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Office of the Chairman

May 28, 1980

Mr. Arthur Sidner, Chairman
Environmental Quality Board
Room 101, Capitol Square Building
550 Cedar Street
St. Paul, MN 55101

Dear Mr. Sidner:

Pursuant to Environmental Quality Board regulations, the Metropolitan Council is transmitting the enclosed draft environmental impact statement for the proposed Burnsville Landfill expansion to the Board and all Board-designated distribution points for filing purposes (MEQC 29). A public meeting on the document has been set for June 26, 1980 at 2:30 p.m. in the Metropolitan Council Chambers.

Sincerely,

Charles Weaver
Chairman

CW/cb

DRAFT ENVIRONMENTAL IMPACT STATEMENT

BURNSVILLE SANITARY LANDFILL EXPANSION

BURNSVILLE, MINNESOTA

May 29, 1980

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

DRAFT ENVIRONMENT IMPACT STATEMENT

BURNSVILLE SANITARY LANDFILL EXPANSION

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BURNSVILLE SANITARY LANDFILL EXPANSION

SECTION I

SUMMARY

IDENTIFICATION OF DOCUMENT

Preface

In 1979, Edward Kraemer and Sons, Inc., owner and operator of the Burnsville 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 worksheet, 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 environmental impact statement be prepared and that the Metropolitan Council prepare the EIS. The EQB concurred with the MPCA recommendations on February 21.

Organization of EIS

The Environmental Impact Statement has ten sections. Section Two briefly describes the existing landfill operations and the proposed action. Section Three describes the existing environment of the Burnsville 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.

This EIS was prepared concurrently with EISs for the Freeway and Pine Bend Landfills also in Dakota County, Minnesota. Sections Six through Ten of the EIS cover a number of issues that interrelate with the expansion of all three landfills. These sections of the EIS are contained in the Pine Bend Landfill EIS. Sections Six-Ten of the Pine Bend EIS are therefore an appendix to this document and the Freeway EIS. The collection and management system cost section of Section III also references the Pine Bend EIS as an appendix.

PROPOSED ACTION

The Burnsville application is for a permit to the existing landfill which is in Section 32, T.27 N., R. 24.W in Burnsville, Dakota County, Minnesota. The Burnsville Landfill is an 85-acre site which has been in continual operation since the mid-1960s. The proposed expansion involves filling a 17-acre parcel located west of the existing landfill, and increasing the maximum permitted elevation of the landfill from 780 to 800 feet. These areas will be filled with general residential and commercial refuse. The existing landfill has a remaining permitted capacity of 806 acre-feet. At this capacity, the landfill has another 2 to 3-year "life" given normal receiving rates.

The proposed vertical and horizontal expansions would provide for an additional 3,418 acre-feet of space (3.9 million cubic yards), and will increase the estimated life of the landfill by 6 to 7 years given a fill rate of about 300 acre-feet per year (40,000 cubic yards per month). If allowed to expand, the landfill could operate for another 8 to 10 years given normal receiving rates.

MAJOR ENVIRONMENTAL IMPACTS

Air Quality and Noise

The construction, operation and closing of the proposed expansion areas will result in a minimum amount of fugitive dust, odors and methane gas. Current operational procedures at the 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 people and property.

The potential for adverse methane gas impacts will be increased by the proposed expansion areas. 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 to install a gas monitoring system to evaluate any future requirements for on-site and perimeter gas control measures.

Water Quality

The primary impact on surface water quality from operations in the proposed expansion area would be an increased potential for minor leachate contamination of the Minnesota River, and contamination and siltation of nearby off-site ponds and wetlands. 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. The same is true for nearby off-site ponds and wetland areas.

The application and grading of daily and final cover material at the landfill will serve to direct on-site drainage to the 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.

There is no potential for leachate contamination of the water supply wells, since none are located within the area of leachate influence identified at the landfill. The proposed expansion may contribute additional leachate to the groundwater system, and subsequently the Minnesota River. The minor increase in leachate production is predicted to have only minimal impact on the river. Most pollutants will show no detectable change based on the dilution model within the river.

Terrestrial and Aquatic Ecology

Construction activities in the proposed expansion areas, particularly the excavation and fill procedure, will unavoidably eliminate vegetation on the areas involved. Reduction of vegetation will, in turn, decrease the habitat of wildlife populations. This action will have minimal effect on areawide predator populations faced with a decrease in food supply. 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.

Filling activity in the expansion area will have one additional irreversible impact. A small wetland area on the expansion area will be filled. This action will have minimal effect on the areawide wetland resources.

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 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 Interstate Highway 35W-Cliff Road 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 areas will create an isolated mound virtually level with the opposing bluff on the north side of the Minnesota River.

The expansion areas will add about 11 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 routing and/or additional fuel costs for area haulers. Filling of the expansion areas will, therefore, lessen the need to develop new landfills sooner, and help maintain present land disposal charges and collection rates.

REASONABLE ALTERNATIVES

The Burnsville Sanitary Landfill, without expansion, will close in 1982. No resource recovery or new landfill facilities would likely be operating in time to represent reasonable alternatives to the proposed expansion.

Existing 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. 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 Environmental Impact Statement. The Minnesota Pollution Control Agency's staff prepared Sections Seven and Eight and a portion of Section Six.

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

University of Minnesota	C. McJilton, F. Thompson, H. Paulus, J. Mulhansen
Minnesota Department of Health	P. Gutkowski, T. Bosman, M. Convey, J. Washburn, D. Anderson, G. England, R. Koch, M. Seliga
Minnesota Occupational Safety and Health Administration	D. Schilling, J. Berg, B. Bracht, W. Mergens
Minnesota State Planning Agency	P. Ashbrook
American Lung Association	B. Hughes
Dakota County	D. Gurney
Barr Engineering	D. Farb, L. Dalen
Dakota County Soil and Water Conservation District	B. Christenson
St. Paul Refuse Haulers Association	F. Rauschnot
Minnesota Historical Society	R. Fridley
Dakota County Historical Society	F. Miller
Minneapolis Refuse, Inc.	C. Kutter, C. Baker
Lake Sanitation, White Bear Lake	M. Ayde
City of St. Paul	F. Forsberg, R. Person
Pope-Reid Associates	R. Reid, S. Smith
U.S. Corp of Engineers	J. Esson
Peterson Forage Seed Co., Savage	S. Peterson
Minnesota Department of Natural Resources	T. Kucera, C. Henderson, J. Davidson, K. Gill, C. Cohen, R. Norrgard, J. Dustrude
City of Minneapolis	M. Enquist

Private Hauler

U.S. Fish and Wildlife Service

City of Burnsville

City of Bloomington

Northern States Power Company

Edward Kraemer and Sons, Inc.

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BURNSVILLE SANITARY LANDFILL EXPANSION

SECTION II

DESCRIPTION OF EXISTING LANDFILL AND PROPOSED ACTION

DESCRIPTION OF EXISTING LANDFILL

SITE LOCATION

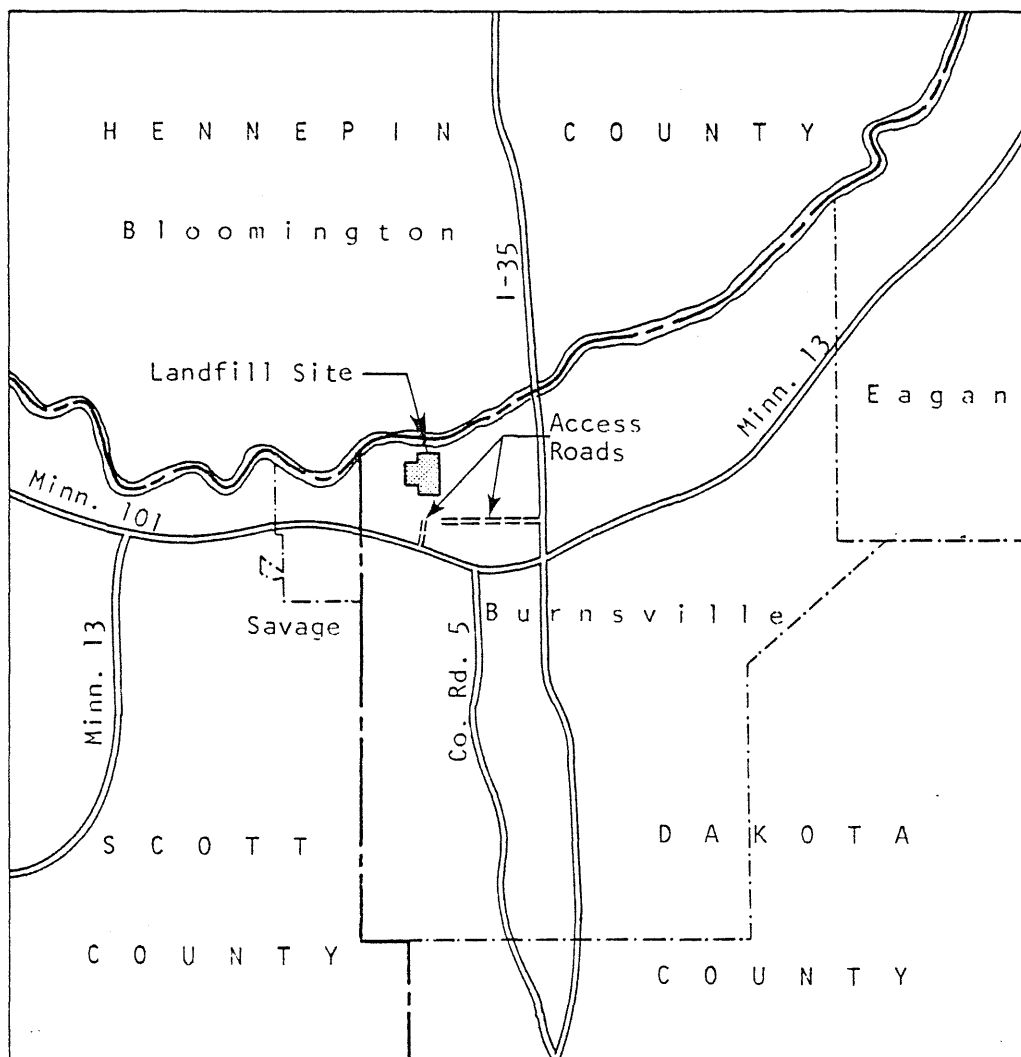
Legal Description

The Burnsville Landfill permit application is for a horizontal expansion of the landfill to include an adjacent 17-acre parcel and for a vertical expansion of the existing landfill. The landfill is located in Section 32, T. 27N., R. 24W. in the City of Burnsville, Dakota County, Minnesota. The location and limits of the existing landfill property and the proposed 17 acre expansion area are shown in Figures II-1 and II-2. The legal description of the existing landfill property and the proposed horizontal expansion area are included in Appendix I.

The Burnsville zoning map, dated November 1977, identifies the existing landfill and proposed expansion I-2, general industrial. The 1965 Burnsville Comprehensive Plan also identifies the site as general industry.

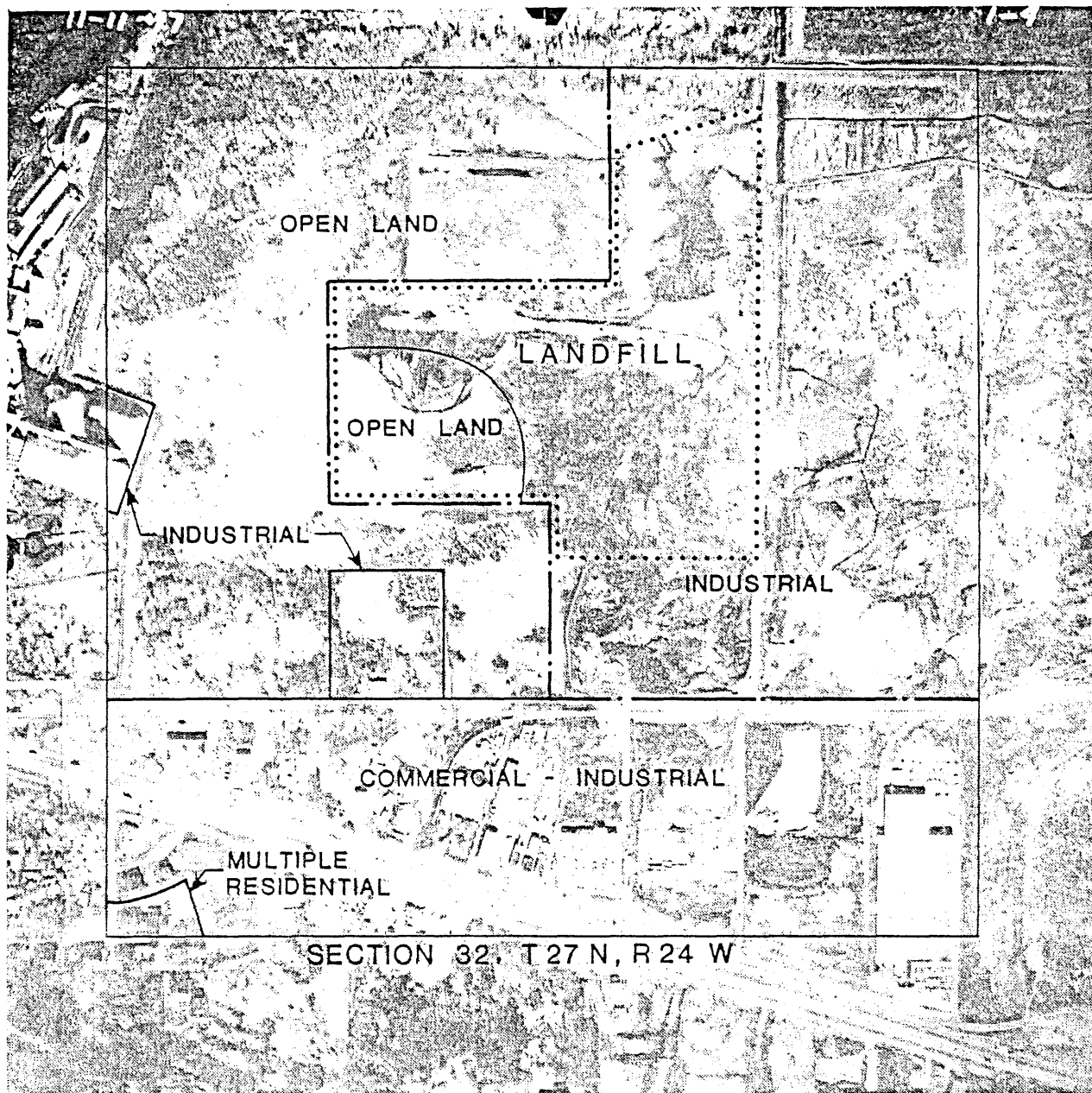
As Figures II-2 and II-3 illustrate, the existing land use in the vicinity of the landfill is industrial or open land. A dolomite quarry operated by Edward Kraemer and Sons is east of the landfill and to the west, owned by Cargill, is the site of a grain storage and barge loading terminal. The Minnesota River is approximately 950 feet north of the landfill.

The Burnsville Sanitary Landfill is an existing permitted landfill (MPCA Permit No. SW-56) which has been in continual operation since the mid-1960's. The landfill is operated under a conditional use permit with the City of Burnsville and a solid waste disposal license with Dakota County. The landfill occupies 85 acres and is owned and operated by Edward Kraemer & Sons, Inc. of Burnsville, Minnesota.



N
▲
1" = 2 Miles

FIGURE II-1
EXISTING HAUL ROADS
BURNSVILLE SANITARY LANDFILL



..... Limits of Landfill Expansion



1" = 1,000'

FIGURE II-2
EXISTING LAND USE
BURNSVILLE SANITARY LANDFILL

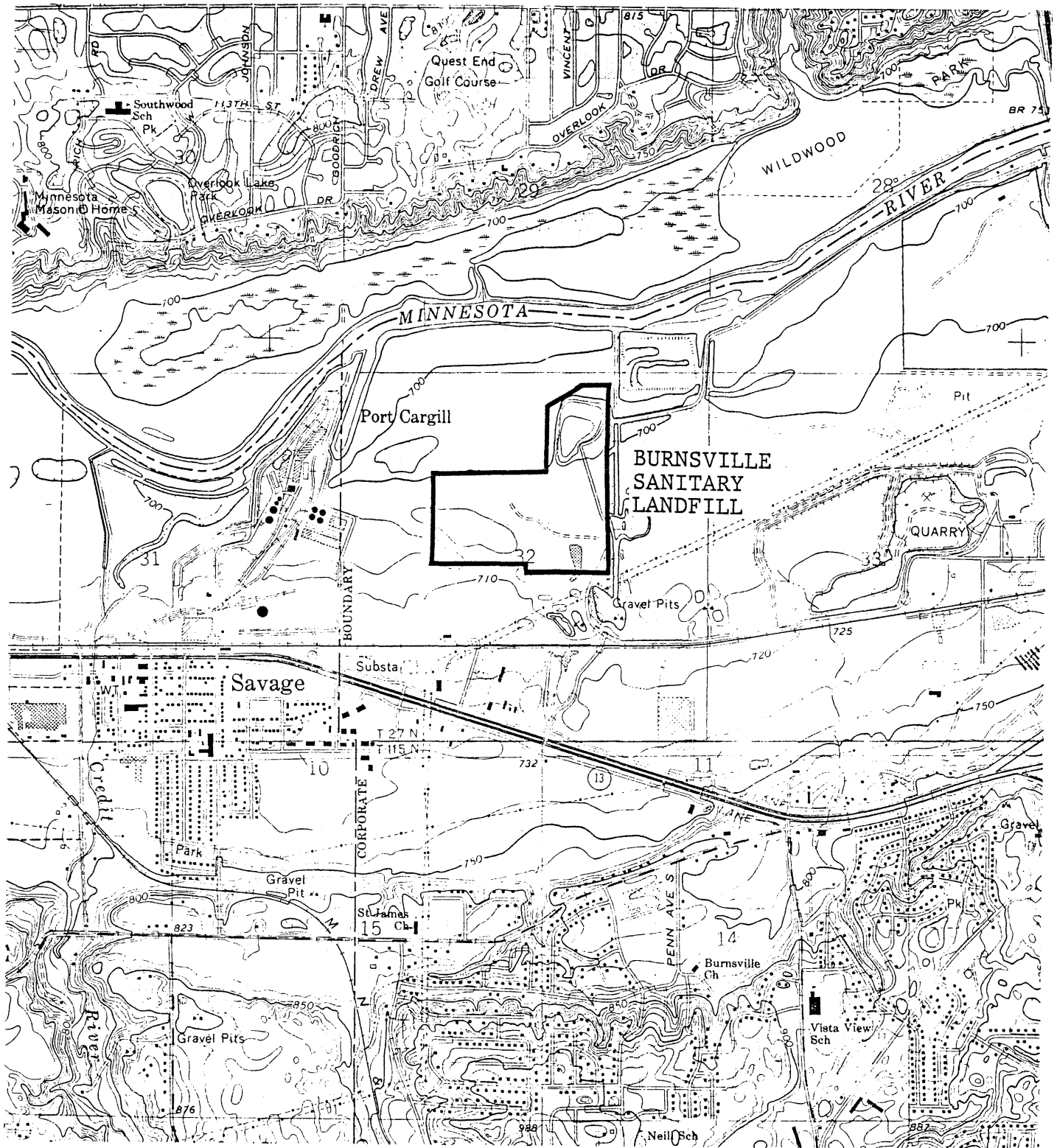


Figure II-3 Quad Map Excerpt

-10-

Scale 1" = 2000'

From: USGS Bloomington Quadrangle

Major Access Roads

Solid waste is brought to the disposal site by commercial haulers or private individuals along the roads shown in Figure II-1. There are two all-weather, blacktop access roads to the landfill. The primary haul routes are Interstate Highway 35W with access at Cliff Road (formerly 122nd St), and Highway 13 with access at an unnamed road from a controlled intersection on Highway 13.

