

excavating to bedrock
hazardous waste

<u>January 25, 1978</u>

no violations noted

<u>February 16, 1978</u> (Dakota County inspection)

excavating to bedrock

<u>May 10, 1978</u> (Dakota County inspection)

daily cover
vegetation
litter
leachate
water monitoring system

<u>June 29, 1978</u> (Dakota County inspection)

daily cover
ponded water
working face too large
water monitoring system
final cover

<u>July 31, 1978</u>

no violations noted

<u>August 29, 1978</u> (Dakota County inspection)

daily cover
final cover
vegetation
surface drainage

<u>November 29, 1978</u>

no violations noted

<u>December 26, 1978</u> (Dakota County inspection)

daily cover
working face too large

<u>January 2, 1979</u> (Dakota County inspection)

daily cover
working face too large

<u>January 17, 1979</u>

operational reports

<u>April 20, 1979</u>

litter
daily cover

<u>May 4, 1979</u>

litter
daily cover

<u>June 1, 1979</u>

working face too large
daily cover
intermediate cover
demolition area

<u>July 2, 1979</u>

litter
daily cover

<u>August 1, 1979</u>

daily cover
final cover
demolition area

<u>September 5, 1979</u>

daily cover
surface drainage
final cover

<u>November 28, 1979</u>

Notice of Noncompliance issued to site

<u>December 3, 1979</u>

no violations noted

<u>December 14, 1979</u>

working face
daily cover
equipment
demolition area

<u>January 18, 1980</u>

no violations noted

<u>February 12, 1980</u>

no violations noted

<u>March 3, 1980</u>

no violations noted

<u>April 11, 1980</u>

no violations noted

<u>May 2, 1980</u>

no violations noted

<u>June 10, 1980</u>

operational reports

<u>July 9, 1980</u>

daily cover
operational reports

<u>August 15, 1980</u> (preoperational inspection)

daily cover
surface water drainage

<u>September 18, 1980</u> (preoperational inspection)

daily cover

<u>October 7, 1980</u>

Notice of Violation issued

<u>October 21, 1980</u>

leachate
working face
daily cover
intermediate cover

<u>November 7, 1980</u> (preoperational inspection)

daily cover
intermediate cover

<u>December 15, 1980</u> (preoperational inspection)

daily cover

<u>January 22, 1981</u> (preoperational inspection)

no violations noted

III

APPENDIX III

SUPPLEMENT TO
FINAL ENVIRONMENTAL IMPACT STATEMENT (EIS)
BURNSVILLE WATER SUPPLY WELL FIELD TESTING PROGRAM

INTRODUCTION

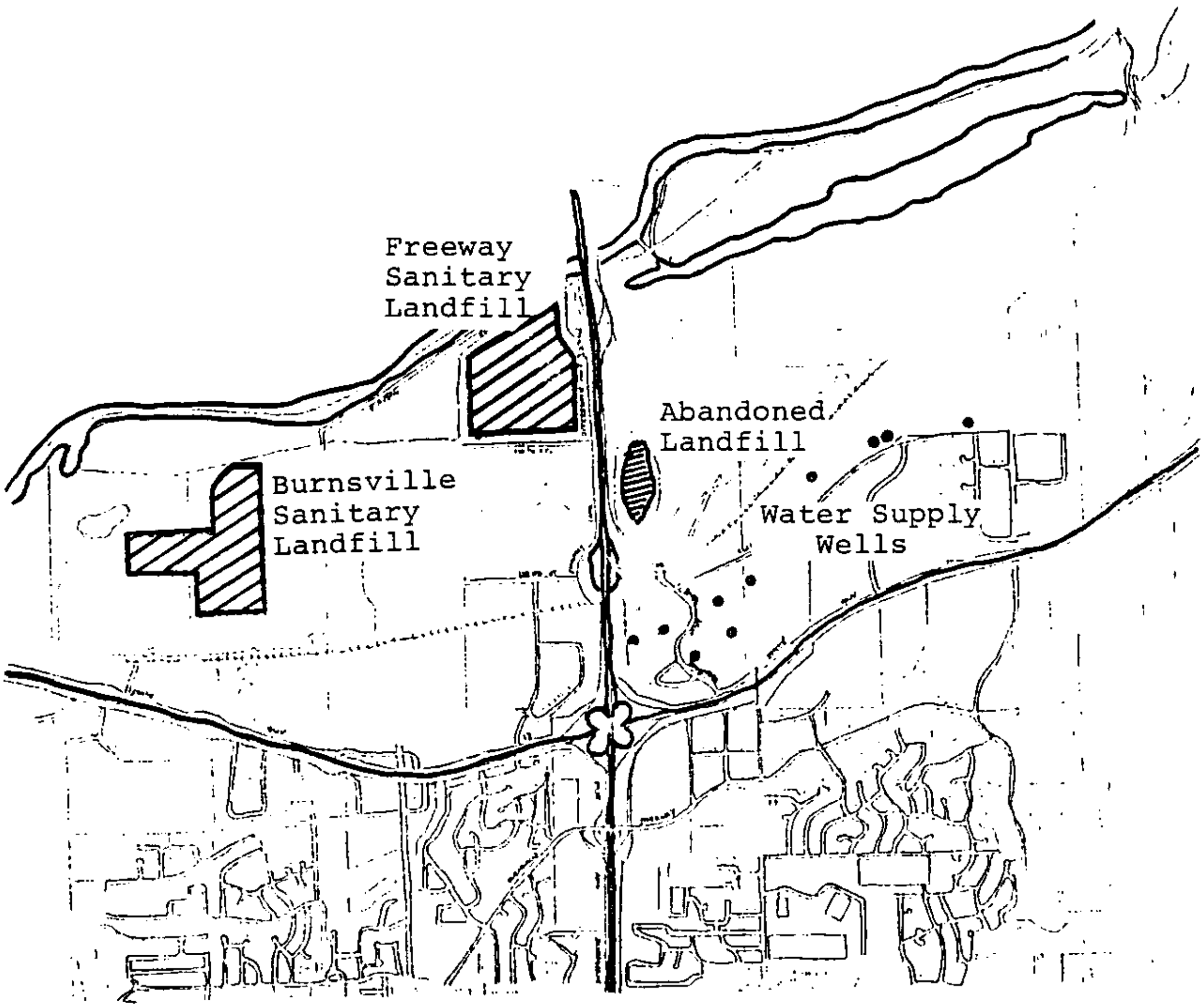
In August 1980, the Minnesota Environmental Quality Board granted the Metropolitan Council an extension of time to complete the EIS on the Freeway Sanitary Landfill expansion. The extension of time was necessary to await the results of a report being prepared for the City of Burnsville on its water supply well field expansion program. The City's well field is located about 3,800 feet south of the Freeway Landfill. The Council felt the City's report would provide further definition on the groundwater hydrology in the vicinity of the Freeway Landfill and any impacts that might occur to the groundwater and City's well field as a result of the Landfill's expansion.

The City's report on its water supply well field expansion was completed in December 1980. The following analyses of the City's report supplements the final EIS on the landfill expansion.

WELL FIELD TESTING PROGRAM

Well field testing procedures, starting in March 1980, were conducted as part of Burnsville's continuing municipal water well development program. The well field testing program was undertaken in response to conclusions presented in a report regarding groundwater investigations in 1978 which identified a condition that posed a potential contamination threat to the Jordan aquifer in the well field area. According to the 1978 report, observed interference water level fluctuations indicated the possibility of groundwater gradient reversals extending beneath the Minnesota River floodplain.

The proximity of the City's water supply well field to the Freeway Landfill is shown in Figure 1. As can be seen, the landfill is about 3,500 feet north of the well field. In addition, Figure 1 shows the location of the Burnsville Sanitary Landfill and an abandoned landfill north and slightly west of the well field. The abandoned landfill is located on the east side of I-35W while the Freeway Landfill is physically separated from the abandoned landfill by I-35W. The abandoned landfill is approximately 2,000 feet north of the well field at the nearest point and the Freeway Landfill is about 3,800 feet north of the well field at the nearest point. The immediate location of the abandoned landfill to the well field was the major reason for the City to undertake the 1980 study. The possibility of leachate from the abandoned landfill descending to the Jordan aquifer during periods of pumping at the wells that produce the gradient reversal represented the most immediate potential threat. The original intent of the City's study was to look for possible or potential impacts from the abandoned landfill. However, at the time the Council had decided to delay completion of the EIS until this study was completed, it had become apparent that the study might be useful to identify impacts or any potential impacts on the City's well field as a result of the Freeway Landfill or its expansion.



Burnsville's Water Supply Well Field

Figure ~~1~~

The implementation of the well field testing procedures required as a basic minimum, one observation well in Jordan sandstone and one observation well in the Shakopee dolomite. Accordingly, the existing Jordan aquifer well located at the former site of the City's sewage treatment facility was modified for water level instrumentation and a new well was constructed in the Shakopee dolomite approximately 48 feet south of the Jordan aquifer well.

Water samples were collected weekly starting on July 1, 1980 and continuous water level recorders were installed at the Jordan and Shakopee observation wells on July 17, 1980. Pumping tests were then run at the City's water supply wells number 2, 3, 4, 6, 7, 8 and 10 during the month of August (see Figure 2). The tests consisted of pumping an individual well for two hours while the other wells remained off. The closest wells to the pumping well were used as observation wells. Water level fluctuations were also recorded at the Jordan and Shakopee observation wells.

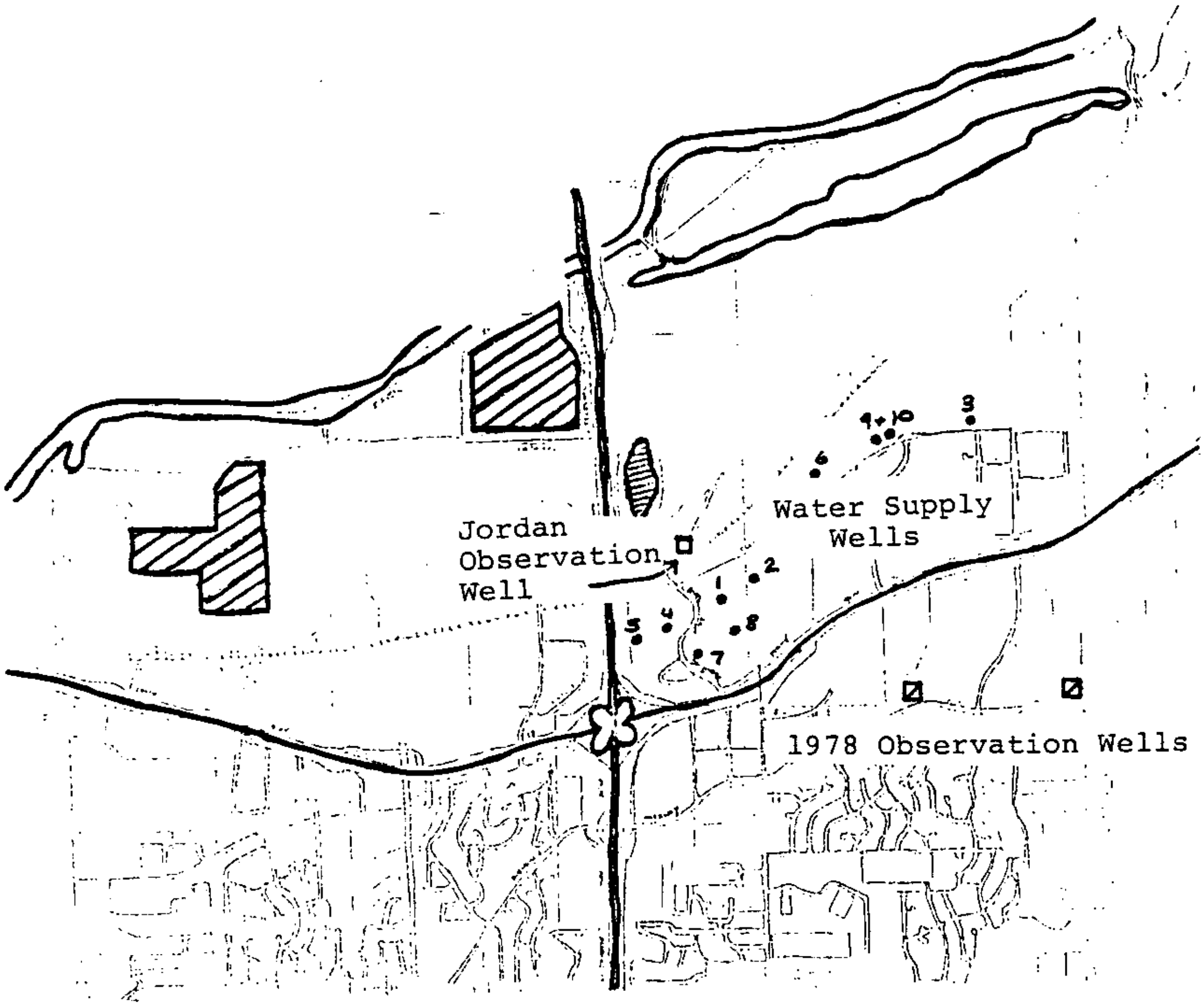
HYDROLOGY

In evaluating an aquifer that is selected as a source of water supply, the recharge and discharge relationship with underlying and overlying aquifers must be considered. Under natural conditions the water in the Jordan sandstone was in a state of equilibrium. Although the water level fluctuated from season to season and year to year in response to changes in recharge and discharge, over long periods of time the average discharge was equal to the average recharge and the fluctuation occurred through a relatively narrow zone.

Prior to the development of groundwater supplies or other works of man that disturbed the natural flow of groundwater, recharge to the Jordan aquifer occurred mainly beneath the upland areas remote from the major stream valleys and discharge occurred through the overlying geologic units to the major streams and lakes located in the flood-plains. At Burnsville, the natural groundwater discharge was concentrated in the Minnesota River Valley and ultimately, the groundwater left the area as stream flow or evapotranspiration.

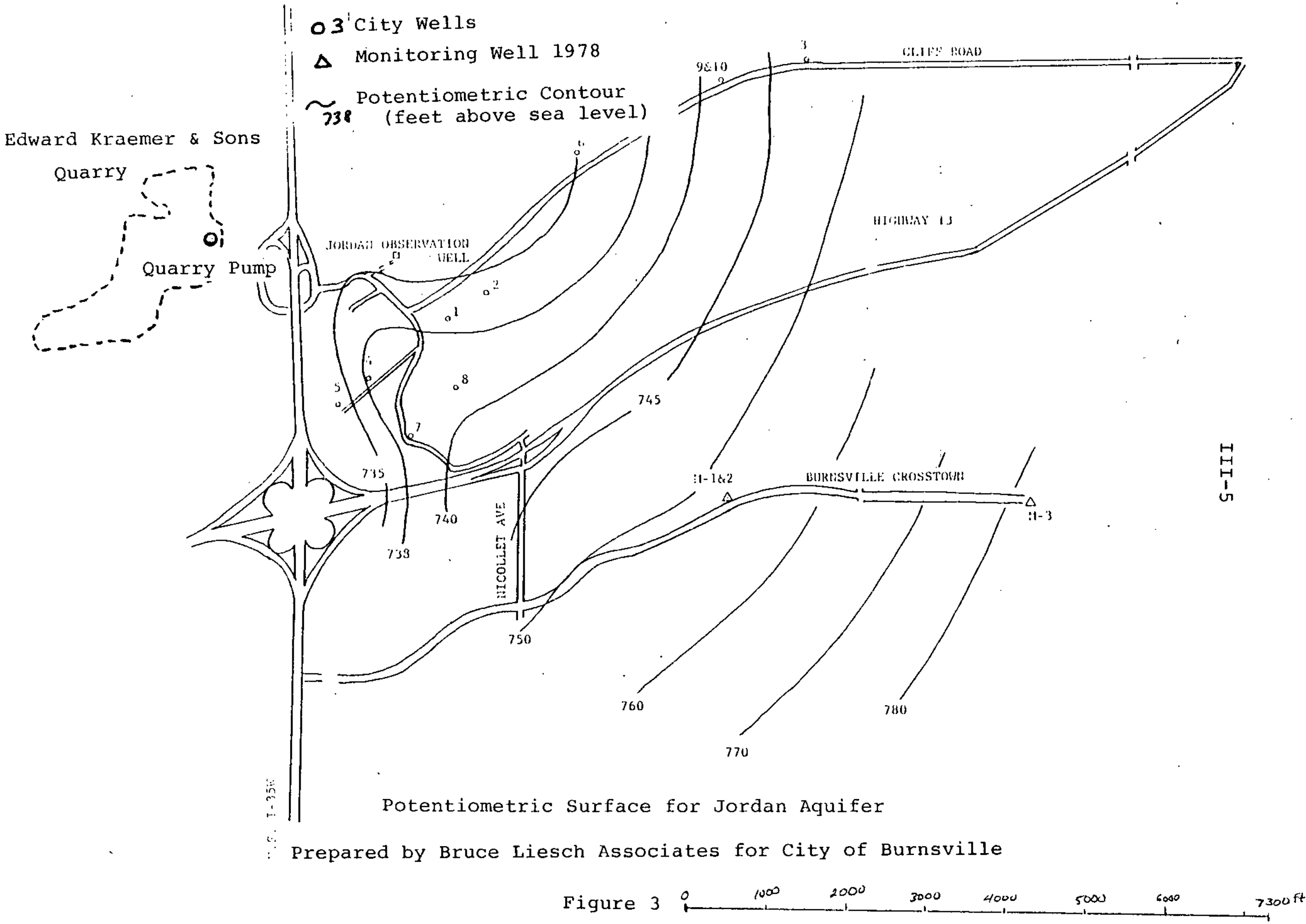
A potentiometirc surface map based on available water levels in Jordan wells is shown on Figure 3.

The installation of wells in the Jordan aquifer and development of a quarry in the overlying Shakopee-Oneota dolomites approximately 3,000 feet west (see Figure 3) of the observation wells tends to modify the natural equilibrium and distort the flow patterns within each unit as well as the groundwater transfer between the units. Dewatering operations at the quarry, which is in an area of natural groundwater discharge, created a cone of depression, increased the vertical gradient from the Jordan aquifer and consequently also increased the transfer of water from the Jordan. In contrast, the new wells open only to the Jordan aquifer, tend to reduce the vertical gradient in the areas of natural discharge and in heavily pumped areas cause a transfer of water from the dolomite to the sandstone.



Well Field Testing Program

Figure 2



Potentiometric Surface for Jordan Aquifer

Prepared by Bruce Liesch Associates for City of Burnsville

Figure 3

The geologic cross sections shown on Figures 4 and 5 represent the stratigraphy of the Burnsville area and indicate the general direction of groundwater flow. In a natural condition the hydraulic gradient is from the south to the north, flowing towards the river. Under the influence of pumping of the city wells, this gradient is reversed in the area north of the well field, such that groundwater moves to the south towards the well field. Along with the reversal of the groundwater flow there is leakage from the Shakopee dolomite into the underlying Jordan sandstone.

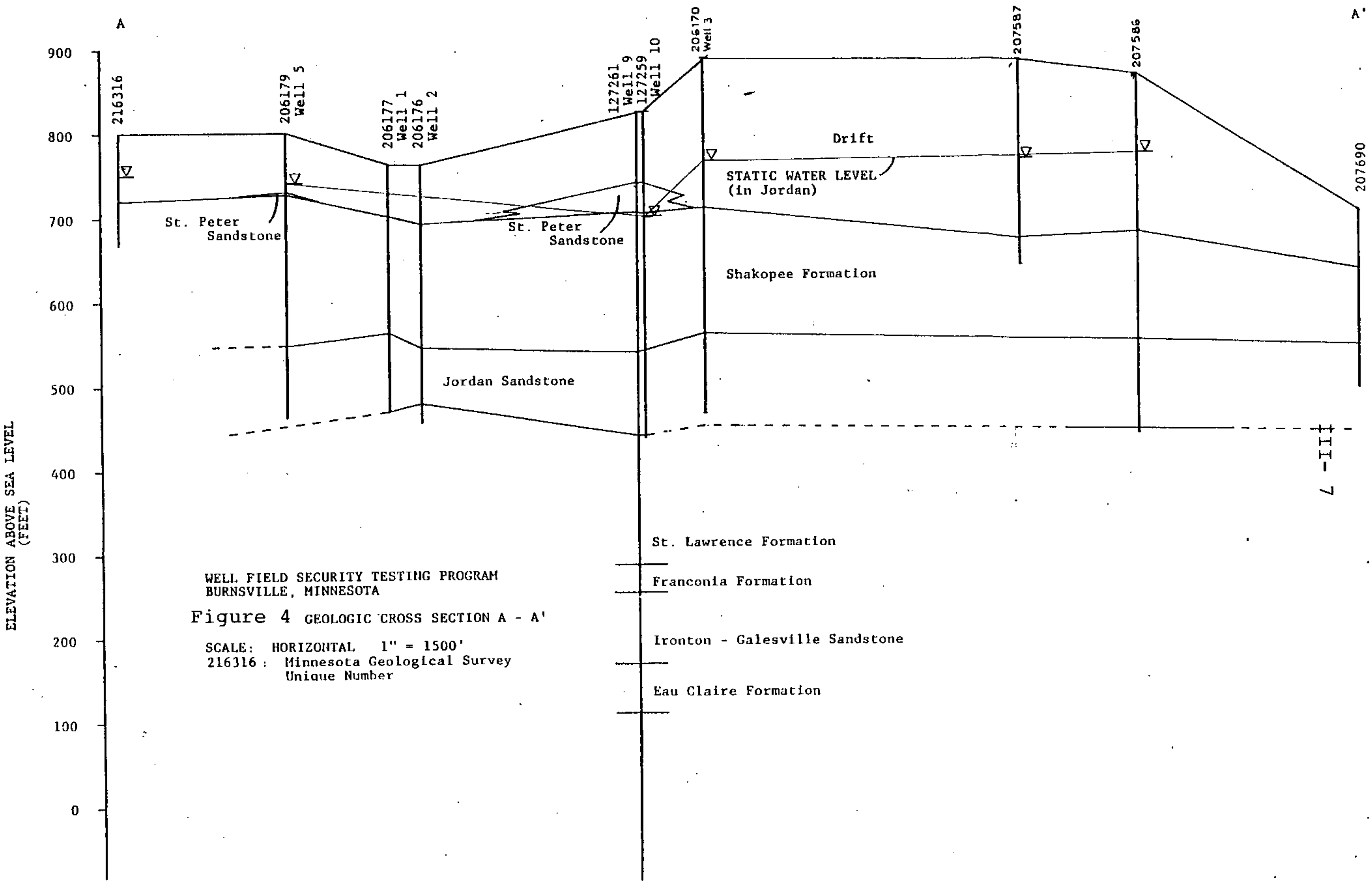
This reversal of the groundwater flow takes place during part of the pumping cycle and during part of the recovery cycle. Reversal of flow is known to be noncontinuous because after the pumping of all the city wells, the Jordan observation well recovers to the point where it is discharging at the surface while the Shakopee well has a water level 8 to 9 feet below the surface. This indicates that the Jordan is leaking into the overlying Shakopee and flow into the Jordan from above cannot take place.

PUMPING TEST ANALYSIS

During the testing procedure at each well, drawdown and recovery water levels were measured at the pumped well, at nearby municipal production wells and at the Jordan and Shakopee observation wells. The data were plotted and analyzed using the time-drawdown, time-recovery Theis non-equilibrium method modified by Jacob, and by distance-drawn equilibrium methods.

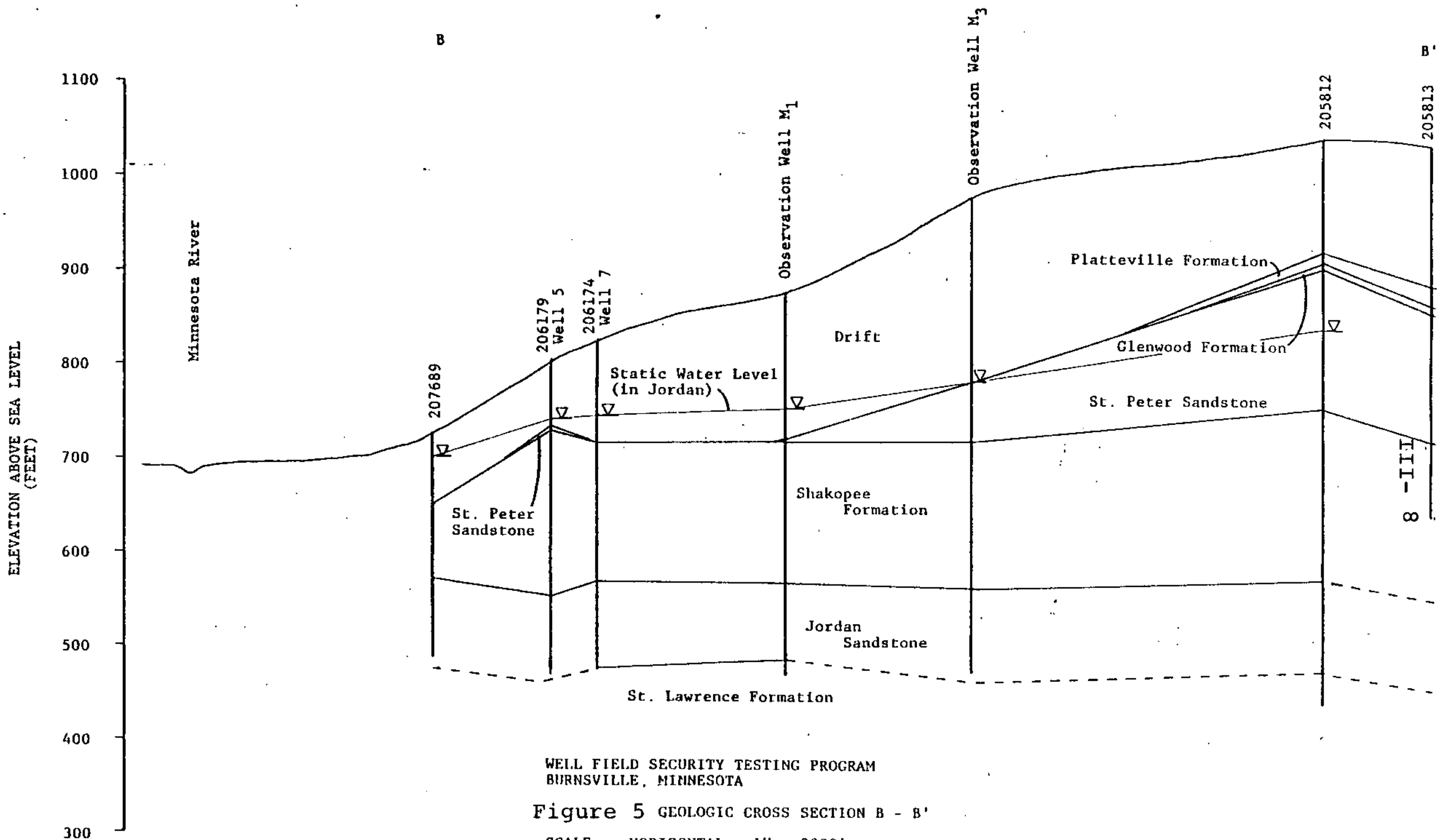
Upon completion of the analysis of the pumping data, a mathematical model, based on distance-drawdown curves, was developed to simulate the reaction of the aquifer and its potentiometric surface to varying pumping rates and well field configurations. This allowed a study of the reaction of the aquifer to the location and pumping of new wells in various configurations. As a calibration control for the model, a pumping test was run October 13 and 14, 1980. This test consisted of pumping all the wells except 6, and observing the drawdown in the wells throughout the 9.5 hours of pumping. Water levels were measured before the test to determine the trend caused by recovery from anticedent pumping and to determine the approximate projected water level in the flowing Jordan observation well.

The computed drawdowns derived from the mathematical model and the actual drawdowns observed in the October 13 and 14 pumping test were in very close agreement, expecially in the observation wells. This indicates that the model, based on the distance-drawdown curves, along with the assumptions are representative of the hydraulic conditions in the Burnsville well field area. It should be pointed out, however, that the model is semi-empirical in nature and simulated the reaction of the aquifer and its potentiometric surface based on observations of the City's well field under varying pumping conditions. The predicted drawdown is based on water level observations at the two observation wells immediately north of the well field and the Kraemer well to the west. The predicted drawdown is thus based, at least in part, on field observation data and is not entirely theoretical. It is not, however, entirely empirical. Drawdown north of the observation wells toward the Freeway Landfill



WELL FIELD SECURITY TESTING PROGRAM
BURNSVILLE, MINNESOTA

Figure 4 GEOLOGIC CROSS SECTION A - A'



WELL FIELD SECURITY TESTING PROGRAM
BURNSVILLE, MINNESOTA

Figure 5 GEOLOGIC CROSS SECTION B - B'

SCALE: HORIZONTAL 1" = 2000'

207689: Minnesota Geological Survey Unique Number

4520103

is at best predicated and not observed. Additional observation wells north of the City's well field would help to further define hydrologic characteristics in the vicinity of the Freeway Landfill.

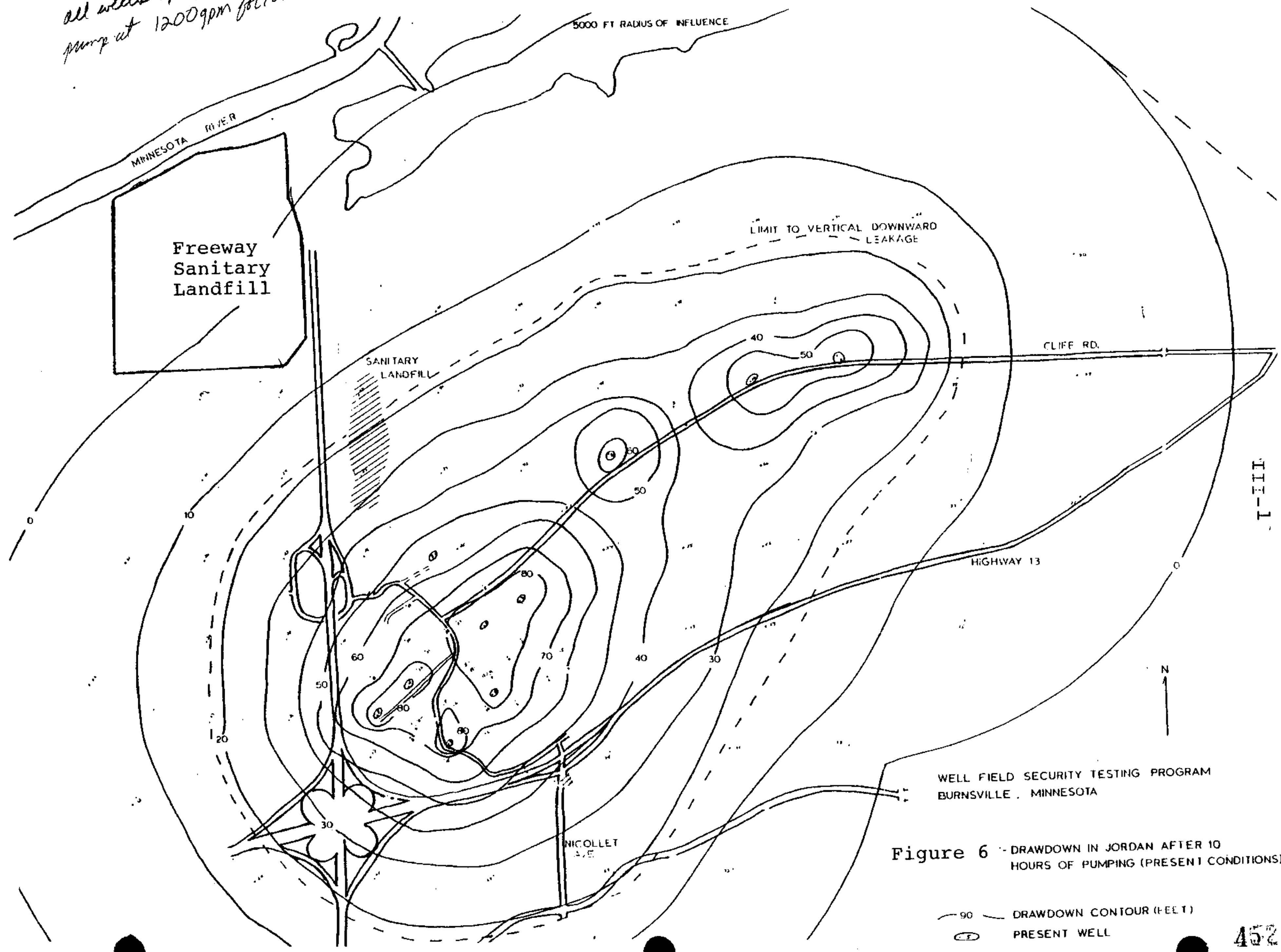
Drawdown maps were compiled using the aquifer mathematical model to observe the reaction to various well configurations. The first drawdown map, Figure 6, represents the drawdown associated with pumping all the present city wells at 1200 gpm for 10 hours, at which point equilibrium was reached. An additional well was then added at the intersection of Nicollet and Highway 13 (SW corner) and a drawdown map developed to study the change in the Jordan water levels, Figure 7. The proposed new well was assumed to be located in a segment of the aquifer represented by the model in the vicinity of well 8. With this new well pumping, additional drawdown observed at the Jordan observation well would be 2.6 feet after 10 hours of pumping. In a worst-case scenario the new well could follow the distance-drawdown curve for well 2 and cause 4.3 feet of drawdown at the Jordan observation well at equilibrium.

A major concern in Burnsville is the possible contamination of the water supply from leachate at the abandoned landfill site north of the well field. Upon analysis of the drawdown maps of Figures 6 and 7, it appears that no appreciable change is observed in the Jordan water surface by the addition of a well at the intersection of Nicollet and Highway 13. The distance between the new well and the southern-most extent of the abandoned landfill is approximately 4,100 feet. At this distance the new well would cause a maximum increase in drawdown under the abandoned landfill of 1.2 to 1.9 feet, dependent on the assumed distance-drawdown relationships. At a point approximately three-quarters of the way through the abandoned landfill there would be no drawdown change caused by the new well.

Hydrographs of the Shakopee and Jordan observation wells under the conditions of all wells pumping are shown in Figures 9 and 10. The intersections of the hydrographs indicate points where flow direction between the two formations is reserved. By extrapolating the Jordan observation well recovery curve to a status level, the drawdown in the Jordan at which leakage begins to occur can be determined. During the drawdown and recovery cycle, leakage between formations is reversed at a drawdown of between 14 and 17 feet. A line of leakage is assumed to be between the 10- and 20-foot drawdown contour lines in Figures 6 and 7. Under both well configurations studied, three fourths of the abandoned landfill is in an area of vertical leakage from the Shakopee dolomite into the Jordan sandstone during part of the pumping cycle. The Freeway Landfill is about 1,000 feet northeast of this vertical leakage line.

The drawdown contours in Figure 6 were further defined in Figure 8 by the City's consultant using a computer model. Figure 8 shows the drawdown contours with pumping all of the present city wells at 1,200 gpm for 10 hours. The vertical leakage line is now about 300 feet from the landfill under the assumptions of the model.

Assumes
all wells except #6
pump at 1200gpm for 10hrs



WELL FIELD SECURITY TESTING PROGRAM
BURNSVILLE, MINNESOTA

Figure 6 - DRAWDOWN IN JORDAN AFTER 10 HOURS OF PUMPING (PRESENT CONDITIONS)

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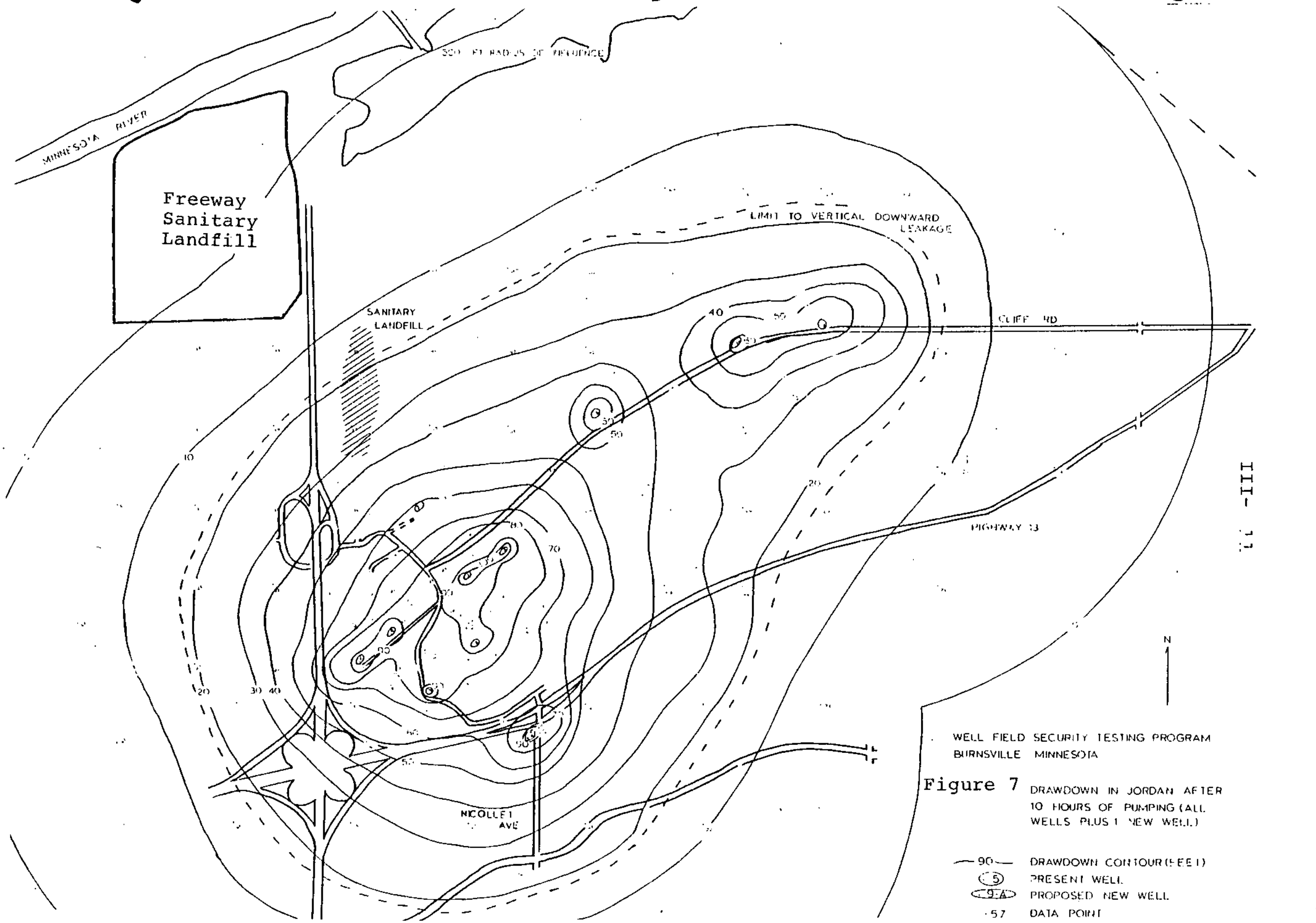


WELL FIELD SECURITY TESTING PROGRAM
BURNSVILLE MINNESOTA

Figure 7 DRAWDOWN IN JORDAN AFTER 10 HOURS OF PUMPING (ALL WELLS PLUS 1 NEW WELL)

—90— DRAWDOWN CONTOUR (FEET)
(5) PRESENT WELL
(9-A) PROPOSED NEW WELL
·57 DATA POINT

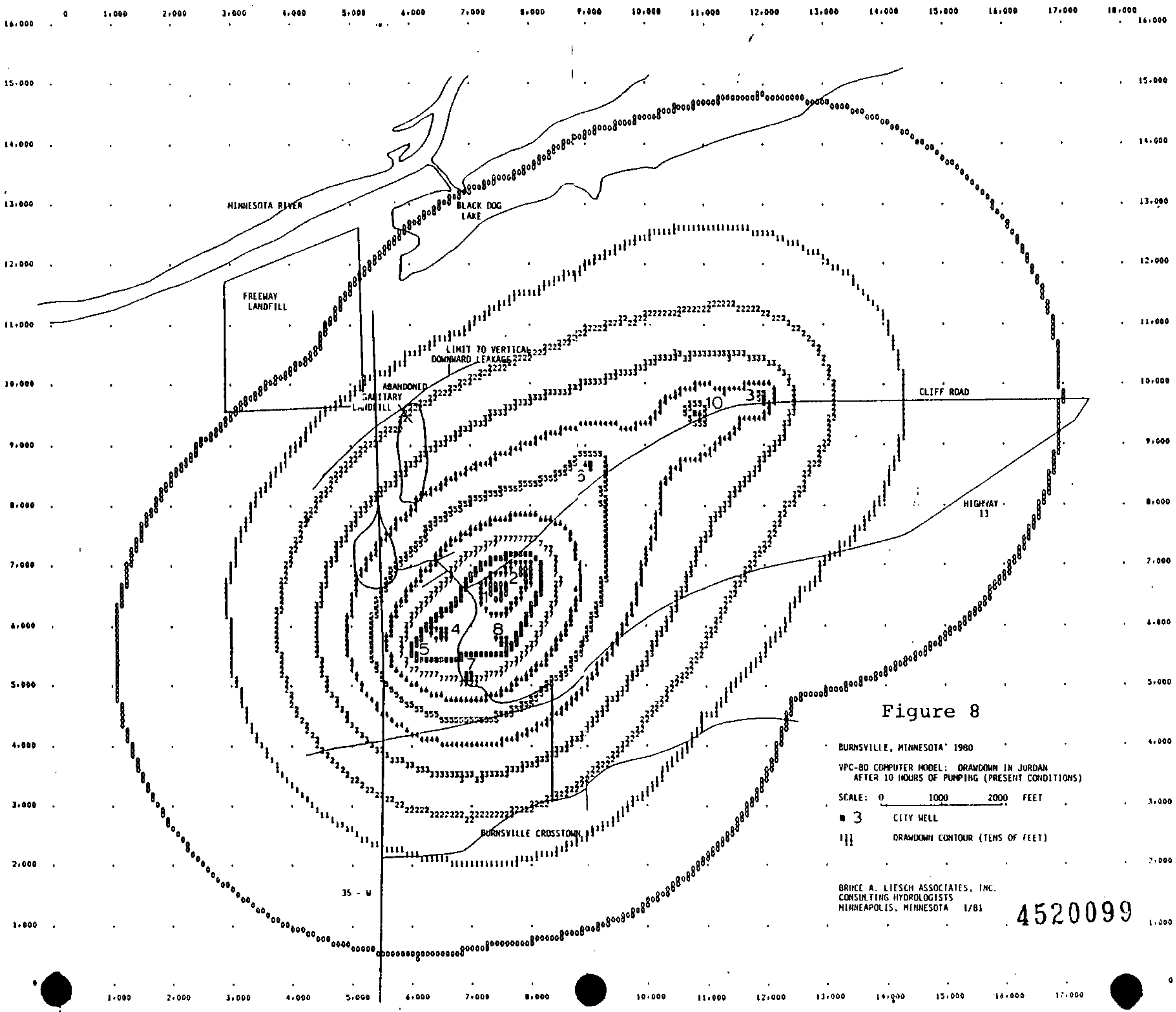
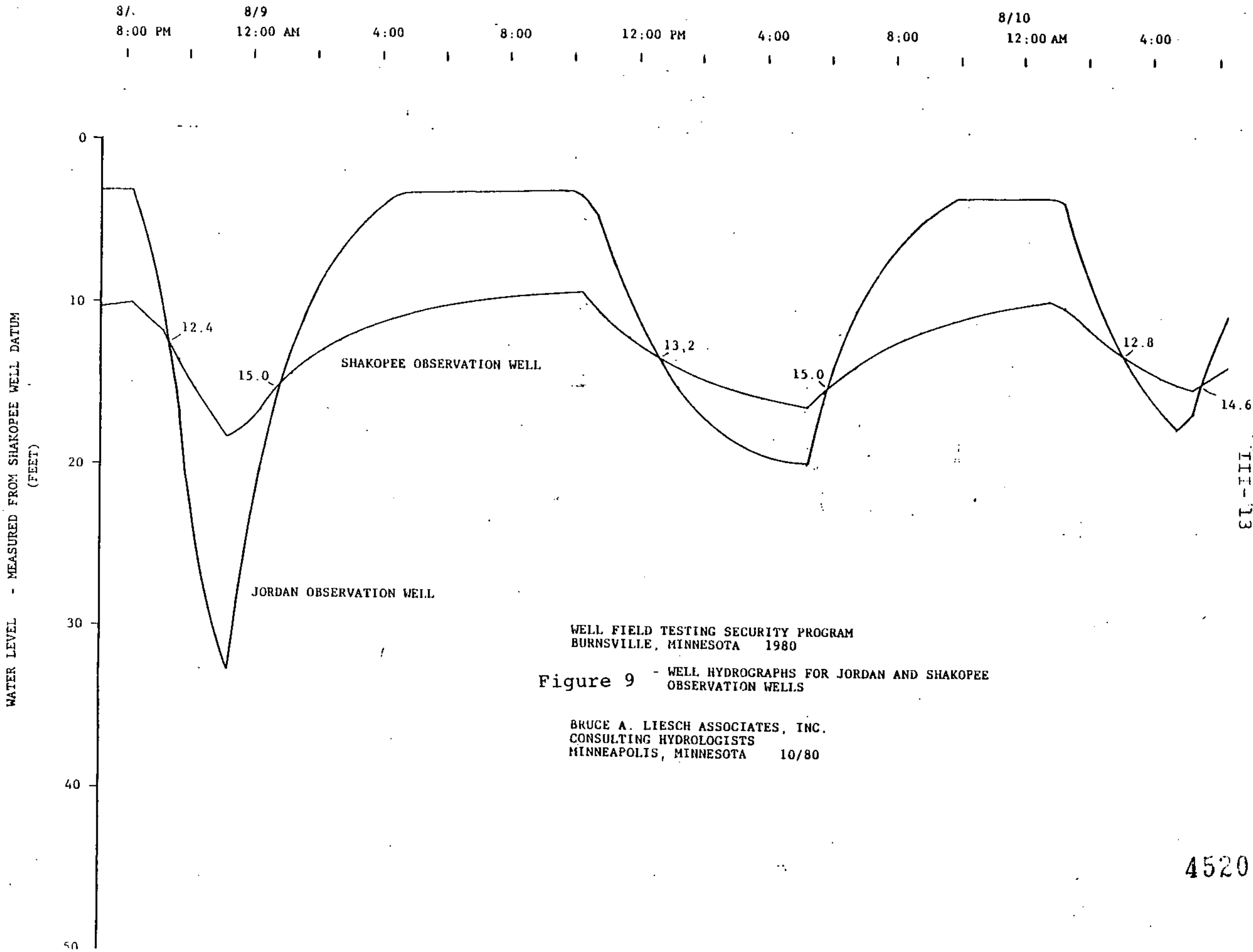

MINNESOTA RIVER
BLACK DOG LAKE
FREEWAY LANDFILL
LIMIT TO VERTICAL DOWNWARD LEAKAGE
ABANDONED SANITARY LANDFILL
CLIFF ROAD
HIGHWAY 13
BURNSVILLE CROSSTOWN
35 - W
BURNSVILLE, MINNESOTA 1980
VPC-80 COMPUTER MODEL: DRAWDOWN IN JORDAN AFTER 10 HOURS OF PUMPING (PRESENT CONDITIONS)
SCALE: 0 1000 2000 FEET
3 CITY WELL
1 DRAWDOWN CONTOUR (TENS OF FEET)
BRUCE A. LIESCH ASSOCIATES, INC.
CONSULTING HYDROLOGISTS
MINNEAPOLIS, MINNESOTA 1/81
4520099

Figure 8



WELL FIELD TESTING SECURITY PROGRAM
BURNSVILLE, MINNESOTA 1980

Figure 9 - WELL HYDROGRAPHS FOR JORDAN AND SHAKOPEE OBSERVATION WELLS

BRUCE A. LIESCH ASSOCIATES, INC.
CONSULTING HYDROLOGISTS
MINNEAPOLIS, MINNESOTA 10/80

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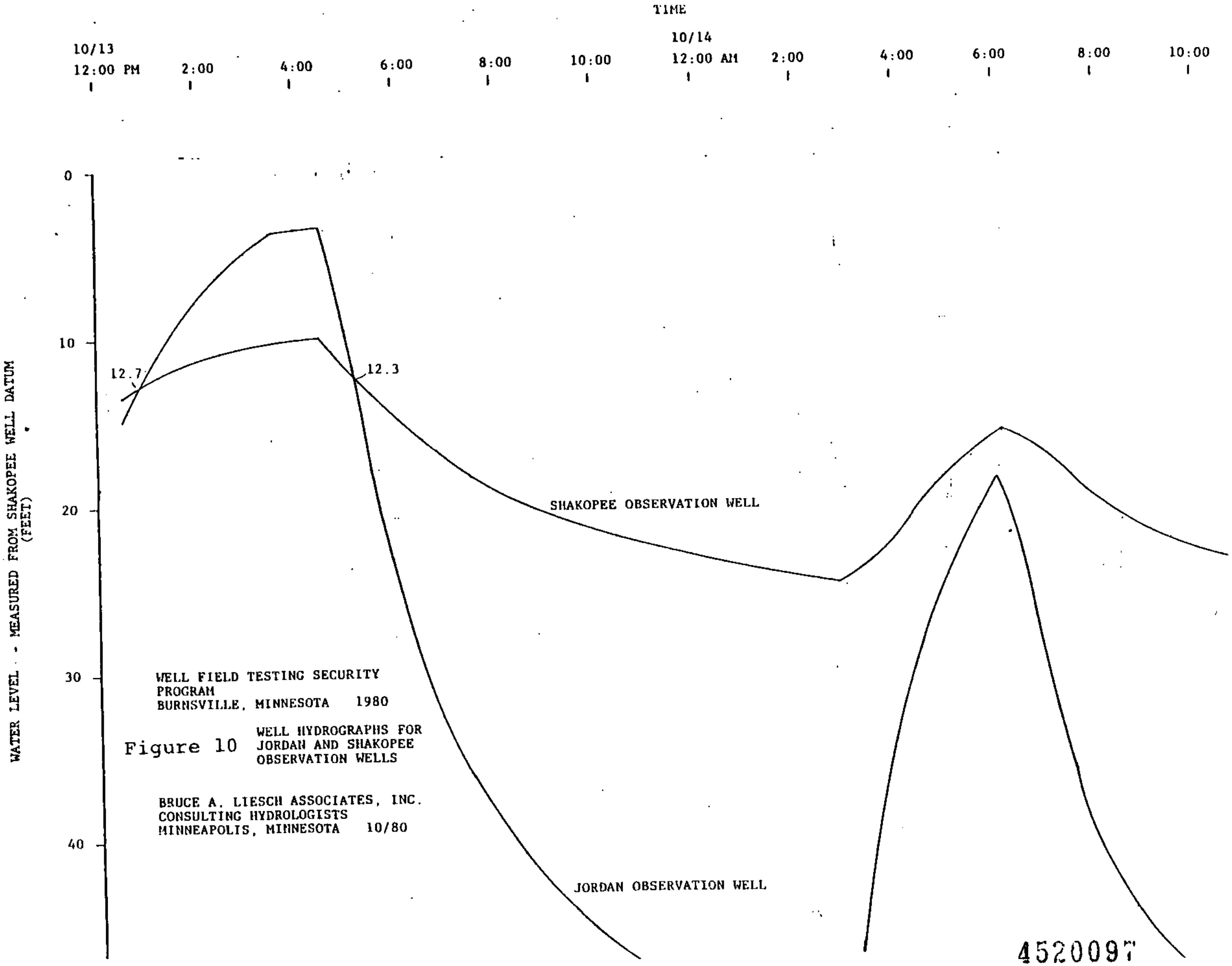

WELL FIELD TESTING SECURITY PROGRAM
BURNSVILLE, MINNESOTA 1980

Figure 10 WELL HYDROGRAPHS FOR JORDAN AND SHAKOPEE OBSERVATION WELLS

BRUCE A. LIESCH ASSOCIATES, INC.
CONSULTING HYDROLOGISTS
MINNEAPOLIS, MINNESOTA 10/80

4520097

The hydrograph of Figures 9 and 10 gives some idea as to the length of time leakage from the Shakopee into the Jordan takes place. To determine how long leakage occurs under the abandoned landfill site, these water level curves have to be modified. Figure 10 shows the modification of the drawdown trends, indicating the water levels in the formations underlying the abandoned landfill.

According to Figure 8, the abandoned landfill's southern most extent is overlying an area which has 40 feet of drawdown associated with steady state pumping and a northern-most extent associated with 20 feet of drawdown at steady state. Figure 11 shows that leakage starts at the Jordan and Shakopee observation wells 15 minutes after pumping begins but does not start at the beginning of the landfill until the pumps have been going for 150 minutes. Figure 11 also indicates that at 18 feet of drawdown or less, there is no leakage from the Shakopee into the Jordan. The 18-foot drawdown contour line shown in Figures 6, 7 and 8 represents the limit of vertical leakage form the Shakopee to the Jordan at steady state conditions. Since the pumps are seldom run long enough to attain a steady state condition, the drawdown under the abandoned landfill and the leakage associated with the drawdown is almost always less than predicted.

An analysis was conducted to determine the length of time that groundwater leaked from the Shakopee dolomite into the Jordan sandstone during the period of maximum pumpage. Table 1 shows the results of the analysis, indicating that the leakage from above occurs over a much longer time period than the natural flow from the Jordan to the Shakopee. At one point there are 25.5 hours of leakage over three pumping cycles in which the water level in the Jordan is below the water level in the Shakopee at the observation wells.

In contrast, hydrographs from two and one-half weeks later, Figure 9, indicate that the upward flow from the Jordan into the Shakopee occurs over much longer periods of time than reversed flow. During the pumping of August 9, flow was reversed for a period of five hours, followed by a period of upward flow of nine hours. Previous to the five hours of reversal, the flow was from the Jordan to the Shakopee over a 12-hour period. Figure 10 indicates an extended period of leakage into the Jordan during the middle of October. This was caused by extended pumping to fill a storage reservoir and does not represent a normal pumping period for October.

This analysis indicates that only over a short period of time during the year does leakage into the Jordan exceed the natural condition of leakage direction from the Jordan into the Shakopee. The study, however, is inconclusive as to whether the time period of the gradient reversal is sufficient for contaminants to reach the City's wells.

It is important to recognize that showing that downward leakage occurs beneath or close to a possible source of contamination does not prove that the contamination will reach the City's wells. It must also be shown that there is sufficient time for that contamination to move through the Shakopee into the Jordan and to the well field. This movement of contamination must occur during a time when leakage is reversed because after the heavy pumping of the wells

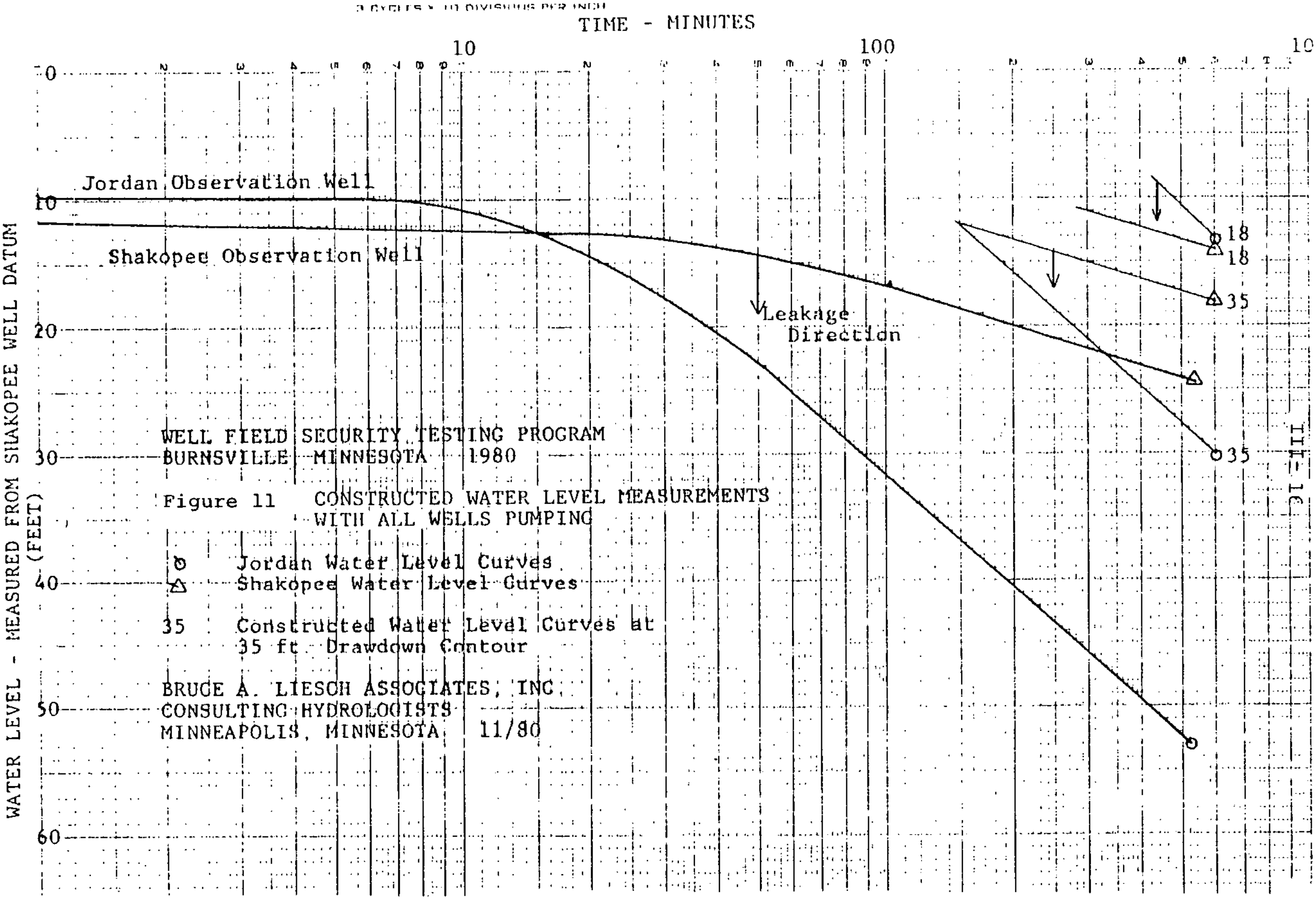

Figure 11 CONSTRUCTED WATER LEVEL MEASUREMENTS WITH ALL WELLS PUMPING

4520095

TABLE 1 - Analysis of Leakage Direction Measured at the Jordan and Shakopee Observation Wells 7/22-7/28, 1980.

Date July 1980	Flow Into Jordan Start	Flow Into Jordan Stop	Flow Into Shakopee Start	Flow Into Shakopee Stop	Total Time Hrs.	Total Time Min.
22	1:10P	5:20P			4	10
22			5:20P	6:40P	1	20
22-23	6:40P	4:30A			9	50
23			4:30A	10:20A	5	50
23	10:20A	4:40P			6	20
23			4:40P	5:00P		20
23-24	5:00P	8:50A			15	50
24			8:50A	10:20A	1	30
24-25	10:20A	5:00A			18	40
25			5:00A	6:30A	1	30
25	6:30A	11:00A			4	30
25			11:00A	2:30P	3	30
25	2:30P	7:20P			4	50
25			7:20P	10:40P	3	20
25-26	10:40P	3:00A			4	20
26			3:00A	11:30A	8	30
26	11:30A	3:40P			4	10
26			3:40P	5:00P	1	20
26-27	5:00P	12:00A			7	0
27			12:00A	9:30A	9	30
27-28	9:30A	11:00A			25	30

ceases, seepage again is upward into the Shakopee. To show that contamination will reach the wells, it must be determined that the gradient is reverse for a long enough period of time for the contamination to travel from the top of the Shakopee to the City's wells. If there is not sufficient time, and as along as the flow is only reversed for a small portion of the year, it seems logical that any contamination that enters the Shakopee or Jordan but does not reach the wells would be flushed from the aquifer during the time when the gradient follows its natural upward direction from the Jordan to the Shakopee.

This is not to say, however, that the results of the testing and modeling have, indeed, presented the worst possible case and it can be concluded that the City's well field will not be impacted by the Freeway Landfill or its expansion. Drawdown north of the observation wells toward the Freeway Landfill is at best predicted and not observed. Moreover, the study did not determine the extent and magnitude of horizontal flow in the Shakopee. The Shakopee is a limestone formation, its porosity is low and permeability high. Based on discussions with Bruce Liesch (author of the City's study), it was pointed out that horizontal flow in the Shakopee towards the leakage zone may exist and may allow the rapid and extensive contaminant transport to the area where leakage occurs into the Jordan. Additional observation wells north of the City's well field in the vicinity of the Freeway Landfill would help to further define hydrologic characteristics in this area and verify the study's predicted findings.