SOLID WASTE SERVICE CONDITIONS

Areawide

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

Solid Waste Quantities and Composition

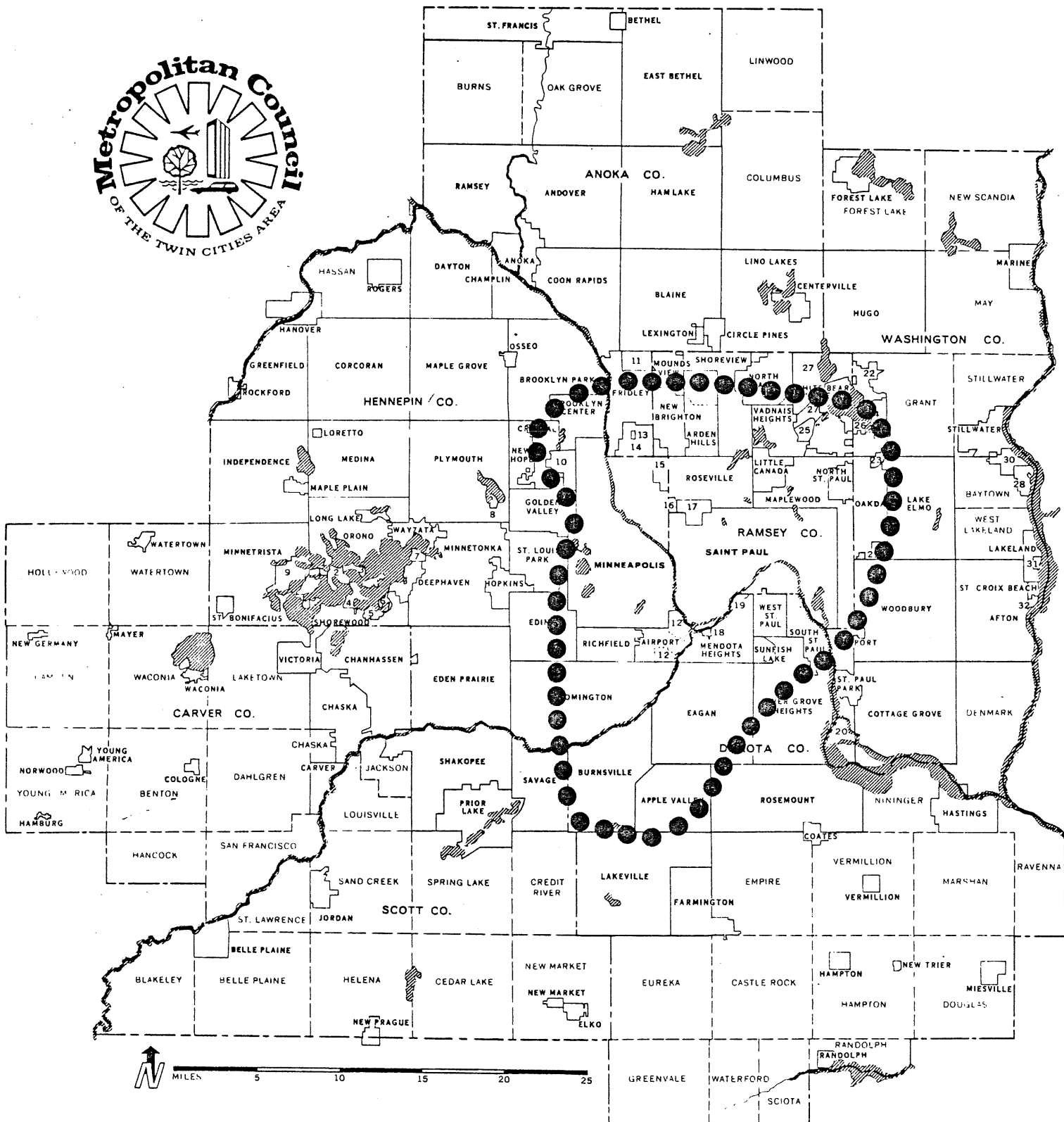
The Burnsville Sanitary Landfill generally receives about 240,000 tons per year (670 tons per day) of mixed municipal solid waste. Mixed municipal waste consists of solid waste that is collected from residential, commercial and industrial sources. No hazardous or liquid wastes are accepted at the landfill.

Recently the Burnsville Sanitary Landfill raised their disposal charges. Because of this, receiving rates at the gate have dropped approximately 50 percent. (Presently Burnsville is receiving about 123,000 tons per year (340 tons per day).

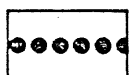
Collection-and Disposal System

The Burnsville Sanitary Landfill serves a collection area bounded approximately by eastern Hennepin County including Brooklyn Center, Crystal, Robbinsdale, Golden Valley, St. Louis Park, Edina, Bloomington, and Minneapolis; all of Ramsey County except the northern portions of Moundview, Arden Hills, North Oaks, and White Bear; the southern parts of Anoka County including Columbia Heights, Hilltop, and Fridley; the eastern portion of Washington County including Newport, Woodbury, Landfall, Oakdale, Pine Springs, Willernie, Birchwood, and Mahtomedi; and the northern portion of Dakota County including South St. Paul, West St. Paul, Inver Grove Heights, Mendota Heights, Lilydale, Mendota Heights, Eagan, Apple Valley, and Burnsville. A recent waste shed analysis by a consultant for the Metropolitan Inter-County Association Council shows the general service area boundaries for the Burnsville Sanitary Landfill (see Figure II-4).

The Burnsville Sanitary Landfill was originally permitted by the



TWIN CITIES METROPOLITAN AREA



Burnsville Wasteshed

Figure II-4

Minnesota Pollution Control Agency (MPCA) at 9,546 acre-feet of capacity. In a normal year, it is estimated that 300 acre feet of capacity are used. It is further estimated that about 2 to 3 years of remaining life currently exists at the landfill given normal receiving rates.

Waste is brought to the disposal site by commercial haulers or private individuals. Since most of the waste comes directly to the landfill without prior processing at transfer stations, the compaction within the packer trucks themselves represents the only compaction before disposal at the landfill.

SITE OPERATION

General Methods of Landfilling

The Burnsville Sanitary Landfill contains an on-site temporary building which provides emergency shelter. The scale house is a permanent structure located at the entrance road to the landfill. A maintenance building is located approximately 2,000 feet north of the scale house. The permanent office building serving both the landfill and the quarry operations is located near the aggregate loading area east of the landfill.

The landfill is operated from 7 a.m. to 4:30 p.m., Monday through Friday and from 8 a.m. to 2 p.m. on Saturdays. The operating hours may be extended to 6 a.m. to 5 p.m. during 1980. An attendant is on duty at the scale house during operating hours; limiting access to the site, weighing each commercial vehicle, collecting dumping fees, and providing directions to the working face. Tables II-1 and II-2 show the equipment used at the landfill and the personnel needed to operate the facility at waste inflow rates of 40,000 cubic yards per month.

Filling Sequence -- Currently, solid waste is being placed in two lifts each consisting of nine cells as shown in Figure II-5. Demolition waste is being placed on top of the existing landfill to a height not to exceed four feet to provide access to the working face. Placement of demolition waste and refuse began with Cell A and will proceed through Cell G in the direction as indicated in Figure II-5. Each lift consists of maximum of four feet of demolition waste, approximately eight feet of refuse and appropriate cover. Upon completion of the first lift of Cell A through Cell G, a second pad of demolition material will be placed followed by a second lift of refuse. As each cell of the second lift reaches the final refuse elevation, cover will be placed over that cell. After the completion of Cell G, two lifts of refuse will be placed in Cell H, Cell I and the test section area in the same manner as Cell A through Cell G.

TABLE III-1

EQUIPMENT INVENTORY

Machine	FUNCTION				Number Of Units
	Excavation	Earth Moving	Spreading & Compacting	Other	
613 Scrapers	x	x			4
816 Compactors			x		2
Caterpillar 966 Loaders				x	3
Caterpillar D-8 Tractor/Dozers			x		2
Euclid Trucks (20 yards)		x			3
Dragline				x	1
Tandem Trucks				x	12
Pickup Truck				x	2
Watertaken Truck				x	1

TABLE II-2

LANDFILL SITE PERSONNEL

<u>Description</u>	<u>Number Employed</u>
Foreman	1
Weigh Master	3
Equipment Operator	7
Clerk	1
Mechanic	2
Welder	1

Compaction Procedure -- Refuse is unloaded at the working face from both commercial compactor trucks and private customers (uncompacted). Access to the working face is provided by a pad of demolition material with sufficient cover to permit access for commercial compactor trucks. The pad is a maximum of four feet thick. Refuse placed on the working face is compacted in eight-foot vertical lifts by two Caterpillar 816 compactors. A D8 Caterpillar tractor-dozzer is used to assist in moving the unloaded refuse to the working face and for placing cover over the working face.

The disposal of solid waste is confined to two faces. One face called the "working face" is used for the placement of refuse and a second face called the "demolition face" results from the placement of demolition material used for the access pad. The total area of the working face will vary from a minimum of 10,000 square feet to a maximum of 30,000 square feet depending on the amount of refuse being unloaded at any given time. A cross section showing the working face and the demolition face is shown in Figure II-6.

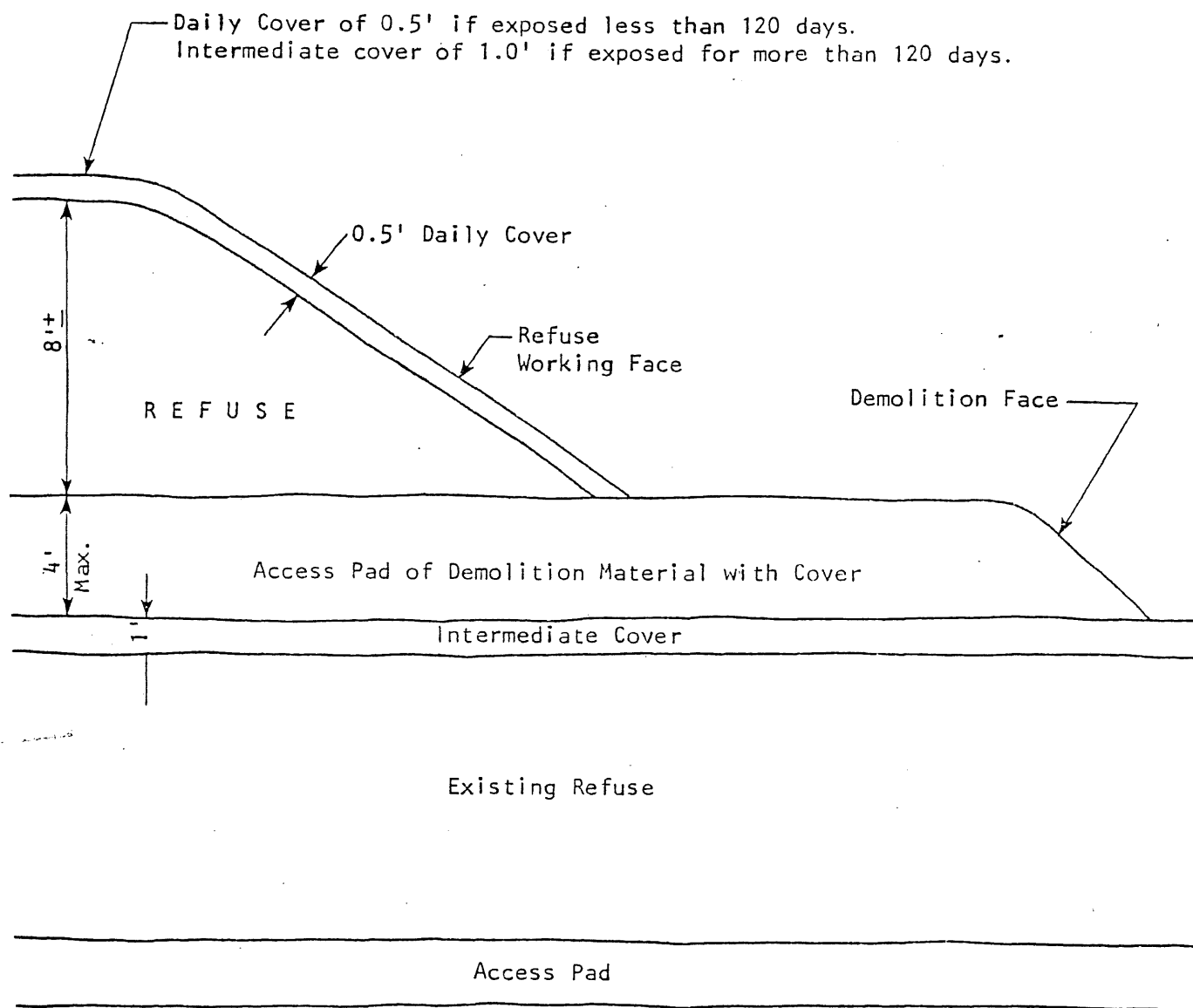
Cover Procedure - Cover material of soil taken from land owned by Kraemer and Sons, Inc. is placed over the refuse. Daily cover consists of six inches of cover material placed over the working face usually at the end of the working day. A "daily cover test section" is being constructed at the landfill to define the amount of material that constitutes "adequate daily cover." Intermediate cover consists of one foot of cover material placed over areas which will not receive another refuse lift within 120 days. Final cover consists of two feet of cover material including sufficient topsoil to maintain vegetation. Final cover is placed on all areas brought to final contour (terminated areas). Fill areas terminated after April 15 and before October 1 are seeded to provide Crown Vetch or Cromak vegetation within 30 days after the application of cover and topsoil. Areas terminated between October 1 and April 15 of the following year are covered and seeded by May 15.

Site Inspections

Appendix II contains a chronology of significant events that have occurred at the Burnsville Sanitary Landfill including MPCA site inspections.

Environmental Controls

Leachate Control -- A small amount of leachate occurs along the southeastern toe of the refuse in the area shown in Figure II-7. A trench has been excavated in the area of the leachate seep. Crushed rock was placed in the base of the trench and the trench was filled with clean sand. As the sand becomes saturated with leachate, it is removed and deposited in the landfill. In the past, this has occurred approximately every two weeks during the frost-free months of April through October. The removed sand is then replaced with clean sand.



TYPICAL REFUSE CELL SECTION

Not to Scale

Figure II-6

There is no leachate collection system under the landfill.

Ground Water Monitoring System -- The current monitoring plan includes sampling of ground water wells for chemical oxygen demand, pH, chloride, ammonia, and specific conductance. The ground water level is also measured in each well prior to sample collection. The locations of the wells are shown in Figure II-7. The drainage ditch located east of the landfill is monitored for the same parameters at two locations shown in Figure II-7. The wells and drainage ditch are sampled once every three months. All information is reported to the MPCA. At the time of closure, all water quality monitoring data will be reviewed to determine if post-closure monitoring is necessary. A post-closure monitoring plan will be submitted to the MPCA, as necessary, prior to final inspection on the site.

Surface Water Drainage -- Surface runoff from the landfill is controlled by uniformly grading and vegetating the side slopes to reduce the formation of gulleys. The surrounding area generally drains away from the landfill. The east and south side drain to a drainage ditch located east of the landfill, the north side of the landfill drains to the Minnesota River, and the west side drains west and north to the Minnesota River.

Vector Control -- Inspections by MPCA personnel and landfill personnel have not detected the presence of vectors. If there is evidence of vector activity on the site, a qualified exterminator or pest control agency will be hired to perform necessary eradication and follow-up inspections. Vectors are apparently not a problem on 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 necessary.

The existing landfill has not had problems with gas production or odors beyond the landfill site. The landfill has no special controls for handling gas produced within the refuse. There are no permanent buildings located on landfilled areas.

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 -- Litter on the landfill site is controlled by litter control fences and a litter pickup crew. Two fences have been placed on the east edge of the landfill as shown in Figure II-7. One is located at the base of the landfill and the second is located at the top of the refuse. Beginning in the spring of 1980, a portable wind screen will be used near the working

face to minimize the amount of windblown litter leaving the working face. Two attendants pick up paper and other litter that may be scattered on the site.

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

Security and Safety Procedures

Fire Protection -- A 1,000-gallon capacity water truck is available to control fires in compactor trucks or at the landfill. The water truck is equipped with a high pressure pump with a 1 1/2-inch diameter discharge hose. A 300-gallon per minute pumping system with 500 feet of aluminum pipe is available for obtaining water from the drainage ditch located along the east edge of the landfill. The drainage ditch located east of the landfill provides a high volume water source for fire protection. Stockpiles of cover material are maintained near the working face to assist in controlling fires. The Burnsville Fire Department has a fire station within five miles of the site and is aware of the existing operation and access points. Fire extinguishers are kept on all equipment and in all shelters.

Security -- Access to the landfill is controlled by the attendant in the scale house during working hours and by locked gates during non-operating hours. A night watchman is on duty when the landfill is closed. The landfill area, however, is not fenced and off-road access is possible.

Sanitary -- Sanitary facilities are supplied through "satellite" type facilities near the scale house. The main office serving the landfill and the adjacent quarrying and gravel washing operation has permanent sanitary facilities.

Emergency Communications -- A telephone is available for emergency communications during all operating hours in the weigh station.

Closure

The final permitted contours of the existing landfill are shown in Figure II-7. Within one month after any continuous area of approximately 10 acres or more is brought to final grade, the area will be covered with two feet of compacted cover material sloped to the final contours. The finished surface of the filled area will be seeded to provide Crown Vetch or Cromak vegetation within 30 days after application of cover material. Areas terminated between October 1 and April 15 will be covered and seeded by May 15. As set forth in the stipulation agreement between Edward Kraemer and Sons, Inc. and the MPCA, final cover will not be applied in areas included in the pending permit application.

Prior to termination of operations at the site, the MPCA and the Dakota County Engineer will be notified so a site inspection can be conducted before personnel and equipment are removed from the property.

Post Closure

A detailed description and a plan of the completed site will be recorded with the Dakota County Recorder's Office within one month after closure of the landfill. This description will give the general type and location of solid waste, the type and number of lifts, and original and final elevations of the completed sanitary landfill.

Post-closure land use for the landfill site will likely be open space. At the time of closure, all water quality monitoring data will be reviewed to determine if post-closure monitoring is necessary. A post-closure monitoring plan will be submitted to the MPCA, as necessary, prior to final inspection of the site.

On-Site Energy

The majority of the energy demand from operations of the Burnsville Sanitary Landfill comes from the following on-site equipment: 4 scrapers, 2 compactors, 3 caterpillars, 2 tractor/dozers, 3 euclid trucks, 12 tandem trucks, 2 pickup trucks, and 1 watertank truck. Annual diesel fuel requirements are approximately 65,000 gallons. On-site fuel storage holds approximately 60,000 gallons of diesel fuel.

DESCRIPTION OF PROPOSED ACTION

PRESENT APPLICATION

The requested permit modification would allow the vertical expansion of the existing 85-acre landfill by increasing the maximum permitted elevation of the landfill from 780 to 800 feet (see Figure II-7). The proposed project would also allow the expansion of the existing boundaries of the landfill onto an adjacent 17-acre parcel located west of the existing landfill (see Figure II-7).

The existing landfill has a remaining permitted capacity of 812 acre-feet. At this capacity the landfill would continue to operate for approximately another 2 to 3 years given normal receiving rates.

The proposed vertical and horizontal expansion would provide for an additional 2400 acre-feet of space (3.9 million cubic yards) and will increase the estimated life of the landfill by 6 to 7 years given waste inflow rates of about 300 acre-feet per year. (40,000 cubic yards per month). Allowed the expansion, the landfill could dispose of solid waste for another 8 to 10 years given normal receiving rates.

SITE LOCATION

The proposed action is located within and adjacent to existing permitted boundaries of the Burnsville Sanitary Landfill, in Section 32 T., 27N., R. 24W. in the city of Burnsville, Dakota County, Minnesota (see Figure II-7).

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

LEGAL DESCRIPTION

For a legal description of the proposed expansion area, see Appendix I.

ANTICIPATED LIFE, REFUSE SUPPLY, CAPACITY

The 20 foot vertical addition and the 17 acre horizontal expansion to the 85 acre landfill will hold approximately 2400 acre-feet of refuse. Given normal wasterceiving rates of approximately 300 acre-feet per year, this additional capacity will extend the life of the landfill by six to seven years.

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

MAJOR ACCESS ROADS

The major access roads for the proposed expansion areas 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 Burnsville Sanitary Landfill. The filling sequence for the landfill expansion has been divided into four phases, the limits of which are shown in Figure II-8. The filling sequence for each phase is outlined below.

Phase 1 -- Refuse will be placed in the Phase 1 area between the limits of the currently permitted landfill and elevation 800 in two lifts each containing five cells. The locations of the cells and the directions of filling are shown in Figure II-9.

Phase 2 -- Refuse will be placed in the 17-acre horizontal expansion area between elevation 708 and elevation 800. A demolition pad will be placed below elevation 708. Filling in Phase 1 will be carried out in a series of approximately eight lifts, with each lift made up of four or five cells. The location of the Phase 2 area, cell location and direction of

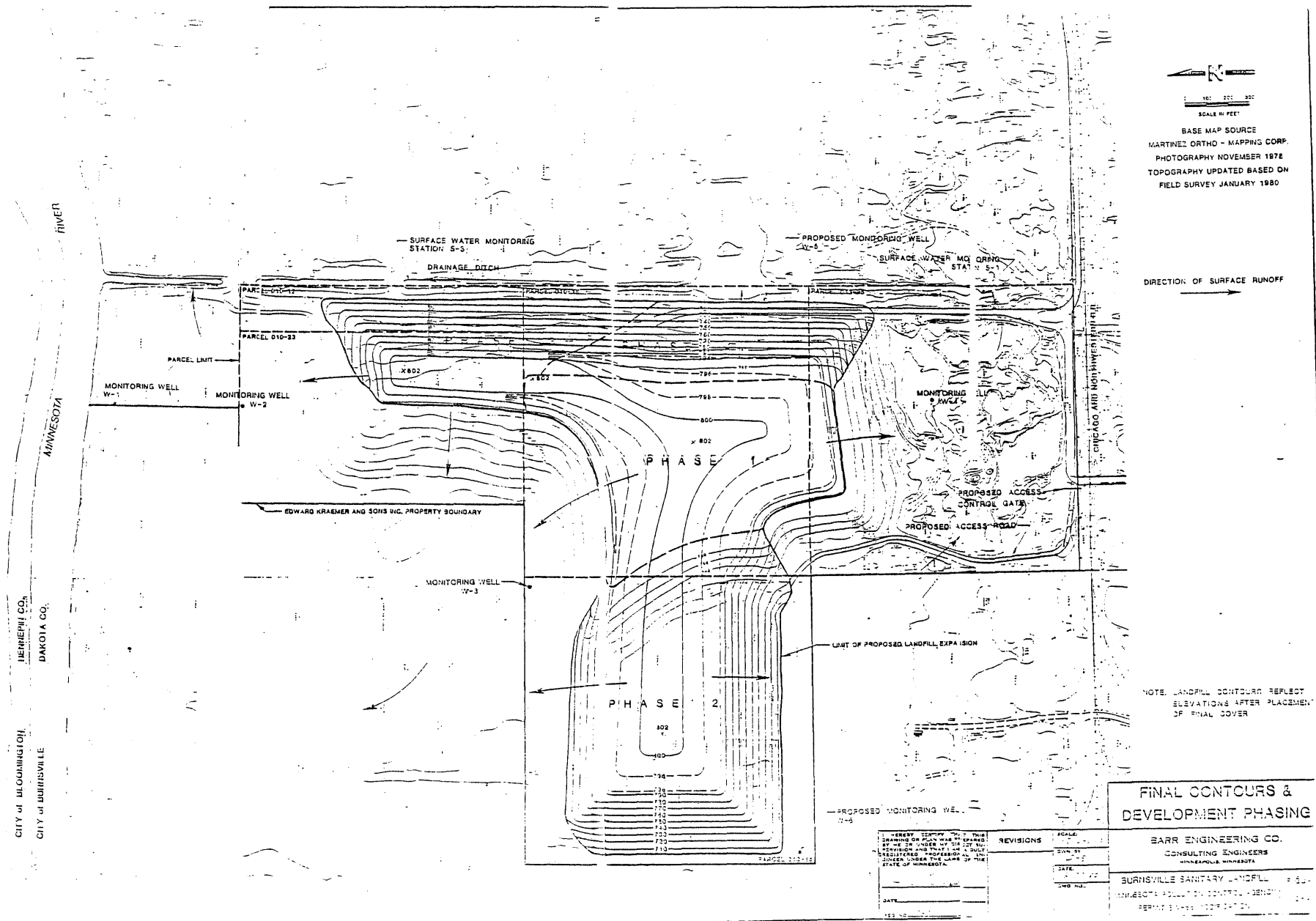
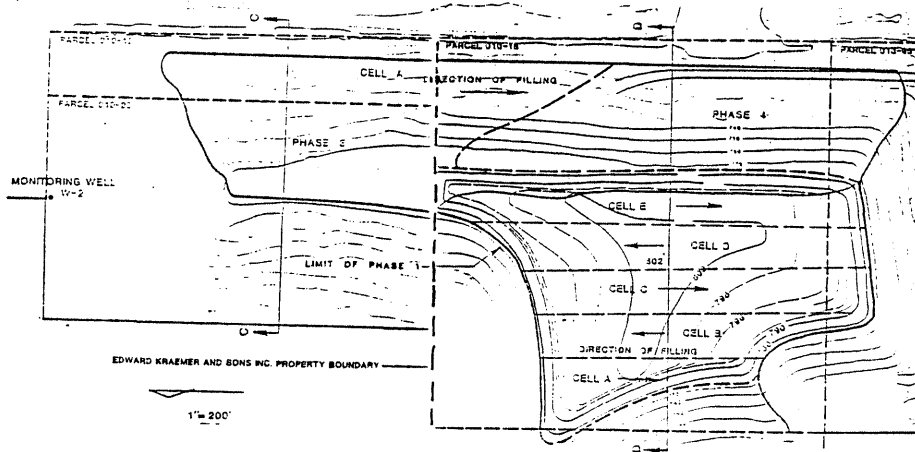
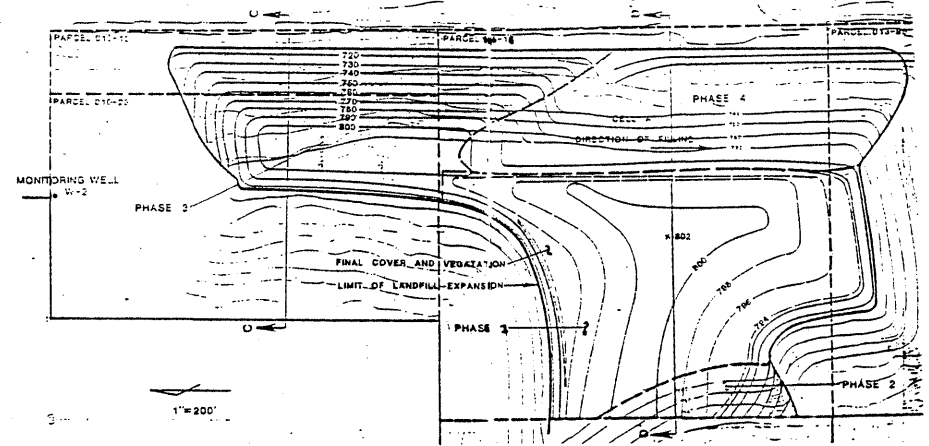


Figure II-8

Final Contours and Development Phasing



CELL LAYOUT - PHASE 1 & 3



CELL LAYOUT - PHASE 4

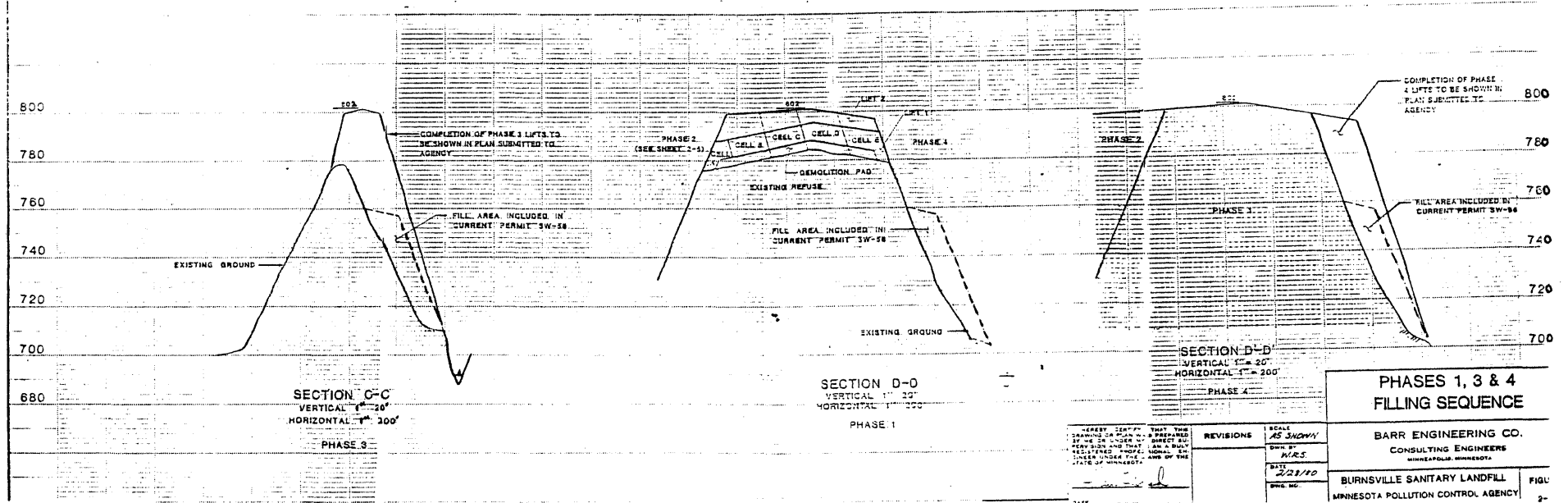


Figure II-9

Phases 1,3,4, Filling Sequence

filling are shown in Figure II-10. Figure II-10 also illustrates a cross section of the flood protection dike that will be used to remove the 17-acre horizontal expansion area from the flood fringe. The flood protection dike will be in place prior to any placement of refuse in Phase 2.

Phase 3 and Phase 4 -- Refuse will be placed on the east side of the landfill between the top of the refuse placed under the existing permit and the final contours shown in Figure II-8. A detailed plan for filling this area will be submitted to the MPCA before filling proceeds in this area.

ENVIRONMENTAL CONTROLS

The landfill expansion will require the placement of two new water quality monitoring wells. The new monitoring wells will be constructed using the procedures used to place existing monitoring wells W-2, W-3 and W-4. The wells will be constructed of PVC pipe and screen. The annulus around the well screen will be backfilled with clean sand and sealed at the surface to prevent the direct movement of surface water to the well screen. Well screens will be placed five feet below the ground water surface. The monitoring wells will be placed within two months after approval of landfill expansion unless approval comes during the period October 1 to April 1, in which case the new wells will be placed by June 1.

The location of litter control fences may be changed during the course of the landfill operation; however, a fence will remain in place along the east edge during the entire operation; Fencing will also be placed along the toe of the dike in the 17-acre horizontal expansion area.

SECURITY AND SAFETY PROCEDURES

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

BUILDINGS

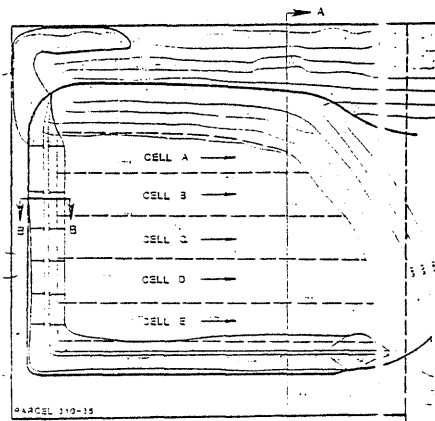
No new buildings are proposed for the landfill expansion.

ENERGY

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

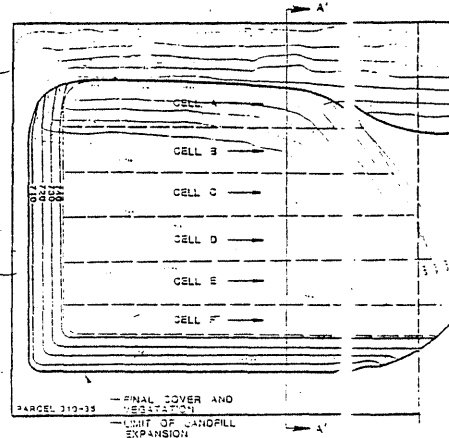
PROPOSED CONSTRUCTION

The landfill expansion will require the construction of an access road to the horizontal expansion area in Phase 2 as shown in Figure II-8. The new access road will be constructed by Edward Kraemer and Sons, Inc. The road will be an all-weather road with a minimum width of 30 feet and a crushed rock surface.

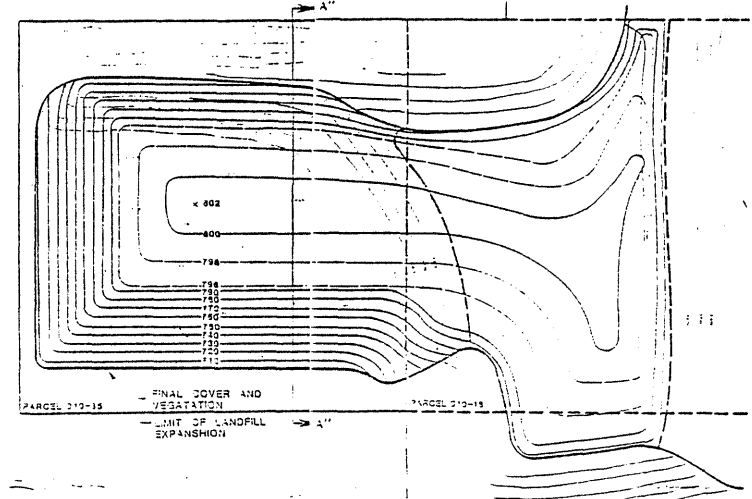


LIFT 1
PHASE 2

BREAK IN DIKE TO ACCOMMODATE
INTERIOR DRAINAGE DURING LIFTS
1 AND 2 OF PHASE 2.



LIFT 4
PHASE 2



(COMPLETION OF PHASE 1 & PHASE 2)

-26-

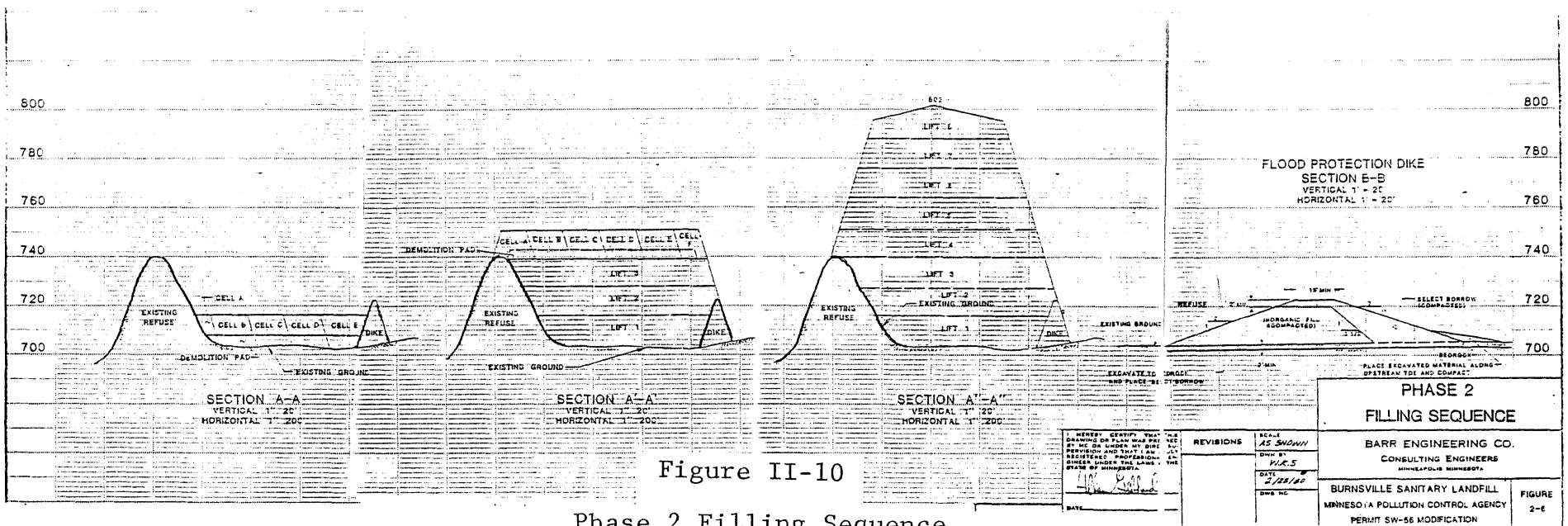


Figure II-10
Phase 2 Filling Sequence

The landfill expansion will also necessitate the construction of a flood protection dike around the horizontal expansion area. A typical cross section through the dike is shown in Figure II-10. The top of the dike will have a minimum width of 15 feet and an elevation of 722.5 MSL which allows three feet of freeboard above the 100-year frequency flood level of 719.5 MSL. The dike side slopes will be a minimum of 3 (horizontal) to 1 (vertical). The area beneath the dike will be excavated to bedrock. A minimum two-foot thick blanket of select borrow material will be placed below the dike and a 10-foot (minimum) thickness of select borrow material will be placed on the face as shown in Figure II-10. The sandy silt material excavated from beneath the dike will be placed along the toe of the dike. Since the dike is located in a backwater area of the Minnesota River, riprap will not be necessary to protect the slopes from erosion.

Until refuse is placed above the elevation of the top of the dike, approximately 50 feet of the flood control dike will remain open to allow surface runoff from the interior of the horizontal expansion area to drain out during non-flood periods. This portion of the flood control dike will be closed at least 48 hours prior to significant flooding on the Minnesota River. This should not be difficult since significant flooding on the Minnesota River has a lead time of between four and 10 days.

The new access road, access control gate and flood control dike will be constructed prior to the placement of refuse in the Phase 2 fill area.

BURNSVILLE SANITARY LANDFILL EXPANSION

SECTION 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 beneficial 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 Burnsville Sanitary 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 center-line 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 of 1970; the highest recorded temperature was 104°F. in July of 1941. The Annual Temperature Profile of the area is shown below:

TABLE III-1: ANNUAL TEMPERATURE PROFILE
TEMPERATURE DEGREES F

Maximum

Days annually 90°F and above	15 days
Days annually 32°F and above	83 days

Minimum

Days annually 32°F and above	153 days
Days annually 0°F and above	34 days

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

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-2 shows mean humidity (recordings over a fifteen year period) and mean precipitation (recordings over a thirty six year period) for the Minneapolis-St. Paul area.

TABLE III-2: MINNEAPOLIS-ST. PAUL MEAN
HUMIDITY AND PRECIPITATION

<u>Month</u>	<u>Humidity (%)</u>				<u>Precip. in.</u>
	<u>Midnight</u>	<u>6 am</u>	<u>Noon</u>	<u>6 pm</u>	
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	<u>77</u>	<u>79</u>	<u>72</u>	<u>74</u>	<u>0.89</u>
Year	75	80	61	61	25.94

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

The annual precipitation at the Minneapolis/St. Paul Airport (7 miles from the Burnsville Landfill) averages 29.3 inches per year. Table III-3 summarizes the estimated average monthly precipitation at the Burnsville Sanitary Landfill site. These averages were calculated from precipitation records (1949-1974) at the Chaska, Farmington, Jordan, Minneapolis and Montgomery weather stations.