HYDROLOGIC INVESTIGATION WEST OF THE BURNSVILLE WELL FIELD

A 10-hour pumping test was run by the City's consultant on December 29, 1980 to determine the effect the City's wells would have on drawdown in a Jordan well on the Kraemer and Sons quarry property west of the Ctiy's well field. The test consisted of pumping city wells 1, 2, 4, 5, 7 and 8 and observing drawdown in the Jordan well on the Kraemer quarry property as well as drawdown in city wells 3 and 6 and in the Shakopee and Jordan observation wells.

The results of the pumping test represent the actual drawdown expected during the peak pumping periods of the City's well field. The results were compared to the theoretical drawdown computed from the mathematical model developed for the Burnsville area and the conclusions drawn. Figure 12 shows revised drawdown contours using the Kraemer observation well data. These revised contours show significantly lower drawdowns to the west of the well field than those shown in Figures 6, 7 and 8. The revised contours superimposed on Figure 8 would seem to move the limit of gradient reversal from a point about 300 feet from the southeast corner of the Freeway Landfill to a point about 500 feet from the Freeway Landfill.

The water levels observed at the quarry well indicate a deep cone of depression in the Jordan aquifer caused by pumping from the quarry. The cone of depression beneath the quarry acts as a barrier sink to the movement of groundwater in the Shakoee-Oneota-Jordan aquifer system. The measured interference water level drawdown at the quarry well caused by the Burnsville Jordan wells pumping at a maximum rate

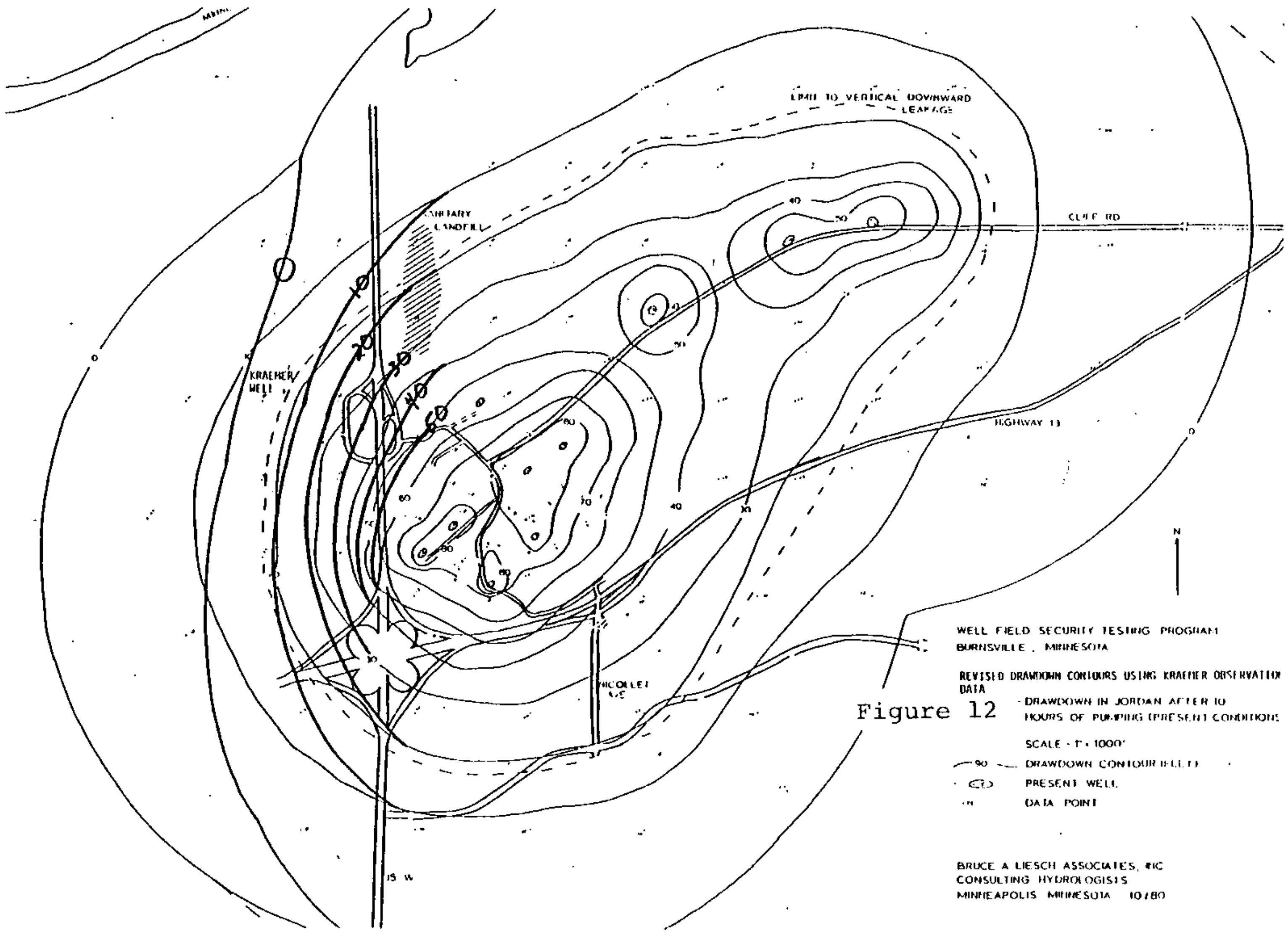

Figure 12

4520092

for 10 hours was 1.35 feet. In contrast, the mathematical model indicated an interference drawdown of 17 feet. The lack of agreement between the actual observed interference conditions and the mathematical model may be attributed to a) a higher effective coefficient of transmissivity in the area of the quarry than has been assumed for the model, b) an increase in the coefficient of storage caused by partial dewatering of the Shakopee dolomite and partial transition from artesian to water table condition, c) higher leakage rates from the Shakopee to the Jordan in the intervening area between the well field and the quarry, d) a combination of all the factors a, b and c. A higher coefficient of transmissivity and higher leakage rates would be natural physical characteristics of the units. The increase in the coefficients of storage that would accompany a transition to partial water table conditions would be induced by the deep cone of depression in equilibrium beneath the quarry. A cessation of pumping at the quarry would cause a trend toward natural conditions and the protective effects of the barrier sink would be diminished or eliminated.

The further testing at the Kraemer well cannot be extrapolated to mean assumed conditions for all areas of the aquifer under consideration. Measurements taken at the Kraemer well merely indicate that the assumptions of the model were conservative as they relate to the actual drawdowns measured in the vicinity of the quarry.

CONCLUSIONS

1. The mathematical model developed for the Burnsville well field is inconclusive as to whether or not the Freeway Landfill and its expansion will adversely impact the City's well field.

2. Drawdown north of the observation wells toward the Freeway Landfill is based on mathematical modeling and not observed conditions.

3. The extent and magnitude of horizontal flow in the Shakopee has not been determined. Horizontal flow in the Shakopee towards the leakage zone may exist and may allow the rapid and extensive contaminant transport to the area where leakage occurs into the Jordan.

4. The mathematical model is semi-empirical in nature. Additional observation wells north of the City's well field would help to further define hydrologic characteristics in the vicinity of the Freeway Sanitary Landfill and verify the model's predicted findings. In the vicinity of the Jordan and Shakopee observation wells the flow direction is reversed at a drawdown of between 14 and 17 feet where upon flow is from the Shakopee into the Jordan. The Freeway Sanitary Landfill is about 500 feet northwest of this vertical leakage line.

5. Under current pumping conditions and only during short periods of peak demand, the combined cones of depression in the Burnsville well field produce a net transfer of groundwater from the Shakopee-Oneota dolomites to the Jordan sandstone within the area encompassed by the dashed line between the 10-foot and 20-foot drawdown contours shown in Figure 8.

Poor Quality

Only during short periods in the summer does the length of time of flow from the Shakopee dolomite into the Jordan sandstone exceed the length of time of flow from the Jordan sandstone into the Shakopee dolomite.

The potential for short-term groundwater contamination in a limited area adjacent to the abandoned landfill appears to be more a function of the duration of the pumping periods at the existing municipal wells rather than additional wells pumping it more remote sites to the south and east.

ne potential for long-term, widespread contamination of the rdan aquifer would be greatly enhanced by the extended mping periods at the existing municipal wells resulting from increase in the water requirements rather than by orderly ansion of new wells to the south and east.

ng steady state conditions, the water pumped from the an is replaced by groundwater leakage through the Shakopee-ta descending from the overlying geologic units. To avoid mination it would be preferred that the replacement water rived largely from the St. Peter sandstone and glacial deposits south of the well field rather than from the alluvium.

ilable geohydrologic data are not sufficient to ne the actual presence of groundwater contamination.

IV

APPENDIX IV

SUMMARY OF PUBLIC MEETING RECORD COMMENTS
COUNCIL RESPONSE TO PUBLIC COMMENTS
CHANGES TO EIS
EDITORIAL CHANGES
WRITTEN COMMENTS

4520089

RESOURCE RECOVERY

Comments

Comments on the draft EIS were submitted by the DNR respecting materials and energy recovery. The DNR stated that the EIS should address both the present and future cost-effectiveness of resource recovery as an alternative to the landfill expansion.

Council Response

To assess the complete costs of present and future resource recovery, sugggested by the DNR, is beyond the scope of this EIS. The Council has recently completed a major report on resource recovery and materials recovery options in the Region and the metropolitan counties are presently evaluating the cost-effectiveness of specific reduction and recovery projects. This effort of the Council and counties will continue over the next two years as per requirements of the new Waste Management Act. In 1983, the cost-effectiveness of these projects will have been fully evaluated and the Council and counties will make decisions that will lead to the implementation of the needed projects. Such information is presently not readily available and is beyond the scope of this EIS.

The Council agrees, however, that the resource recovry portion of the EIS should include additional information on the potential of this alternative. The Alternatives Section of the EIS has been revised to include further discussion on materials and energy recovery. Reference to the Pine Bend EIS has been deleted. The possibility of accelerating resource recovery and materials recovery programs are now included in the final EIS.

COMPARATIVE ANALYSIS WITH NEW FACILITY ALTERNATIVES

Comments

The State Planning Agency (SPA) submitted comments stating that it would be useful to "rank" this proposal with new landfills that will be sited in the Metropolitan Area. SPA states that new landfills will likely be more expensive than today's facilities, if they are to meet current environmental and social requirements, and that pending decisions should be on the basis of how much capacity the Region needs until future landfills are sited.

Council Response

Presently, there are no new landfill proposals being considered in the Metropolitan Area. The draft EIS already contains cost information on siting a new landfill using a 120-acre site as an example of the range of costs involved. The Council agrees with SPA that a comparison of the economic and environmental costs of the Freeway Landfill proposal with future, perhaps more environmentally sound, alternatives would be useful to know to make well informed decisions. The costs, however, of siting a landfill, of controlling environmental impacts and obtaining the necessary approvals on a project will vary, perhaps, significantly, depending on the location, size and impacts of the project. The example of costs presented in the draft EIS is not meant for direct comparison with the Freeway Landfill, but only for informational purposes. The Council agrees with SPA that such direct comparisons are useful; however, since such information was not reasonably available it was felt that this was beyond the scope of the EIS.

WASTESHED ANALYSIS

Comments

Comments were received at the public meeting on the project concerning the Landfill's wasteshed or service areas. The City of Burnsville points out that the Landfill (referring to Figure II-4 in the draft EIS) receives wastes from the Metropolitan Area in general and such wastes are becoming a threat to the City's water system.

Council Response

Figure II-4 is ambiguous with regard to where the majority of the refuse is collected. Figure II-4 is deleted from the final EIS and Figure III-19 is substituted for it. Figure III-19 was determined on the basis of a telephone survey by the Metropolitan Council staff of area haulers and landfill operators and discussions with nearby community officials. Figure III-19 more accurately reflects current conditions of the landfill. As shown in Figure III-19, the landfill's wasteshed extends from Minneapolis' north boundary southward to lakeville in Dakota County and from St. Paul's east boundary westward to Hopkins in Hennepin County. The Council agrees with the City that the landfill is a regional facility providing disposal services for a portion of the Metropolitan Area.

There are various compensations open to Burnsville for having a metropolitan facility, such as the Freeway Landfill. The Waste Management Act of 1980 recognizes that landfills are metropolitan facilities and provides that cities or towns with existing facilities will be exempt from debt service payment on new facilities funded with metropolitan bonding. Existing landfills are no longer classified as pollution control facilities and can now be taxed. In addition, the WMA requires the Council by January 1, 1982 to report to the Legislative Commission on Waste Management on methods of mitigating and compensation for the local risks, costs and other effects of solid waste disposal facilities. It is expected that new legislation respecting this matter will be recommended in the Council's report.

GROUNDWATER MONITORING

Comments

The DNR states that the monitoring program described in the EIS should include analysis of leachate for PCBs, heavy metals and phenols in addition to other parameters. The MPCA states that the depth of all the wells should be included in the EIS to indicate what aquifer or portion of the aquifer is being sampled and the zone of influence for each of these wells.

Council Response

The MPCA determines which parameters are tested for as part of the monitoring program. The location and types of monitoring stations, sampling frequency and procedures and the parameters that are tested for are generally specified as conditions in the permit issued by the MPCA. The MPCA, with reason, can modify that permit at any time to change the monitoring program. The current monitoring plan includes sampling of groundwater wells quarterly for chemical-oxygen demand (filtered), BOD (filtered), pH, chloride, chromium, copper and specific conductance. Surface water stations are monitored quarterly for COD (filtered and total), BOD (filtered and total), chloride, pH, specific conductance, copper and chromium (total). These parameters are known as indicator parameters which migrate fastest and will show up earliest in monitoring systems. Should the indicator parameters rise, the monitoring program can be expanded to include testing for other constitutents.

Appendix V has been added to the EIS to show the results of monitoring at the landfill for the last three years. In mid-September 1977, five piezometers were installed to help characterized groundwater quality in the area. The wells were constructed of 1-1/2 inch plastic pipe, and each well point was placed approximately 10 feet below the observed groundwater level. The depth of the Landfill monitorng wells are included in the following table. These wells extend into the bedrock aquifer.

Well	Surface Elevation (MSL)	Depth of Well (Feet Below Ground Surface)	Elevation/ Bottom of Well (MSL)
1	708.6	34.5	674.1
2	707.8	34.0	673.8
3	703.0	29.5	673.5
4	724.1	34.8	689.3
5	722.1	34.3	687.8

LOCAL COMPENSATION

Comments

A comment was submitted by the State Planning Agency at the public meeting on the draft EIS in regard to taxation of landfill facilities. The Agency points out that this would be one way to compensate local governments for problems the facility may cause in the future.

Council Response

In response to this comment, the City of Burnsville submitted tax figures to the Council for three scenarios: 1) the 1980 tax if the landfill were presently taxable, 2) if the landfill were assessed and taxed differently if it were full and closed, and 3) what the land tax would be if there was water, sewer, streets, etc. in and ready for development.

The parcel numbers, assessed values, acreages and 1980 taxes are listed below.

Parcel Number	Assessed Value Existing	Acreage Existing
02800-010-90	$ 43,924	40
02800-010-85	$ 43,924	40
02800-010-75	$ 19,966	20
02800-010-80	$ 69,744	26.7
Total	$177,558	126.7
1980 Mill Rate	.0975526	
Tax	$ 17,321.25	

2) The landfill property would be assessed equally $17,321.25 if it were full and closed.

3) The 1980 market value rate is $18,000 per acre for Burnsville Industrial Park. The gross land area is reduced 25 percent for streets and the tax is then estimated to be as follows.

	Existing Landfill
Total acreage	126.7
Reduction for streets (25 percent)	31.7
Net acreage	95.0
Assessors market value/acre	$ 18,000
Total market value	$1,710,450
Assessment rate (percent)	0.43
Assessment value	$ 735,494
Mill rate	.0975526
Tax	$ 71,749.35

It should also be noted that for the 1980 assessment, taxes payable 1981, the asssessor has increased land values 25 percent; therefore, if the mill rate remains about the same, the above estimated taxes would also increase by approximately the same amount.

It should be pointed out that the 1980 Waste Management Act required the Council to prepare by January 1, 1982, a report to the Legislative Commission on Waste Management respecting methods of mitigating and compensating for the local risks and effects of solid waste disposal facilities. Methods of financing mitigation and compensation measures will be considered in the report.

COMPLIANCE WITH EXISTING PERMIT CONDITIONS

Comments

Comments were received at the public hearing on the draft EIS concerning the Landfill's history of compliance with operational regulations. The State Planning Agency (SPA) submitted comments stating that the draft EIS paid insufficient attention to the compliance history of the Landfill with respect to daily cover. SPA states that the EIS does not discuss the implications of known daily cover violations with respect to the granting of a permit for the Landfill's expansion. SPA suggests that the draft EIS should incorporate discussions concerning the frequency of the cited violations, the likelihood of violations between inspections, and the operator's explanation for the lack of daily cover. SPA further suggests that the draft EIS should cover the position of the county and state regulatory agencies regarding the history of violations, their analysis of the impact of the violations on the environment and nearby residents, and their expectations for future compliance. Finally, SPA suggests that the draft EIS should discuss the relative merits of granting the respective landfill permits (such as Woodlake, Freeway, Burnsville and Pine Bend Landfills) on the basis of the different compliance records of the different facilities. SPA points out that we can either assume that enforcement will be adequate to ensure future compliance, or assume that regulatory resources will be inadequate to ensure compliance where the permittee has not shown a predisposition in that direction. The MPCA submitted comments referring to page 139 of the draft asking if there is evidence that the landfill operations now include daily cover. The MPCA also submitted an enforcement chronology on the landfill (Feb. 23, 1981) requesting that it be contained in the final EIS.

Council Response

As correctly pointed out by the SPA, the landfill has had a history of operating violations of Minn. Rule SW-6 (2). The most consistent violations have been for improper termination of previously filled areas, maintainting too large a working face, and inadequate daily cover. Other violations noted on a less frequent basis include ponding surface water on-site, litter, lack of vegetation on terminated areas and untimely submittal of report forms and plan compliance. Appendix II has been revised to more accurately reflect the history of violations and compliance at the landfill. MPCA enforcement chronology replaces the draft EIS's chronology.

The problems have been of such magnitude, that on November 25, 1978, the MPCA issued a Notice of Noncompliance to the landfill and referenced 14 violations of Minn. Rule SW-6(2) noted by MPCA staff during the period June 1, 1979 to November 5, 1979. After this notice was received, the facility greatly improved its operation and level of compliance until recently (July 1980) when problems with lack of daily cover and improper termination of previously filled areas were again noted.

It is extremely difficult to assess what impact has occurred as a result of violations at the landfill. Lack of daily cover will provide increased opportunities for infiltration at the Landfill thus increasing the potential for leachate and methane gas production. Failure to apply daily cover will also increase the chances for blowing litter and the breeding and infestation of vectors. The degree to which this has occurred at the landfill as a result of noncompliance with state rules would be extremely speculative and beyond the scope of an EIS. Unless the landfill is inspected practically everyday to determine if violations are occuring or unless surrounding residents are reporting frequent violations, the environmental impacts from such violations are almost impossible to determine. The projected impacts of leachate and methane gas production are generally determined based on compliance with permitted conditions at the landfill. Incidents of vectors and litter will often imply a past violation of permitted operating practices.

Appendix II and relevant text areas of the EIS have been revised to more accurately reflect compliance conditions of the landfill.

Concerning the issue of granting or denying a permit to a facility operator based on the operator's past performance, the following is an opinion on the matter from the Metropolitan Council's legal staff. State law provides that solid waste facilities may not be operated or extended without a permit issued by the MPCA. Minn. Stat. 116.081 (1978). Permits issued pursuant to this provision can be revoked or modified whenever it is necessary, in MPCA's opinion, to prevent or abate pollution. Minn. Stat. 116.07, subd. 4 (1978).

Minn. Stat. 116.07 (1978) authorizes MPCA to adopt solid waste disposal standards. These standards appear at SW 5 and SW 6 of the Minnesota Code of Agency Resulations. SW 6 required landfill operators to obtain permits prior to operating solid waste facilities. SW 5(2) requires permit applications to be accompanied by plans as described in the regulations and by a plan of operation. SW 5(3) states that plans and specifications shall be approved and a permit issued when the MPCA believes they are in accordance with the regulations (emphasis is supplied). SW(5) provides that permits may be revoked for violation of the regulations. Sanitary landfill regulations and requirements are described in SW 6.

Neither the statutes nor the regulations provide for permit denial based upon past performance pursuant to a MPCA permit. To the contrary, both the statutes and regulations explicitly provide that existing permits may be revoked or modified. Additionally, the regulations provide for mandatory MPCA approval of permit applications whose plans and specifications are in accordance with the regulations.

MPCA action is governed by its officially adopted regulations. These regulations do not include past performance as a criteria for current permit applications. The MPCA cannot use such a criteria without first amending its regulations. Such a criteria cannot be implied. Furthermore, since the statute upon which the regulations are based provides that permits may be revoked or modified to prevent pollution, it seems doubtful that the regulations could be amended to provide past performance as a reason for denying a permit application.

Minn. Stat. 473.873, subd. 3 (1978) provides the MPCA "may issue permits for the operation of waste facilities in the Metropolitan Area where the operation thereof is consistent with applicable regulation..., provided that no permit may be issued for the operation of a waste facility in the Metropolitan Area which is not in accordance with the Metropolitan Council's solid and hazardous waste policy plan." Further, "If the Council determines that a permit is in accordance with its policy plan, the Council <u>shall</u> approve the permit." (Emphasis added.)

This provision gives the Council veto over permit applications in the Metropolitan Area--as long as the Council acts within the scope of its own authority.

The Council's standard of review for permit applications is consistency with the goals, policies, standards and criteria in its Solid Waste Policy Plan. Protection and enhancement of environmental quality are two of the considerations the Council must use in preparing its Policy Plan. Accordingly, while prevention of environmental degradation is preeminently a function belonging to the MPCA, it is partially within the Council's domain as well.

Unless the Solid Waste Policy Plan embodies past performance of the permit applicant as a standard, the Council cannot negatively review the application for that reason.
No such criteria currently exist in the Solid Waste Policy Plan. Criteria 6b and 6e, relating to solid waste facility personnel, focus on the need for adequately trained personnel who are capable of environmentally safe management. There is no policy stating that the Council will deny permits to those facility operators who, though apparently capable, have failed to operate their facilities consistent with permit conditions.

The statute granting the Council review authority in this field does not on its face provide for a regulatory or enforcement function by the Council. The statutory scheme plainly does lodge this function in the MPCA. While the Council is empowered to embody environmental concerns in its policy plans, it would be anomalous to read Section 473 as implying that the Council can enforce permit conditions. To imply such a power in the Council would go beyond the wording of the statute and would give the Council an enforcement power unique among the powers given by the legislature to the Council. It would also create an inconsistency between 116.07, subd. 4a and 473.823, subd. 3.

Pursuant to Minn. Stat. 473.723, subd. 3 (1978), the Council can apply the criteria and standards of its Policy Plan in the permit review process. The components of the Policy Plan are describe at 473.149, subd. 1 (1978). Operator past performance is not listed, though "operation" and "economic viabliity" are. Operating criteria and standards are not the same thing as performance. Criteria and standards are absolute measures against which behavior, i.e. performance, is measured.

Accordingly, it is doubtful that the Council could properly assume a regulatory function by amending its Policy Plan to include a criteria consisting of past performance pursuant to a MPCA permit. As a practical matter, this would entail the creation of highly detailed criteria: how many violations? over what time period? should there be a distinction between intentional and unintentional violations? must there be a process for operator challenge to alleged violations? Plainly this would drag the Council into a highly complex regulatory and enforcement function, for which it has not received legislative authorizaton and for which it presently has neither the expertise not the experience.

COMPLIANCE WITH EPA'S "OPEN DUMP" CRITERIA

Comments

SPA submitted comments regarding the draft EIS on what effect EPA's open dump inventory criteria would have on this landfill. SPA states that all facilities in the state will be expected to be in compliance with EPA's criteria for the classification of solid waste disposal facilities and that if this landfill is in violation of these criteria it may be cited as an open dump. SPA states that the EIS should discuss this issue, particularly in light of leachate that generally occurs from open dumps.

Council Response

According to the MPCA, the landfill was given a "2" rating under the state open dump survey completed in December 1980. The MPCA examined past quarterly monitoring and operational reports and inspections of the landfill and, on the basis of these reports, determined that the landfill is a high priority site with a high potential for pollution in accordance with the federal Land Disposal Criteria and State regulations. The MPCA identified the following problem areas at the site in determining its rating of the landfill operational deficiences over the past few years, including daily cover deficiencies; confirmed leachate at the landfill; location of the landfill in a floodplain; violation of federal surface waters criteria; and potential problems with disease vectors because of operational deficiencies. It should be noted, though, that EPA has not officially adopted final land disposal criteria.

The landfill was operated as a dump prior to being permitted as a landfill in October 1971. It's our understanding that the landfill originally opened in the late 1960s. As to the operation of the facility prior to being permitted, it is difficult to know exactly what was occuring at that time. Open dumps were generally considered nuisance facilities in the Metropolitan Area in the 1960s. Because of this, the state passed its first solid waste law in 1969 requiring that solid waste facilities be permitted in accordance with adopted state standards. The extent to which the landfill as an open dump was a nuisance facility and contributed to environmental degradation is unknown and would be speculative at this point. The Council believes such discussion is beyond the scope of the EIS.

Appropriate secions of the EIS have been revised to reflect the above discussion.

IMPACT ON BURNSVILLE'S WATER SUPPLY WELL FIELD

Comments

Several comments were submitted regarding the landfill expansion's impact on the City of Burnsville's water supply well field. In August 1980, EQB granted the Council an extension of time to complete the final EIS on the expansion until the city had completed a report on its well field expansion program. The Council felt the city's report would provide further definition on th groundwater hydrology in the vicinity of the landfill and any impacts that might occur to the groundwater and city's well field as a result of the landfill's expansion. The city's report was completed in December 1980. The Council prepared an analysis of the report and filed it as a supplement to the draft EIS in January 1981. Because the findings of the supplement differed from the draft EIS, another public meeting was held Feb. 26, 1981 to receive comments on the supplement.

The following summary of comments is divided between those received on the draft EIS and those received on the supplement to the draft. Because the supplement appears to answer many of the comments on the draft EIS, the Council's response to the comments deals with this issue as a whole.

Draft EIS Comments

The MDOH states that the although the current dewatering operations at the Kraemer Quarry appear to draw leachate towards the south and intercept the leachate, once dewatering ceases, leachate may be drawn towards the Burnsville well field during periods of high demand, threatening that supply. The MDOH further states that the Jordan Sandstone is hydraulically continuous with the Shakopee-Oneota Dolomite (Prairie du Chien) and that the wells are high capacity wells and during heavy pumping periods, drawdown is sufficient to cause groundwater flow reversal. The MDOH states that it is strongly recommended that monitoring wells be located east and south of the landfill to detect any leachate migration that may occur in these directions and to assess the extent and magnitude of leachate spread. The MDOH points out the study being conducted by Bruce Liesch Associates for the city will more specifically define those conditions governing groundwater flow reversal.

The MPCA submitted comments stating that it would be useful if the EIS evaluated the pumping rate at nearby wells at which groundwater flow reversal and contamination occurs. The MPCA also submitted comments stating that the EIS should identify what groundwater is used for wells at the site.

The City of Burnsville submitted comments stating that the MDOH has required the city to prepare a report to assess the potential of groundwater flow reversal during heavy pumping periods of its well field. The city points out that such reversal could cause leachate from the landfill to enter the municipal water system. The city states that the EIS fails to adequately assess the impacts on groundwater and public health due to the landfill.

Supplement Comments

The MDOH submitted comments outlining the historical developments and findings of the studies investigating the potential impacts of the operating Freeway Landfill and the abandoned McGowan Landfill on the Burnsville well field. In February 1980, the MDOH stated to the City that it would not approve the installation of a new Jordan well in its present well field unless a fairly comprehensive hydrogeologic investigation was conducted to determine the extent and magnitude of the flow reversal. The MDOH was concerned about thepossibility of intercepting leachate from the abandoned McGowan Landfill and the Freeway and Burnsville Landfills. The MDOH points out that the findings of this study (completed in December 1980) indicated that the abandoned landfill and Freeway Landfill may indeed adversely impact the well field. The MDOH further states that there is some uncertainty in these findings in that it is impossible to say at this time whether actual field conditions are any worse or better than indicated by the study's model, because of the study's theoretical basis. The MDOH concludes that there is a need for more field information in the vicinity of the landfill and a need to evaluate groundwater behavior and movement in the Shakopee Dolomite. The extent and magnitude of horiziontal flow in the Shakopee cannot be determined at this time because there is only one observation well in this formation. The MDOH states that with heavy pumping of the well field, there appears to be movement of leachate towards the well field and that if pumping rates become more extensive, there is a high potential of leachate reaching the well field and contaminating the municipal water supply. The MDOH recommends that additional Jordan and Shakopee observation and monitoring wells should be installed adjacent to the abandoned landfill and the Freeway Landfill to monitor both groundwater flow and leachate migration. The MDOH states that it agrees with the conclusions of the supplement and recommends its adoption into the final EIS.

The City of Burnsville submitted comments stating its study (December 80) was inconclusive as to the exact impact that the Freeway Landfill would have on the well field. The city agrees with the findings of the supplement and believes that additional observation wells north of the well field should be installed to further define the impact of the landfill. The city states there must be a positive determination as to whether or not the landfill will impact the well field prior to any further action on the expansion.

The Minnesota DNR submitted comments agreeing with the conclusions of the supplement in that 1) the expansion of the well field should be toward the south or east, away from the existing landfills, 2) increased pumping of exising wells may draw landfill leachate toward the well field, and 3) the well field is already threatened with contamination whether or not a new well is added. The MDOH further states the supplement is not clear whether or not expansion of the landfill will increase the potential for contamination of the wells.

The MPCA submitted comments stating the supplement presents sufficient information regarding the possibility that leachate from the Freeway Landfill may contaminate city wells. The MPCA states that further study to quantify leachate migration from the landfill is a matter that could be properly taken up as part of the permit application. The MPCA further points out that additional hydrological studies of the leachate aquifers may be unnecessary if the city phases out four of its wells. The MPCA states that if this occurs, the furthest extent north in which water would migrate down and enter the Jordan aquifer from the Shakopee formation could recede south from the vicinity of the landfill.

Fred Richards, on behalf of the Freeway Landfill, submitted several comments on the supplement and comments responding to comments submitted by the MDOH and the City of Burnsville. In general, Richards states it is important to recognize that simply proving that downward leakage occurs beneath a source of possible contamination does not prove that the contamination will reach the city well field. It must be shown that there is sufficient time for the contamination to move through the Shakopee, into the Jordan and to the city well field. According to Richards, this movement of contamination must occur during a time when leakage is reversed because after heavy pumping ceases, seepage again is upward into the Shakopee. Richards points out that in the case of the well field, each year (or period of heavy pumping) should stand by itself as long as the direction of flow during the major portion for the year is from the Jordan to the Shakopee. To show that contamination will reach the wells, Richards states that it must be determined that thegradient is reversed for a long enough period of time for the contamination to travel from the top of the Shakopee to the city wells. Richards states that if there is not sufficient time and as long as the time of flow reversal is a small part of the year, any contamination that enters the Shakopee or the Jordan but does not reach the city wells would be flushed from the aquifer during the time when the gradient follows its natural upward direction from the Jordan to the Shakopee. Richards further states that it could be agreed that since contamination has not been measured in the city wells to date, contamination is not likely in the future under present or reduced rates of pumping since the movement of contamination is not likely to be progressive with time.

Richards submitted further comments stating that the supplement should further distinguish between the Freeway Landfill and the abandoned landfill. Richards also states that the results of the pumping test and resulting drawdown at the Kraemer well show that the extrapolation of drawdown from the Burnsville well field over estimates the actual limit of gradient reversal and that, in fact, the Liesch study using "worst case assumptions" shows that the limit of downward leakage does not intercept the Freeway Landfill. Richards states that the discussion of the measurements (and figures) taken at the Kraemer quarry should be included within the supplement. Richards states that one could conclude from the Liesch study that there is likely not sufficient time for contamination from the landfill to reach the city's wells in any one period of heavy pumping and that any contamination reaching the Shakopee or Jordan would be flushed from the aquifer into the river during the much longer period of time when the natural movement of groundwater is upward. Richards further states that the report did not draw conclusions that increasing levels of nitrates, chlorides and specific conductivity in the Shakopee monitoring well indicate possible landfill leachate contamination as stated by the MDOH. Richards points out that more information is needed regarding other sources of potential contamination at the old sewage treatment plant.

Responding to the MDOH's comments of horizontal flow within the Shakopee, Richards states their conclusions cannot be found nor supported for terms as "rapid and extensive contaminant transport" and "intercept contaminants very quickly." Responding to the city's comments that the Liesch study and supplement is inconclusive in identifying impacts of the landfill on the well field, Richards states the Liesch report focuses principally on the abandoned landfill and concludes that even under worst-case conditions, the Freeway Landfill is outside the limit of reversed vertical leakage.

Council Response

The Metropolitan Council delayed completion of the final EIS on this project until the City of Burnsville could complete its study on its well field expansion program. This study and its impact on the landfill are contained ina supplement to the draft EIS that was prepared January 26, 1981. The comments received regarding this issue center around exacting what this study tells us, what it doesn't tell us, and whether it represents a worse case analysis. Based on the discussion below, the supplement has been revised and appended to the final EIS as Appendix III.

The intent of the draft supplement was to show what impact the Freeway Landfill and its expansion might have on the City's water supply system. Although the intent of Liesch's study for the City was primarily concerned with the City's well field, the well field's expansion, and impact from the abandoned landfill, the close proximity of the Freeway Landfill to the well field and abandoned landfill results in a study which presented data that could be analyzed with respect to the Freeway Landfill as well. However, as correctly pointed out by Richards, the reader of the draft supplement could be confused between the abandoned landfill and the Freeway Landfill. The final supplement has been revised to further distinguish between the two landfills.

The final supplement has also been revised to incorporate the results of the further drawdown testing that was done at the Kraemer dewatering operation (see Figure 12, Final Supplement). As correctly stated by Richards, the results of the pumping test at the Kraemer well show that the extrapolation of drawdown from the Burnsville well field overestimates the actual limit of gradient reversal. The overestimate of drawdown (model versus actual observations) may, however, only extend west toward the quarry operation and not the rest of the model's predicted drawdown area as suggested by Richards. As Liesch points out, the lack of agreement between the actual observed conditions and the mathematical model may be attributed to a) a higher effective coefficient of transmissivity in the area of the quarry that has been assumed for the model, b) an increase in the coefficient of storage caused by partial dewatering of the Shakopee dolomite and partial transition from artision to water table condition, c) higher leakage rates from the Shakopee to the Jordan in the interviewing area between the well field and the quarry, d) a combination of all the factors a, b and c. Liesch's mathematical model assumes that the aquifer is homogenetic with respect to factors a and c. The further testing at the Kraemer well cannot be extrapolated, as Richards has done, to mean assumed conditions for all areas of the aquifer. The mathematical model's predicted drawdown may, in fact, only be overestimating toward the quarry area. As pointed out by the MDOH, the further testing at the Kraemer well simply confirms the extensive dewatering currently ongoing at the quarry which will minimize the drawdown from the City's wells.

The final supplement has been revised concerning the nature of the mathematical model used to predict drawdown. Predicted drawdown is based on water level observations at two observation wells immediately north of the well field and at the Kraemer well. The predicted drawdown area is, thus, based at least in part, on field observation data and is not entirely theoretical as suggested by the draft supplement. It is not, however, entirely empirical as suggested by Richards. Drawdown north of the observation wells is at best predicted and not observed. Additional observation wells north of the City's well field toward the Freeway Landfill would help to verify the model's predicted findings. The final supplement has been revised, therefore, to point out that the model is semi-empirical in nature and not entirely empirical or theoretical.

Richards correctly points out that the supplement did not draw conclusions that increasing levels of nitrates, chlorides, and specific conductivity in the Shakopee monitoring well indicate possible landfill leachate. The EIS has been revised to state that the data was insufficient to make such a determination. This issue will have to be investigated further under the permitting process.

The issue of horizontal flow in the Shakopee formation has not been investigated. The Shakopee is a limestone formation, porosity is low and permeability high. Based on discussions with Liesch this issue should be further investigated. The Council agrees with the position of the MDOH.

The City of Burnsville pointed out that the cost the City has incurred or may incur in the future relating to the existence of both the Freeway and Burnsville Landfills and the effect on their water system should be paid by other users of the lanfill system. The following is a staff analysis respecting contamination and operation of a landfill and liability.

Liability

Under present law, the allocation of liability for contamination of wells by solid waste disposal facilities, including landfills, is governed by the common law of negligence and of nuisance. Either theory could be utilized by a property owner ("owner") in a suit against the landfill owner and others to recover damages for pollution of a well on his property.

In order to hold a defendant liable, the owner of the polluted well must prove tht the defendant owed the owner a duty of care, that the defendant failed to exercise the care required, that the defendant's action or inaction caused the pollution of the well, and the amount of damages, expressed monetarily.

It is likely that landfill operators owe the owners of surrounding property the duty of care. A more difficult problem would be establishing whether the landfill operator exercised the amount or type of care required. This is the problem of establishing a standard against which the operator's procedures and actions would be measured. The standard of care would probably be defined by the use of experts in the field of landfill operations. If the operator has conducted landfill operations in a manner based upon the current state of the art, the operator is not liable, even if the owner's well is polluted.

The owner must prove a causal link between the landfill operator's actions or inaction and the damage caused to the well. Such a link could pose expensive and perhaps insurmountable proof problems. The land owner must show that the pollution was caused more likely than not by the operation of the landfill, not merely that the landfill could have caused the pollution. The defendant would attempt to show that the actions of others were responsible for the pollution, especially in a situation arising subsequent to the closing of the landfill.

Finally, the owner must establish the dollar amount of his damages, generally consisting of his expenses incurred to repair the damage or replace the water source.

In a nuisance suit, the land owner need only show that the operator's actions constituted a nuisance which interfered with the owner's right to use and enjoyment of his property, including his well. The courts do not presume that landfills are always nuisances. Liability will be imposed only where there is proof that a substance, which is unnatural to the land and which has a natural tendency to cause harm if it escapes, has escaped and harmed another's land. Negligent or careless operation need not be proved, nor does proof of nonnegligent operation excuse the defendant. The measure of damages in a nuisance suit is the depreciation in the market value of the owner's property, because of the pollution.

Either a public or private landfill operator could be held liable for damages in a negligence or nuisance suit. A problem with a private defendant might be that he or his assets cannot be found or that he is without sufficient assets to satisfy the judgment. The negligence liability of political subdivisions is limited in terms of dollars by statute. This limitation may or may not apply to nuisance suits. The liability probably persists even after the land has been transferred to another person or entity.

If a landowner could preliminarily show substantial damage being caused by a currently operating landfill, a court might temporarily enjoin the continued operation of the landfill pending a liability determination or permanently enjoin its operation, unless the operator can comply with the terms of the injunction. Compliance with the terms of an injunction could be very expensive. Such an injunction suit could be brought pursuant to the common law, or to the Environmental Rights Act, Minn. Stat. 116B (1978). In case of the latter, a citizns' suit could be maintained even though no damages are claimed. Minnesota law also provides for the imposition of criminal and civil penalties for violation of the state's Water Pollution Control Act and the Act establishing the Pollution Control Agency.

The issues of the period of time after a landfill is closed during which an operator may remain liable and of liability upon sale or reuse of used landfill sites have not been addressed.

If the private defendant is found to be liable, but is either unavailable or without assets, the owner is essentially left remedyless. If the pollution problem is severe or widespread and is causing a threat to the public health, the taxpayers will likely bear the burden of the cleanup by default. If the city's water supply has been polluted and no solvent defendant is available, the taxpayers again will have to bear the financial burden of the cleanup. Plainly, as in the case with closure and post-closure liability for pollution caused by hazardous waste facility owners, the situation regarding solid waste site operator liability could appropriately be addressed by legislation providing for financial assurance of closure and post-closure care on the part of the operators. The Waste Management Act of 1980, Laws 1980, Ch. 564, Art. X, Subd. 2C requires the Council to report to the legislative commission on the problem of compensating localities for the risks associated with solid waste disposal facilities. Thus, the legislature has recognized the limitations of existing law with regard to the problem of paying for the cleanup of pollution caused by defendants who are unavailable or without assets.

CAPACITY OF THE SITE

Comments

The MDOH pointed out that page 2 of the draft EIS states the proposed expansion of 1,860 acre-feet will increase the estimated life of the facility by three to six years, given a fill rate of about 160 acre-feet per year. At this fill rate, 160 acre-feet, an additional 1,860 acre-feet of space, would increase the estimated life of the landfill by more than 11 years. Also, there is a discrepancy in the landifll capacity figures cited on pages 10 and 144.

Council Response

It was estimated the landfill expansion would provide an additional three to six years of life. This was made on the basis of other landfills filling up and the resultant portions of solid waste being redirected to the Freeway Landfill (see Alternatives to Proposed Action - Section VI). The MDOH is correct in stating that at a continuing-use rate of 160 acre-feet per year, the facility could run for more than an additional 11 years. This, however, is not the case, since the facility at some time will experience increases in its use rate as other alternative landfills fill up. The EIS has been revised on page 2 to clear up this confusion.

With respect to pages 10 and 144, the MDOH points to an error in the capacity figures on page 10. The present remaining volume space is about 951 acre-feet, as correctly stated on page 144. Page 10 has been revised to include the correct figure.

AIR QUALITY

Comments

The MPCA submitted comments stating the expansion will result in increased fugitive dust because the top elevation of the landfill will be 20 feet higher. The MPCA points out that the expanded landfill will presumably be exposed to greater wind erosion. Also, the environmental and aesthetic impacts of blowing litter should be evaluated in the EIS along with potential mitigating measures.

Council Response

As correctly pointed out by the MPCA, the increased elevation of the expanded landfill will increase the potential for fugitive dust emissions and blowing litter. Current operational procedures at the landfill, however, should be sufficient to mitigate most impacts. It should be pointed out, that prior to filling the proposed expansion area, the operator intends to construct a screening berm on the eastern edge of the landfill (see Figure II-9).

The approach to the landfill and the main site road to the present active fill area are paved. In addition, water from a fire truck is available to sprinkle on the dirt portions of the road if further dust control is necessary. An attendant picks up paper and other debris which may be scattered on the site. Litter control fences are also used to prevent wind-blown material from leaving the site.

It may be necessary to pave the main site road to the active fill area within the expansion area. Stepped-up enforcement by the MPCA would also help if litter and fugitive dust becomes a problem while filling the expansion area. Other control measures would include limiting the size of the working force, proper application of cover materials in daily operations, provision of temporary fencing and provision of regular maintenance operations.

The Air Quality portion of Sections IV and V of the EIS have been revised to include additional discussions on the impacts of fugitive dust and litter resulting from the expansion.

SITE-SPECIFIC DESIGN ALTERNATIVES

Comments

The DNR submitted comments stating that the EIS does not address the reason why clay is not going to be used as a daily cover material. The DNR further states that the EIS should include more information on alternatives for preventing or minimizing leachate flow into the Minnesota River including analyses of trenches or collection wells. The DNR states that this information would be particularly useful in

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view of the fact that the landfill will continue to contribute leachate to the River after it ceases to be actively used. The MPCA also submitted comments stating that the site-specific design alternatives in the draft EIS were inadequate and that the closure discussion on the landfill should specify that a soil material of an acceptable permeability rate will be used in order that infiltration will be minimized.

Council Response

The landfill will generate leachate which will eventually enter into the groundwater and surface water systems. The landfill's expansion will result in the production and generation of greater quantities of leachate and extend its immediate aerial impact. The EIS shows that dilution of the leachate should be sufficient to mitigate surface water impacts. Groundwater, however, will be directly impacted immediately surrounding the facility. The impact on most local water supply wells should be neligible, but because of the close distance between drawdown of the city's wells and the expanded landfill's identified zone of leachate influence, precautions should be taken with respect to these wells.

Leachate control approaches would reduce either the quantity of leachate generated or the potential for the escape of leachate from the Landfill and subsequent degradation of groundwaters. The disadvantage associated with these options, however, relates to the generally substantial costs involved in implementing and maintaining these systems. At some point, the costs of leachate control result in diminishing benefits. It is usually very difficult to determine when this occurs, because of the difficulties in arriving at the costs of environmental impacts and the benefits of its control.

The Council agrees with the DNR and the MPCA that the EIS should contain a discussion of minimizing leachate from the landfill. Sections V and VI of the EIS have been revised to include discussion on leachate control measures that would provide the expanded facility an increased level of protection and minimize direct groundwater impacts.

The Council disagrees with the MPCA that the EIS should specify (require) that a soil material of an acceptable permeability will be used in order to minimize infiltraton at the expanded landfill. The EIS is a disclosure document and provides information as to what effect various controls or mitigating measures will have on impacts from the expanded facility. Once the EIS is completed, it is up to the decision-making bodies to make the final decisions as to which controls will be used or not using the EIS as an informational resource. If the EIS specifies or requires particular controls or mitigating techniques, it goes beyond being a disclosure-informational resource to becoming the final decision-making document. In such a case, the authority of the decision-making bodies would be preempted. A recent State Attorney General's opinion has been written on this matter stating this position.

Methane gas and other problems which would necessitate the consideration of site-specific design features were not identified as major potential problems of the expanded facility. To the extent problems were identified, the Council believes that the EIS adequately covered the site-specific design measures that could be employed. Notwithstanding, if leachate control facilities are implemented at the Landfill, methane buildup could become a problem at which point appropriate mitigative measures would have to be taken. The EIS has been revised to discuss this matter (see Section V).

TRANSPORTATION IMPACTS

Comments

A comment was received for the public meeting record on the draft EIS from the City of Burnsville concerning the effects of the expansion on transportation. The City points out that the I-35W and Black Dog Road are congested and the expansion will extend the period of time of congestion. The Minneosta Department of Transportation (MnDOT) points out that the access road to the site, 113th St., should be shown in either Figure II-1 or II-2 in the EIS. MDOT also states that the limits of the Minnesota River, Black Dog Lake and I-35W should be shown in Figure II-2. MDOT further points out that the draft EIS states the landfill generates an average of 150 daily truck trips, which represents approximately three percent of the total truck trips on I-35W. MDOT states that this statement is correct if 150 trip ends are generated; however, if 150 trips are generated daily, that would constitute 300 trip ends and represent six percent of the total truck traffic on I-35W.

Council Response

The City of Burnsville correctly points out that the period of time of congestion will be extended due to the expansion. This was identified in the EIS. The MDOT, however, in commenting on the Burnsville Landfill expansion noted that the Burnsville expansion should not adversely effect the levels of service on I-35W or T.H. 13. One would expect, therefore, no impacts from the Freeway Landfill expansion on the levels of service on I-35W or T.H. 13, with the exception of a continuation of existing impacts as noted by the City.

In accordance with the suggestions of MDOT, Figure II-2 has been revised to show 113th St. and the limits of the Minnesota River, Black Dog Lake and I-35W. The MDOT correctly points out the differences between trip ends and trips. The EIS should say 75 daily truck trips and not 150 as stated. At 75 daily trips, this would represent 150 trip ends and three percent of the total truck trips on I-35W. The EIS has been revised to state that 75 daily truck trips are generated from the landfill.

PROTECTION OF THE LANDFILL AGAINST FLOODING

Comments

The DNR submitted comments stating that most of the existing dike protecting the landfill is of adequate height to prevent erosion from a 100-year frequency flood. The DNR states, however, that at the intersection of the landfill dike with the Edward Kraemer dike the elevation is not high enough to keep out 100-year floodwaters. The DNR suggests that this portion of the dike should be upgraded to provide adequate protection. The DNR also states that the operation of the dike floodgates should be specified in the EIS to prevent future cases of failure to secure the gates during flood events. Finally, the DNR states that the EIS should contain an analysis of upstream flood state increases, if any, resulting from the landfill's expansion.

The MPCA also stated that the significance of the fact that floodwaters can inundate portions of the landfill are not fully evaluated.

Council Response

The regional flood stage is 719.7 and the normal annual flood stage is 703. The design of the existing landfill was originally approved by the MPCA and Metropolitan Council with the condition that an earthen dike be constructed to the height of the 100-year frequency flood. Information presented by the DNR states that most of the dike is continuous and above the 100-year frequency flood level except at the intersection point of the Freeway Landfill dike and the Kraemer dike. At this point, DNR notes from map readings and a preliminary field inspection that the dike dips down below the level of the majority of the dike.

There have been occasions when the dike has broken due to high water levels and excavation just west of the landfill areas. Also, DNR has noted that aspen and other shrub growth on the earthen dike may potentially weaken the integrity of the dike's structures. If the dike is not in compliance with the original permit, or if the dike structure is in need of upgrading or reinforcement, these actions should be completed to ensure that the proposed expansion does not further threaten potential flooding of the refuse material.

The flap gate which prevents the water from flowing upstream in the easterly drainage ditch during periods of high water levels in the river, is supposedly in working order according to MnDOT maintenance staff who are responsible for the culvert and flap gate. However, it would be reasonable to require the landfill operator to periodically inspect the flap gate to ensure that foreign material does not prevent it to close properly and thereby avoid future flooding in the drainage ditch.

The proposed expansion of the Freeway Landfill should occur entirely above elevation 722 and, therefore, is beyond the level which may influence upstream flood stage increases. Furthermore, the entire existing landfill is within the "flood fringe" and further development should theoretically not influence upstream flood conditions.

LEACHATE PRODUCTION AT THE LANDFILL

Comments

The MDOH points out that the landfill's expansion will increase the duration of leachate production and that this will also increase leachate concentration as the contact time of water percolating through the landfill is increased. The MDOH also states that the EIS should contain discussion assessing the potential impact of submergence leachate production at the landfill. The MDOH states that it would appear that leachate production may well exceed three inches/year due to normally high groundwater levels aggravated by flooding events.

The MPCA submitted comments stating that the vertical expansion may increase the rate of leachate flow due to the increased pressure corresponding to higher elevations. The MPCA states that for every foot of increase in elevation or head, there is almost a half a pound per square inch pressure increase which in effect increases the flow rate through the mass into the underlying soil.

Council Reponse

It is uncertain whether or not any of the leachate constituent parameters will increase in concentration due to the expansion. It is known that leachate strength generally decreases in time after refuse is buried and after decomposition has begun. However, specific predictions as to the exact time when concentrations are at a maximum are very difficult to obtain without more accurate field monitornig data. Although the contact time for leachate exposed to refuse may indeed increase due to the proposed expansion, it is uncertain whether this would cause increased leachate strength. The cumulative effect on leachate strength of placing new refuse within the vertical expansion on top of existing and presently decomposing material is virtually unpredictable.

The physical condition of the vertical expansion which would produce increased leachate flow are additional hydraulic pressure assuming that all of the refuse layers are saturated and additional structural pressure due to the added weight of the expansion material. Hydraulic pressure is probably the most significant of the two factors and will not occur until the entire existing landfill and expansion volumes reach field capacity. Under these conditions, leachate volume may be produced at an increased rate over that which occurs presently. However, it is very difficult to accurately predict the amount or degree of increase that may occur since this value would vary depending on cover, slope, vegetation and actual refuse saturation conditions.

INCREASED METHANE PRODUCTION DUE TO SATURATED REFUSE AT THE BOTTOM OF THE LANDFILL

Comments

MPCA stated that the increase in water retention at the bottom of the fill area may increase the decomposition rate and hence methane production.

Council Response

Methane production rate is probably increased during the times of high water levels which reach the refuse layers. Additional methane gas that is produced within the landfill will be vented through the cover material and at the landfill perimeter, ultimately dissipating at harmless concentrations into the atmosphere. The EIS does state that methane could be a problem, particularly after closure of the facility.

STATUS OF THE EASTERLY DRAINAGEWAY

Comments

MPCA stated that the EIS needs to reflect more accurately the status of the easterly drainage ditch as it may pertain to its reclassification.

Council Response

The drainageway to the east of the landfill is currenty classified as waters of the state since it is not a part of the landfill operation or property. Recreational and fisheries standards apply at this time. Based on monitoring data, the existing landfill does cause violations of these standards given the current designation. However, since the MPCA is in the process of reclassifying this drainageway to class 7: limited resource value waters, it is reasonable to assume that the expansion impacts should be assessed against class 7 standards. Waters of class 7 should not exceed acutely toxic levels of pollutants nor cause violations as discharging tributaries to other waters of the state. Assuming the Freeway drainageway will be reclassified, it is not predicted that these standards will be violated by the proposed expansion or even cumulatively with the existing landfill.

EFFECT OF INCREASED POLLUTANT CONCENTRATIONS ON THE MINNESOTA RIVER

Comments

The MPCA submitted comments that the water quality of the Minnesota River is considerably degraded by point and nonpoint sources from the Metropolitan Area and that all controllable sources of water pollution should be evaluated as to the treatability and ultimate benefit on the river. Specifically, MPCA requests information on the DO concentration effects of the river and the cumulative impacts of the expansion plus the existing landfills on the un-ionized ammonia concentrations as compared to the new standards.

Council Response

The draft EIS stated that the reach of the Minnesota River past the Freeway Sanitary Landfill is classified as water quality limited indicating that, even with secondary or best practicable levels of treatment, the river is not expected to meet stream standards. Once during the summer of 1974 and several times during 1976 there were violations of the MPCA's dissolved oxygen standard, 5 milligrams per liter. During the late summer months of July, August and September 1976, both the Jordan and the Fort Snelling stations experienced problems with dissolved oxygen. Therefore, although the existing landfill is shown to have a worst case impact on the river of increasing the biological oxygen demand (BOD) by up to 23 percent, the effect of the proposed expansion is less certain but will most likely not be a significant contribution to existing conditions of depressed oxygen conditions in the river.

The MPCA standard for ammonia was recently changed so that un-ionized ammonia is calculated at specific conditions of temperature and pH. Given the new standard, it is likely that upstream background concentrations are in violation of the standard during summer low-flow conditions at least some of the time. Therefore, during those times that the river is bordering a violation of the new ammonia standards, it is possible that the existing landfill could contribute enough additional ammonia to drive the concentration over the standard. However, MPCA water quality staff have stated that unless the landfill is producing acutely toxic concentrations at the point of discharge (that is, concentrations of greater than 1.0 mg/l un-ionized ammonia), that dilution is probably still adequate to prevent significant problems for the river's ecosystems. Preliminary calculations derived from the 1980 Minnesota River Low Flow Survey (MWCC, 1980) support this conclusion, and indicate that although the total ammonia levels of the Freeway Landfill tributary (proposed to be classified as class 7: limited resource value waters), were measured at 12.5 mg/l on August 13, 1980 and 11.7 mg/l on August 19, 1980, this would result in a calculated concentration of un-ionized ammonia in the creek itself of about 0.24 mg/l given the conditions of the river at time of sampling. These concentrations in this unanmed creek are well below the acutely toxic level of 1.0 mg/l un-ionized ammonia. Once again, it is important to keep the distinction in mind between these pollutant concentrations due to the exisitng landfill and the predicted levels due to the proposed expansion which are uncertain but probably less significant.

EDITORIAL CORRECTIONS

Comments

A number of comments submitted for the public meeting record on the draft EIS are of an editorial nature, noting corrections and clarifications. The Council does not believe a response analysis is necessary for these comments. The following changes are made on the basis of these comments. Page numbers refer to pages in the draft EIS.

Corrections to the EIS

Page 10, Section II, Solid Waste Quantities and Composition, First paragraph, second sentence.

Change "470 acre-feet" to "951 acre-feet."

Page 12, Section II, Filling Sequence, first paragraph.

Change Arabic numbers to Roman numerals.

Page 23, Section II, General Method of Landfilling.

Add the following sentence: "The landfill operator proposes no changes in the site's operation respecting environmental control."

Page 25, Section III, Meteorology/Climatology, Temperature.

Delete Table III-1

Page 44, Section III, Water Quality, Leachate Movement.

Add the following paragraph. "Once produced from the bottom of a landfill, leachate constituent concentrations may potentially be reduced by the following attenuation mechanisms: absorption, ion-exchange, chemical precipitation, oxidation-reduction, biodegradation and dilution. It is difficult to estimate the exact degree of attenuation that will occur within the soils underlying a landfill. Several factors affect the extent of attenuation including soil type, soil permeability, original leachate concentrations, amount of unsaturated soil and reversibility or permanence of each specific attenuation mechanism. In general, clays have the highest attenuation; silts have a moderate attenuation. Fractured bedrock and highly porous gravels do not attenuate leachate in most instances."

Page 46, Section III, Site Geology, first paragraph.

Add the following sentence: "It should be noted that the MPCA has observed visual bedrock outcrops in unfilled areas of the permitted site. Waste materials are, therefore, currently being placed directly on bedrock.

Page 61, Section III, Water Quality, Local Water Supply.

Table III-13

Add data for private water supply well (number 19) for U.S. Salt Co.

Page 62, Section III, Water Quality, Local Water Supply.

Figure III-11

Add private water supply well (number 19) for U.S. Salt Co. to the map.

Page 68, Section III, Surface Water Quality, State Regulations, third paragraph.

Add the following sentence: "The landfill is technically in violation of this regulation. However, it should be pointed out that the landfill was in operation prior to the MPCA regulations. By virture of the fact of the current permit on the landfill, the MPCA has given the landfill a variance to this regulation."

Page 69, Section III, Regulatory compliance, Minnesota River, Table III-15.

Change the following: pH from "6.5 - 8.6" to "6.0 - 8.5;" "total dissolved solids" to "total dissolved salts"; delete alkalinity standard for 4A; delete sulfate standard.

Page 78, Section III, Single Source/Dilution Model, third paragraph.

Change "L = loading of the potential pollutant to the Minnesota River from the Burnsville Landfill" to "L = loading of the potential pollutant to the Minnesota River from the Freeway Landfill."

Page 80, Section III, Single Source/Dilution Model, first paragraph.

Change "L = loading of the potential pollutant to the Minnesota River from the Burnsville Landfill" to "L = loading of the potential pollutant to the Minnesota River from the Freeway Landfill."

Page 83, Section III, Groundwater Quality, State Regulations, first paragraph, sixth sentence.

Change to: "Where differences exist between WPC 14 and WPC 22, the more stringent conditions shall be applied."

Page 84, Section III, Groundwater Quality, Regulatory Compliance, third paragraph.

Reword first sentence to read: "A comparison of the ground-water monitoring test results with WPC 14 shows that standards were exceeded for copper in Well 1, for copper in Well 2, for chloride and copper for Well 4 and for chloride for Well 5."

Page 89, Section III, Local Water Supply Quality, Figure III-14.

Show U.S. Portland Cement well in figure.

Page 106, Section III, Socio-Economics, Existing Traffic Volumes, first paragraph, fourth sentence.

Delete "150" and insert "75."

Page 134, Section IV, Aesthetics, Primary Impacts.

Add the following sentences: "Expansion of the landfill will make it much more visible from the surrounding area, especially from I-35W and Highway 13. The landfill visually will not be compatible with the surrounding topography."

Page 134, Aesthetics, Direct or Indirect Effects.
Add the following sentence: "The expanded landfill will be much more visible from the surrounding area, especially from I-35W and Highway 13."

Page 152, Section VIII, Multistate Responsibilities, Water Quality, first paragraph, second sentence.

Delete "interstate" and insert "intrastate."

Page 154, Section X, Metropolitan Solid Waste Plan, Policy Framework, first paragraph.

Second and fourth sentences. Delete "Burnsville," insert "Freeway."

B'ville

CITY OF BURNSVILLE
1313 East Highway 13 • Burnsville, Minnesota 55337

Admin. ________ JUL 18 1980
P. R. ________
H. R. ________
CS/PIO ________

For your information ________
Take appropriate action ________
Please reply ________
Prepare reply for Chmn sig ________

July 16, 1980

Mr. Charles Weaver, Chairman
Metropolitan Council
Metro Square Building, Room 300
St. Paul, Minnesota 55101

Subj: The draft of the Environmental Impact Statement of the Freeway Sanitary Landfill Expansion and the Burnsville Sanitary Landfill Expansion.

Dear Mr. Weaver:

The following comments are intended to apply to both of the above draft EIS statements. Please take the appropriate steps to see that these comments are entered in the record in both cases.

The number one concern of the City of Burnsville, is the continued quality of its municipal water system. Prior to expanding its water system to serve the needs of our growing population, the City has been required to prepare a detailed report. We are required to do this by the Minnesota Department of Health. Included in the report are such things as monitoring the quality of the water from a test well and further constructing a ground water model. The cost of doing this is approximately $15,000. The reason for doing it is the potential for ground water flow reversal during high river stages. Such reversal could cause leachates from the sanitary landfill to enter our municipal water system.