Table III-3: AVERAGE MONTHLY PRECIPITATION
NEAR BURNSVILLE SANITARY LANDFILL

	<u>Inches</u>
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	<u>0.8</u>

Average Total Annual Precipitation 29.3 Inches

As can be seen from Tables III-2 and III-3, 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 Burnsville Sanitary 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 fifty states and District of Columbia in frequency of tornadoes based on the forty-nine 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-4). 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 (0-3 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.

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 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 (O₃),

TABLE III-4: WIND SPEED AND DIRECTION SUMMARY FOR
MINNEAPOLIS-ST. PAUL, MINNESOTA
(1941-1970)

<u>Month</u>	<u>Mean Wind Speed-(mph)</u>	<u>Prevailing Direction</u>	<u>Fastest Mile*</u>		<u>Year</u>
			<u>Speed (mph)</u>	<u>Direction</u>	
Jan	10.4	NW	40	SE	1956
Feb	10.5	NW	52	NW	1952
Mar	11.2	NW	47	E	1951
Apr	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
Sep	9.8	S	47	N	1951
Oct	10.4	SE	73	S	1949
Nov	11.0	NW	60	SW	1958
Dec	<u>10.4</u>	<u>NW</u>	<u>52</u>	<u>W</u>	<u>1946</u>
Annual	10.5	NW	92	W July	1951

*Fastest Mile Wind - Speed is fastest observed 1-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.

particulates (dust and soot), sulfur dioxide (SO_2), and nitrogen oxides (NO_x). The Environmental Protection Agency 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-5 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-5 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-5, 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 3-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 3-hour primary standard for sulfur oxides, along with annual and 24-hour secondary standards. In addition, Minnesota's 1-hour carbon monoxide standard (both primary and secondary) of 30 parts per million (ppm) is 5 ppm lower than the corresponding federal standards.

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 met 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 non-attainment for each pollutant

TABLE III-5: COMPARISON BETWEEN NATIONAL AND MINNESOTA
AMBIENT AIR QUALITY STANDARDS

POLLUTANT	WORDING OF STANDARD	PRIMARY ^a STANDARD		SECONDARY ^b STANDARD	
		National	State	National	State
SUSPENDED PARTICULATE MATTER	Annual geometric mean conc. Maximum 24-hour concentration Not to be exceeded more than once per year	75 $\mu\text{g}/\text{m}^3$ 260 $\mu\text{g}/\text{m}^3$	75 $\mu\text{g}/\text{m}^3$ 260 $\mu\text{g}/\text{m}^3$	60 $\mu\text{g}/\text{m}^3$ 150 $\mu\text{g}/\text{m}^3$	60 $\mu\text{g}/\text{m}^3$ 150 $\mu\text{g}/\text{m}^3$
SULFUR OXIDES	Annual arithmetic avg. conc. *Maximum 24-hour concentration Not to be exceeded more than once per year *Maximum 3-hour concentration Not to be exceeded more than once per year	.03 ppm .14 ppm	.02 ppm .10 ppm .25 ppm	.50 ppm	.02 ppm .10 ppm .25 ppm
CARBON MONOXIDE	*Maximum 8-hour concentration Not to be exceeded more than once per year *Maximum 1-hour concentration Not to be exceeded more than once per year	9 ppm 35 ppm	9 ppm 30 ppm	9 ppm 35 ppm	9 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.

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 odorous 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. For a further description of areawide compliance with federal and state air quality standards see Environmental Impact Statement For Woodlake Sanitary Landfill Expansion, Technical Work Paper No. 3, Minnesota Pollution Control Agency, 1980.

Burnsville Landfill Area

Existing land use in the vicinity of the Landfill is industrial or open land. A dolomite quarry operated by Edward Kraemer and Sons is east of the landfill, and to the west, owned by Cargill is the site of a grain storage and barge loading terminal.

The MPCA has established three air monitoring stations (MPCA No.'s 0375, 0376, 0377) in the southern portion of Bloomington located approximately 2-4 miles from the Burnsville Landfill. Table III-6 shows the results of monitoring at these stations for particulates and sulfur dioxides.

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

TABLE III-6

1978 Particulate Summary (Micrograms/Cubic Meter)

<u>Location</u> <u>MPCA No.</u>	<u>State</u> <u>Rank</u>	<u>No.</u> <u>Obs</u>	<u>Geom</u> <u>Mean</u>	<u>Std</u> <u>Dev</u>	<u>Max</u> <u>Obs</u>	<u>2nd</u> <u>High</u>	<u>No.</u> <u>260u/m³</u>	<u>No.</u> <u>150u/m³</u>
0375	50	26	56.5	1.6	128	120	0	
0376		27	26	40.9	1.5	101	83	0
0377		20	33	39.4	1.7	98	71	0

1979 Particulate Summary (Micrograms/Cubic Meter)

<u>Location</u> <u>MPCA No.</u>	<u>State</u> <u>Rank</u>	<u>No.</u> <u>Obs</u>	<u>Geom</u> <u>Mean</u>	<u>Std</u> <u>Dev</u>	<u>Max</u> <u>Obs</u>	<u>2nd</u> <u>High</u>	<u>No.</u> <u>260u/m³</u>	<u>No.</u> <u>150u/m³</u>
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)

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

1979 Sulfur Dioxide Summary (ppm)

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

Source: Minnesota Pollution Control Agency, 1979.

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-7 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 Burnsville Landfill. The air quality at the landfill site may also be influenced by the adjacent quarry operation, by an adjacent asphalt plant and by transportation-related emissions from Interstate 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 maximum 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 standards. Also the federal primary standard was not exceeded.

Regulatory Compliance

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

Existing Landfill Site

The Burnsville Sanitary Landfill is located in the northwest portion of the Burnsville Township. 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.

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,

Table III-7

TWIN CITIES METRO AREA

MAJOR POINT SOURCE EMISSIONS INVENTORY, 1977

Site	PARTICULATES		HYDROCARBONS	
	Tons/Year	Effective Stack Hgt.	Tons/Year	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	-	-

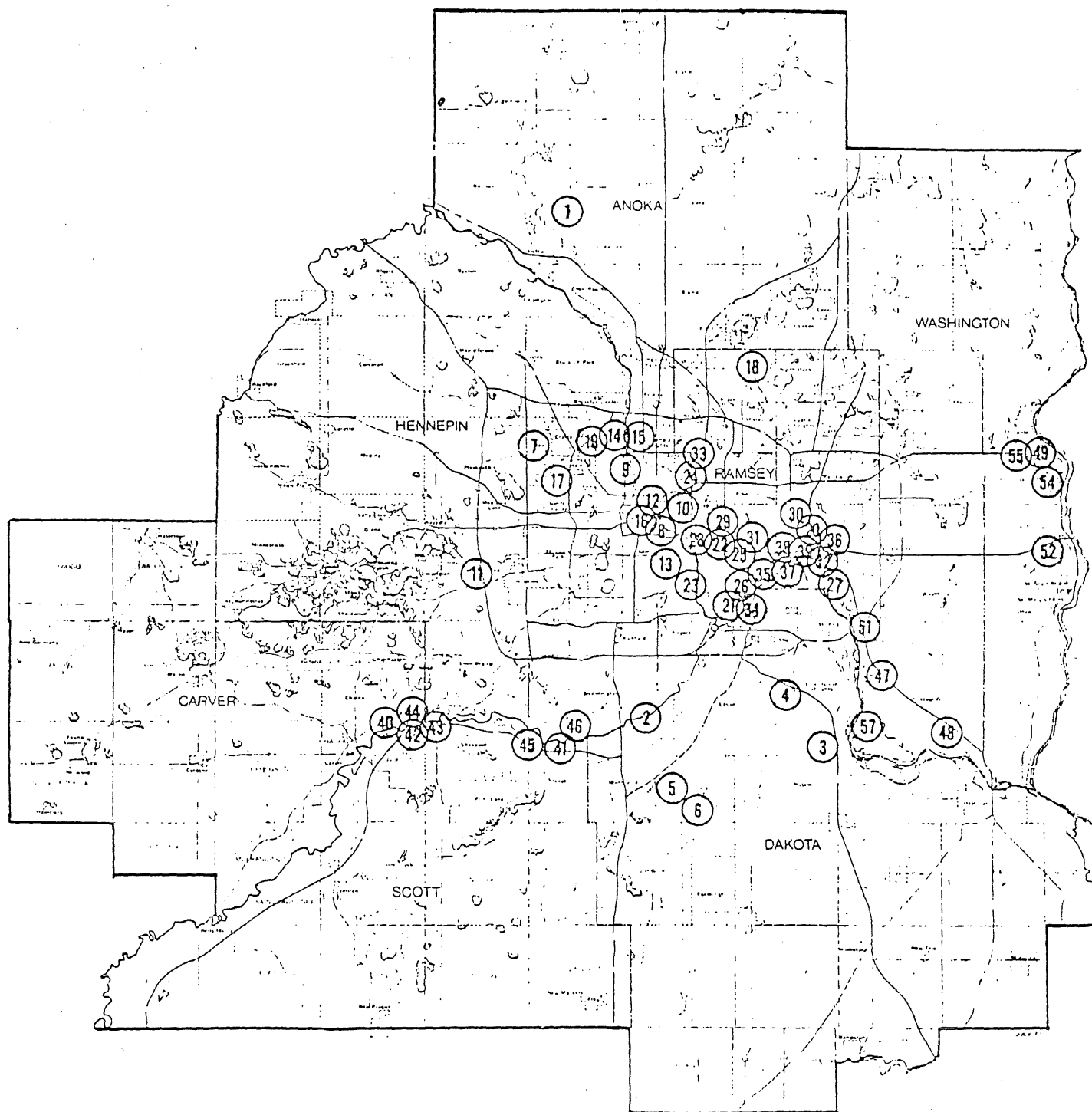
Table III-7 cont'd.

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.

Figure III-1

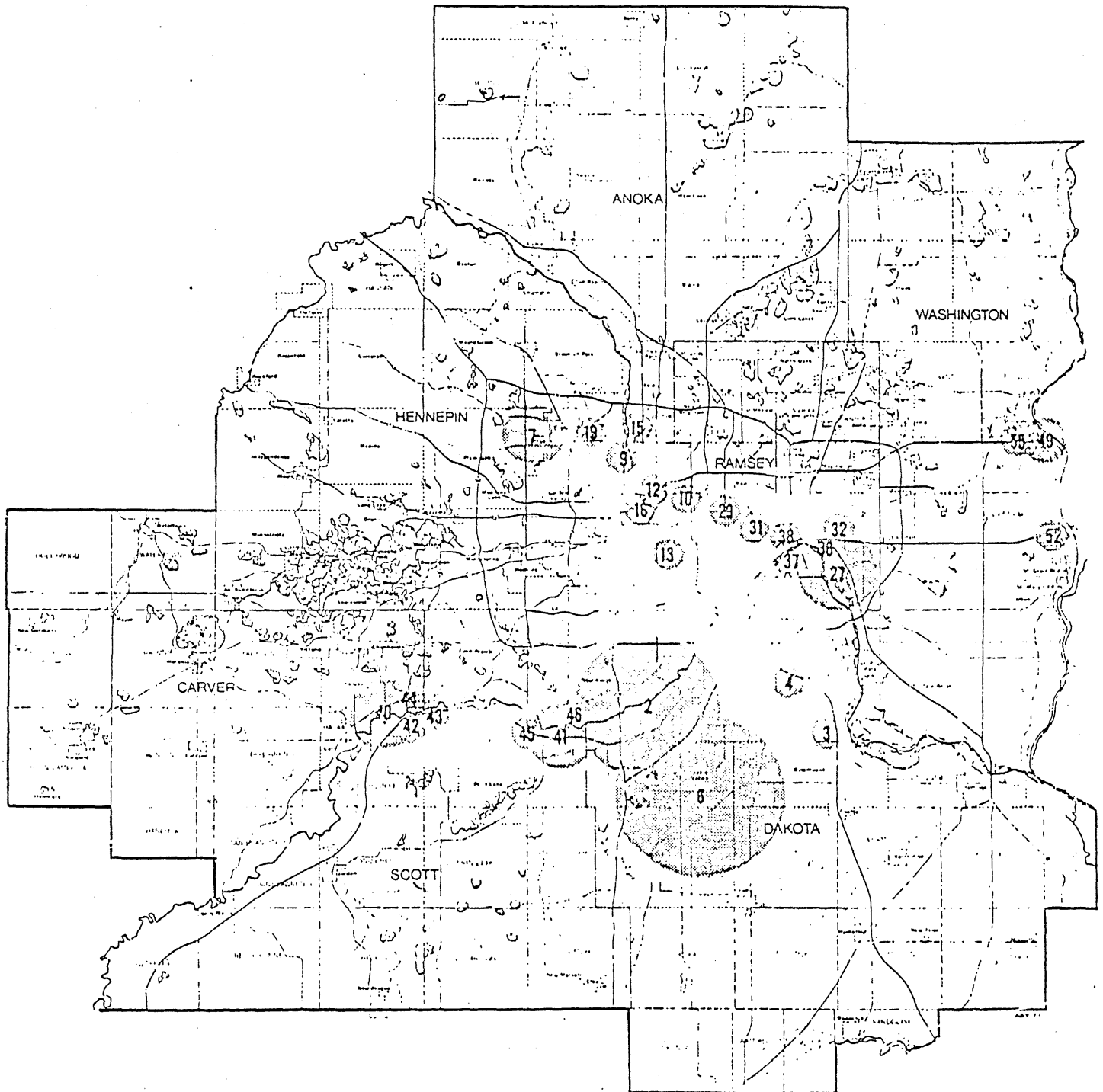
LOCATION OF MAJOR EMISSION SOURCES



SOURCE: Metropolitan Waste Control Commission, 1977

Figure III-2

METROPOLITAN AREAS IMPACTED BY PARTICULATES



SOURCE: Metropolitan Waste Control Commission, 1977

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 carriers of refuse traffic to the Burnsville Sanitary Landfill are Interstate 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 ten 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 Burnsville Sanitary 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.

No problems attributable to gas have been reported at the existing landfill. There are no permanent structures on the landfill. Temporary structures, including a maintenance building and working face shelter house allow sufficient air flow through their roofs, doors and windows to be considered as being vented. The permanent scale house is located 800 feet from the limit of the landfilled refuse. The closest structure not owned by Edward Kraemer and Sons, Inc. is located 1,200 feet south of the landfill.

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 the 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. On-site inspections of the Burnsville Landfill have indicated no odor problems.

Regulatory Compliance -- Based on available information, the existing Burnsville Sanitary Landfill appears to be in compliance with regulations concerning potential air emissions from the landfill. There is no record of significant adverse odor impacts from the landfill. Furthermore, 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-8.

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-9 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 Burnsville Sanitary Landfill. It is, therefore, difficult to assess compliance with the above regulations.

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-10 shows a range of dBA levels for typical equipment used at the landfill site.

Table III-8

MINNESOTA POLLUTION CONTROL AGENCY NOISE STANDARDS (dBA)

NA C	Day (7:00 A.M. to 10:00 P.M.)		Night (10:00 P.M. to 7:00 A.M.)	
	<u>L</u> <u>50</u>	<u>L</u> <u>10</u>	<u>L</u> <u>50</u>	<u>L</u> <u>10</u>
1	60	65	50	55
2	65	70	65	70
3	75	80	75	80

Table III-9

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

<u>Duration per day, hours</u>	<u>Sound level (dBA)</u>
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-10

<u>Machine</u>	<u>dBA Range</u> (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 following equipment is in use at the landfill during operating hours: one dozer, two compactors, three scrapers, and seven refuse trucks. The approximate cumulative ambient noise produced by this equipment is 102 dBA. The noise received by the nearest private dwelling (2900 feet from the working area of the fill) is 67 dBA. This is a substantial reduction of noise; however, it does slightly exceed 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 sensitive receptors closest to the existing landfill and the proposed expansion include industrial and commercial businesses which operate at distances between 1,200 feet and 2,500 feet from the landfill. The proposed horizontal expansion area, Phase II, is approximately 2,900 feet from the nearest private dwelling.

Topographic features buffer the present working area of the landfill. The flood protection dike (see Figure II-10) will serve as a buffer for the horizontal expansion area until the lift height exceeds the dike's height of 722.5 feet. There will be no buffer during the construction period of Phase II (see Figure II-8). Phase II, upon completion will function as a buffer between the residences and work areas of Phases III and IV.

Operating hours at the site are from 7 a.m. to 4:30 p.m., Monday through Friday and from 8 a.m. to 2 p.m. on Saturdays. After those hours, no heavy equipment is in operation.

SO001A

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.

Control of Leachate Movement

Because of the potential risk involved in allowing leachate to perco-

late 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.

Surface Water Runoff

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 BURNSVILLE 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 Burnsville 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 Burnsville 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 (MSL) to the height of the bluffs in Bloomington of about 810 feet (MSL). The presently existing surface elevations of the landfill site vary from Elevation 695 to Elevation 766. The topography of the site prior to any landfiling activity likely varied from about Elevation 696 to Elevation 705. The topography of the 17-acre horizontal expansion area varies from Elevation 702 to Elevation 710.

Site Geology

Bedrock -- The Burnsville 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 less than one foot to over 24 feet. The location of these borings are shown in Figure III-3. 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 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.

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 one to about 24 feet.