We note with interest that both of the landfills receive their waste from the metropolitan area in general. In the case of the Freeway Land fill (see Page 10) virtually all of Ramsey County, portions of Washington County, Southern Hennepin County, portions of Northern Dakota County and Scott County are within the wateshed. In the cases of the Burnsville Landfill, the wasteshed has virtually the same limits. In other words, wastes from the entire metropolitan area are deposited in Burnsville and become a threat to Burnsville's municipal water system.

We concur with the comments by the Director of the Division of Environmental Health, Mr. Roger L. DeRoos, in his letter dated June 16, 1980. We feel that the draft EIS in both cases is totally inadequate in addressing the water quality, water quantity

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Page 2

July 16, 1980

Mr. Charles Weaver, Chairman
Metropolitan Council

and public health impacts. Our concerns are chiefly twofold: (1) The EIS fails to adequately address the impacts on the ground water due to the two landfills. (2) The City feels strongly that any costs it is presently incurring due to ground water monitoring, plus future costs that the City may incur for monitoring or correcting any contamination problems, must be borne by either the landfill operators and/or the metropolitan area as a whole.

The City is also concerned about the affects on transportation. We would only like to note, that the intersection of Trunk Highway #13 and the access to the Burnsville Sanitary Landfill and also the intersection at Trunk Highway 35W and Black Dog Road are already congested. The extension of the landfills will only of course, extend the period of time of congestion.

We also note, that both drafts contained an End-Use Plan, the City reserves the right to be the final authority on the end uses of these properties.

Sincerely,

CITY OF BURNSVILLE

C. A. Siggerud

C. A. Siggerud, P.E.
Director of Public Works

CAS/lc

cc: Roger L. DeRoos, Ph.D., Director
Division of Environmental Health

B'ville
CITY OF BURNSVILLE
1313 East Highway 13 • Burnsville, Minnesota 55337

February 26, 1981

Mr. Charles Weaver, Chairman
Metropolitan Council
300 Metro Square Building
St. Paul, Minnesota 55101

Attn: Mr. Paul A. Smith
Senior Environmental Planner

Re: Comments on Supplement to the Draft E.I.S.
on the Freeway Sanitary Landfill Expansion
Metropolitan Council Referral File No. 7819-1

Dear Paul:

I would first like to thank you for this opportunity to comment on the supplement to the Draft E.I.S. on the Freeway Landfill expansion. The proposed expansion of existing landfills in the City of Burnsville and the legislation mandating four additional landfill sites and one hazardous waste disposal site within Dakota County are of great concern to the residents of the City of Burnsville.

The need for this additional hearing is caused by the ground water study done by the City of Burnsville and completed in December of 1980. That study was inconclusive as to the exact impact that the Freeway Landfill has or will have on our municipal well field. The Burnsville study as well as the conclusions in your supplement recommend additional observation wells north of the City's well field. The City of Burnsville feels strongly that these additional observation wells be constructed, tested and analysis made of the results prior to any further action on the Freeway Landfill expansion permit. The study so far concludes that the Freeway Landfill could have an effect on the Burnsville water system. There must be a positive determination made whether or not there is an effect and the exact extent of that effect.

The Burnsville study that was done in 1980 was funded by the City of Burnsville. Its results were reviewed by the Minnesota Department

4520060 C.M.

Mr. Charles Weaver -2- February 26, 1981
Metropolitan Council

of Health in a letter addressed to the City dated December 19, 1980. Virtually all of the recommendations of the Department of Health, if fully implemented, result in increased cost to our residents. Some of these recommendations include additional observation wells, reducing the use of Municipal Wells #1, #2, #4 and #5 which are the closest to the landfill, possible phasing out of these and other wells, additional water quality monitoring from the existing producing wells, and the locating of future wells in the southern part of the City. The cost of implementing all of these recommendations is immeasurable at this time; however, it is obvious that such cost is going to be very high.

The water system is operated on a Revenue fund. The revenue is generated by charging a user fee. To expect the users to defray the cost of implementing the Board of Health recommendations is unreasonable. These users received no benefit from the existence of landfills nor will they receive any benefit from any landfill expansion. Therefore, it is the City's position that any cost associated with the Board of Health recommendations should be borne by other than users of the system. We believe that it is certainly within the Metropolitan Council's power to see that the City is reimbursed for any and all costs.

In conclusion, the City has two main concerns. They are: (1) That no further action be taken on the Freeway Landfill expansion until such time as there is conclusive data on the effect of the Freeway Landfill on the Municipal water system, and (2) That the cost the City has incurred or may incur in the future relating to the existence of landfills and the effect on the Burnsville water system should be paid for by other than users of that system.

This City stands ready to work with you and the Metropolitan Council in every way.

Sincerely,

CITY OF BURNSVILLE

Michael L. Falk
Acting City Manager

MLF/mlg

ROUTING

Admin. JUL 07 1980
P. R. ✓
H. R.
CS/PIO

For your information
Take appropriate action ✓
Please reply
Prepare reply for Chmn sig

minnesota department of health
717 s.e. delaware st. minneapolis 55440
612 296-5221

June 24, 1980

Mr. Charles Weaver, Chairman
Metropolitan Council
Metro Square Building, Room 300
7th and Robert Streets
St. Paul, Minnesota 55101

Dear Mr. Weaver,

The staff of the Division of Environmental Health has reviewed the Draft Environmental Impact Statement for the Freeway Sanitary Landfill Expansion (dated June 4, 1980) and has proposed the addition of the following information that we feel will make the Statement complete.

The vertical expansion of the landfill will increase the duration of leachate production (p. 118). It is highly probable that this will also increase leachate concentration as the contact time of water percolating through the landfill is increased. Once field capacity is achieved, leachate production is estimated to be 3 inches/year, assuming the only source of water is derived from infiltration of precipitation falling directly on the landfill surface. Based on information included in the Draft Environmental Impact Statement, sections of the Freeway Landfill are usually beneath the watertable. Groundwater elevations range from 698 to 703 feet (p. 52), while the landfill bottom is at 695-700 feet. In addition, high river stages will elevate the local watertable, resulting in increased "submergence" of the landfill below the watertable. This is particularly critical when one realizes the river stage for a 10-year flood is 708.1 feet and the highest recorded flood stage is 718.6 feet (1965). Although these points are mentioned in the Draft Environmental Impact Statement, no comments are offered assessing the potential impact of submergence. From the above information, it would appear that leachate production may well exceed the 3 inch/year minimum due to normally high groundwater levels aggravated by flooding events.

The Draft Environmental Impact Statement indicates no threat to the nine Burnsville municipal wells located at least 3200 feet to the southeast. These wells are cased to the Jordan Sandstone. This contention is initially justified on the basis that regional groundwater flow is towards the Minnesota River (to the north) and that dewatering operations at the Kraemer Quarry intercepts any leachate migration to the south. On page 53, it states "The quarry pumping operation serves as a collector for all water percolating from the landfill area into the bedrock formation." The quarry is apparently

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pulling water from the southern 400 feet of the landfill (p. 52), indicating the reversal of groundwater flow in the landfill site due to the quarry dewatering. Although the quarry should be an effective barrier to minimize the threat to the Burnsville wells, when the quarry eventually ceases operations, this barrier is removed. Although the nine municipal wells are all Jordan wells, the Jordan Sandstone is hydraulically continuous with the Shakopee-Oneota Dolomite (Prairie du Chien). The municipal wells are high capacity wells and drawdowns in the Prairie du Chien - Jordan system during heavy pumping periods is sufficient to cause groundwater flow reversal. This condition was identified in a report prepared by Bruce A. Liesch Associates, Inc., for the City of Burnsville (5/22/78).

Recognizing this serious threat, the City of Burnsville has installed two monitoring wells (one in the Jordan Sandstone, one in the Shakopee Dolomite) between the Freeway Landfill and the city's well field on Cliff Road. These wells are located approximately 1000 feet north of the intersection of River Ridge Boulevard and Cliff Road.

The City of Burnsville has also retained a consultant (Bruce A. Liesch Associates, Inc.) to conduct a hydrogeologic and geochemical study of the Prairie du Chien - Jordan system to more specifically define those conditions governing groundwater flow reversal and the potential impact of the Freeway Landfill. This program involves monitoring water levels in all municipal and observation wells, sampling biweekly for total organic carbon, iron, ammonia, bacteria, chlorides, pH, specific conductivity, and nitrates/nitrites, and detailing the bedrock geology. A preliminary report should be available in November, 1980. The Department of Health has required the City of Burnsville to install the two monitoring wells and to implement the hydrogeologic investigation before any more wells could be approved for the Cliff Road well field. The City anticipates doubling the number of wells by 1990.

Realizing that leachate may migrate to the south due to quarry dewatering, and that the Burnsville municipal well field may draw leachate further south, it is strongly recommended that monitoring wells be located east and south of the landfill to detect any leachate migration that may occur in these directions and to assess the extent and magnitude of leachate spread. Of the five monitoring wells at the landfill, four are located north of the landfill and one is located within the landfill. In order to adequately assess the migration of leachate, the current monitoring effort is not sufficient, particularly when groundwater degradation by leachate underneath the landfill is known (p. 138).

We also have concerns about possible leachate migration to the south and east of the site. A well sample collected from a well serving the Corner House Restaurant (12020 Highway 35W) located southeast of the landfill (now the site of the Volkswagen Dealership) contained elevated levels of TDS (870 mg/l), chloride (180 mg/l), sulfates (67 mg/l), and specific conductivity (1200 mg/l)? This well was abandoned in May 1976. Likewise, the U.S. Salt and Freeway Landfill domestic wells contain elevated levels of alkalinity, hardness, and sulfates.

In summary, the proposed vertical expansion of the Freeway Landfill will increase both the concentration and duration of laeächate production. Current dewatering operations at the Kraemer Quarry appear to draw leachate towards the south and intercept the leachate. Once dewatering ceases, leachate may be drawn towards the Burnsville municipal well field during periods of high demand, threatening that supply.

Sincerely,

Roger L. DeRoos, Ph.D., Director
Division of Environmental Health

RLD:plb
cc:Dale Wikre, MPCA
Environmental Quality Board

Review of the Supplement
to the Draft Environmental Impact Statement
on the Freeway Landfill Expansion

Minnesota Department of Health

In our testimony at this public hearing, the Department wishes to outline the historical developments and findings of the studies investigating the potential impacts of the operating Freeway Landfill and the abandoned McGowan Landfill on the Burnsville well field, to discuss the Department's position regarding this situation, and to make recommendations in developing a better understanding of the hydrology of the area to determine the extent and magnitude of the potential problem.

During the fall of 1979, the City of Burnsville submitted plans to the Department for the construction of municipal well #11 at the intersection of Highway 13 and Nicollet Avenue. This well was to be completed in the Jordan Sandstone. The City's well field currently consists of 10 wells, situated primarily along Cliff Road. Nine wells are completed in the Jordan Sandstone and the tenth is finished in the Hinckley Sandstone. As part of the development of this proposal, the City had retained the consultant Bruce A. Liesch Associates, Inc., in the spring of 1978 to determine the hydraulic characteristics of the Jordan Sandstone and to develop the most efficient well field design. One finding of this study indicated the possibility that the drawdowns in the Jordan Sandstone during periods of heavy pumping would be sufficient to result in groundwater flow reversal. Normal regional groundwater flow is northwards towards the Minnesota River and flow in the Jordan Sandstone is upwards into the Shakopee Dolomite.

In February of 1980, the Department met with City representatives and their consultants, Orr-Schelen-Mayeron and Associates, Inc., and Bruce A. Liesch Associates, Inc., to discuss the plan for installation of well #11. The Department stated it would not approve installation of a new Jordan well at the proposed location because of this potential of flow reversal unless a fairly comprehensive hydrogeologic investigation was conducted to determine the extent and magnitude of flow reversal. The Department was concerned about the possibility of intercepting leachate from the abandoned McGowan Landfill east of I-35W, the operating Freeway Landfill, and the operating Burnsville Landfill. The abandoned landfill and the Freeway Landfill are within one mile of the Burnsville well field. All the landfills appear to be situated on the Shakopee Dolomite. The study recommended by the Department involved potentiometric level monitoring of the municipal wells and two monitoring wells (one Jordan well, one Shakopee well). The monitoring wells are located midway between the well field and the abandoned landfill. In addition, water samples were collected weekly from the two monitoring wells and periodically from the City wells. The geochemical monitoring was designed to indicate potential leachate migration from the landfills to the well field. This study was conducted by Bruce A. Liesch Associates, Inc., and completed in December 1980. The findings of this study are incorporated into the Supplement of the Draft EIS.

The findings of this investigation include:

1) Normal groundwater flow in the area is upwards from the Jordan Sandstone into the Shakopee Dolomite and towards the Minnesota River.

2) During periods of heavy pumping (summer), drawdowns are sufficient to cause reversal of normal flow so that the Shakopee "leaks" into the Jordan. This condition of vertical leakage extends to an area north of the abandoned landfill, within 300 feet of the Freeway Landfill, and persists during much of the summer.

3) In order to shift the boundary of vertical leakage from the Shakopee into the Jordan so that the line is situated south of the abandoned landfill, Burnsville wells 1, 2, 4, 5 may have to be closed.

4) The line of zero drawdown in the Jordan extends midway into Freeway Landfill.

5) Increasing levels of nitrates, chlorides, and specific conductivity in the Shakopee monitoring well towards late summer may indicate possible contamination by landfill leachate.

6) The extent and magnitude of horizontal flow in the Shakopee cannot be determined at this time because there is only one observation well in this formation. Horizontal flow towards the leakage zone may exist beyond the leakage zone and may be critical in rapid and extensive contaminant transport to the area where leakage occurs into the Jordan. Once contamination has entered the area of leakage, all nine Jordan municipal wells may intercept contaminants very quickly.

The results of this study are somewhat theoretical in nature, particularly in the vicinity of the landfills. However, there is some uncertainty with a number of parameters used in modeling that it is impossible to say at this time if the actual field conditions are any worse or any better than indicated in the model. The findings do indicate that the abandoned landfill and Freeway Landfill may indeed adversely impact the well field based on available information. Clearly, the landfills are hydraulically influenced by pumping the City well field.

Subsequent pumping tests conducted in late December indicated a drawdown at the Kraemer and Sons Quarry of only 1.35 feet as opposed to a predicted drawdown of 17 feet due to pumping of the municipal wells. However, this finding simply confirms the extensive dewatering currently ongoing at the quarry which will minimize the drawdown from the City wells. This is certainly not an unexpected finding, but does indicate the quarry may intercept some leachate migrating southward while it is in operation.

In response to this serious condition, the Department of Health has adopted the following position regarding the City's well field.

1) No additional Jordan wells, including the proposed well at Highway 13 and Nicollet Avenue, should be permitted in the zone of influence of the existing well field. With the indications of possible leachate movement to this well field, it is not prudent to place all wells within the same aquifer where possible contamination may impact all wells over a relatively short time period.

2) A Mt. Simon-Hinckley Sandstone well may be appropriate for the proposed location provided there are confining units above this aquifer at this location (no nearby buried bedrock valley penetrating through to the Mt. Simon-Hinckley).

3) A management pumping schedule should be established for the existing well field to reduce groundwater exchange from the Shakopee to the Jordan. Since municipal wells nos. 1, 2, 4, and 5 are closest to the two landfills, pumpage of these wells should be reduced to as great a degree as possible. The Department strongly recommends that the City phase these wells out of service.

4) Additional Jordan and Shakopee observation-monitoring wells should be installed adjacent to the abandoned landfill and the Freeway Landfill, particularly south and east of the Freeway Landfill. These points would monitor both groundwater flow and leachate migration in the vicinity of the landfills.

5) The well at the Lucky Twin Drive-In Theatre site should be incorporated into the observation-monitoring well network.

6) Groundwater quality should be monitored monthly for municipal wells 1, 2, 4, 5, and 6 and the monitoring wells during June, July, and August and quarterly for the monitoring wells for the rest of the year.

7) The Department strongly recommends that future well development occur in the southern part of the City, outside the zone of influence of the existing well field.

In summary, the Department feels there is an existing threat to the well field because of the proximity to the abandoned landfill and the Freeway Landfill. Although there is some uncertainty regarding how rigidly the results of modeling can be interpreted, the Department believes this uncertainty can work either way. There is certainly a need for more field information in the vicinity of the landfills and a need to evaluate groundwater behavior and movement in the Shakopee Dolomite. With heavy pumping of the well field, there appears to be movement of leachate towards the well field. If pumping rates were to become more extensive, there is a high potential of leachate reaching the well field and contaminating the municipal water supply.

The Department agrees with the Conclusions of the Supplement to the Draft Environmental Impact Statement on the Proposed Freeway Landfill Expansion and recommend their adoption into the Draft EIS.

STATE OF MINNESOTA
DEPARTMENT OF NATURAL RESOURCES
CENTENNIAL OFFICE BUILDING • ST. PAUL, MINNESOTA • 55155

IV-36

July 3, 1980

ROUTING

Admin. ________ JUL 07 1980
P. R. ✓
H. R. ________
CS/PIO ________

For your information ________
Take appropriate action ✓
Please reply ________
Prepare reply for Chmn sig ________

Mr. Charles Weaver
Metropolitan Council
Metro Square Building
St. Paul, MN 55101

RE: Freeway Sanitary Landfill Expansion
Draft Environmental Impact Statement

Dear Mr. Weaver:

The Department of Natural Resources has reviewed the above referenced document and offers the following comments for your consideration.

Most of the existing dike protecting the landfill is of adequate height to prevent erosion from the 100 year frequency flood. However, at the intersection of the landfill dike with the Edward Kramer dike the elevation is not high enough to keep out 100 year floodwaters. In order to prevent failure during a flood event this portion of dike should be upgraded to provide adequate protection. A Corps of Engineers permit may be necessary for the upgrading. Also operation of the dike floodgates should be specified in the document to prevent future cases of failure to secure the gates during flood events.

The statement explains that flood stage increases at the site will be one-tenth foot over existing conditions. There should also be an analysis and reporting of the upstream flood stage increases if any, resulting from the expansion.

The document should have included more information on alternatives for preventing or minimizing leachate flow into the Minnesota River. Such mitigative measures could include trenches or collection wells. This information would be particularly useful in view of the fact that the landfill will continue to contribute leachate to the river long after it has ceased being actively used.

The monitoring program described in the document should include analysis of leachate for PCBs, heavy metals and phenols in addition to other parameters.

The document should address the reason why clay is not going to be used as a daily cover material. Has this decision been made on the basis of cost, availability, or feasibility?

4520052

Mr. Charles Weaver
July 3, 1980
Page Two

The present and future cost/effectivenss of resource reovery as an alternative to landfill expansion should be addressed.

Thank you for the opportunity to review this project.

Sincerely,

Thomas W. Balcom

Thomas W. Balcom
Environmental Review Coordinator

TWB:DB:mp

cc: Karen Loechler
Ron Harnack
Earl Huber

STATE OF MINNESOTA IV-38
DEPARTMENT OF NATURAL RESOURCES
CENTENNIAL OFFICE BUILDING • ST. PAUL, MINNESOTA • 55155

March 9, 1981

Mr. Paul Smith
Environmental Planning
Metropolitan Council
Suite 300 Metro Square Bldg.
St. Paul, MN 55101

RE: Supplemental Draft Environmental Impact Statement
Freeway Sanitary Landfill Expansion

Dear Mr. Smith:

The Department of Natural Resources has reviewed the above referenced document and offers the following comments for your consideration.

We agree with the conclusions reached in the document that: 1) the expansion of the Burnsville City well field should be toward the south or east away from the existing landfills, 2) increased pumping of existing wells may draw landfill leachate toward the well field, and 3) the well field is already threatened with contamination whether or not a new well is added. What is not clear from the document is whether or not the expansion of the landfill will increase the potential for contamination of the wells.

We would also reiterate our earlier comments on the DEIS which we made in our letter of July 3, 1980.

Sincerely,

Thomas W. Balcom
Environmental Review Coordinator

TWB:DB:mp

cc: Karen Loechler
Ron Harnack

Minnesota Pollution Control Agency

March 17, 1981

Paul Smith
Metropolitan Council
300 Metro Square Building
7th & Robert Streets
St. Paul, Minnesota 55101

Dear Mr. Smith:

Agency staff have received the supplement to the draft EIS on the proposed expansion of the Freeway Landfill and offer the following comments on the draft EIS.

The Agency staff believes the supplement presents sufficient information regarding the possibility that leachate from the Freeway Landfill may contaminate wells operated by the City of Burnsville. As stated in the conclusions of the supplement, the information indicates that under current maximum pumping conditions at the Burnsville well field, the normal upward flow of groundwater from the Jordan aquifer to the Shakopee aquifer is reversed in an area which has a boundary close to the Freeway Landfill. Due to the theoretical nature of the boundary determination, the boundary may actually include the southern portion of the Freeway Landfill. If the landfill is within this zone of influence, the leachate known to be produced in the landfill would be expected to enter the Jordan aquifer. The Agency staff believes that further study to attempt to quantify leachate migration from the Freeway Landfill is properly a matter to be taken up as part of the permit application. The results from any further study could lead to an expansion of the groundwater monitoring system at the landfill. Therefore, the information presented in the EIS is sufficient for the purposes of the EIS, and the Agency staff agrees that a final EIS should be prepared and submitted to the EQB for approval.

It should be noted that the additional hydrological studies of the bedrock aquifers may be unnecessary if the City of Burnsville phases out the four wells. The Minnesota Department of Health recommends discontinuing using these wells in order to avoid contamination by the abandoned dump which lies

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Paul Smith, Met Council
page 2

between the Freeway Landfill and the well field. The furthest extent north in which water would migrate down and enter the Jordan aquifer from the Shakopee formation would recede south from the vicinity of the Freeway Landfill if this occurs. Consequently, the potential impact of the Freeway Landfill on the Burnsville wells would be virtually eliminated. In this case, further hydrologic investigations may not be necessary as part of the permit application.

Attached to this letter is an Agency staff memorandum dated February 23, 1981, entitled "Enforcement Chronology at Freeway Sanitary Landfill." As the memorandum states, it presents a supplement to the enforcement chronology included as "Appendix II" of the draft EIS. I request that this information be added to the EIS in order to present a complete record of the findings of Agency and county inspections at the Freeway Landfill.

If you have any further questions, feel free to contact Gregg Downing at 297-2733.

Sincerely,

Louis J. Breimhurst

Louis J. Breimhurst
Executive Director

Attachment

cc: Gregg Downing

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March 12, 1981

Mr. Paul A. Smith
Environmental Planner
Metropolitan Council
300 Metro Square Building
7th and Robert
St. Paul, Minnesota 55101

Re: Comments of Freeway Sanitary Landfill - Supplement Draft Environmental Impact Statement, January 20, 1981
Our File No. 4996-003

Dear Mr. Smith:

On behalf of Freeway Sanitary Landfill, please find enclosed its comments relative to the above draft supplement environmental impact statement for the Freeway Sanitary Landfill in Burnsville, Minnesota.

Should you have any questions regarding these comments, please feel free to contact Mr. Allan Gebhard of Barr Engineering, myself or Messrs. Richard and Michael McGowan directly.

We look forward to completion of the final supplement in order that the EIS process can be completed in order to allow permit issuing agencies to now consider this pending vertical expansion permit application.

Very truly yours,

Frederick S. Richards

FSR/nje
Enclosure
cc: Mr. Allan Gebhard
Messrs. Richard and Michael McGowan

4520047

COMMENTS BY FREEWAY SANITARY LANDFILL TO SUPPLEMENT TO DRAFT ENVIRONMENTAL IMPACT STATEMENT DATED JANUARY 20, 1981

The following comments are submitted to the Metropolitan Council in response to the draft Supplement EIS being prepared in regard to Freeway Sanitary Landfill's application for vertical expansion of its existing permitted landfill. These comments are not only in response to the draft Supplement, but also in response to the comments offered at the public hearing on this draft held on February 26, 1981, and the written comments submitted by the City of Burnsville and the Minnesota Department of Health.

Before offering its specific comments on the draft Supplement, Freeway would make the following general comments which it feels should be once again emphasized and contained in the Supplement.

General Comments

1. The expansion being sought is only for a vertical expansion and not in any way a horizontal expansion of an already permitted and licensed sanitary landfill.

2. Freeway has been and will always continue to be concerned about the effect the landfill operation may have on its surrounding environment. Groundwater quality studies have been done in the past, are currently being done today, and in agreement with the Minnesota PCA, will continue to be done in the foreseeable future. To date, the results of these studies demonstrate that all water quality standards of the state are being met and that there has been no adverse impact upon the potable water supply of any municipality.

3. In discussing landfills in the Supplement, a distinction must be made, and emphasized, that Freeway Sanitary Landfill is a separate and distinct landfill operation from an abandoned landfill operation. The latter is located on the east side of Interstate 35W while the former is physically separated from that abandoned landfill by the interstate highway. Also, the abandoned landfill is approximately 2,000 feet away from the City of Burnsville's municipal well field at the nearest point while the existing landfill is approximately 4,000 feet away at its nearest point, or some 2,000 feet differential.

With these general comments, this permit applicant would offer the following specific comments regarding the draft Supplement and the other governmental agencies' comments:

Comments on Draft Supplement

1. Bruce Liesch and Associates have prepared modifications to the drawdown contours in Figures 6 and 8 based on the drawdown measured at a Jordan well at the Edward Kraemer and Sons quarry during a pumping test of the City wells. These revised contours show significantly lower drawdowns to the west of the well field than those shown in Figures 6 and 8 of the Supplement. Attached hereto is a copy of Figure 6 as revised by Liesch and Associates to show the contours based on the drawdowns actually measured at the Kraemer well.* The revised contours superimposed on Figure 8 would seem to move the limit of gradient reversal from a point about 300 feet from the southeast corner of the Freeway Landfill to a point about 500 feet from the Freeway Landfill. More importantly, the results of the pumping test and resulting drawdown at the Kraemer well may show that the straight line extrapolation of drawdown data from the Burnsville well field and the two monitoring wells at the old sewage treatment plant overestimates the actual limit of gradient reversal. In any event, it seems logical that the revised contours be used in Figures 6 and 8 of the Supplement and that the discussion of the measurements taken at the Kraemer quarry now contained on page 17 of the Supplement in the section entitled "Hydrologic Investigation West of the Burnsville Well Field" be made a part of the "Well Field Testing Program," possibly following the first paragraph on page 3.

2. The last two sentences of the fourth paragraph on page 8 of the Supplement under "Pumping Test Analysis" indicates that the model is "theoretical in nature." Freeway's engineers disagree with this description in that the model was based on measured pumping and drawdown data. A more accurate description would be that the model is "empirical in nature."

3. In the second paragraph on page 11 of the Supplement, it should be made clear that this discussion is about the abandoned landfill. The suggestion is made that each time the word "landfill" is used in this paragraph it be preceded by the word "abandoned" to be sure that confusion is not created with the Freeway Sanitary Landfill.

*Copy already furnished to Metropolitan Council. Please advise if another copy needed.

4520045

4. In the first sentence in the third paragraph on page 11, Figures 8 and 9 should read Figures 9 and 10. In the fourth paragraph on page 11, the third sentence should read "The vertical leakage line is now about 300 feet from the landfill under the assumptions of this model."

5. The third full paragraph on page 17 is very important and is not emphasized enough in the rest of the Supplement. This paragraph states:

> "This analysis indicates that only over a short period of time during the year does leakage into the Jordan exceed the natural condition of leakage direction from the Jordan into the Shakopee."

It is important to recognize that showing that downward leakage occurs beneath a source of possible contamination does not prove that the contamination will reach the City wells. It must also be shown that there is sufficient time for that contamination to move through the Shakopee into the Jordan and to the City well field. This movement of contamination must occur during a time when leakage is reversed because after the heavy pumping of the wells ceases, seepage again is upward into the Shakopee. This situation is different from the typical groundwater pollution condition where contaminant movement occurs year after year and eventually reaches downgradient wells. It would seem that each year should stand by itself as long as the direction of flow during the major portion of the year is from the Jordan to the Shakopee. To show that contamination will reach the wells, it must be determined that the gradient is reversed for a long enough period of time for the contamination to travel from the top of the Shakopee to the City wells. If there is not sufficient time, and as long as the flow is only reversed for a small portion of the year, it seems logical that any contamination that enters the Shakopee or Jordan but does not reach the wells would be flushed from the aquifer during the time when the gradient follows its natural upward direction from the Jordan to the Shakopee. In fact, it could even be argued that since contamination has not been measured in the City wells to date, contamination is not likely in the future with present or reduced pumping rates since the movement of contamination is not likely to be progressive with time. This whole concept has not been discussed in the Supplement and must be highlighted in order to emphasize the fact that the Liesch findings are based upon "worst case assumptions."

6. On page 18 Conclusion 3, it could be argued that studies based on "worst case assumptions" show that the limit of downward leakage does not intersect the Freeway Sanitary Landfill. Even if vertical leakage does occur beneath a potential source of contamination, "the analysis indicates that only over a short period of time during the year does leakage exceed the

natural condition of leakage diretion from the Jordin into the Shakopee." From this, one could conclude that there is likely not sufficient time for contamination from the Freeway Sanitary Landfill to reach the City wells in any one period of heavy pumping and that any contamination reaching the Shakopee or Jordan would be flushed from the aquifer into the river during the much longer period of time when the natural movement of groundwater is upward. Furthermore, measurements taken in the Kraemer quarry well indicate that the assumptions of the model were conservative as they relate to the actual drawdowns measured to the west.

Comments on Agency Comments

1. On page 2, the Minnesota Department of Health (MDH) lists a number of "findings" of the investigation conducted by Bruce Liesch and Associates. In reviewing the Liesch report these "findings" listed by the MDH cannot be idenfitied. Specifically:

a. The MDH concludes that one of the findings of the Liesch investigation was that:

> "during periods of heavy pumping (summer), drawdowns are sufficient to cause reversal of normal flows so that the Shakopee "leaks" into the Jordan. This condition of vertical leakage extends to an area north of the abandoned landfill within 300 feet of the Freeway Landfill and persists during much of the summer" (emphasis added).

The conclusion of the Liesch report (conclusion 4 -- page 16) is that:

> "only during short periods in the summer does the length of time of flow from the Shakopee dolomite into the Jordan Sandstone exceed the length of time of flow from the Jordan Sandstone into the Shakopee dolomite."

The Liesch report also states (conclusion 3 -- page 16) that:

> "under current pumping conditions and only during short periods of peak demand, the combined cones of depression in the Burnsville well field produce a net transfer of groundwater from the Shakopee Oneota dolomites to the Jordan Sandstone within the area encompassed by the dashed line between the 10-foot and 20-foot drawdown contours shown by Figure 10."