SOIL BORINGS

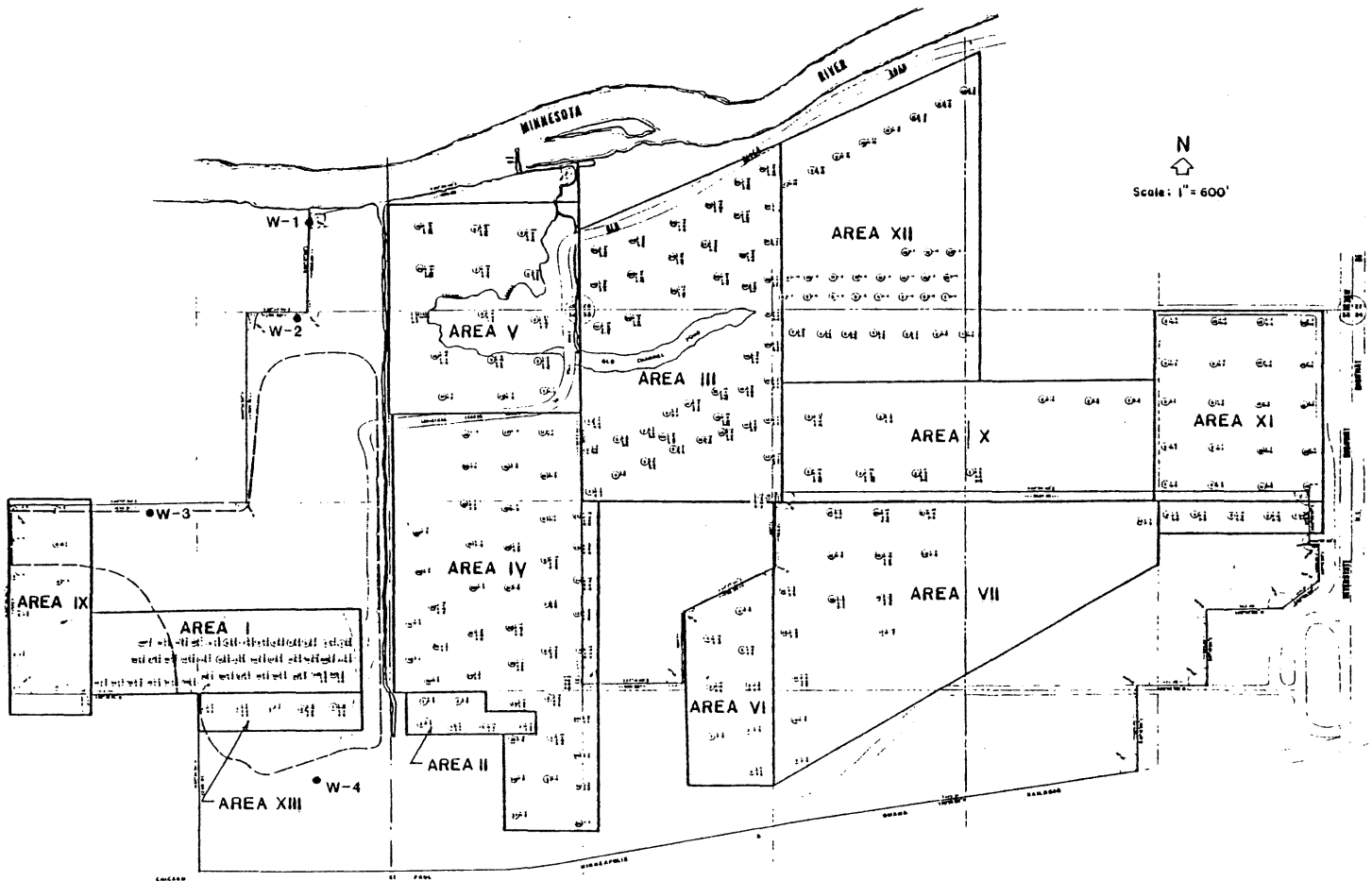


Figure III-3

BEDROCK CONTOURS

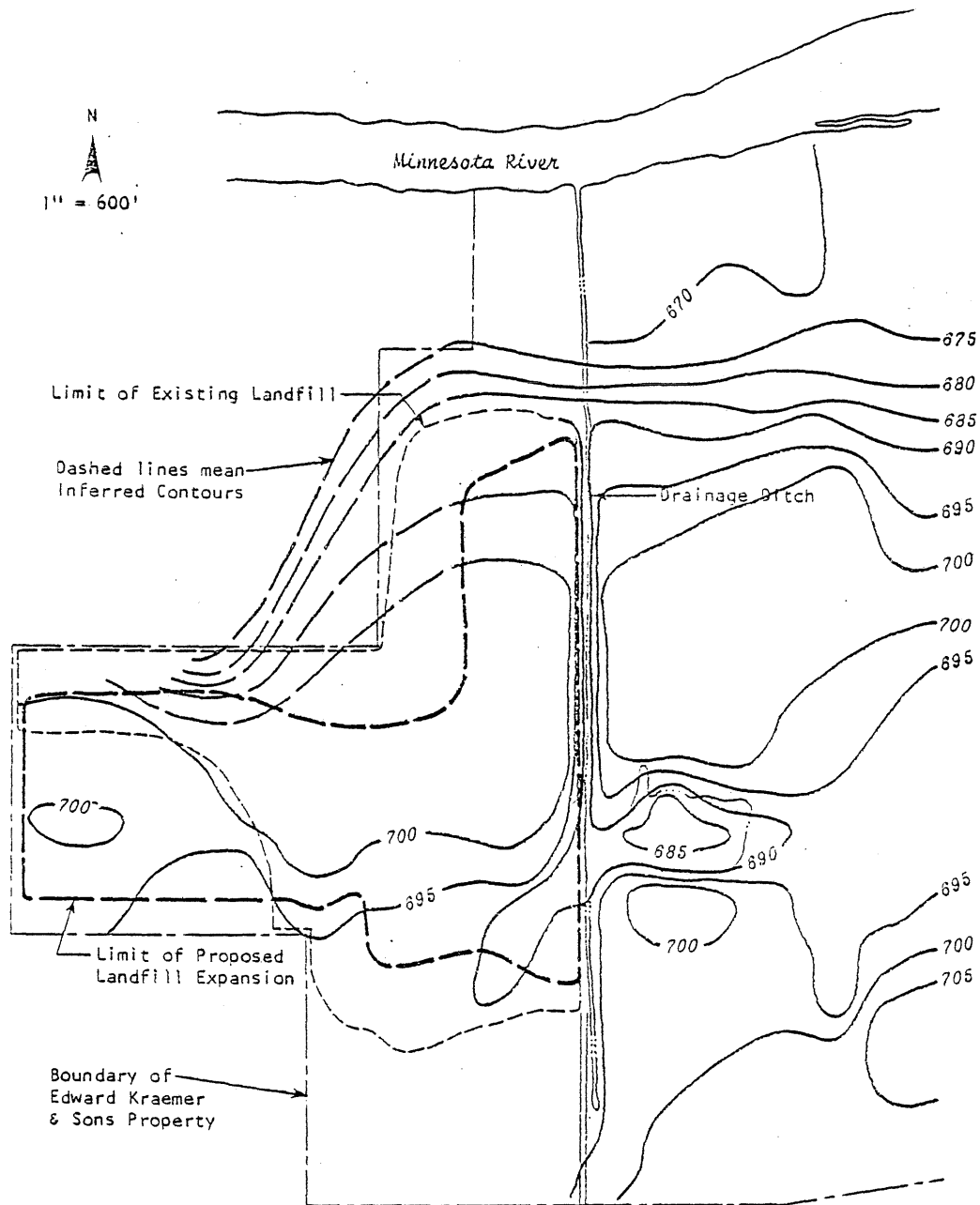


Figure III -4

GEOLOGIC COLUMN IN VICINITY OF BURNSVILLE LANDFILL

Period	Geologic Unit	Range in Thickness (ft.)
Quaternary	Alluvial & Colluvial Deposits (Qd)	Variable
Ordovician	Prairie du Chien Group (OpC)	150 [±]
Cambrian	Jordan Sandstone (ϵ_j)	80-100
	St. Lawrence Formation (ϵ_{sl})	175-200
	Franconia Formation (ϵ_f)	
	Iron-ton Sandstone (ϵ_i)	60-65
	Gales Sandstone (ϵ_g)	
	Eau Claire Formation (ϵ_{ec})	85-90
	Mt. Simon Sandstone (ϵ_{ms})	over 200
Precambrian	Hinckley Sandstone (PE_h)	

Figure III-5

Soils -- Bedrock in the vicinity of the Burnsville Landfill is covered by a thin layer of alluvial deposits of the Minnesota River, colluvial deposits, and organic soils. The natural soils are predominately organic and inorganic silty clays north of the landfill based on the available boring logs. The soils over a major portion of the 17-acre horizontal expansion area have been removed after the borings shown in Figure III-3 were placed.

Groundwater Hydrology

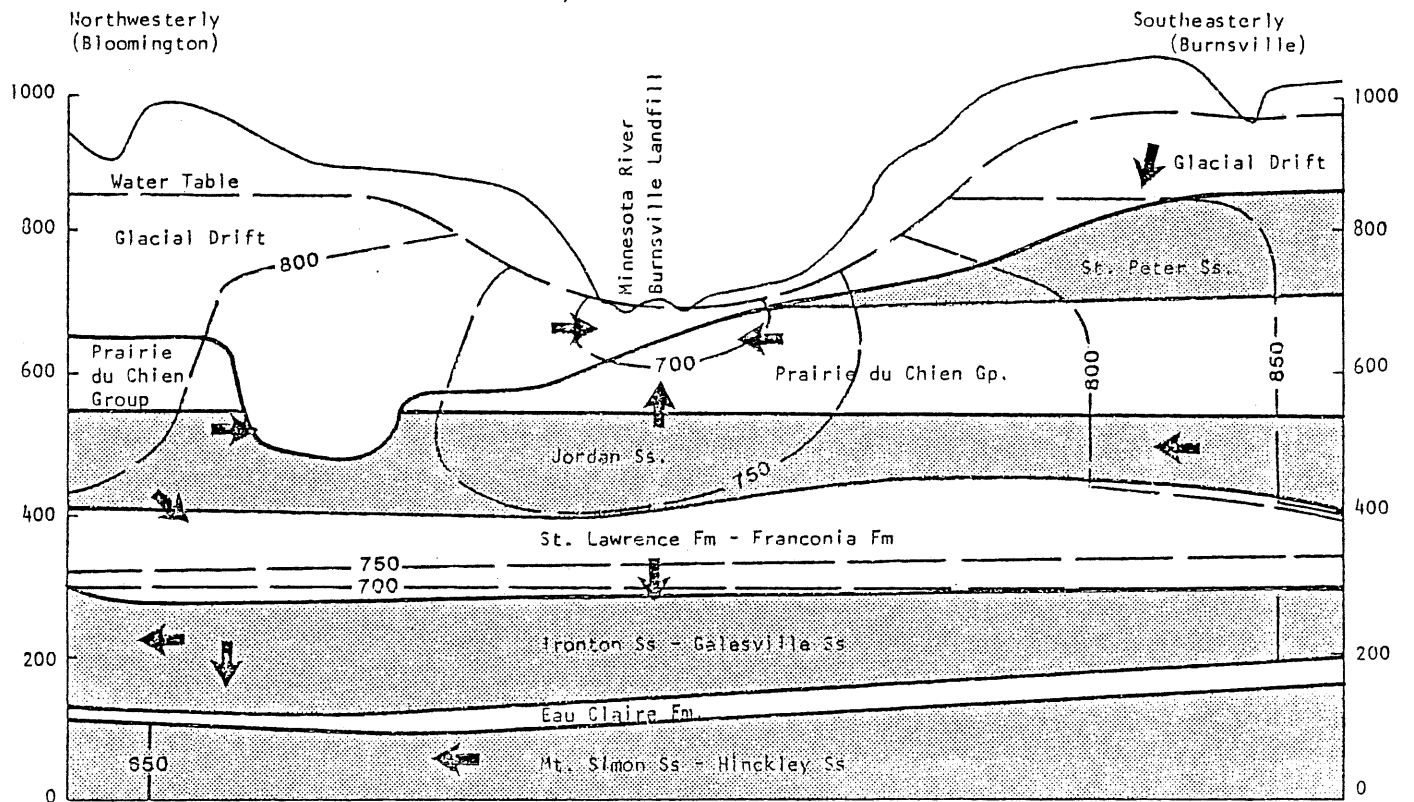
Regional Setting -- The Twin Cities Structural Basin contains several aquifer systems. The aquifer systems which underlie the landfill are the Prairie du Chien-Jordan, Iron-ton-Galesville, and Mt. Simon-Hinckley. Their relative relationship and thickness are shown in Figure III-6. The St. Peter Sandstone 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 Minnesota 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.

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 -- During the summer of 1970, the water table configuration near the landfill was determined from the soil borings shown in Figure III-3. The water table configuration determined at that time is shown in Figure III-7. A comparison of the water table data in Figure III-7 and the bedrock surface data in Figure III-4 indicate that the water table was in the Prairie du Chien Dolomite at least beneath a portion of what is now the landfill. The average water table lies between five and 10 feet beneath the refuse buried in the landfill as determined from the soil borings.

Water table elevations measured in three observation wells installed in May 1978 and in a fourth well installed in the early 1970s adjacent to the Minnesota River are summarized in Table III-11. The locations of these wells and the water table elevations observed on May 25, 1979 and August 28, 1978 are shown in Figure III-8. During the monitoring period of May 1978 to December 1979, the lowest groundwater levels were observed in August 1978 and the highest levels were observed in May 1979.

GENERALIZED REGIONAL CROSS-SECTION THROUGH BURNSVILLE 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

WATER TABLE CONTOURS - AUGUST, 1970

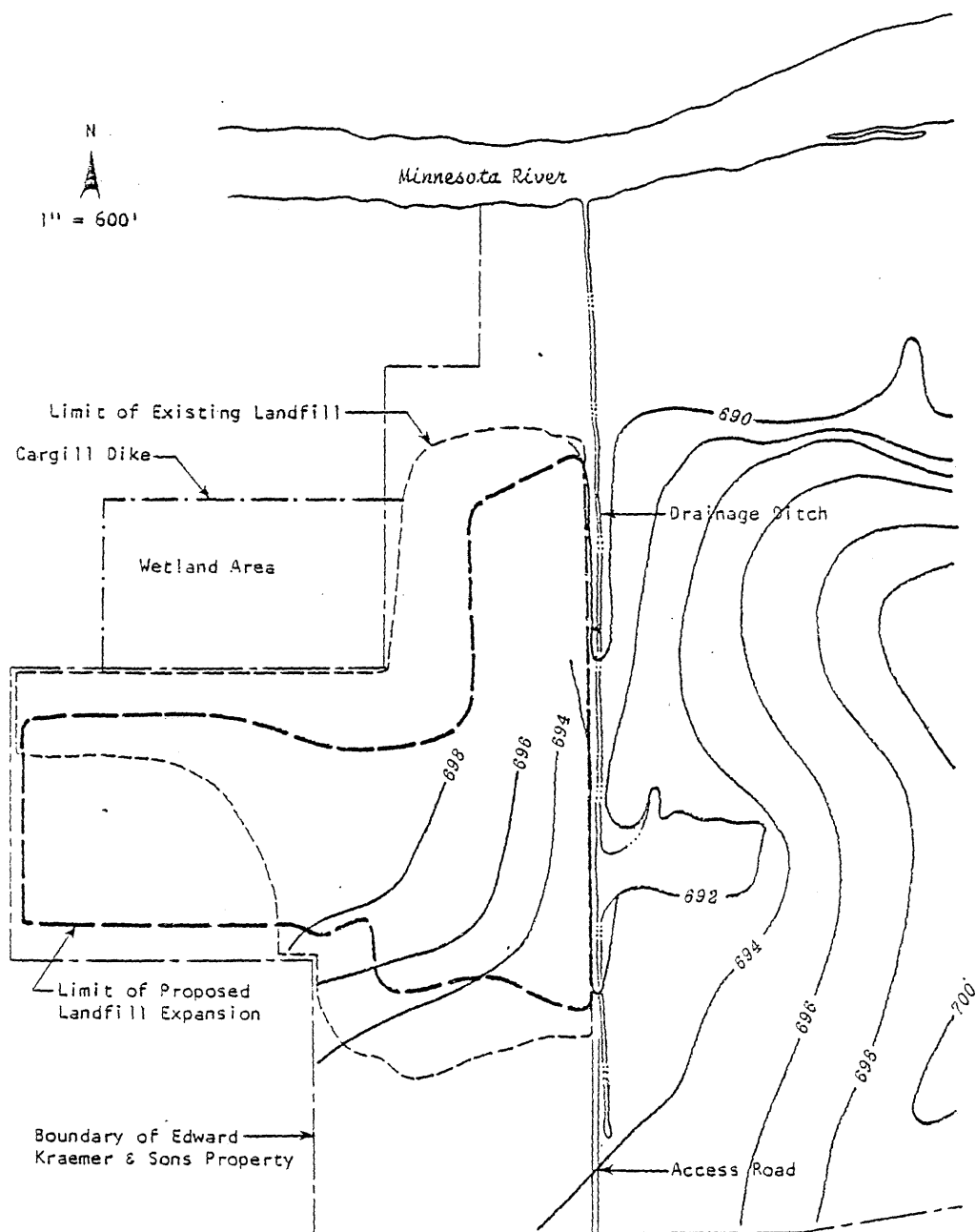


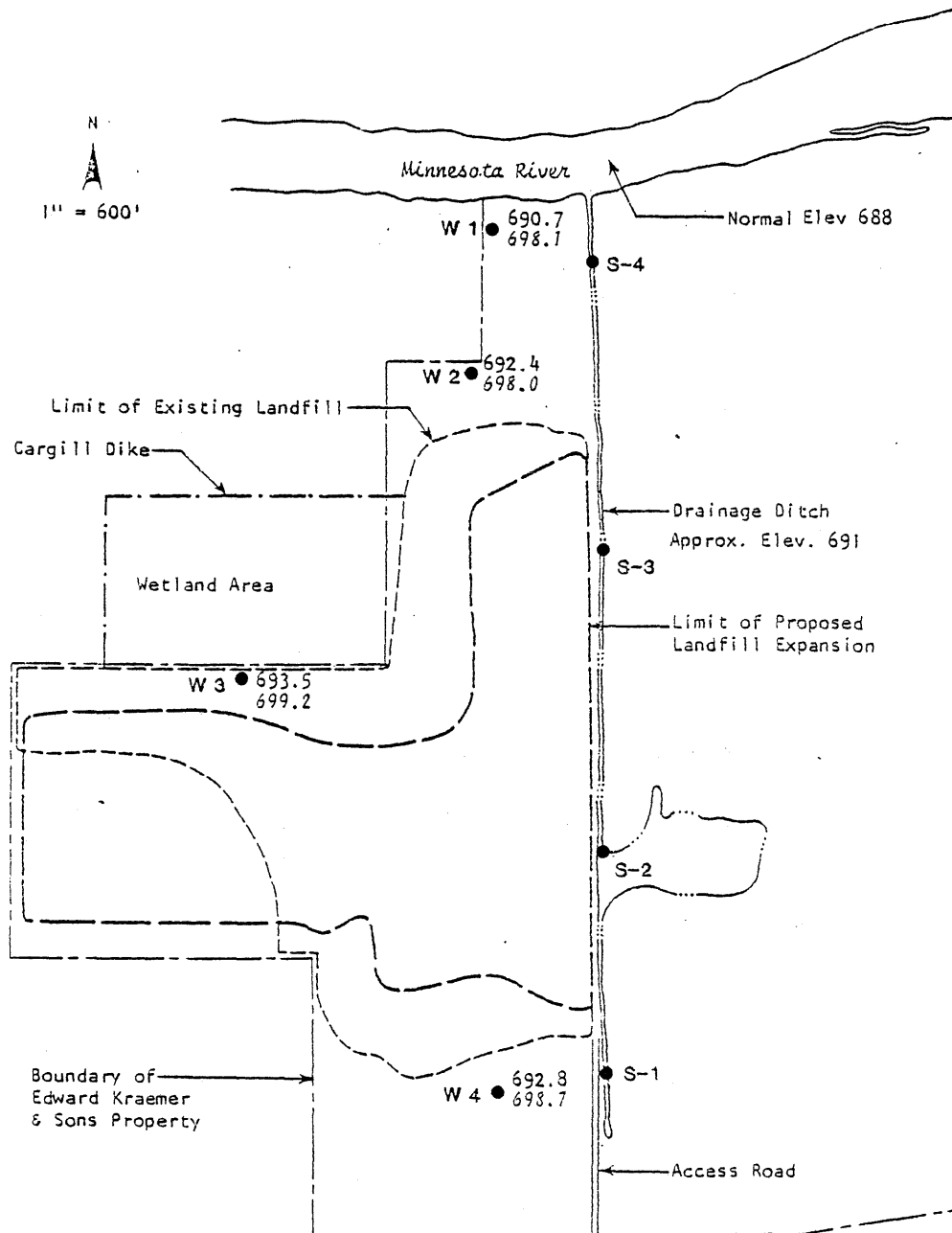
Figure III-7

LEVELS - OBSERVATION WELLS

Ground Water Elevation (MSL)							
<u>Well</u>	<u>5-24-78</u>	<u>7-6-78</u>	<u>8-8-78</u>	<u>5-25-79</u>	<u>7-19-79</u>	<u>10-4-79</u>	<u>1-23-80</u>
W-1	691.8	691.1	690.7	698-1	692.6	691.7	689.9
W-2	693.7	695.8	692.4	698.0	695.2	696.2	692.0
W-3	694.6	696.2	693.5	699.2	698.0	*	*
W-4	693.5	694.6	692.8	698.7	693.8	694.2	692.3
* Not Sampled; well covered with surface water							

Table III - II

WATER QUALITY MONITORING STATIONS and
HIGH & LOW WATER TABLE ELEVATIONS
(MAY 1978-DEC 1979)
BURNSVILLE SANITARY LANDFILL



690.7 = 8/28/78 Level (MSL)
698.1 = 5/25/79 Level (MSL)

W = monitoring well
S = surface water
monitoring station

Figure III-8

Available groundwater data indicate that the surficial groundwater in the vicinity of the landfill is dominated by two controls. One is the wetland north of the landfill on Cargill property and the second is the drainage ditch east of the landfill. The wetland area, shown in Figure III-7, is enclosed by a dike with a regulated outlet. During 1979, the outlet was closed and water in this area was above Elevation 702. This water recharged the groundwater table causing water levels to rise in the landfill observation wells. Even during 1978 when the outlet was open and water levels were much lower in this area, the wetland seemed to serve as a groundwater recharge area. The drainage ditch along the east side of the landfill acts as local groundwater discharge zone for the shallow groundwater beneath the landfill. As a result, the predominant flow pattern for the surficial groundwater beneath the landfill is from west to east which is from the wetland, beneath the landfill, and to the drainage ditch.

Because the Burnsville Sanitary Landfill is in a regional discharge zone for the shallow regional groundwater aquifers beneath the site, groundwater in the underlying Prairie du Chien-Jordan aquifer has an upward component of flow caused by progressively higher piezometric levels with depth. Although there are no deep wells to confirm this on the landfill property, this upward gradient has been documented at Freeway Sanitary Landfill to the northeast. In addition, bedrock wells in the area show that piezometric levels in the Prairie du Chien-Jordan aquifer are above the level of the Minnesota River. Thus, any groundwater moving laterally and coming in contact with the existing refuse or vertically infiltrating to the water table through the existing refuse will remain in the uppermost portion of the shallow groundwater as it flows to the drainage ditch east of the landfill. The approximate limit of groundwater affected by leachate is shown in Figure III-9.

Surface Water Hydrology

Surface waters near the landfill include the Minnesota River and the drainage ditch east of the landfill shown in Figure III-8. In the addition, a small pool of water has been created east of the landfill by removing a small deposit of sand and gravel.

This section summarized the flow hydrology for both the Minnesota River and the eastern drainage ditch as determined by Barr Engineering (1980). 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 005330000 on the Minnesota River near Jordan. The period of record for this gage is 1935 through 1978. The gage is located at River Mile 39.4, approximately 27 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.

WATER SUPPLY WELLS WITHIN 1 MILE
OF BURNSVILLE LANDFILL BOUNDARY

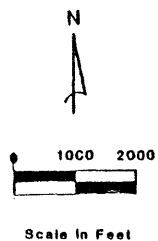
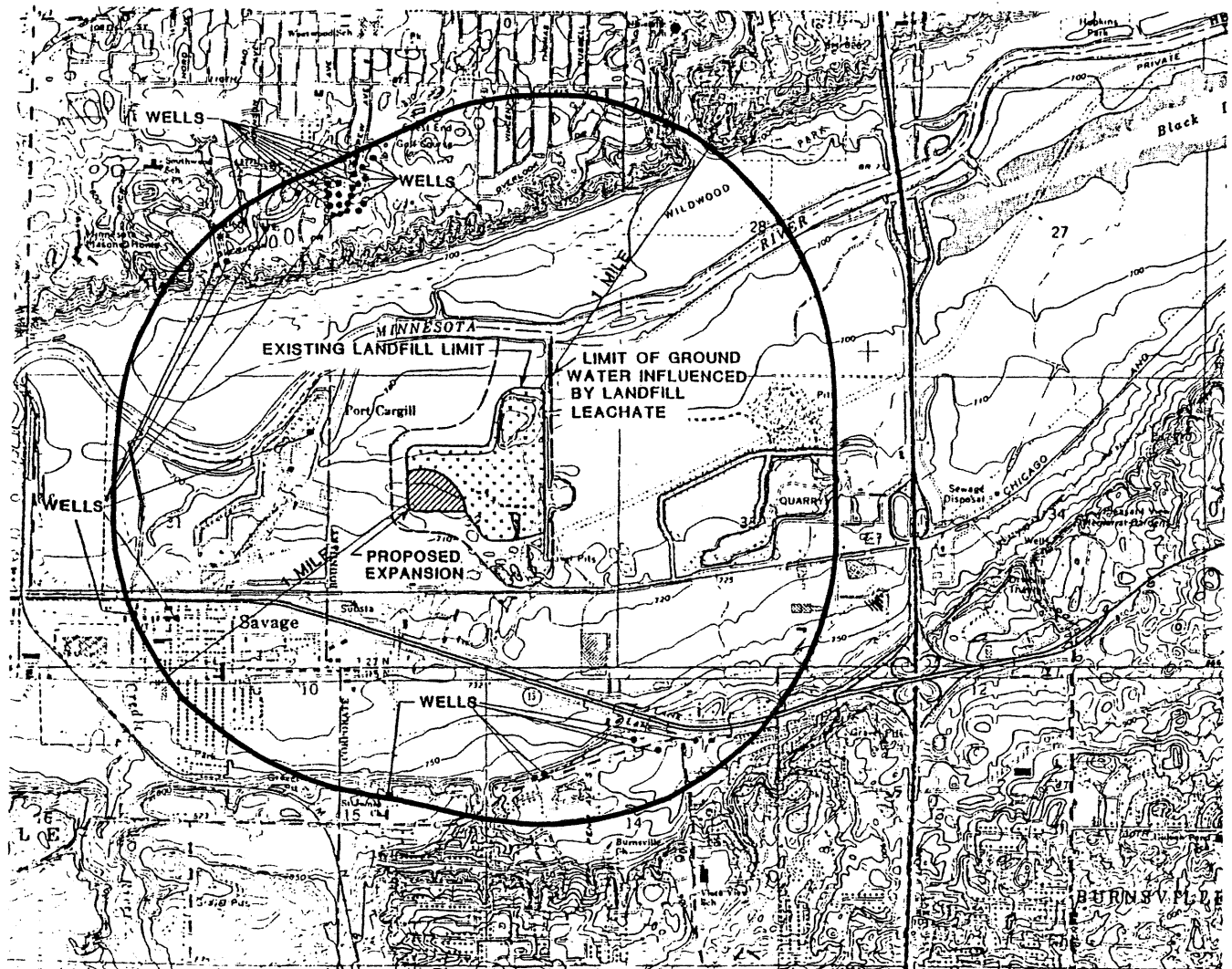


Figure III-9

Flood Hydrology for the Minnesota River

The greatest recorded flood on the Minnesota River adjacent to the landfill site occurred in April 1965 with an estimated peak discharge of 117,000 (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-12.

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-13.

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 inundated 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 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 location of the floodway and the flood fringe adjacent to the landfill as defined by the Burnsville Flood Insurance Study and the Burnsville Floodplain Ordinance is shown in Figure II-7. Although placement of refuse in the existing landfill predates the floodplain studies in the area, a portion of the existing landfill is technically located in the flood fringe, however, filling has extended well above the flood level.

The east and south faces of the existing landfill are protected from the 100-year frequency flood by dikes owned by Edward Kraemer and Sons, Inc. located as shown in Figure II-7. The north face of the existing landfill is protected from about a 10-year frequency flood by dike owned by Cargill and by a dike owned by Edward Kraemer and Sons, Inc. which connects the Cargill dike to the 100-year frequency Kraemer dike system as shown in n Figure II-7.

Flood Hydrology for the Easterly Drainage Ditch -- The drainage ditch located east of the landfill has a drainage area of approximately three square miles. The Burnsville Drainage Plan (Barr 1966) indicates that, under ultimate development conditions, the 100-year

LARGEST RECORDED
MINNESOTA RIVER FLOODS PAST
BURNSVILLE SANITARY LANDFILL

<u>Date</u>	<u>Discharge*</u> (cubic feet per sec.)	<u>Recurrence Interval</u>
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-12

MINNESOTA RIVER FLOOD LEVELS
NEAR BURNSVILLE SANITARY LANDFILL

<u>Recurrence Interval</u>	<u>Discharge</u> (cubic feet per second)	<u>Flood Elevation</u> <u>at Landfill</u> (1929 MSL Datum)
10 year	48,400	708.1
100 year (without floodway)	115,000	718.2
100 year (with floodway)	115,000	718.3

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

Table III-13

frequency discharge in the drainage ditch near the landfill scale house will be between 2,000 and 3,000 cfs. Storm water currently enters the ditch from the tributary area south of the landfill access road through two storm sewers located under the access road. The elevation of flood water in the area adjacent to the landfill under 10-year frequency flooding will be between Elevation 704 and Elevation 706. Under these conditions, less than 0.5 acre of the existing landfill will be inundated and the inundation is expected to last for less than 12 hours.

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.

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 Engineering 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. Existing wells within one mile of the landfill boundaries were located and the areas influenced by these wells were defined to help assess the impact of the landfill on these wells. Existing wells within one mile of the landfill finished in the Prairie du Chien-Jordan or shallowed aquifers were identified by Barr (1980) from the files of the Minnesota Geological survey. These files contain logs for 27 wells (likely used only for nonpotable purposes) north of the Minnesota River within one mile of the landfill, and nine wells and one quarry (which acts as a large well) within one mile of the landfill south of the Minnesota River. The locations of the wells within one mile of the landfill are shown in Figure III-9 and pertinent data about each well are summarized in Table III-14.

Groundwater flow patterns to these wells were determined by an analytical groundwater flow model developed by Barr Engineering (1980) in accordance with Polubarinova-Kochina (1962) and Verruyt (1970). For the model, a single potentiometric function was derived

DATA FOR WELLS WITHIN ONE MILE OF LANDFILL^b

Minnesota Unique Number	Township, Range & Section Number	Approximate Ground Surface Elevation (MSL)	Well Depth (ft.)	Static Water Elevation (MSL)	Daily Average Pumping Rate (gpm)
205500	T. 27, R. 24, S. 29	930	476	715	.3 ^a
205504	T. 27, R. 24, S. 30	925	110	775	.3 ^a
205535	T. 27, R. 24, S. 29	930	128	745	.3 ^a
205536	T. 27, R. 24, S. 29	920	143	-	.3 ^a
205537	T. 27, R. 24, S. 29	915	135	-	.3 ^a
205538	T. 27, R. 24, S. 29	920	138	718	.3 ^a
205542	T. 27, R. 24, S. 29	920	141	730	.3 ^a
205543	T. 27, R. 24, S. 29	930	140	738	.3 ^a
205544	T. 27, R. 24, S. 29	920	143	-	.3 ^a
205545	T. 27, R. 24, S. 29	930	142	745	.3 ^a
205546	T. 27, R. 24, S. 29	930	143	730	.3 ^a
205547	T. 27, R. 24, S. 29	930	194	760	.3 ^a
205548	T. 27, R. 24, S. 29	925	314	715	.3 ^a
205549	T. 27, R. 24, S. 29	930	168	-	.3 ^a
205550	T. 27, R. 24, S. 29	925	322	715	.3 ^a
205552	T. 27, R. 24, S. 29	930	150	-	.3 ^a
205553	T. 27, R. 24, S. 29	930	104	778	.3 ^a
205554	T. 27, R. 24, S. 29	927	153	-	.3 ^a
205555	T. 27, R. 24, S. 29	935	150	739	.3 ^a
205556	T. 27, R. 24, S. 29	926	143	744	.3 ^a
205557	T. 27, R. 24, S. 29	925	131	-	.3 ^a
205558	T. 27, R. 24, S. 29	925	296	-	.3 ^a
205560	T. 27, R. 24, S. 29	925	102	-	.3 ^a
205566	T. 27, R. 24, S. 30	920	349	755	.3 ^a
205567	T. 27, R. 24, S. 30	910	106	747	.3 ^a
205570	T. 27, R. 24, S. 30	922	132	717	.3 ^a
205571	T. 27, R. 24, S. 30	932	153	717	.3 ^a
205838	T. 115, R. 21, S. 14	905	140	700	.3 ^a
205839	T. 115, R. 21, S. 15	905	103	760	.3 ^a
207056	T. 115, R. 21, S. 14	790	81	750	20
207061	T. 27, R. 24, S. 31	725	143	623	.3 ^a
207059	T. 115, R. 24, S. 14	905	140	693	.3 ^a
207689	T. 27, R. 24, S. 33	722	240	702	1040
207691	T. 115, R. 21, S. 14	796	257	749	200
211808	T. 115, R. 21, S. 14	900	300	620	.7 ^a
Cargill	T. 27, R. 24, S. 31	710	232	-	300
Savage Well #1	T. 27, R. 24, S. 31	-	-	-	600

^aEstimated daily average consumption rate

^bFrom well logs filed at Minnesota Geological Survey

Table III-14

Which took into account the regional Prairie du Chien-Jordan aquifer flow to the Minnesota River, the drainage ditch adjacent to the landfill, the quarry east of the landfill, and all wells within one mile of the landfill. This function was used to determine the distribution of the potentiometric surface for the upper portion of the Prairie du Chien-Jordan aquifer in the area surrounding the landfill.

The distribution of the potentiometric surface in the Prairie du Chien-Jordan aquifer was used to determine the boundaries of groundwater flow that is intercepted by each well. The boundaries of the areas intercepted by each well are shown in Figure III-10.

Because the Minnesota River is the regional groundwater discharge zone for the Prairie du Chien-Jordan aquifer, groundwater moving through the aquifer north of the river does not interact with the groundwater in this aquifer south of the river. Thus, all of the wells north of the river intercept groundwater flowing to the river from the north. Likewise, wells south of the river intercept groundwater flowing to the river from the south.

The well closest to the landfill is located at the Port Cargill facilities west of the landfill. This well is finished in the Jordan aquifer and has an estimated pumping rate of 300 gpm according to the superintendent of the Port Cargill facilities. Because the piezometric level in the Jordan aquifer is distinctly higher than the piezometric level in the Prairie du Chien aquifer in this vicinity, pumping the Port Cargill well will cause only minimal interference in the overlying Prairie du Chien aquifer. As shown in Figure III-10, the Port Cargill well does not intercept any area potentially affected by leachate from the landfill.

As shown in Figure III-10, the quarry operated by Edward Kraemer and Sons, Inc. east of the landfill has a broad envelope of intercepted flow. Since the quarry is dewatered at a rate of approximately 1000 gpm (1.5 MGD), it functions as a shallow, wide well. This configuration concentrates its drawdown effects in the upper portion of the aquifer. Consequently while the quarry is intercepting a wide band of groundwater flowing in the upper portion of the aquifer, there is still groundwater flowing under the quarry to the river in the lower portion of the aquifer.

The groundwater flow model confirmed that groundwater in the upper aquifer in the immediate vicinity of the landfill flows generally eastward to the drainage ditch east of the landfill. The exact configuration of the flow under the landfill is determined, in part, by the water elevation in the diked wetland on the adjoining Cargill property and, in part, by flow in the Prairie du Chien aquifer from the south.

The municipal wells for Burnsville are situated east of I-35W. They cannot be affected by the existing landfill since the Burnsville wells have envelopes of flow similar to those shown in Figure III-10. The actual configuration of their flow envelopes is dependent on the local piezometric gradients in the uppermost portion of the Prairie du Chien aquifer, the zone of the aquifer complex that the

ENVELOPES OF INTERCEPTED FLOW
TO WELLS LOCATED WITHIN 1 MILE OF
BURNSVILLE LANDFILL BOUNDARY

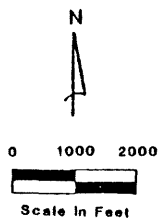
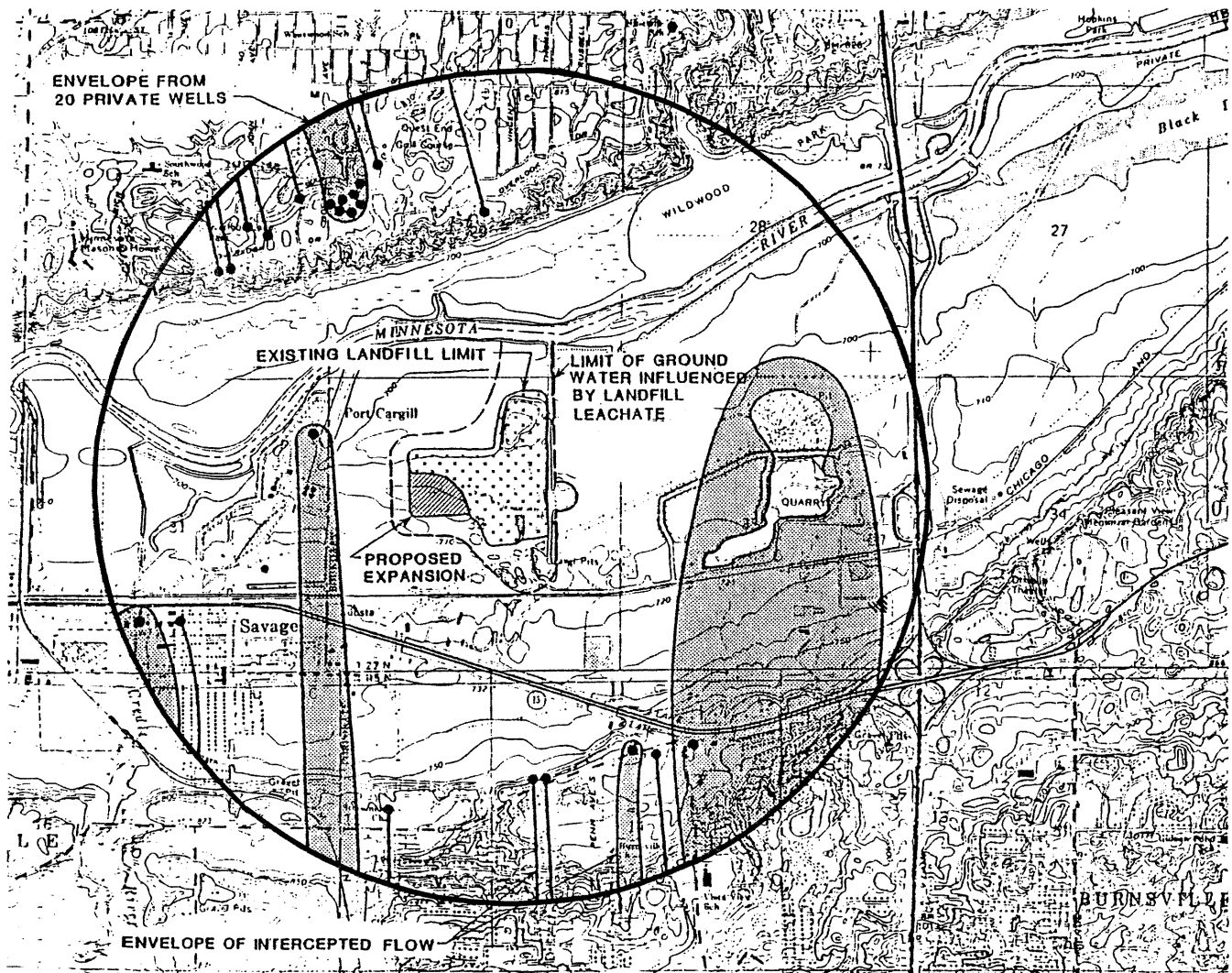


Figure III-10

wells are completed in, and their pumping rates. The quarry dewatering that exists between the landfill and the municipal wells represents a second level of protection by intercepting any flow that could otherwise possibly occur between the landfill and the wells.

The only locations where a well could be influenced by the landfill would be between the landfill and the river or drainage ditch and immediately south or west of the landfill. Because there are no water supply wells presently between the landfill and the Minnesota River and because development is prohibited in this area by the floodway zoning designation, groundwater between the landfill and the river will not be used for water supply purposes. The area immediately south of the landfill is either owned by Edward Kraemer and Sons, Inc., or is served by the municipal water system.

Site Specific Water Budget

The water balance for the Burnsville Sanitary Landfill has been determined by Barr Engineering (1980) 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 evaporation) 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 estimated average annual infiltration rate for the existing permitted area before and after final closure is 5.0 and 3.0 inches per year, respectively. Table III-15 summarizes the site specific water balance for the landfill under existing conditions (before and after final closure). The infiltration rates for vegetated and nonvege-

SITE SPECIFIC WATER BALANCE
EXISTING LANDFILL

<u>LANDFILL CONDITION</u>	<u>Estimated Average Annual Infiltration Rate</u>
Existing Conditions (During Operation)	5.0"/yr.
Existing Conditions (After Closure)	3.0"/yr.
 <u>SUB-AREA CONDITIONS</u>	
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%)	9.8"/yr.

Table III-15

tated areas of three and 30 percent slope are also shown in Table III-15. 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.