Thus, a principal conclusion of the Liesch study is that the 1980 measurements indicate that leakage into the Jordan exceeds the natural condition of leakage from the Jordan into the Shakopee only over a short period of time during the year and not occur over "much of the summer" as interpreted by the MDH.

Reiterating to some extent the comments above, it is important to recognize that simply proving that downward leakage occurs beneath a source of possible contamination does not prove that the contamination will reach the City well field. It must also be shown that there is sufficient time for the contamination to move through the Shakopee, into the Jordan and to the City well field. This movement of contamination must occur during a time when leakage is reversed because after heavy pumping of the wells ceases, seepage again is upward into the Shakopee. The flow reversal caused by the Burnsville well field is not similar to a typical groundwater pollution case where contaminant movement continues year after year and eventually reaches down-gradient wells. In the case of the Burnsville well field, it would seem that each year (or period of heavy pumping) should stand by itself as long as the direction of flow during the major portion of the year is from the Jordan to the Shakopee. To show that contamination will reach the wells, it must be determined that the gradient is reversed for a long enough period of time for the contamination to travel from the top of the Shakopee to the City wells. If there is not sufficient time and as long as the time of flow reversal is a small part of the year, then it seems logical that any contamination that enters the Shakopee or the Jordan but does not reach the City wells would be flushed from the aquifer during the time when the gradient follows its natural upward direction from the Jordan to the Shakopee. In fact, it could even be argued that since contamination has not been measured in the City wells to date, contamination is not likely in the future under present or reduced rates of pumping since the movement of contamination is not likely to be progressive with time.

b. The MDH also indicates that the Liesch investigation found that:

> "increasing levels of nitrates, chlorides, and specific conductivity in the Shakopee monitoring well toward late summer may indicate possible contamination by landfill leachate."

In reviewing the Liesch report, no conclusion to that effect can be found. In fact, the report concludes (page 17) that "the available geohydrologic data are not sufficient to determine the actual presence of groundwater contamination." Although the results of water analyses were included in Appendix B of the Liesch report, the report did not draw conclusions from that data. More information is needed regarding the other sources of potential contamination at the old sewage treatment plant adjacent to the Shakopee monitoring well. It is certainly possible that the slight increase in chloride, nitrate and specific conductance concentrations between 7/1/80 and 8/19/80 is related to the past operations at the sewage treatment plant and/or the storage of materials near the sewage treatment plant during the past. It is interesting to note that the nitrate, chloride, and specific conductance concentrations decreased to about their July 1, 1980 levels by the end of October, 1980.

c. The MDH also indicates that the Liesch investigation found that:

> "the extent and magnitude of horizontal flow in the Shakopee cannot be determined at this time because there is only one observation well in this formation. Horizontal flow toward the leakage zone may exist beyond the leakage zone and may be critical in rapid and extensive contaminant transport to the area where leakage occurs into the Jordan. Once contamination has entered the area of leakage, all nine municipal wells may intercept contaminants very quickly."

Again, in reviewing the Liesch report, such a conclusion cannot be found nor can any support be found for terms as "rapid and extensive contaminant transport" and "intercept contaminants very quickly."

2. Page 2, 7th Paragraph -- The third sentence of this paragraph indicates that: "the findings (of the Liesch report) do indicate that the abandoned landfill and Freeway Landfill may indeed adversely impact the well field based on available information." To the contrary, the report indicates that the Freeway Sanitary Landfill is outside the limit of vertical gradient reversal based on available information.

3. Page 3, 8th Paragraph -- The fourth and fifth sentences of this paragraph indicate that: "with heavy pumping of the well field, there appears to be movement of leachate towards the well field. If pumping rates were to become more extensive, there is a h igh potential of leachate reaching the well field and contaminating the municipal waters supply." These two sentences seem to confuse leachate from the abandoned landfill and leachate from the Freeway Sanitary Landfill. The Liesch report concludes that even with heavy pumping of the well field, the Freeway Sanitary Landfill is outside the limit of vertical leakage.

4520041

4. In the City of Burnsville's comments, the second sentence of the second paragraph indicates that the Liesch study was "inconclusive as to the exact impact the Freeway Landfill has or will have on the municipal well field." The fourth sentence concludes that "the study so far concludes that the Freeway Landfill could have an effect on the Burnsville water system." Freeway's engineers disagree that these are conclusions of the Liesch report. The Liesch report focuses principally on the abandoned sanitary landfill and concludes that even under worst case conditions, the Freeway Sanitary Landfill is outside the limit of reversed vertical leakage.

Conclusion

Freeway Sanitary Landfill suggests that these comments offered here be used to modify the draft Supplement accordingly, or be included in the final Supplement in order that that fact finding document can be used as intended, that is as a factual document. Conclusions, summaries or phrases such as are contained in the MDH comments like "this serious condition," "threat to the well fields," and "high potential of leachate reaching the well field and contaminating municipal water supply wells" are simply not borne out by the conclusions of the Liesch study. The facts are that the Liesch study which is based on "worst case assumptions" shows that the limit of downward leakage does not intercept the Freeway Sanitary Landfill. Even if vertical leakage does occur beneach a potential source of contamination, the available facts indicate that only over a short period of time during the year is leakage opposite to the natural leakage direction from the Jordan into the Shakopee. Furthermore, measurements taken in the Kraemer quarry well indicate that the assumptions of the model were conservative as they relate to the actual drawdowns measured to the west.

When these facts are fully presented, the permit issuing agencies can then use the Environmental Impact Statement and the Supplement to decide relevant issues raised in dealing with this vertical expansion permit application.

Minnesota Pollution Control Agency

July 30, 1980

Paul Smith
Metropolitan Council
300 Metro Square Building
7th & Robert Streets
St. Paul, Minnesota 55101

Dear Mr. Smith:

The Minnesota Pollution Control Agency has reviewed the draft EIS on the Freeway Sanitary Landfill expansion. Many of the comments given on the Pine Bend and Burnsville Landfill EIS's equally apply for the Freeway EIS. Unfortunately, this document references the Pine Bend and Burnsville draft EIS's which do not contain the MPCA comments and Metropolitan Council's responses presented in the final EIS's. Consequently, this EIS does not contain an adequate discussion on alternatives, material recovery, soils, cover and closure requirements, area wells, etc. The comments and responses given for the Pine Bend and Burnsville draft EIS's should be reviewed for applicability to the Freeway EIS and so noted. In addition, the attached page-by-page and general comments were made by the staff in the following subject areas:

1. Alternatives - pp. 3, 145-149
2. Water quality and leachate production - pp. 2, 3, 44, 78, 80, 83, 118, 120 and 121
3. Surface water runoff - p. 72
4. Area drinking water wells - pp. 121 and 122
5. Flooding potential and effects - p. 56
6. Vegetative cover - p. 72
7. Cover materials - p. 19
8. Management - pp. 46, 72 and general comments

Sincerely,

Terry Hoffman
Executive Director

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4520039

MPCA Comments on
Freeway Sanitary Landfill Draft EIS
July 23, 1980

Page 2 The vertical expansion may increase the rate of leachate flow due to the increased pressure corresponding to higher elevations. During rainfall periods water can enter the saturated mass at a higher rate to replace that which is moving vertically through the mass. For every foot of increase in elevation or head, there is almost a half a pound per square inch pressure increase which in effect increases the flow rate through the mass into the underlying soil. Therefore, there will be an increase in the total leachate production from the landfill.

Page 3 There is a statement that the proposed expansion will not affect wells if pumping rates remain the same. It would be more usefull to provide an evaluation as to the pumping rate which will likely cause contamination problems. This will provide information on the limitations placed on the resource as a result of the proposed action. Page three indicates that traffic congestion and litter are impacts of the proposed action. However, an alternative, no action, does not indicate that this impact will be mitigated. For the most part the no action alternative has not been fully or properly evaluated.

Page 15 In the description of the monitoring systems the depth of all wells should be included to indicate what aquifer or portion of the aquifer is being sampled.

Page 19 In the closure discussion of the landfill, the type of soil material and degree of compaction should be specified, so that infiltration can be minimized.

Page 44 There should be a discussion within this section regarding the other processes which also contribute to leachate attenuation such as oxidation reduction, chemical reaction, absorption and dilution. We agree that attenuation in this situation is probably not an important factor in considering environmental effects.

Page 46 The EIS indicates that bedrock varies from 3-45 feet. It should be noted, however, that visual bedrock outcrops were observed in unfilled areas of the permitted site. Therefore, waste materials are currently being placed directly on bedrock.

Page 56 The significance of the fact that flood waters can inundate portions of the landfill are not fully evaluated.

Page 68 -third paragraph--Does the Freeway site violate SW 6 (1) with respect to distance from the "high water mark of a lake, pond or flowage and at least 300 feet from a stream?" If so, has a variance been secured?

Page 69 Table III - 15 - Correct the following:

pH - should be: 6.0-8.5
Total dissolved solids should read total dissolved salts.
There is no total Alkalinity Standard in 4A.
The sulfate standard is not applicable in this case.
It is intended for wild rice areas.

Page 72 Vegetative cover on finished portions of the landfill is very sparse and can not be considered vegetative cover from a typical open grass area. Therefore, runoff calculations are probably in error. With respect to runoff calculations, there should be information regarding the loss of soils from the fill area and the need for long term perpetual maintainence as well as settling basins to remove suspended materials prior to the runoff entering the river.

Page 73 - third paragraph - "The saturated material" What does this refer to? If it is solid waste, does this increase in water retention increase the decomposition rate and hence methane production?

Pages 78,80 - Are these calculations based on Freeway or Burnsville Loadings? definition of L indicates the values come from Burnsville.

Page 83 - third paragraph - This paragraph needs to reflect more accurately the current status of the drainageway with respect to standards. (See Schade's memo to Cliff Anderson, 5/9/80 and G. Blaha's memo to C. Anderson, 5/2/80). The water in the drainageway may exceed recreational and fisheries standards. However, the Agency has made a determination that more appropriately, the drainageway should be classified as a Limited Resource Value water, allowing the application of less stringent standards. This recommendation for a new classification is currently under review by the hearing examiner and a decision on its appropriateness is expected in early fall.

Page 83 - The statement "Where difference exist between WPC 14 and WPC 22, the more stringent conditions are applied." This should read "conditions shall be applied."

Page 83 The significance of a 23 percent increase in BOD is determined by the dissolved oxygen content resulting from the organic decomposition in the river. Therefore, there should be information on the DO concentration effects on the river. In particular, there should be information regarding cumulative effects of BOD from all sources that effect this river segment. Recognizing that the water quality of the river is considerably degraded by point and nonpoint sources from the Metropolitan area all controllable sources of water pollution should be evaluated as to the treatablility and ultimate benefit on the river. This evaluation has not been made and should be a part of the EIS.

Page 84 - last paragraph - What WPC 14 standards are referred to here? Groundwater standards do not cover ammonia and specific conductance.

Page 89 Figure 14 does not show where the U.S. Portland Cement well is located.

Page 118 Statements regarding the leachate production rate should be revised to account for higher production rates due to increased elevation head.

Page 120 - top paragraph - Refer to comment regarding p. 83.

Page 121 The combined effects of the landfills with the expansions will increase significantly the background concentrations of several parameters in the river. Recognizing that the downstream dischargers rely on dilution to meet water quality standards, the landfill may become a significant contributer to the problem. The section on cumulative impact should contain an evaluation on whether there will be additional downstream violations or an aggravation of existing violations. The combined landfills will increase ammonia in the Minnesota River from 0.7 mg/l NH_3-N to 1.0 mg/l (43%). Lesser increases are noted for other water quality parameters. The expansion will prolong leachate discharge and no conclusion could be reached regarding whether or not leachate concentration will increase (p. 119). In view of this, the landowner wants to develop a mariner harbor (p. 19). This subject should be addressed in this EIS. Based on the above information, it is quite possible that the marina will provide a direct route for leachate to enter the river more expeditiously from the landfill. The leachate may have less time to degrade, undergo less dilution and be released in higher concentrations than expected. Furthermore, the new water quality standards will probably address un-ionized ammonia. A projected 43% increase in un-ionized ammonia in the final downstream mix may violate the new un-ionized standard during low flow. In fact, current upstream total ammonia concentrations may calculate to un-ionized ammonia concentrations that would exceed proposed water quality limits.

Page 121-123 It is stated that the wells at the site should remain free of leachate influence based on the ground water flow characteristics underneath the landfill. This in not necessarily the case since an increase in concentration of leachate constituents could have an impact. Also, what ground water is used for should be indicated for wells at the site. In addition, the impact of additional wells and increased withdrawal rates should be evaluated in regard to ground water flows.

Page 134 In the Aesthetics Section there should be an evaluation of the visual impacts of any additional 20 foot high expansion. What was previously flood fringe and low lying land will now be a mound with steep slopes. Presumably the distance from which this landfill will be seen will be substantially increased. Also its final configuration as it relates to the natural setting should be evaluated.

Page 136 There should be a discussion on increased fugative dust because the top elevation of the landfill will be 20 feet higher. Presumably, it will be exposed of greater wind erosion. Also the environmental and estetic impact of blowing litter should be evaluated along with potential mitigating measures.

Page 139 - paragraph 3 - Do we have any specific evidence that the operations do now include daily cover? Any recent site inspections?

Page 145 The no action alternative indicates that there will be impacts such as increased fuel costs, etc. However, the Burnsville landfill is located very close to the existing Freeway landfill which presumably would be the most logical alternative landfill. Are, in fact, fuel costs going to increase? If so, are the increased costs significant?

The EIS indicates that a new landfill would be required nine months earlier if the proposed action were denied. This, however, is the only impact which applies to this discussion. Siting activities, construction, leachate collection systems, cost, etc. will all occur regardless of this expansion. The EIS gives a false impressions that 4.2-5.6 million dollars of site development cost will be required if this landfill expansion does not occur. The EIS does not seriously evaluate alternative sites to this proposed action. The significant impacts of this proposed action cannot be evaluated against alternatives with the information currently provided in the draft EIS.

Page 152 The Minnesota River is an intrastate water body.

Page 154 The Freeway landfill is refered to as the Burnsville landfill when reviewing the proposed action with the policy framework.

GENERAL:

In general, the EIS fails to adequately evaluate the impacts and the severity of the impacts of the alternatives which are, also, not fully evaluated. The staff believes that the no build alternative should be further evaluated and compared to a more thorough evaluation of environmental effects of the proposed action. It does not appear that alternatives have been seriously considered. The relatively small amount of additional capacity this landfill provides to the Metropolitan area may be replaced by existing landfills and by new landfills which will need to be constructed in the future.

ADMIN 1000 (... '8) State Planning Agency
SF-00005-01
Environmental Quality Board IV-55

DEPARTMENT

STATE OF MINNESOTA

Office Memorandum

TO : Paul Smith
Metropolitan Council

DATE: 6/17/80

FROM : Robert F. Benner, Executive Director
Environmental Quality Board

PHONE: 296-9027

SUBJECT: Draft EIS prepared by Met Council staff on Proposed Expansions of the Freeway, Pine Bend, and Burnsville Sanitary Landfills.

I have directed staff to review the draft EIS and wish to provide you with the following comments:

Daily Cover Compliance History -- Daily cover is a key requirement of MPCA's solid waste rules, and one which MPCA defended rigorously during our Solid and Hazardous Waste Study effort. Given this emphasis, the EISs pay insufficient attention to the compliance histories of the various sites with respect to daily cover.

The EIS Appendices indicate that Freeway and Burnsville landfills have been cited by MPCA numerous times for violation of this requirement, while Pine Bend has been relatively citation-free. But apart from a few sentences acknowledging citations (e.g., Freeway EIS, pp. 12, 41), and a few comments relating the lack of daily cover to odor and litter, there is no discussion of the implications of these violations for granting expansion permits. In particular, I believe it would be useful to incorporate discussions of the following issues:

- frequency of cited violations, the likelihood of violation between inspections, and the operator's explanation for the lack of daily cover.

- the position of the county and state regulatory agencies regarding the history of violations, their analysis of the impact of the violations on the environment and the nearby residents, and their expectations for future compliance.

- the relative merits of granting the respective permits on the basis of the different compliance records of the different facilities.

The daily cover issue is an example of a more general issue, namely the weight to give a permit applicant's prior performance in evaluating and granting a permit. Pete Ashbrook tells me this question comes up in feedlot permit hearings, where citizens question whether the permit conditions will be met by the permittee or enforced by the regulatory agency.

We can either assume that enforcement will be adequate to ensure future compliance, or assume that regulatory resources will be inadequate to ensure compliance where the permittee has not shown a predisposition in that direction. I believe the latter assumption is sounder and I think most citizens would agree. But I do not know the legality of denying a permit ("prior restraint") on grounds of past performance.

Leachate Problems - The EISs do not address the implications of the upcoming Resource Conservation and Recovery Act's "Open Dump Inventory." All facilities in the state will be expected to be in compliance with EPA "criteria for classification of solid waste disposal facilities." (Title 40, Code of Federal Regulations, Part 257.) In particular, a discussion would be useful of leachate from the landfills in light of Part 257.3-3(a): "A facility or practice shall not cause a discharge of pollutants into waters of the U.S. that is in violation of the requirements of the National Pollutant Discharges Elimination System ..."

If any of these landfills is in violation of this or other "open dump" criteria, it may be cited as an open dump during RCRA-required open dump inventory.

Expected Revenues from Landfills - The EISs note that the 1980 Waste Management Act made landfills taxable by local governments (e.g., Freeway EIS, p. 141). It would be interesting to show exactly how much property tax these facilities might be expected to pay, to see how much compensation the local governments may expect for the problems the facility may cause.

Comparitive Analysis Between Applications, and the "New Facility" Alternative - I believe it would be useful to rank the applicationson the basis of various factors, including environmental and social impacts, and compliance histories. Similarily, these alternatives should be ranked against siting new sanitary landfills. Each EIS discusses the need for landfill capacity in the Metro area, but that is not to say that all applications must be approved, or that new facilities might not be environmentally preferable, even if they are hard to site, more expensive, and more disruptive to the individual hauler (Freeway EIS, p. 145-- some say haulers should be using transfer stations anyway, to save time and gasoline).

At some time during this decade the Metro area will need new landfills and resource recovery facilities. They will likely be more expensive than today's facilities, if they are to meet current environmental and social requirements. But this should be seen as a challenge to the Area, not as a threat. The pending decisions should be how much capacity does the Area need before more acceptable and suitable facilities are available, and which of these expansions are necessary to provide that capacity in the most environmental and economically sound fashion. That is the question that must be addressed in the EISs.

cc Don Kredit
Met Council

Minnesota
Department of Transportation
Transportation Building
St. Paul, Minnesota 55155

July 9, 1980

Phone 296-1646

Paul Smith
Metropolitan Council
Suite 300
Metro Square Building
St. Paul, MN 55101

In reply refer to: 702
Freeway Sanitary Landfill Expansion
Draft Environmental Impact Statement

Dear Mr. Smith:

The Minnesota Department of Transportation (Mn/DOT) has reviewed the Draft Environmental Impact Statement submitted for the above project. We offer the following comments for your consideration.

The second paragraph on page 2 states that "the proposed vertical expansion would provide for an additional 1860 acre-feet of space ... and will increase the estimated life of the landfill by three to six years given a fill rate of about 160 acre-feet per year." At a fill rate of 160 acre-feet per year, an additional 1860 acre-feet of space would increase the estimated life of the landfill by more than eleven years.

Since access to the landfill is provided by 113th Street South, this road should be shown on Figure II-1 and/or Figure II-2. The limits of the Minnesota River, Black Dog Lake, and Interstate 35W should be shown on Figure II-2.

The second paragraph on page 10 states that the existing landfill has a remaining capacity of 470 acre-feet. The first paragraph on page 2 and Table VI-1 on page 144 show the remaining capacity to be 951 acre-feet.

On page 12, the filling sequence is described as consisting of Phases 1, 2, and 3 (Arabic Numerals). Figure II-5, on page 14, shows Phases I, II, and III (Roman Numerals).

Page 23 states that "Environmental controls will remain the same as that of the present operation." What will be done in the future to prevent the numerous violations of the daily cover requirement and the litter violations which have occured in the past?

4520030

Paul Smith
Page two
July 9, 1980

Table III-1, on page 25, shows that the maximum temperature in the Twin Cities is 32°F and above on only 83 days annually. The table also shows the minimum temperature is 0°F and above on only 34 days annually. The paragraph below Table III-1 states that "the minimum temperature for more than one-half of the year (193 days) is below 32°F." The table shows the minimum temperature is 32°F and above on 153 days annually, for a total of 346 days per year.

In the first paragraph on page 60, reference is made to well number nineteen, a private water supply well for U.S. Salt Company. This well is not listed in Table III-13 nor shown in Figure III-11.

Page 106 states that the freeway landfill generates an average of 150 daily truck trips, which represents approximately three percent of the total truck trips on Interstate 35W. This statement is correct if 150 trip ends are generated; however, if 150 trips are generated daily by the landfill, that would constitute 300 trip ends and represent six percent of the total truck traffic on I-35W.

In the policy framework discussion on page 154, reference is made to the "Burnsville Landfill" and the "Burnsville site." These should be changed to the "Freeway Landfill" and the "Freeway site."

If you have any questions or desire further information from Mn/DOT, please contact Robert Morast, Transportation Analysis Engineer, at our Golden Valley Office, 545-3761.

Sincerely,

Jonette Kreideweis

Jonette Kreideweis
Planner
Environmental Planning Section

3505 Dana Drive
Burnsville, Minn, 55337
March 16, 1981

To whom it may concern:

I am asking to be put on record as being against any expansion of the landfills in the river bottoms in Burnsville. This area is limestone and cracks can carry pollutants, etc into our vital water supplies.

We have a private well and have noticed odors in our water which were not here years ago, and it is a deep well, supposedly in the Jordan vein. We are in the process of having our water tested.

I believe we, as responsible adults, must determine to protect our diminishing water supply and saying "no" to expanding the landfill is one way.

-2-

many communities are forced to use river water for their drinking supplies and there are 3 landfills, 1 closed, in the area of the Minnesota river bottoms in the Savage-Burnsville area. Only time will tell how much damage has already been done!

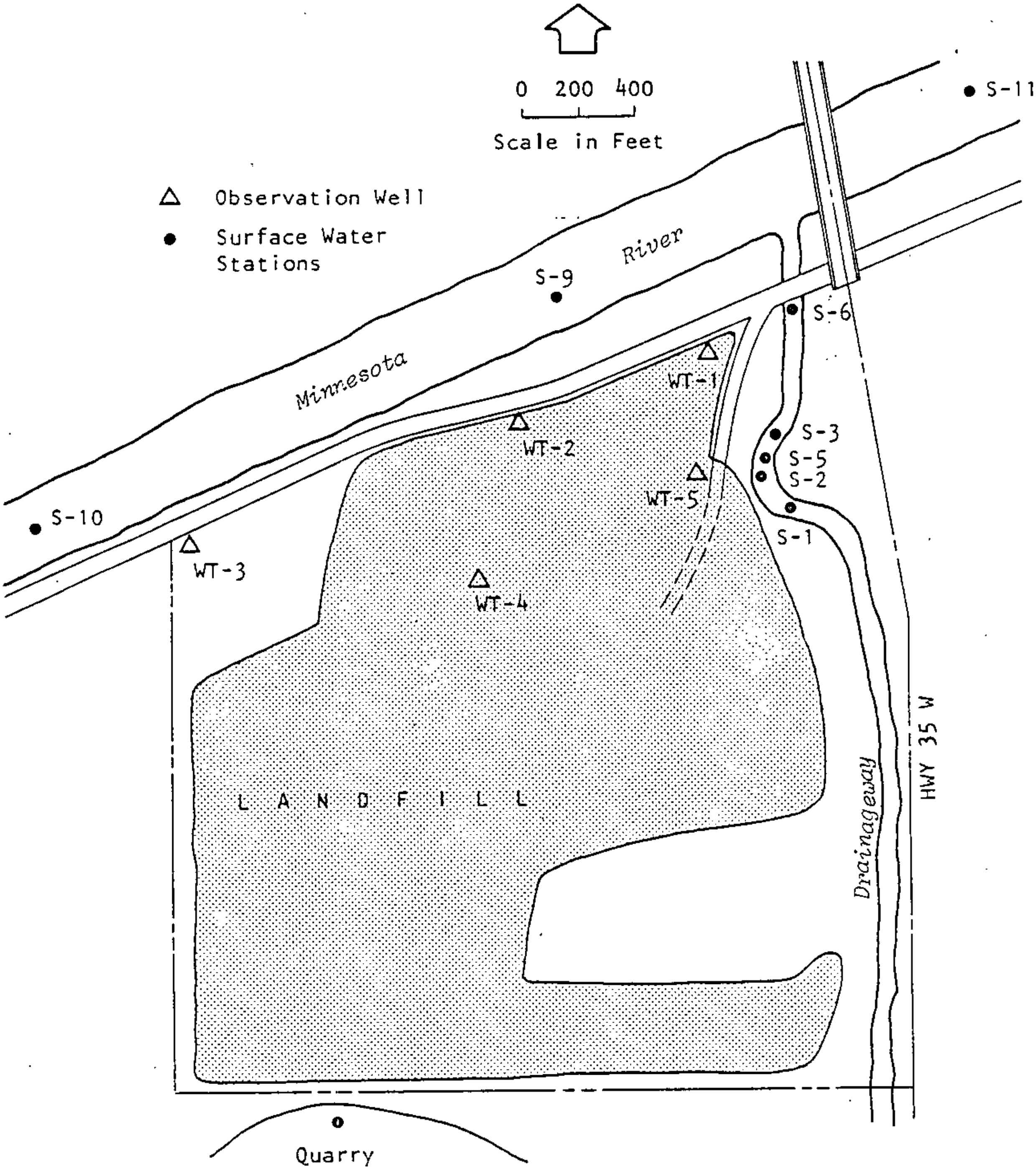
Once again, no to any expansion!

Yours sincerely
Phyllis M Fugler

V

APPENDIX V

WATER QUALITY MONITORING



Sampling Station	MPCA No.
WT-1	60934
WT-2	61034
WT-3	61129
WT-4	61235
WT-5	61334
S-1	40300
S-2	30200
Quarry	40400

WATER SAMPLING STATIONS

FREEWAY SANITARY LANDFILL

4520025

PARAMETER	WT-1 MPCA: 60934				WT-2 MPCA: 61034			
Date	11/7/78	1/29/79	5/25/79	7/20/79	11/7/78	1/29/79	5/25/79	7/20/79
COD, Chemical Oxygen Demand filtered, mg/l	24	16	19	28	52	47	70	64
COD, Chemical Oxygen Demand, mg/l	--	--	--	--	--	--	--	--
Ammonia, mg/l as N	0.7	0.4	0.07	0.5	1.3	1.0	1.8	2.1
Chloride, mg/l as Cl	2	8	3	21	41	86	133	127
Specific Conductance, µmho @ 25°C	574	449	506	595	735	830	1320	1488
pH	7.5	7.8	7.8	7.7	7.3	7.4	7.3	7.2
Copper, total, µg/l as Cu	--	21	22	11	--	7.0	10	16
Copper, filtered, µg/l as Cu	1.1	--	--	--	0.7	--	--	--
Chromium, total µg/l as Cr	--	17	2.9	3.2	--	16	3.8	7.8
Chromium, filtered µg/l as Cr	0.3	--	--	--	1.3	--	--	--
BOD - 5 day, total, mg/l	--	--	--	--	--	--	--	--
BOD - 5 day, filtered, µg/l	--	--	--	--	--	--	--	--

WATER QUALITY DATA
GROUND WATER WT-1 AND WT-2

FREEWAY SANITARY LANDFILL

PARAMETER Date	WT-3 MPCA: 61129				QUARRY SUMP MPCA: 40400			
	11/7/78	1/29/79	5/25/79	7/20/79	11/7/78	1/29/79	5/25/79	7/20/79
COD, Chemical Oxygen Demand filtered, mg/l	20	16	15	20	28	no sample "ice"	19	136
COD, Chemical Oxygen Demand, mg/l	--	--	--	--	--		--	--
Ammonia, mg/l as N	1.7	0.7	0.85	1.2	--		<0.10	13
Chloride, mg/l as Cl	10	16	10	14	56		49	327
Specific Conductance, μmho @ 25°C	460	912	1140	1302	735		963	2604
pH	7.5	7.7	7.6	7.4	8.3		7.8	7.9
Copper, total, μg/l as Cu	--	5.8	20	19	--		2.7	28
Copper, filtered, μg/l as Cu	0.7	--	--	--	1.7		--	--
Chromium, total μg/l as Cr	--	18	2.7	13	--		1.4	4.5
Chromium, filtered μg/l as Cr	0.3	--	--	--	0.5		--	--
BOD - 5 day, total, mg/l	--	--	--	--	--		--	--
BOD - 5 day, Filtered, μg/l	--	--	--	--	--		--	--

WATER QUALITY DATA
GROUND WATER WT-3 AND QUARRY SUMP

FREEWAY SANITARY LANDFILL

4520023

PARAMETER	WT-4 MPCA: 61235				WT-5 MPCA: 61334			
Date	7/20/79				7/20/79			
COD, Chemical Oxygen Demand filtered, mg/l	328				360			
COD, Chemical Oxygen Demand, mg/l	--				--			
Ammonia, mg/l as N	30				33			
Chloride, mg/l as Cl	590				917			
Specific Conductance, μmho @ 25°C	5146				5828			
pH	7.1				6.9			
Copper, total, μg/l as Cu	35				40			
Copper, filtered, μg/l as Cu	--				--			
Chromium, total μg/l as Cr	34				38			
Chromium, filtered μg/l as Cr	--				--			
BOD - 5 day, total, mg/l	--				--			
BOD - 5 day, filtered, μg/l	--				--			

WATER QUALITY DATA
GROUND WATER WT-4 AND WT-5

FREEWAY SANITARY LANDFILL

PARAMETER	S-2 MPCA: 40300				S-1 MPCA: 30200			
Date	11/7/78	1/29/79	5/25/79	7/20/79	5/25/79			
COD, Chemical Oxygen Demand filtered, mg/l	175	no sample "ice"	54	164	93			
COD, Chemical Oxygen Demand, mg/l	226		62	344	90			
Ammonia, mg/l as N	--		--	--	--			
Chloride, mg/l as Cl	766		66	526	93			
Specific Conductance, µmho @ 25^{o}C	3300		800	3400	1150			
pH	7.8		6.9	7.9	7.2			
Copper, total, µg/l as Cu	0.7		5	25	12			
Copper, filtered, µg/l as Cu	0.3		--	--	--			
Chromium, total µg/l as Cr	2.9		1.1	29	1.2			
Chromium, filtered µg/l as Cr	2.5		--	--	--			
BOD - 5 day, total, mg/l	25		3	35	4			
BOD - 5 day, filtered, µg/l	<3		<3	8	<3			

WATER QUALITY DATA
SURFACE WATER S-1 AND S-2

FREEWAY SANITARY LANDFILL

4520021

SUPPLEMENT TO
DRAFT ENVIRONMENTAL IMPACT STATEMENT
FREEWAY SANITARY LANDFILL EXPANSION
BURNSVILLE, MINNESOTA

January 20, 1981

Metropolitan Council
Suite 300 Metro Square Building
St. Paul, Minnesota 55101

INTRODUCTION

In August 1980, the Minnesota Environmental Quality Board granted the Metropolitan Council an extension of time to complete the environmental impact statement (EIS) on the Freeway Sanitary Landfill expansion. The extension of time was necessary to await the results of a report being prepared for the City of Burnsville on its water supply well field expansion. The City's well field is located about a 3500 feet south of the Landfill. The Council felt the City's report would provide further definition on the groundwater hydrology in the vicinity of the Landfill and any impacts that might occur to the groundwater and City's well field as a result of the Landfill's expansion.