The cover materials presently used on Burnsville Landfill consists of peat and sand from dredging. For water balance calculations, it was assumed that the peat in the final cover will cause the soil to have a very high moisture content and field capacity and that the sand in the cover material will cause the soil to have a moderately high infiltration capacity. Water balance calculations indicate that the site will have a low percolation rate and a low average annual leachate production, because the high moisture storage capacity of the cover soil enhances evapotranspiration effects during the summer.

Results of the Metropolitan Council 1978 study using the water balance method indicate that the average annual percolation at Burnsville Landfill will be 2.67 inches and the time required for maximum leachate production will be 34 years from the beginning of landfill operation. Barr Engineering used the infiltration rate after final closure of 3.0 inches per year as the potential leachate production rate.

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 Burnsville 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-16. These standards are applicable at all river flows equal to and greater than the seven day duration, 10-year frequency low flow.

STANDARDS FOR
MINNESOTA RIVER IN VICINITY OF BURNSVILLE LANDFILL

<u>Parameter</u>	<u>MPCA Water Quality Standard</u>	<u>Limiting Classification</u>
Copper	10 µg/l	2C
Turbidity	25 NTU	2C
Conductivity	1000 µmhos/cm @ 25°C	4A
Chloride	100 mg/l	3B
pH	6.5-8.6	4A
Ammonia	1.5 mg/l as N	2C
Dissolved Oxygen	5 mg/l ⁽¹⁾	2C
Total Dissolved Solids	700 mg/l	4A
Total Alkalinity	250 mg/l as CaCO ₃	4A
Sulfate	10 mg/l as SO ₄	4A
Total Hardness	250 mg/l as CaCO ₃	3B
Sodium	60% of total cations in meq/l	4A
Cadmium	10 µg/l	1D
Lead	50 µg/l	1D
Arsenic	50 µg/l	1D
Selenium	10 µg/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 µg/l	1D

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

Table III -16

All other surface waters in the Burnsville 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 around 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 1000 feet of the northern boundary of the landfill and, thus, would be subject 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)).

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 at the seven day duration, two-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 Burnsville Sanitary Landfill is the MWCC station located at River Mile 14.3 approximately two 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 five 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 classified 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 Burnsville 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:

- o Turbidity
- o Conductivity
- o Ammonia
- o Dissolved oxygen
- o Copper
- o Total dissolved solids

- o Bicarbonates (or M-Alkalinity)

- o Sulfate

- o Hardness

- o 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 February 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 85-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 60 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. The primary release of potential pollutants to the river from the landfill may occur from the discharge of leachate affected ground water to the river or to the drainage ditch east of the landfill.

Barr Engineering (1980) assessed the impact of leachate on river quality using a simple dilution model to predict the change in river quality caused by the landfill leachate. 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 (0.029 cfs from the 85 acres of existing landfill) for the Burnsville Landfill.

Information on the quality of leachate was obtained from two sources. In May, 1979, the MPCA sampled a leachate seep at the Burnsville Landfill. Data obtained from that sample is contained in Table III-17 and was used to help define leachate quality. Not all of the parameters of interest were analyzed on this sample. For parameters not analyzed on the leachate sample, literature values based on median leachate concentrations were used in the analysis. These concentrations are presented in Table III-17. 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 landfill monitoring data could not be used due to difficulties in accurately determining the amount of ground water flow reaching the easterly drainage ditch and the river. Accurate measurements of flow in the eastern drainage ditch also were not available.

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

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

where

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

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

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

DATA DESCRIBING LANDFILL LEACHATE QUALITY

<u>Parameter</u>	<u>Literature¹ Concentration</u>	<u>Measured² Concentration</u>
Ammonia	82 mg/l as N	350 mg/l as N
Cyanide	0.028 mg/l as CN	-
Oil	24 mg/l	-
Phenol	0.77 mg/l	-
Bicarbonate (Alkalinity)	1225 mg/l as CaCO ₃	-
Boron	4.7 mg/l	3.0 mg/l
Specific Conductance	6100 μ mhos/cm @ 25°C.	-
pH	6.8	6.0
Chromium	0.05 mg/l	-
Copper	0.05 mg/l	-
Arsenic	Not Detectable (0.00 mg/l)	-
Barium	2.25 mg/l	-
Cadmium	0.03 mg/l	-
Chloride	562 mg/l	1610 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	-	7200 mg/l
Turbidity	-	130 NTU
Sodium	357 mg/l	-
Sulfate	153 mg/l as SO ₄	1080 mg/l as SO ₄
Silver	0.01 mg/l	-
Zinc	-	12 mg/l
BOD ₅	1500 mg/l	-
COD	4490 mg/l	-

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

²Measured by MPCA on Toe Leachate Sample Collected from Southeast Corner of Burnsville Landfill on May 3, 1979.

Table III-17

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 Burnsville 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-18. 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 measured on river samples collected in September, 1976, were compared with the average river quality data shown in Table III-18 to check for any obvious differences between the average values and values actually measured during low flow conditions of September, 1976. Barr (1980) concluded that the river concentrations in Table III-18 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 Burnsville Landfill on the quality of the Minnesota River at the 7-day duration, 10-year frequency low flow is summarized in Table III-19.

ASSUMED BACKGROUND QUALITY OF
MINNESOTA RIVER DURING LOW FLOWS

<u>Parameter</u>	<u>Low Flow Quality</u>
Copper	12 µg/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 µg/l
Lead	11 µg/l
Arsenic	8.6 µg/l
Selenium	2.8 µg/l
Fluoride	0.32 mg/l
Phenols	0.004 mg/l
Chromium	0.007 mg/l
Barium	0.16 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-18

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

PARAMETER	Minnesota River		Burnsville Landfill		Minnesota River	
	UPSTREAM CONCENTRATION	LOADING AT 7-DAY 10 YEAR LOW FLOW LBS./DAY	LEACHATE CONCENTRATION	LANDFILL LOADING LBS./DAY	DOWNSTREAM CONCENTRATION	MPCA WATER QUALITY STANDARD
Copper µg/l	12	3.409 ³	50 ⁶	0.008	12.0	10
Turbidity NTU	76.6	21754 ³	130 ⁶	20	76.7 ³	25
Conductivity phos/cm @ 25 deg. C.	730 ²	134758	6100 ²	618	733	1000
Chloride mg/l as Cl	45	12780	1610 ⁶	251	45.9	100
pH	8.1	-	6.0 ⁶	-	-	6.5-8.5
Ammonia mg/l as N	0.70	199	350 ⁶	54.6	0.89	1.5
Total Dissolved Solids mg/l	573	162732	5346	834	575.9	700
Total Alkalinity mg/l as CaCO ₃	258	73272	1225	191	258.7	250
Sulfate mg/l as SO ₄	123	34932	1080	168	123.6	10
Total Hardness mg/l as SO ₄ CaCO ₃	368	104512	1600	250	368.9	250 ⁴
Sodium mg/l as Na	34.3	9741	357	56	34.5	122 ⁴
Cadmium µg/l as C	10	2.840	30	0.0005	10.0	10
Lead µg/l as Pb	11	3.124	100	0.016	11.0	50
Arsenic µg/l as As	8.6	2.442	ND	-	8.6	50
Selenium µg/l as Se	2.8	0.795	ND	-	2.8	10
Fluoride mg/l as F	0.32	90.88	0.4	0.06	0.320	1.5
phenols mg/l	0.004	1.136	0.77	0.120	0.0044	0.1
Chromium mg/l as Cr	0.007	1.988	0.05	0.008	0.0070	0.05
Barium mg/l as Ba	0.16	45.44	2.25	0.35	0.161	1
Boron mg/l as B	0.16	45.44	3.06	0.47	0.162	0.5
Cyanide mg/l as CN	0.4	113.6	0.028	0.004	0.40	0.02
Silver µg/l as Ag	<10	0.284	10	0.0016	10	50
BOD ₅ mg/l	5.3	1505	1500	234	6.1	--
COD ₅ mg/l	42.5	12070	4490	700	45	--

1. Median values from data in Clark & Piskins, Environmental Geology. Volume 1, 1977, unless otherwise noted.
2. $0.65 \times \text{specific conductance} = \text{total dissolved solids (mg/l)}$.
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 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.

Table III-19

In most cases, the impact of the existing Burnsville 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 four parameters predicted to result in the greatest increase are ammonia, BOD, COD and chloride. All other parameters result in less than a two percent increase. Even with increases of 0.19 mg/l (as N) for ammonia (27 percent increase) and 0.9 mg/l (as Cl) for chloride (two percent increase), the modeled downstream concentrations are well below the MPCA standards for the River. BOD and COD are predicted to increase 15 and 6 percent respectively. However, there are no standards governing these two parameters for the River.

A flow rate of 450 cfs was used to represent flow conditions in the lower Minnesota River at the 7-day duration, 2-year frequency low flow past the landfill site. Modeled impacts of the existing Burnsville Landfill on the Minnesota River under the flow conditions are presented in Table III-20. At the 7-day duration, 2-year frequency low flow, the impact of landfill leachate is reduced. For these low flow conditions, the calculated ammonia concentration in the mixing zone increases by 0.09 mg/l (13 percent), BOD increases by 0.4 mg/l (eight percent), COD increases by 1.2 mg/l (three percent), and chloride increases by 0.5 mg/l (one percent) due to landfill leachate. Again, the modeled downstream concentrations for ammonia and chloride are well below the standards. All other parameters increase by one percent or less, usually with no detectable change.

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

Other Surface Waters In The Landfill Area -- Wetlands are defined as "those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas". Burnsville Sanitary Landfill has a small wetland area on the proposed expansion site and several wetland areas adjacent to its borders.

Wetlands are considered intrastrate water as defined within WPC-24 and shall be classified as 2B, 2C, 3B, 3C, 4A, 4B, 5 and 6 unless

IMPACT OF EXISTING LANDFILL ON MINNESOTA RIVER QUALITY
7 DAY DURATION - 2 YEAR FREQUENCY LOW FLOW

PARAMETER	Minnesota River		Burnsville Landfill		Minnesota River	
	UPSTREAM CONCENTRATION	LOADING AT 7 DAY-2 YEAR LOW FLOW LBS./DAY	LEACHATE CONCENTRATION ¹	LOADING LBS./DAY	DOWNSTREAM CONCENTRATION	MPCA WATER QUALITY STANDARD
Copper ug/l as Cu	12	7.128	50	0.008	12.0	10
Turbidity NTU	76.6	45500 ³	130 ⁶	20	76.63	25
Conductivity umhos/cm @ 25 deg. C.	730 ²	281853	6100 ²	518	732	1000
Chloride mg/l as Cl	45	26730	1610 ⁶	251	45.5	100
pH	8.1	-	6.0 ⁵	-	8.1	6.5-8.5
Ammonia mg/l as N	0.70	415.8	350 ⁶	54.6	0.79	1.5
Total Dissolved Solids mg/l	573	340362	5346	834	574	700
Total Alkalinity mg/l as CaCO ₃	258	153252	1225	191	258.3	250
Sulfate mg/l as SO ₄	123	73062	1080 ⁶	168	123.3	10
Total Hardness mg/l as CaCO ₃	368	218592	1600	250	368.4	250
Sodium mg/l as Na	343	20374.4	357	56	34.4	122 ⁴
Cadmium ug/l as Cd	10	5.94	30	0.0005	10.0	10
Lead ug/l as Pb	11	6.534	100	0.016	11.0	50
Arsenic ug/l as As	8.6	5108.4	ND ⁵	-	8.6	50
Selenium ug/l as Se	2.8	1663.2	ND ⁵	-	2.8	10
Fluoride mg/l as F	0.32	190.09	0.4	0.06	0.320	1.5
Phenols mg/l	0.004	2.376	0.77	0.120	0.0042	0.1
Chromium mg/l as Cr	0.007	4.158	0.05	0.008	0.0070	0.05
Barium mg/l as Ba	0.16	95.04	2.25	0.35	0.161	1
Boron mg/l as B	0.16	95.04	3.0 ⁵	0.47	0.161	0.5
Cyanide mg/l	0.4	237.6	0.028	0.004	0.40	0.02
Silver ug/l as Ag	<10	5.94	10	0.0016	<10.0	50
BOD ₅ mg/l	5.3	3148	1500	234	5.7	--
COD mg/l	42.5	25245	4490	700	43.7	--

1. Median values from data in Clark & Fiskins Environmental Geology, Volume 1, 1977, unless otherwise noted.
2. $0.65 \times \text{specific conductance} = \text{total dissolved solids (mg/l)}$.
3. Turbidity is assumed to be a linear function, this value may be considered to be a loading number, if one NTU is assumed equal to 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.

Table III-20

There is presently no water quality information available on these wetlands, except the ground water monitoring data from the landfill. Water monitoring data shows that all of the ground water monitoring wells exceed some water quality standards. Well 1 exceeds standards with respect to ammonia, copper, and specific conductance. Well 2 exceeds standards with respect to ammonia, chloride, and specific conductance. Wells 3 and 4 both exceed the standard for ammonia and in addition well 4 exceeds the standard for specific conductance. Since groundwater has a direct effect on wetland areas, it is probable that the wetlands on and adjacent to the Burnsville Landfill have much the same water quality and are in violation of some of the water quality parameters.

Wetlands in the Burnsville Landfill area are not used for agricultural or recreational purposes.

GROUND WATER QUALITY

State Regulations

The MPCA has established ground water standards that would be applicable to operation of the Burnsville 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 essentially a non-degradation standard. WPC 14 also applies to ground waters. Where differences exist between WPC 14 and WPC 22, the more stringent conditions are 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 therefrom 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 therefrom 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 Burnsville 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 ground water use between the landfill and the river.

The limited value of the ground water under the Burnsville 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 Burnsville 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 has been monitored since 1972. Beginning in 1972, a shallow well (W-1) on Figure III-8, located between the landfill and the river, was monitored. In 1978, three additional wells (W-2, W-3, and W-4) were installed around the landfill. The locations of these wells are also shown in Figure III-8. Typical values of monitoring data collected from the ground water stations near the Burnsville Landfill are presented in Table III-21.

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-21.

A comparison of the ground water monitoring test results with WPC 14 (see Table III-16) shows that standards were exceeded for ammonia, chloride and specific conductance for Well 2 and for ammonia, copper and specific conductance for Well 1. Leachate that is produced from the Burnsville 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, Barr Engineering Co. (1980) estimated the leachate production rate to be 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.

GROUND WATER QUALITY IN VICINITY OF LANDFILL
(Average of Available Data)

	Landfill Monitoring Wells				Quarry Dewatering
	W-1	W-2	W-3	W-4	
COD, mg/l	493	113	61	114	-
COD (Filtered), mg/l	33	143	86	105	-
BOD ₅ , mg/l	12	16	21	81	3
BOD ₅ (Filtered), mg/l	9	16	21	84	<3
pH (lab) ¹	7.0	6.8	7.4	7.2	7.8
pH (field) ¹	7.3	6.8	7.6	7.6	-
Chloride, mg/l as Cl	33	500	16	50	45
Ammonia, mg/l as N	2.6	4.4	1.1	1.1	0.86
Total Chromium, µg/l as Cr	32	26	27	27	-
Total Chromium (Filtered), µg/l as Cr	19	23	3.1	8.1	2.1
Copper, µg/l as Cu	16	0.8	1.5	0.6	-
Copper (Filtered), µg/l as Cu	2.8	1.9	2.2	0.3	1.2
Specific Conductance, µmhos/cm @ 25° C (Lab)	1,010	2,330	580	843	628
Specific Conductance, µmhos/cm @ 25° C (Field)	1,580	2,860	590	826	-

¹Median Value

Table III-21

LOCAL WATER SUPPLY QUALITY

State Regulations

As previously discussed, adjacent properties to the Burnsville Landfill use individual wells for water supply. The MPCA standards in WPC 14 apply to individual water supply wells. Table III-22 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-16.

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-23 shows the MDOH maximum contaminant levels for inorganic and organic chemicals contained in public water supplies.

Regulatory Compliance

Figure III-11 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-23a) tested met most of the applicable standards contained in Table-22 and all of the applicable standards contained in Table III-23. 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.

WQBUR

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 concentra- tions permitted to be discharged to an uncontrolled environment as pre- scribed by the appropriate authority having control over their use.			Not to exceed the lowest concentra- tions permitted to be discharged to an uncontrolled environment as prescribed by the appropriate au- thority having control over their use.

Table III - 22

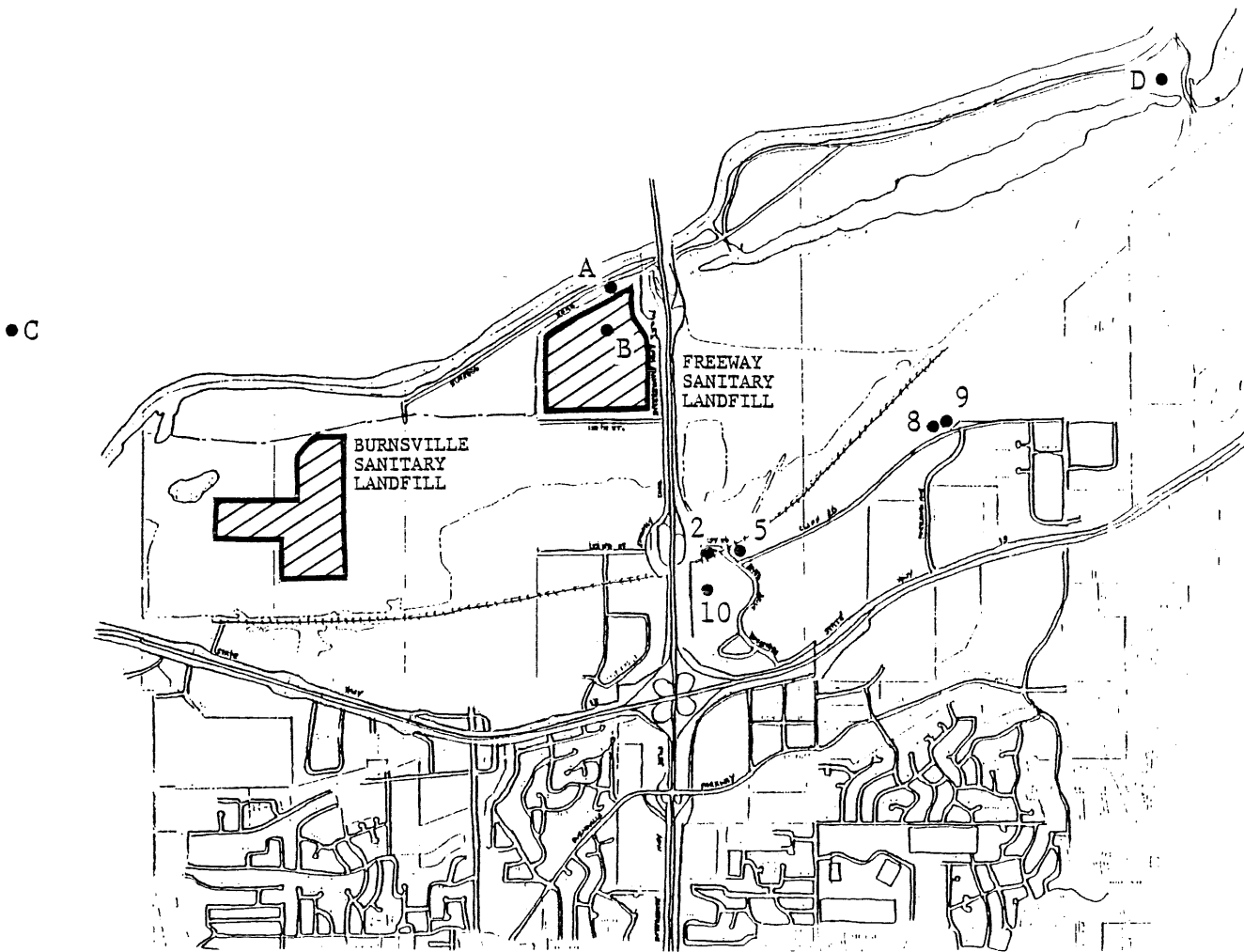
1978 PUBLIC WATER SUPPLY STANDARDS
MINNESOTA DEPARTMENT OF HEALTH

Maximum Contaminant Levels for Inorganic and Organic Chemicals

<u>Inorganic Chemicals</u>	<u>mg/l</u>
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
<u>Organic Chemicals</u>	
Endrin	0.0002
Lindane	0.004
Methoxychlor	0.1
Toxaphene	0.005
Chlorophenoxys	0.1
Silvex	0.01

Table III -23

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

Figure III-11

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	12/6/79
Coliform Group MPN/100 ml Organisms	<2.2	<2.2	<2.2	<2.2	0	0	0	0
Total Solids mg/l	240	320	300	290		300	290	
Total Hardness mg/l as CaCO ₃	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	4800		500	500	
Phenols µg/l	<2.0	3.0	<2.0	2.6				
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 -23A

TERRESTRIAL AND AQUATIC ECOLOGY

VEGETATION

The Burnsville Sanitary Landfill area 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 plant transition zone, the valley is influenced by the maple basswood forest and the oak savannah community.