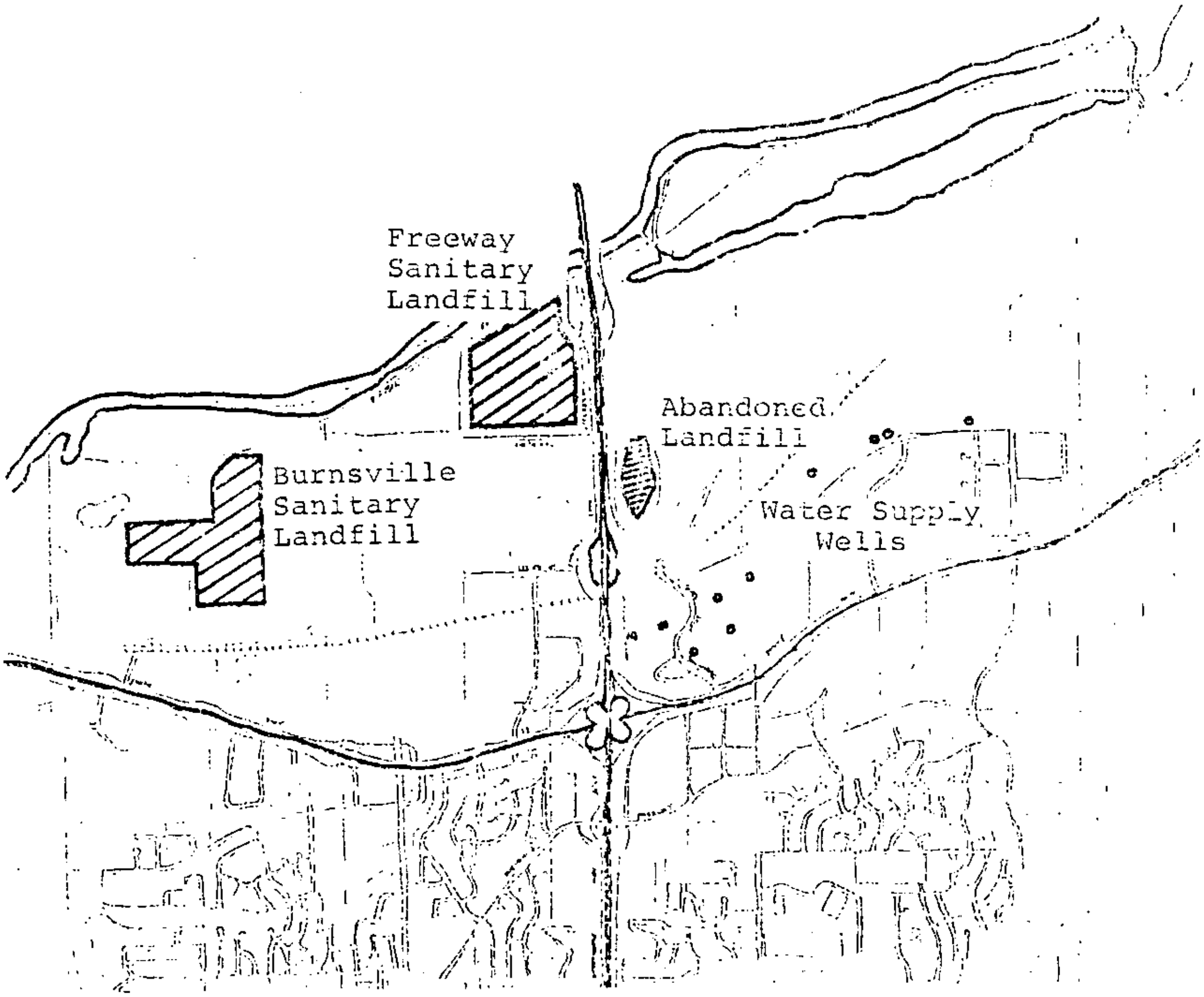
The City's report on its water supply well field expansion was completed in December 1980. The following analyses of the City's report will supplement the draft EIS on the Landfill expansion. The analyses will be contained in the groundwater sections of the final EIS.

WELL FIELD TESTING PROGRAM

Well field testing procedures, starting in March 1980, were conducted as part of Burnsville's continuing municipal water well development program. The well field testing program was undertaken in response to conclusions presented in a report regarding groundwater investigations in 1978 which identified a condition that posed a potential contamination threat to the Jordan aquifer in the well field area. According to the 1978 report, observed interference water level fluctuations indicated the possibility of groundwater gradient reversals extending beneath the Minnesota River floodplain.

The proximity of the City's water supply well field to the Landfill is shown in Figure 1. As can be seen, the Landfill is about 3,500 feet north of the well field. In addition, Figure 1 shows the location of the Bburnsville Sanitary Landfill and an abandoned landfill north and slightly west of the well field. The immediate location of the abandoned landfill to the well field was the major reason for the City to undertake the 1980 study. The possibility of leachate from this landfill descending to the Jordan aquifer during periods of pumping at the wells that produce the gradient reversal represented the most immediate potential threat.

The implementation of the well field testing procedures required as a basic minimum, one observation well in Jordan sandstone and one observation well in the Shakopee dolomite. Accordingly, the existing Jordan aquifer well located at the former site of the City's sewage treatment facility was modified for water level instrumentation and a new well was constructed in the Shakopee dolomite approximately 48 feet south of the Jordan aquifer well.



Burnsville's Water Supply Well Field

Figure 1

Water samples were collected weekly starting on July 1, 1980 and continuous water level recorders were installed at the Jordan and Shakopee observation wells on July 17, 1980. Pumping tests were then run at the City's water supply wells number 2, 3, 4, 6, 7, 8 and 10 during the month of August (see Figure 2). The tests consisted of pumping an individual well for two hours while the other wells remained off. The closest wells to the pumping well were used as observation wells. Water level fluctuations were also recorded at the Jordan and Shakopee observation wells.

HYDROLOGY

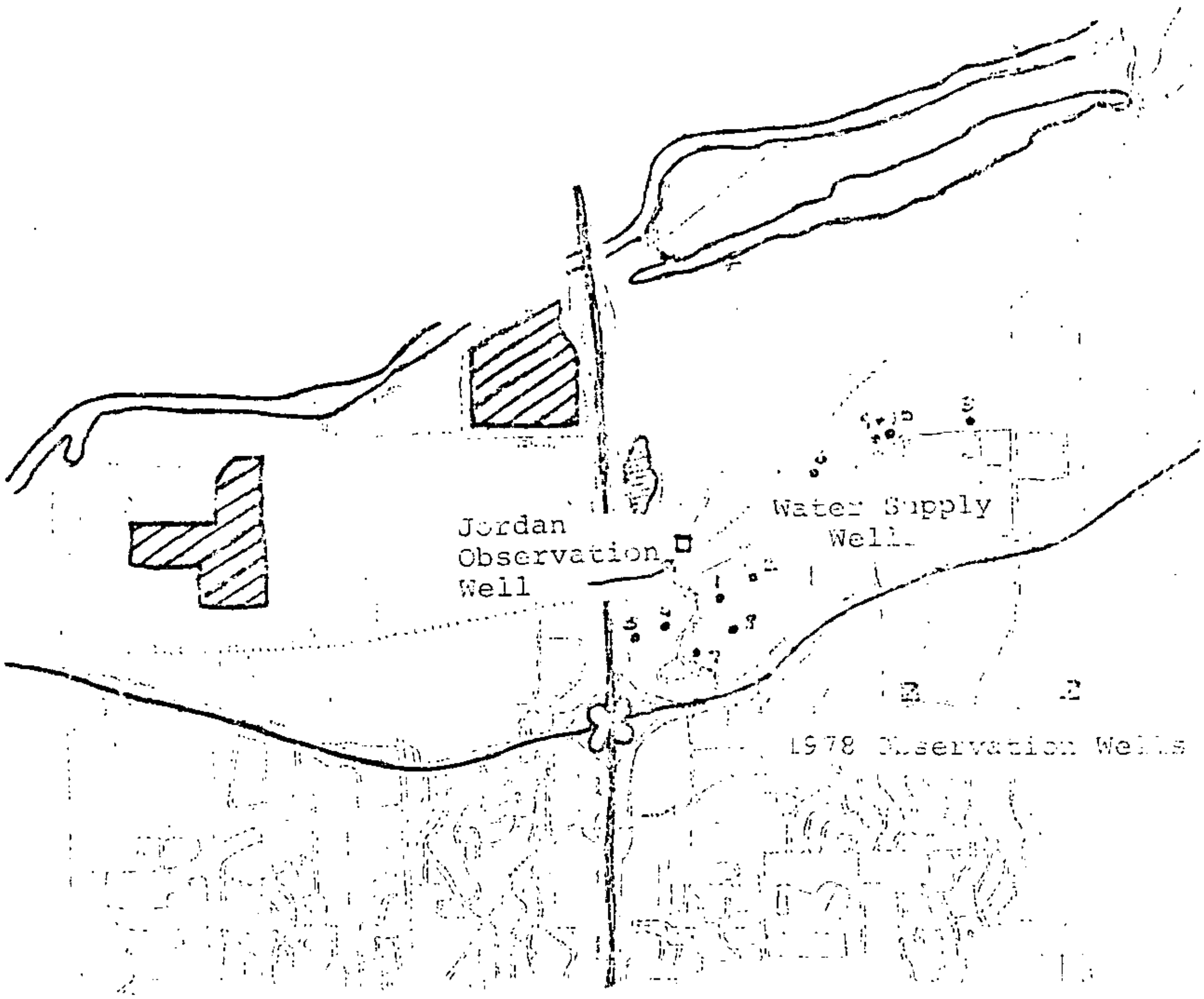
In evaluating an aquifer that is selected as a source of water supply, the recharge and discharge relationship with underlying and overlying aquifers must be considered. Under natural conditions the water in the Jordan sandstone was in a state of equilibrium. Although the water level fluctuated from season to season and year to year in response to changes in recharge and discharge, over long periods of time the average discharge was equal to the average recharge and the fluctuation occurred through a relatively narrow zone.

Prior to the development of groundwater supplies or other works of man that disturbed the natural flow of groundwater, recharge to the Jordan aquifer occurred mainly beneath the upland areas remote from the major stream valleys and discharge occurred through the overlying geologic units to the major streams and lakes located in the floodplains. At Burnsville, the natural groundwater discharge was concentrated in the Minnesota River Valley and ultimately, the groundwater left the area as stream flow or evapotranspiration.

A potentiometirc surface map based on available water levels in Jordan wells is shown on Figure 3.

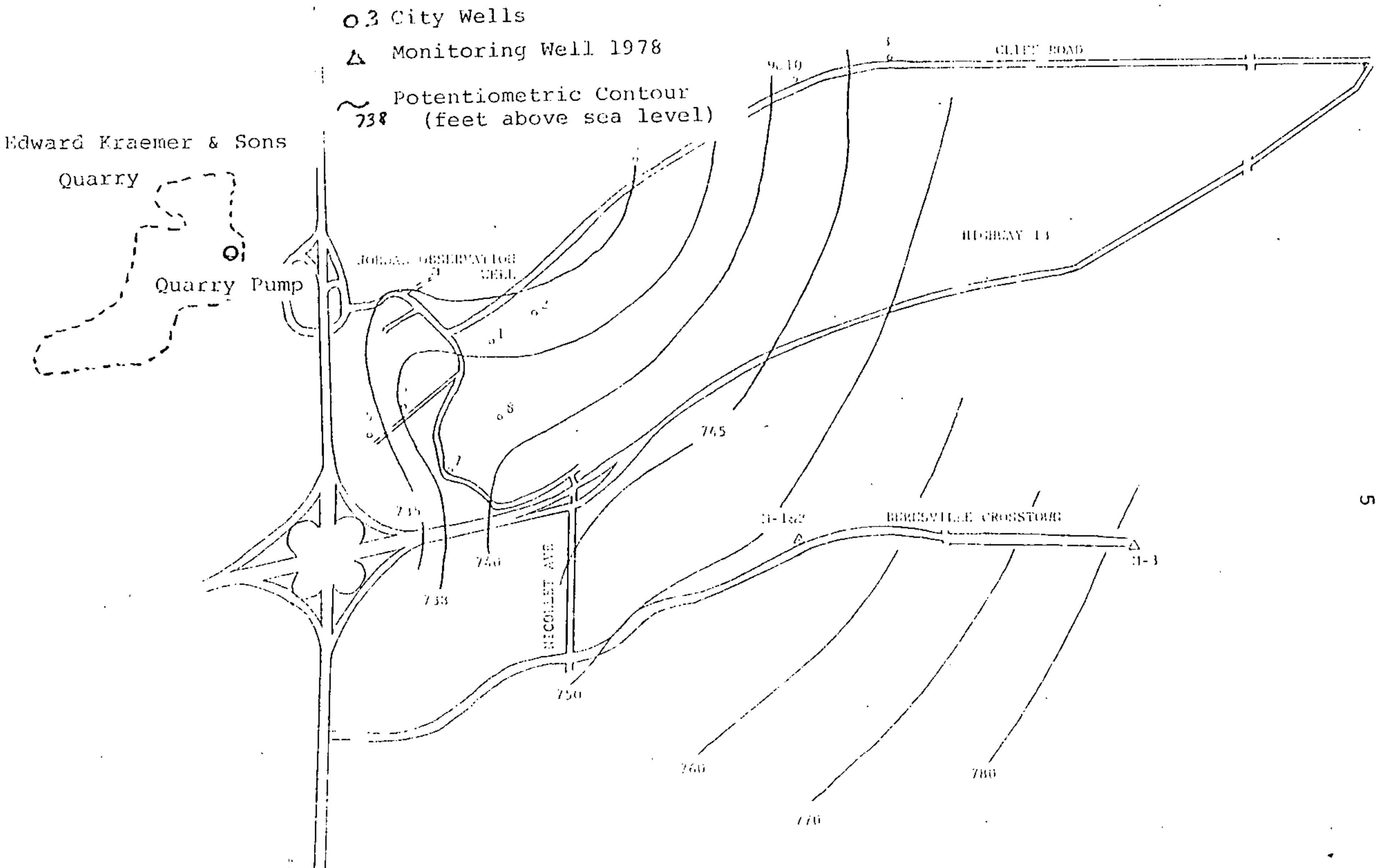
The installation of wells in the Jordan aquifer and development of a quarry in the overlying Shakopee-Oneota dolomites approximately 3,000 feet west (see Figure 3) of the observation wells tends to modify the natural equilibrium and distort the flow patterns within each unit as well as the groundwater transfer between the units. Dewatering operations at the quarry, which is in an area of natural groundwater discharge, created a cone of depression, increased the vertical gradient from the Jordan aquifer and consequently also increased the transfer of water from the Jordan. In contrast, the new wells open only to the Jordan aquifer, tend to reduce the vertical gradient in the areas of natural discharge and in heavily pumped areas cause a transfer of water from the dolomite to the sandstone.

The geologic cross sections shown on Figures 4 and 5 represent the stratigraphy of the Burnsville area and indicate the general direction of groundwater flow. In a natural condition the hydraulic gradient is from the south to the north, flowing towards the river. Under the influence of pumping of the city wells, this gradient is reversed in the area north of the well field, such that groundwater moves to the south towards the well field. Along with the reversal of the groundwater flow there is leakage from the Shakopee dolomite into the underlying Jordan sandstone.



Well Field Testing Program

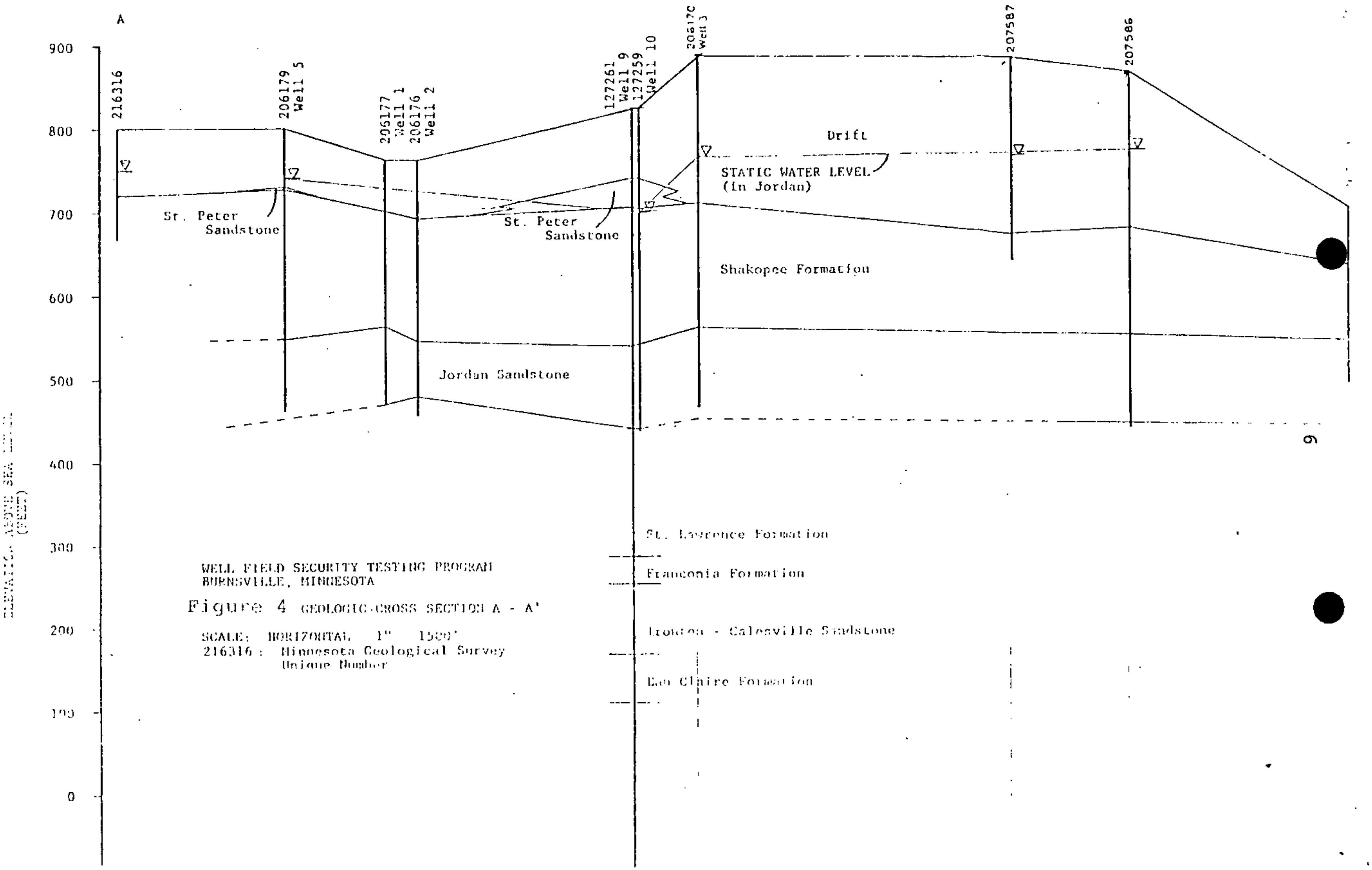
Figure 2



Potentiometric Surface for Jordan Aquifer

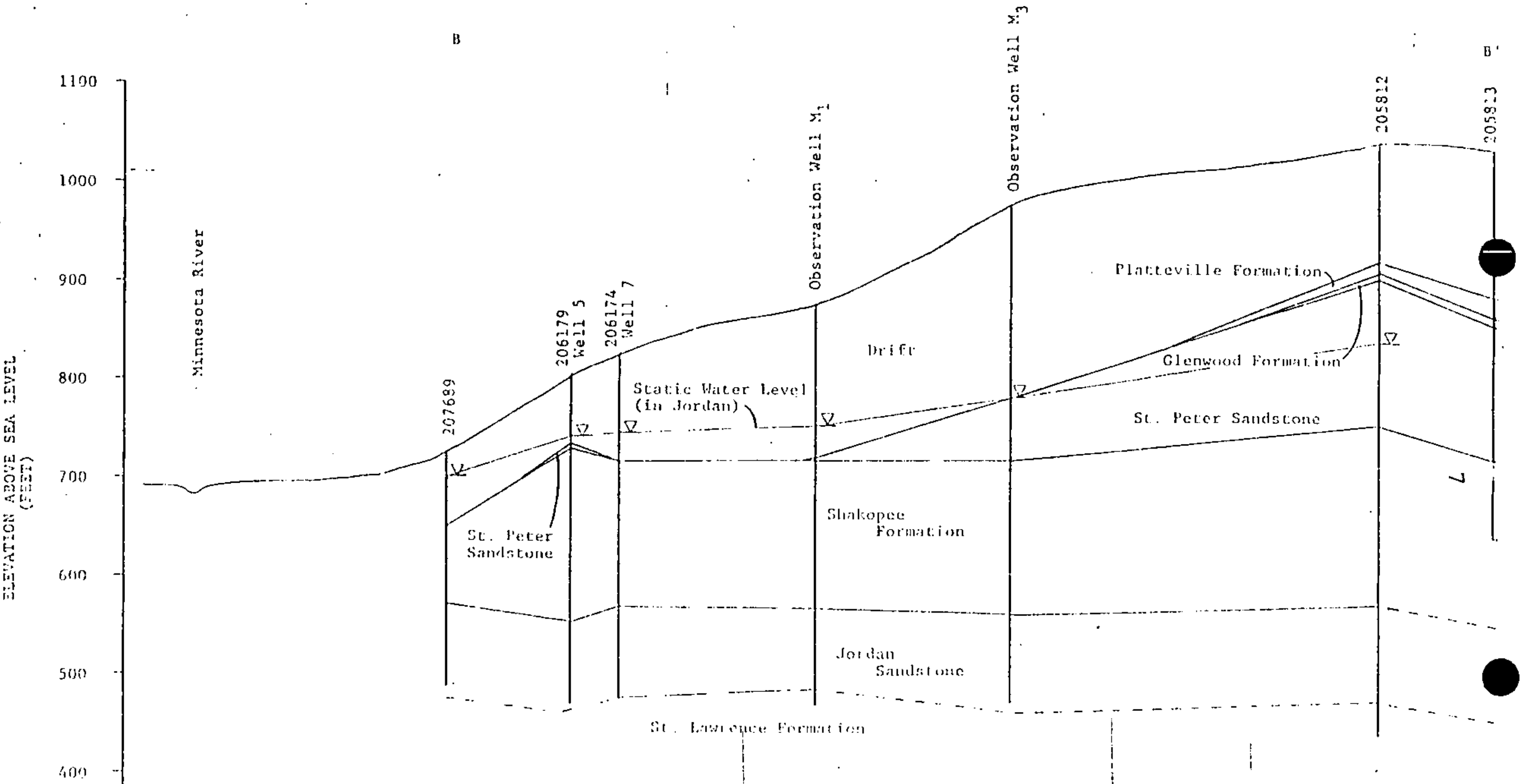
Prepared by Bruce Liesch Associates for City of Burnsville

Figure 3



A
900
800
700
600
500
400
300
200
100
0
ELEVATION ABOVE SEA LEVEL (FEET)
216316
206179 Well 5
206177 Well 1
206176 Well 2
127261 Well 9
127259 Well 10
20617C Well 3
207587
207586
Drift
STATIC WATER LEVEL (in Jordan)
St. Peter Sandstone
St. Peter Sandstone
Shakopee Formation
Jordan Sandstone
St. Lawrence Formation
Franconia Formation
Ironton - Galesville Sandstone
Eau Claire Formation
WELL FIELD SECURITY TESTING PROGRAM
BURNSVILLE, MINNESOTA
Figure 4 GEOLOGIC CROSS SECTION A - A'
SCALE: HORIZONTAL 1" 1500'
216316 : Minnesota Geological Survey Unique Number
9

4520014



WELL FIELD SECURITY TESTING PROGRAM
BURNSVILLE, MINNESOTA

Figure 5 GEOLOGIC CROSS SECTION B - B'

SCALE: HORIZONTAL 1" = 2000'

207689 Minnesota Geological Survey Unique Number

4520013

This reversal of the groundwater flow takes place during part of the pumping cycle and during part of the recovery cycle. Reversal of flow is known to be noncontinuous because after the pumping of all the city wells, the Jordan observation well recovers to the point where it is discharging at the surface while the Shakopee well has a water level 8 to 9 feet below the surface. This indicates that the Jordan is leaking into the overlying Shakopee and flow into the Jordan from above cannot take place.

PUMPING TEST ANALYSIS

During the testing procedure at each well, drawdown and recovery water levels were measured at the pumped well, at nearby municipal production wells and at the Jordan and Shakopee observation wells. The data were plotted and analyzed using the time-drawdown, time-recovery Theis non-equilibrium method modified by Jacob, and by distance-drawn equilibrium methods.

Upon completion of the analysis of the pumping data, a mathematical model, based on distance-drawdown curves, was developed to simulate the reaction of the aquifer and its potentiometric surface to varying pumping rates and well field configurations. This allowed a study of the reaction of the aquifer to the location and pumping of new wells in various configurations. As a calibration control for the model, a pumping test was run October 13 and 14, 1980. This test consisted of pumping all the wells except 6, and observing the drawdown in the wells throughout the 9.5 hours of pumping. Water levels were measured before the test to determine the trend caused by recovery from anticedent pumping and to determine the approximate projected water level in the flowing Jordan observation well.

The computed drawdowns derived from the mathematical model and the actual drawdowns observed in the October 13 and 14 pumping test were in very close agreement, expecially in the observation wells. This indicates that the model, based on the distance-drawdown curves, along with the assumptions are representative of the hydraulic conditions in the Burnsville well field area. It should be pointed out, however, that the model is theoretical in nature and simulated the relation of the aquifer and its potentiometric surface based on observations of the City's well field under varying pumping conditions. Additional observation wells north of the City's well field would help to further define hydrologic characteristics in the vicinity of the Freeway Landfill.

Drawdown maps were compiled using the aquifer mathematical model to observe the reaction to various well configurations. The first drawdown map, Figure 6, represents the drawdown associated with pumping all the present city wells at 1200 gpm for 10 hours, at which point equilibrium was reached. An additional well was then added at the intersection of Nicollet and Highway 13 (SW corner) and a drawdown map developed to study the change in the Jordan water levels, Figure 7. The proposed new well was assumed to be located in a segment of the aquifer represented by the model in the vicinity of well 8. With this new well pumping, additional drawdown observed at the Jordan observation well would be 2.6 feet after 10 hours of pumping.

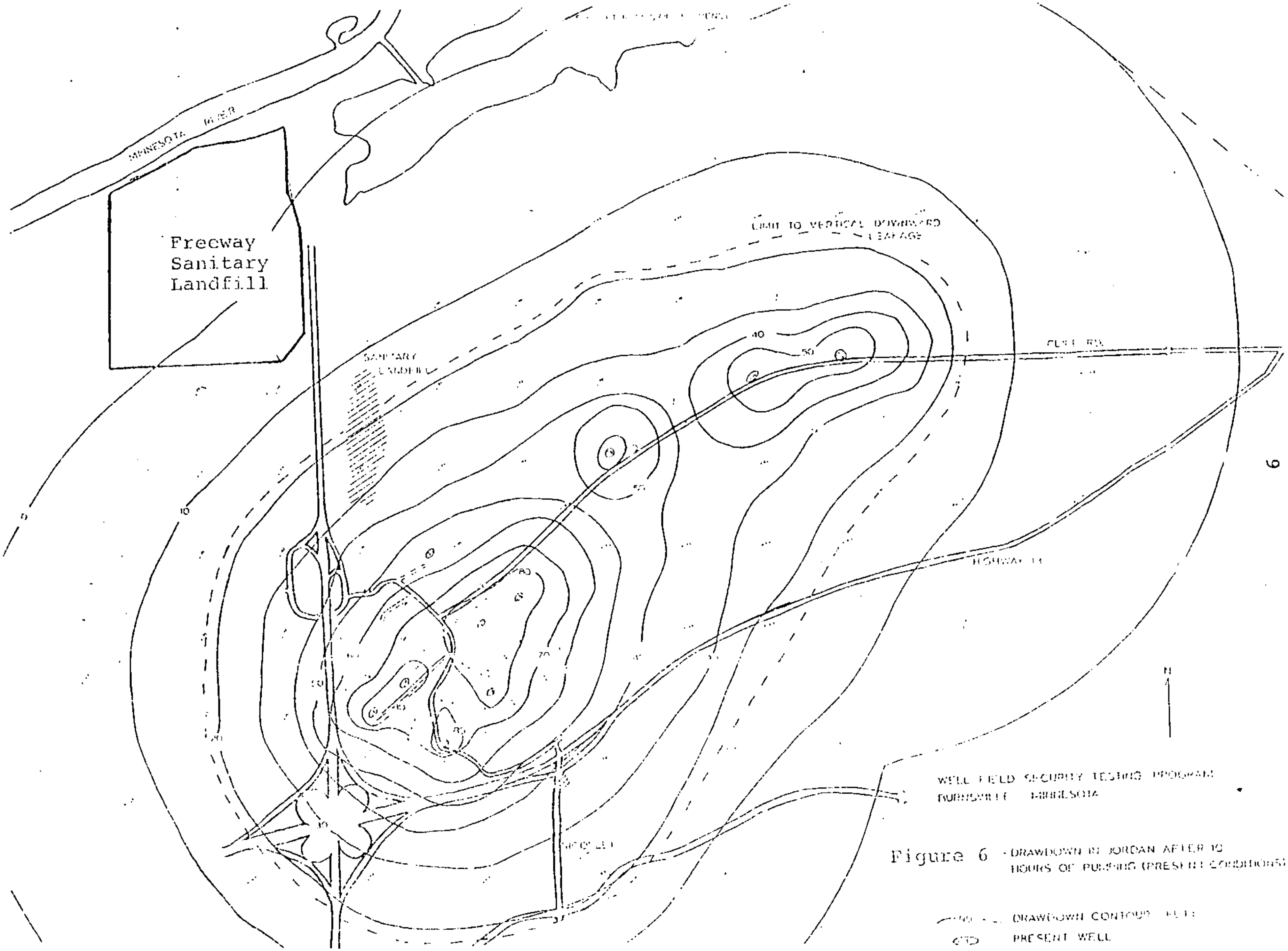


Figure 6 - DRAWDOWN IN JORDAN AFTER 10 HOURS OF PUMPING (PRESENT CONDITIONS)

4520014

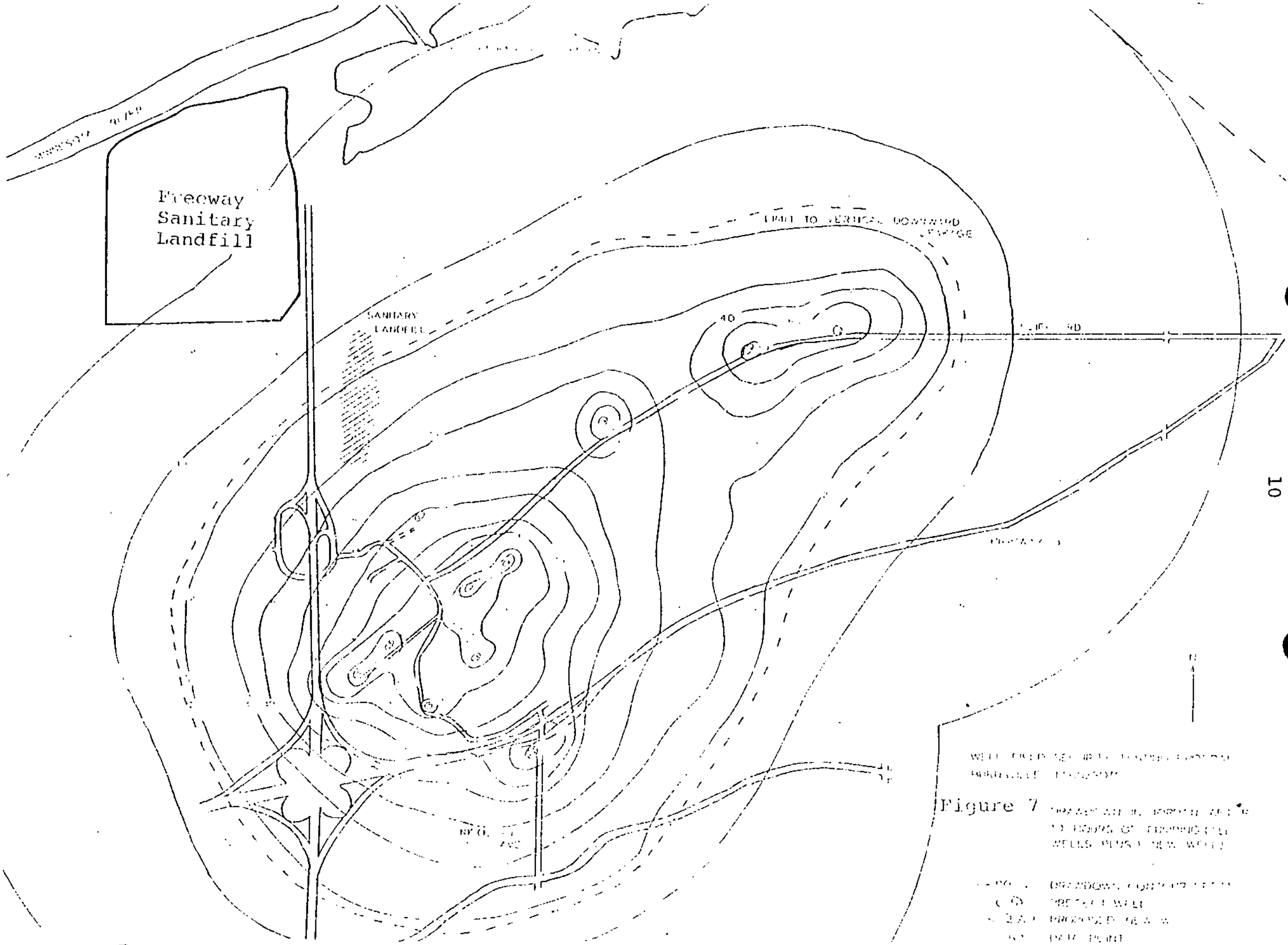


Figure 7

4520010

In a worst-case scenario the new well could follow the distance-drawdown curve for well 2 and cause 4.3 feet of drawdown at the Jordan observation well at equilibrium.

A major concern in Burnsville is the possible contamination of the water supply from leachate at the abandoned landfill site north of the well field. Upon analysis of the drawdown maps of Figures 6 and 7, it appears that no appreciable change is observed in the Jordan water surface by the addition of a well at the intersection of Nicollet and Highway 13. The distance between the new well and the southern-most extent of the landfill is approximately 4,100 feet. At this distance the new well would cause a maximum increase in drawdown under the landfill of 1.2 to 1.9 feet, dependent on the assumed distance-drawdown relationships. At a point approximately three-quarters of the way through the landfill there would be no drawdown change caused by the new well.

Hydrographs of the Shakopee and Jordan observation wells under the conditions of all wells pumping are shown in Figures 8 and 9. he intersections of the hydrographs indicate points where flow direction between the two formations is reserved. By extrapolating the Jordan observation well recovery curve to a status level, the drawdown in the Jordan at which leakage begins to occur can be determined. During the drawdown and recovery cycle, leakage between formations is reversed at a drawdown of between 14 and 17 feet. A line of leakage is assumed to be between the 10- and 20-foot drawdown contour lines in Figures 6 and 7. Under both well configurations studied, three fourths of the abandoned landfill is in an area of vertical leakage from the Shakopee dolomite into the Jordan sandstone during part of the pumping cycle. The Freeway Landfill is about 1000 feet northeast of this vertical leakage line.

The drawdown contours in Figure 6 were further defined in Figure 8 by the City's consultant using a computer model. Figure 8 shows the drawdown contours with pumping all of the present city wells at 1200 gpm for 10 hours. The vertical leakage line is now about 300 feet from the Landfill.
The hydrograph of Figures 9 and 10 gives some idea as to the length of time leakage from the Shakopee into the Jordan takes place. To determine how long leakage occurs under the abandoned landfill site, these water level curves have to be modified. Figure 10 shows the modification of the drawdown trends, indicating the water levels in the formations underlying the abandoned landfill.

According to Figure 8, the abandoned landfill's southern-most extent is overlying an area which has 40 feet of drawdown associated with steady state pumping and a northern-most extent associated with 20 feet of drawdown at steady state. Figure 11 shows that leakage starts at the Jordan and Shakopee observation wells 15 minutes after pumping begins but does not start at the beginning of the landfill until the pumps have been going for 150 minutes. Figure 11 also indicates that at 18 feet of drawdown or less, there is no leakage from the Shakopee into the Jordan. The 18-foot drawdown contour line shown in Figures 6, 7 and 8 represents the limit of vertical leakage form the Shakopee to the Jordan at steady state conditions. Since

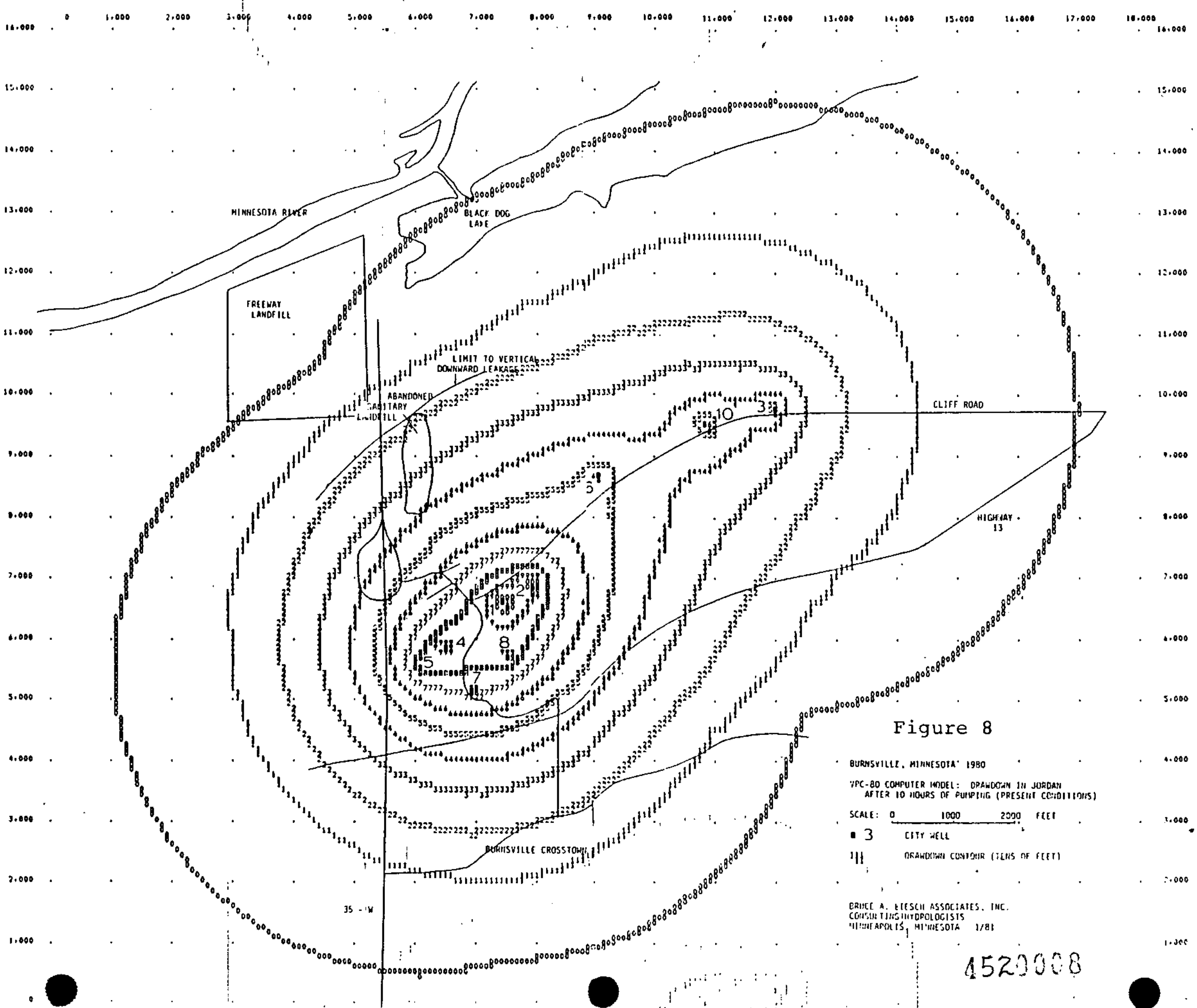


Figure 8

BURNSVILLE, MINNESOTA 1980

VPC-80 COMPUTER MODEL: DRAWDOWN IN JORDAN
AFTER 10 HOURS OF PUMPING (PRESENT CONDITIONS)

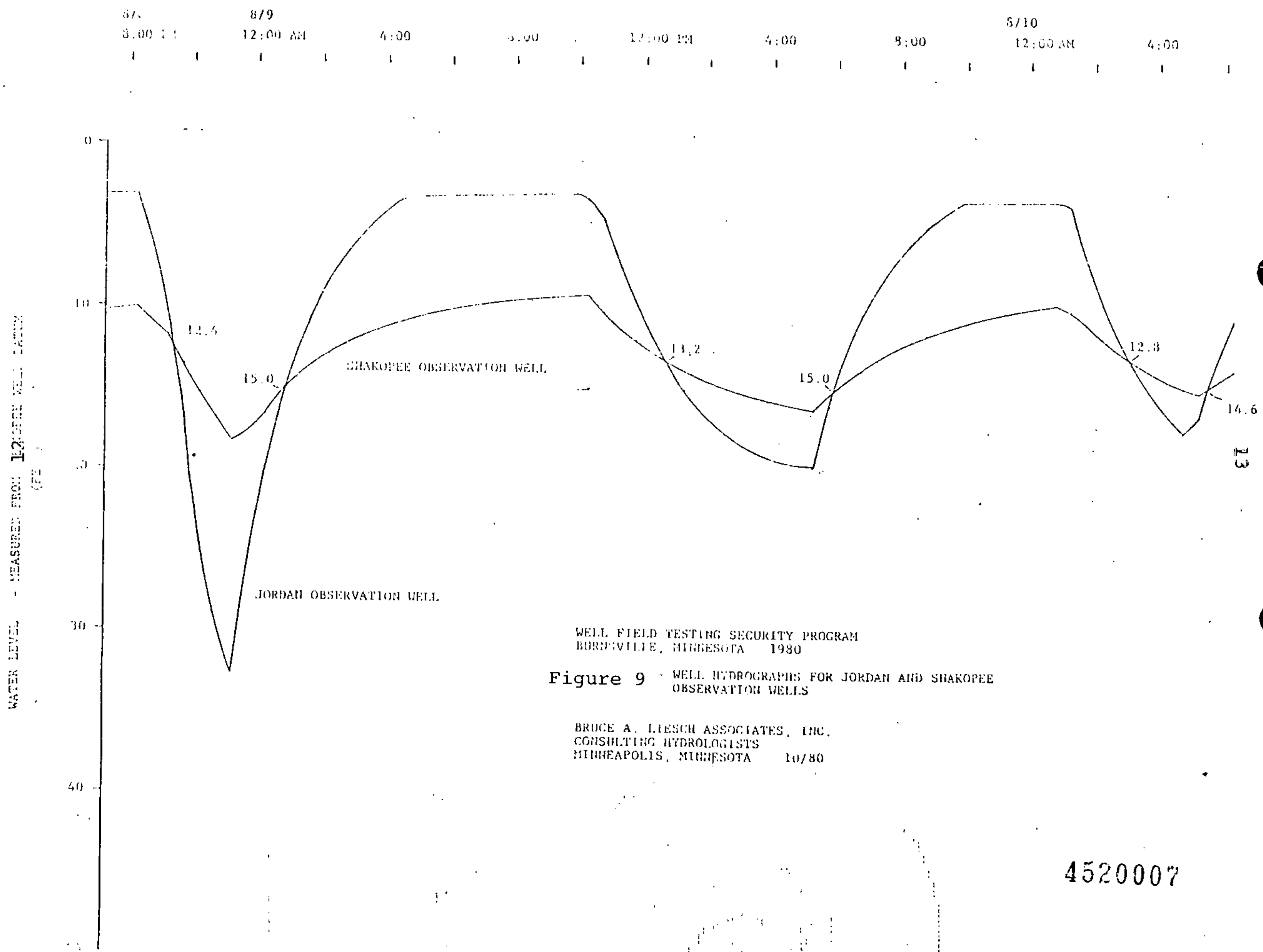
SCALE: 0 1000 2000 FEET

■ 3 CITY WELL

||| DRAWDOWN CONTOUR (TENS OF FEET)

BRUCE A. LIESCH ASSOCIATES, INC.
CONSULTING HYDROLOGISTS
MINNEAPOLIS, MINNESOTA 1/81

4520008



WELL FIELD TESTING SECURITY PROGRAM
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Figure 9 - WELL HYDROGRAPHS FOR JORDAN AND SHAKOPEE OBSERVATION WELLS

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CONSULTING HYDROLOGISTS
MINNEAPOLIS, MINNESOTA 10/80

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4520007

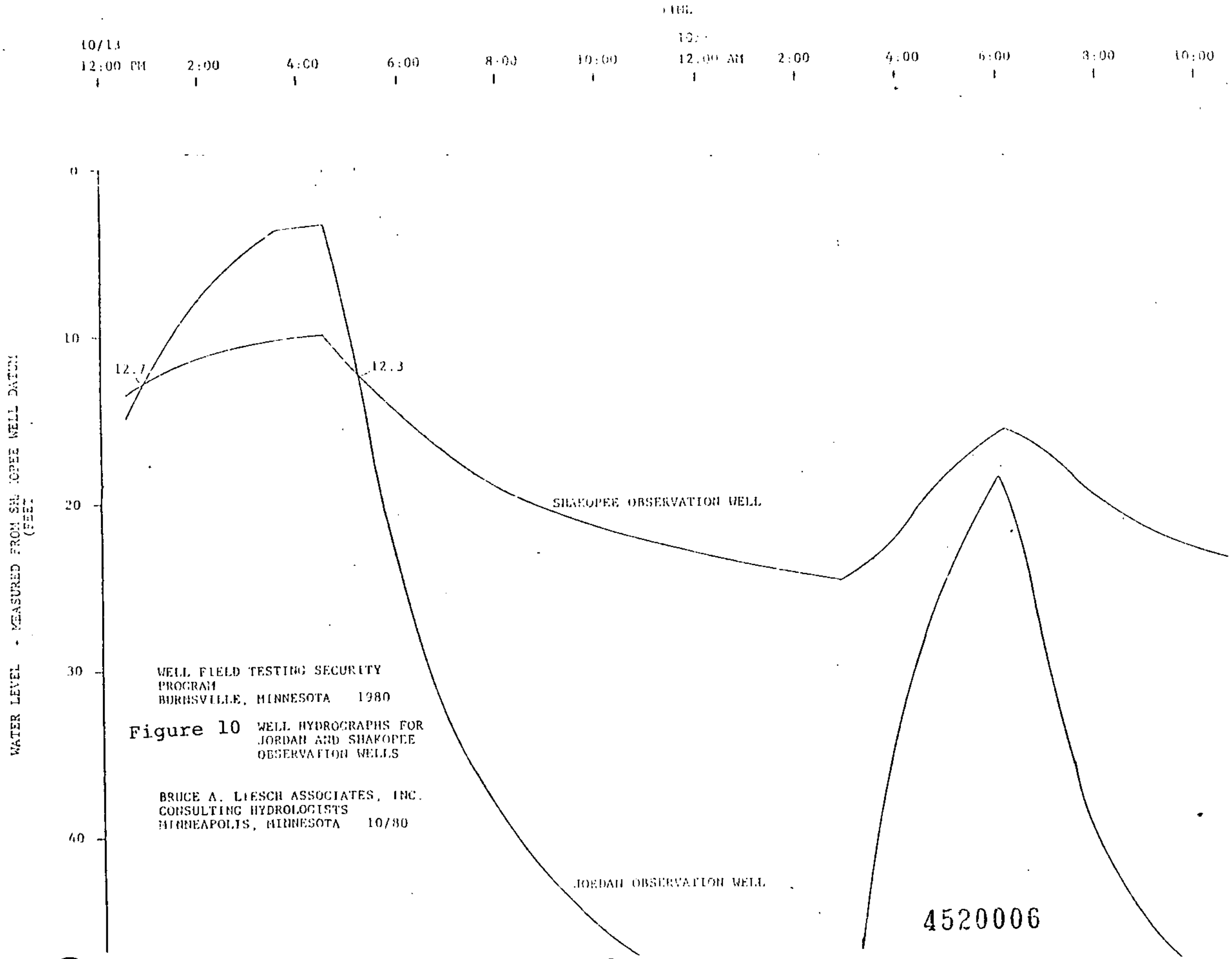

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Figure 10 WELL HYDROGRAPHS FOR JORDAN AND SHAKOPEE OBSERVATION WELLS

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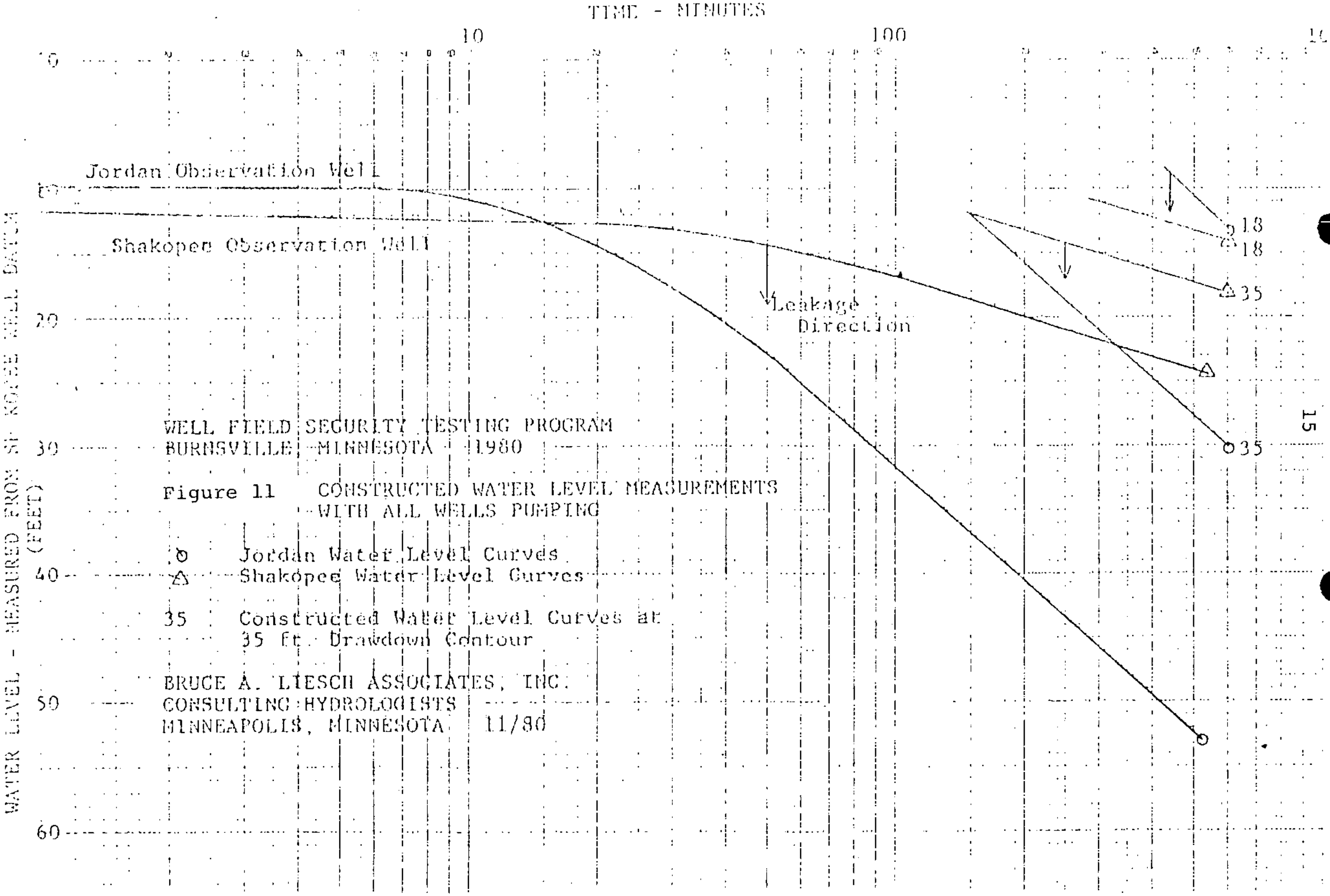
TIME - MINUTES
10
100
WATER LEVEL - MEASURED FROM SE KOPEE WELL DATUM (FEET)
10
20
30
40
50
60
Jordan Observation Well
Shakopee Observation Well
Leakage Direction
18
18
35
35
15
WELL FIELD SECURITY TESTING PROGRAM
BURNSVILLE, MINNESOTA 1980
Figure 11 CONSTRUCTED WATER LEVEL MEASUREMENTS WITH ALL WELLS PUMPING
O Jordan Water Level Curves
Δ Shakopee Water Level Curves
35 Constructed Water Level Curves at 35 Ft. Drawdown Contour
BRUCE A. LIESCH ASSOCIATES, INC.
CONSULTING HYDROLOGISTS
MINNEAPOLIS, MINNESOTA 11/80

4520065

TABLE 1 - Analysis of Leakage Direction Measured at the Jordan and Shakopee Observation Wells 7/22-7/28, 1980.

Date July 1980	Flow Into Jordan Start	Flow Into Jordan Stop	Flow Into Shakopee Start	Flow Into Shakopee Stop	Total Time Hrs.	Total Time Min.
22	1:10P	5:20P			4	10
22			5:20P	6:40P	1	20
22-23	6:40P	4:30A			9	50
23			4:30A	10:20A	5	50
23	10:20A	4:40P			6	20
23			4:40P	5:00P		20
23-24	5:00P	8:50A			15	50
24			8:50A	10:20A	1	30
24-25	10:20A	5:00A			18	40
25			5:00A	6:30A	1	30
25	6:30A	11:00A			4	30
25			11:00A	2:30P	3	30
25	2:30P	7:20P			4	50
25			7:20P	10:40P	3	20
25-26	10:40P	3:00A			4	20
26			3:00A	11:30A	8	30
26	11:30A	3:40P			4	10
26			3:40P	5:00P	1	20
26-27	5:00P	12:00A			7	0
27			12:00A	9:30A	9	30
27-28	9:30A	11:00A			25	30

4520004

the pumps are seldom run long enough to attain a steady state condition, the drawdown under the abandoned landfill and the leakage associated with the drawdown is almost always less than predicted.

An analysis was conducted to determine the length of time that groundwater leaked from the Shakopee dolomite into the Jordan sandstone during the period of maximum pumpage. Table 1 shows the results of the analysis, indicating that the leakage from above occurs over a much longer time period than the natural flow from the Jordan to the Shakopee. At one point there are 25.5 hours of leakage over three pumping cycles in which the water level in the Jordan is below the water level in the Shakopee at the observation wells.

In contrast, hydrographs from two and one-half weeks later, Figure 9, indicate that the upward flow from the Jordan into the Shakopee occurs over much longer periods of time than reversed flow. During the pumping of August 9, flow was reversed for a period of five hours, followed by a period of upward flow of nine hours. Previous to the five hours of reversal, the flow was from the Jordan to the Shakopee over a 12-hour period. Figure 10 indicates an extended period of leakage into the Jordan during the middle of October. This was caused by extended pumping to fill a storage reservoir and does not represent a normal pumping period for October.

This analysis indicates that only over a short period of time during the year does leakage into the Jordan exceed the natural condition of leakage direction from the Jordan into the Shakopee.

<u>HYDROLOGIC INVESTIGATION WEST OF THE BURNSVILLE WELL FIELD</u>

A 10-hour pumping test was run by the City's consultant on December 29, 1980 to determine the effect the City's wells would have on drawdown in a Jordan well on the Kraemer and Sons quarry property west of the Ctiy's well field. The test consisted of pumping city wells 1, 2, 4, 5, 7 and 8 and observing drawdown in the Jordan well on the Kraemer quarry property as well as drawdown in city wells 3 and 6 and in the Shakopee and Jordan observation wells.

The results of the pumping test represent the actual drawdown expected during the peak pumping periods of the City's well field. The results were compared to the theoretical drawdown computed from the mathematical model developed for the Burnsville area and the conclusions drawn.

The water levels observed at the quarry well indicate a deep cone of depression in the Jordan aquifer caused by pumping from the quarry. The cone of depression beneath the quarry acts as a barrier sink to the movement of groundwater in the Shakoee-Oneota-Jordan aquifer system. The measured interference water level drawdown at the quarry well caused by the Burnsville Jordan wells pumping at a maximum rate for 10 hours was 1.35 feet. In contrast, the mathematical model indicated an interference drawdown of 17 feet. The lack of agreement between the actual observed interference conditions and the mathematical model may be attributed to a) a higher effective coefficient of transmissivity in the area of the quarry than has been assumed for the model, b) an increase in the coefficient of storage caused by partial dewatering of the Shakopee dolomite and partial transition from artesian to water table condition, c) higher leakage rates from the Shakopee to the Jordan in the intervening area between the well field and the quarry, d) a combination of all the factors a, b and c. A higher coefficient of transmissivity and higher leakage rates would be natural physical characteristics of the units. The increase in the coefficients of storage that would accompany a transition to partial water table conditions would be induced by the deep cone of depression in equilibrium beneath the quarry. A cessation of pumping at the quarry would cause a trend toward natural conditions and the protective effects of the barrier sink would be diminished or eliminated.

CONCLUSIONS

1. The mathematical model developed for the Burnsville well field is representative of the actual aquifer conditions and can be used to model varying well field configurations of future proposed wells.

2. The mathematical model is theoretical in nature. Additional observation wells north of the City's well field would help to further define hydrologic characteristics in the vicinity of the Freeway Sanitary Landfill. In the vicinity of the Jordan and Shakoee observation wells the flow direction is reversed at a drawdown of between 14 and 17 feet where upon flow is from the Shakopee into the Jordan. The Freeway Sanitary Landfill is about 300 feet northwest of this vertical leakage line.

3. Because of the Freeway Landfill's close proximity to the vertical leakage line and the theoretical basis under which this line was determined, the potential exists for the City's water supply well field to be adversely impacted by contaminants from the landfill.

4. Under current pumping conditions and only during short periods of peak demand, the combined cones of depression in the Burnsville well field produce a net transfer of groundwater from the Shakopee-Oneota dolomites to the Jordan sandstone within the area encompassed by the dashed line between the 10-foot and 20-foot drawdown contours shown in Figure 8.

5. Only during short periods in the summer does the length of time of flow from the Shakopee dolomite into the Jordan sandstone exceed the length of time of flow from the Jordan sandstone into the Shakopee dolomite.

6. The potential for short-term groundwater contamination in a limited area adjacent to the abandoned landfill appears to be more a function of the duration of the pumping periods at the existing municipal wells rather than additional wells pumping at more remote sites to the south and east.

7. The potential for long-term, widespread contamination of the Jordan aquifer would be greatly enhanced by the extended pumping periods at the existing municipal wells resulting from an increase in the water requirements rather than by orderly expansion of new wells to the south and east.

8. During steady state conditions, the water pumped from the Jordan is replaced by groundwater leakage through the Shakopee-Oneota descending from the overlying geologic units. To avoid contamination it would be preferred that the replacement water be derived largely from the St. Peter sandstone and glacial drift deposits south of the well field rather than from the valley alluvium.

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