The existing landfill is covered by silty clay loam and dirt in the area of current operation and pioneer grass and weeds in other areas. Sixteen acres of the expansion area is open land. Topsoil from most of the open land has been stripped and used as cover material for the existing landfill operation. The 12 acres which have been stripped within the last two years are now covered with pioneer species of grasses and moss. The remaining open land of the expansion area is covered by upland grasses, forbs, scattered brush, and occasional groves of trembling aspen.

The undeveloped area to the south of the landfill is open meadowland with some open water areas. To the west is a grain storage and bargeloading terminal owned by Cargill which is on a wet meadowland area. To the north is the Minnesota River. To the southeast is a dolomite quarry owned by Edward Kraemer and Sons Inc. surrounded by meadowland area and occasional large stands of mixed trees (See Figure III-12).

Vegetation surveys by Metropolitan Council staff of the landfill and adjacent land were conducted on February 21 and May 1, 1980. The objective of these surveys was to identify the major plant communities, as characterized by dominant or conspicuous species, found on the existing landfill and on the proposed horizontal expansion area in order to determine vegetation and habitat impacts.

Three general cover types are present on the landfill. Intermediate shrubs, grassland and barren graded soil. Two additional cover types are found on the proposed horizontal expansion area and the adjacent surrounding area: mixed tree stands and wetlands.

Intermediate Shrubs and Forbs

Intermediate shrubs and forbs are scattered throughout the landfill and expansion area. Dominant species found on the landfill are indicative of disturbed areas such as mullein (Verbascum sp.), dogwood (Cornus sp.), wild rose (Rosa sp.), and willow (Salix sp.). Forbs sighted on the landfill include sunflower (Helianthus giganteus), goldenrod (Solidago sp.), field thistle (Cirsium discolor), clover (Melilotus officinalis), aster (Chrysopsis sp.) evening primrose (Oenothera biennis), and Canada thistle (Cirsium arvense).

VEGETATIVE COVER TYPES ON BURNSVILLE SANITARY LANDFILL

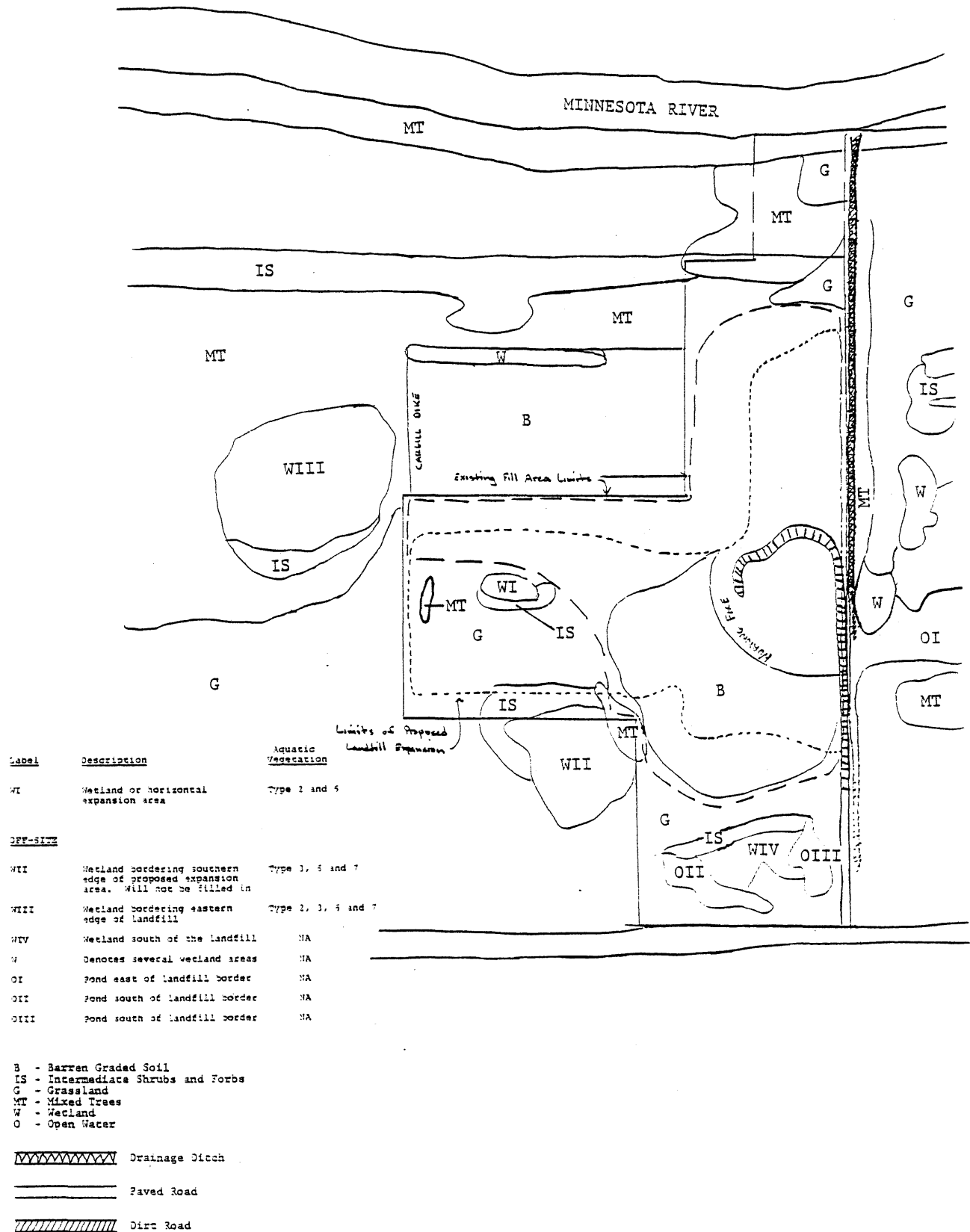


Figure III-12

Grassland

Grassland areas which exist on the landfill and the expansion area are vegetated by a variety of grasses and herbacious species such as brome grass (Bromus sp.), field clover (Petalostemum sp.), dock (Rumex sp.), vetch (Vicia sp.), cord grass (Spartina pectinata), horsetail, moss, smartweed (Polygonum sp.), cocklebur (Xanthium chinense), ragweed (Ambrosia artemisiifolia), wild pink (Silene caroliniana), mustard (Cruciferae sp.), and violet (Violaceae sp.). Completed areas of the landfill have been seeded and are covered with pioneer species of grasses and short dry forbs, such as listed above. Species are very similar on the expansion area and on completed landfill areas because the expansion area has been stripped for cover.

Barren Graded Soil

The remainder of the landfill area has no vegetative cover due to excavation operations where the soil is scraped for daily cover material, and to the landfiling procedure at the working face of the landfill.

Sparse-Mixed Tree Stands

Infrequent stands of mixed cottonwood/willow/aspen are found on the expansion area and adjacent to the landfill dominated by quaking aspen (Populus tremuloides) and willow (Salix sp.), and including elm (Ulmus americana), and wild plum (Prunus sp.).

Wetland

Wetland areas exist on the horizontal expansion area and adjacent areas to the landfill. These areas are characterized by typical wetland species. Shrub-carr, wet meadow, and emergent aquatic vegetation are found in this type of area, including species such as dogwood (Cornus sp.), willow (Salix sp.), cattail (Typha latifolia), reed grass (Phragmites sp.), and floating algae. There is a small wetland area on the horizontal expansion area that will be filled in if the expansion is approved.

WILDLIFE

Wildlife species which are likely to be found within the Burnsville Sanitary Landfill area would include those species commonly associated with the previously described plant communities. Figure III-12 shows the location of the general plant communities on and near the landfill and expansion area. The following species of mammals, birds, amphibians and reptiles were actually sited on the landfill: deer (Odocoileus virginianus), raccoon (Procyon lotor), gopher (Geomys sp.), woodchuck (Marmota monax), mourning doves (Zenaidura macroura), blue-winged teals (Anas discors), killdeer (Charadrius vociferus), robins (Turdus migratorius), grackles (Quiscalus quiscula), pheasants (Phasianus colchicus), finches (Carpodacus sp.), red winged blackbirds (Agelaius phoeniceus), brown-headed cowbirds (Molothrus ater), mallards (Anas platyrhynchos), warbler (Dendroica sp.), garter snake (Thamnophis sirtalis sirtalis).

This survey was not an extensive one and is intended to indicate the type of animal species found in the Lower Minnesota River Basin. For an extensive list of species found in the Lower Minnesota River Basin, see Warner 1979 Wildlife Inventory of the Lower Minnesota River Valley. While not specifically identified, insects at the Burnsville Sanitary 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

Other surface waters in the vicinity of the landfill include a catchment pond attached to the easterly drainage ditch, and two open water ponds south of the landfill. The catchment pond is a manmade depression from the adjacent quarry operations. No aquatic ecology information is available on any of these ponds. The impact of leachate from the existing landfill is unknown.

For information regarding wetlands refer to Wetlands section.

WETLANDS

Wetlands, in general, 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 several wetland areas adjacent to the landfill. These wetland areas would probably be classified as Type 2, 3, 6 or 7 according to USDI Fish and Wildlife Service definitions (see Figure III-12). Representative plants of inland fresh meadows (Type 2) include corex, rushes, redtop, reedgrasses, mannagrasses, prairie cordgrass, and mints. Representative plants of Inland Fresh Marshes (Type 3) are grasses, bulrushes, and various other marsh plants such as cattails, arrowheads and smartweeds. Soils in Inland Fresh Marshes are usually waterlogged and often covered by as much as six inches or more of water. Representative plants of shrub swamps (Type 6) include alders, willows, buttonbrush, dogwood and swamp privet. Wooded swamps (Type 7) are typically waterlogged to within a few inches of surface and are often covered with up to 1 foot of water. These swamps frequently support beds of duckweeds, smartweeds, and other herbs.

There is one wetland area located in the horizontal expansion area. This wetland would probably be classified as Type 3, 6, and according to USDI Fish and Wildlife Service definitions (see Figure III-12). If the landfill expansion is approved, this wetland will be filled in.

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 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 1940's. 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 loss of Higgin's eye mussels in the lower 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 Burnsville Sanitary Landfill is located in the City of Burnsville. The landfill is located approximately .25 mile east of the City of Savage. Directly north, approximately 950 feet, is the Minnesota River.

Figure III-13 shows the land use surrounding the landfill area. Directly north of the landfill is open, undeveloped land. Further north, across the Minnesota River, is the Minnesota Valley National Wildlife Refuge and Recreation Area. Northeast is the Freeway Sanitary Landfill. Directly east is undeveloped, open land. Further east is a dolomite quarry operated by Edward Kraemer and Sons, a mining and processing firm.

Directly south is open, undeveloped land. Further south are several commercial and retail establishments including the following: Furniture World, House of Wood, Menards, Cub Foods, Conn-Co. Shoes Inc., Burnsville Sports Center, Midwest Golf Car, a Buick car dealership and Vermeer Sales and Services. Southeast is Our Own Hardware's warehouse and along Highway 13, east of County Road 5, is a variety of commercial enterprises.

Directly west are grain storage facilities and a barge loading terminal owned and operated by Cargill, Inc. Southwest is open, undeveloped land.

Zoning

Figure III-14 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, and residential.

Regional Development Framework Plan

The Metropolitan 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 Environmental Impact Statement describes the various urban and rural use classifications contained in the plan.

The Burnsville area, including the Burnsville 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

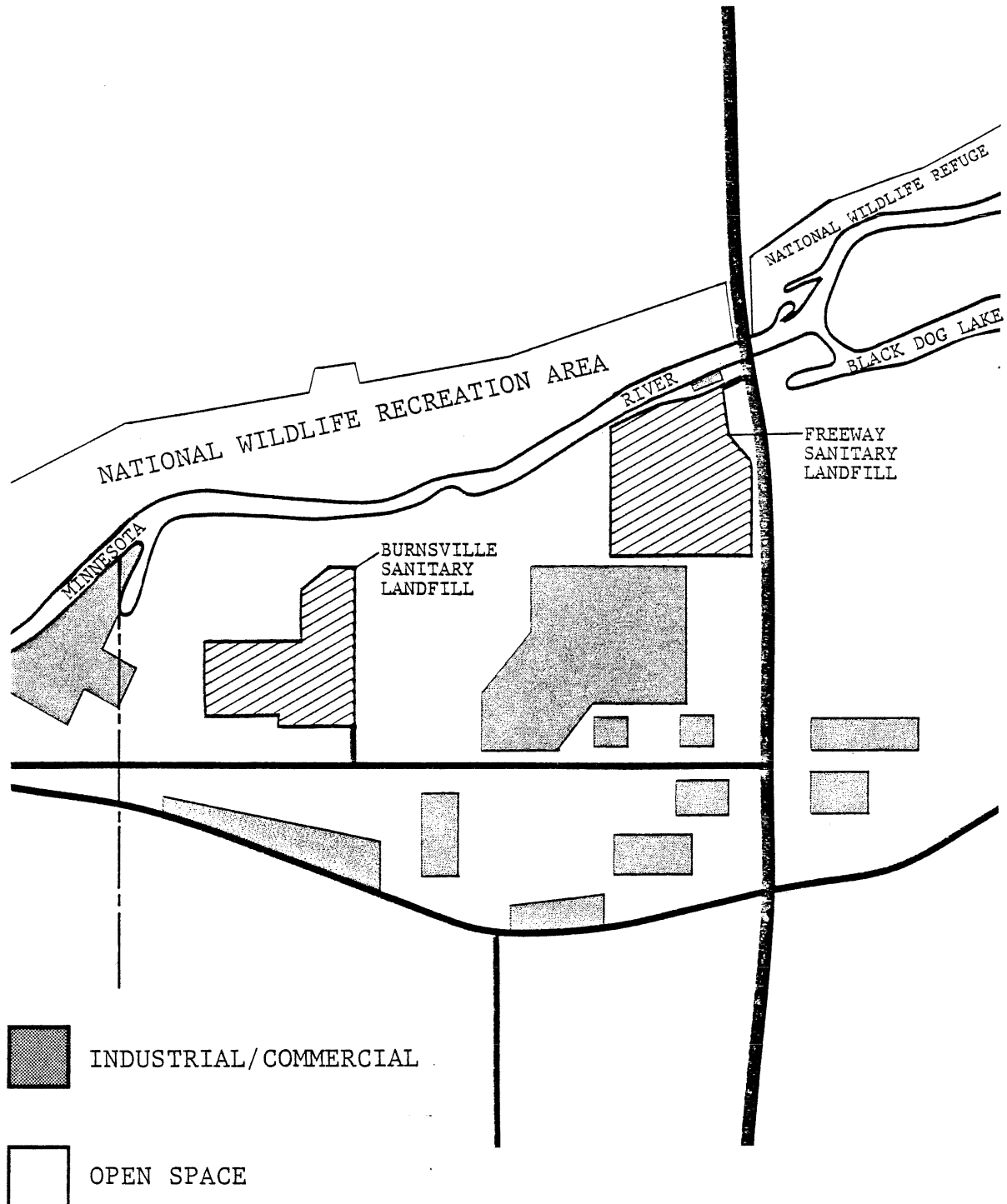
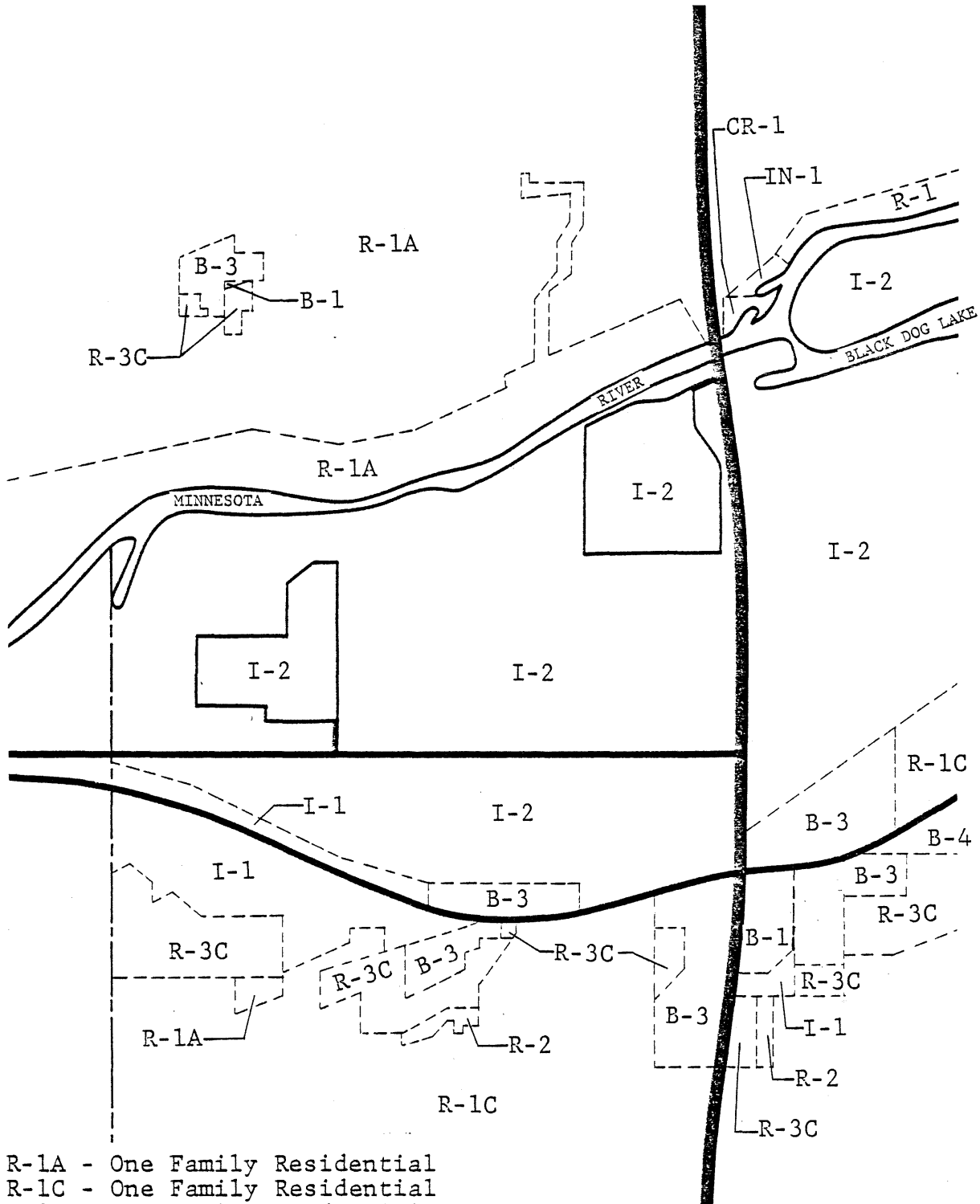


Figure III-13

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-14

PUBLIC FACILITIES AND SERVICES

Fire Services

There are two fire stations in Burnsville which 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 located on Cliff Road, just east of the intersection with Portland Avenue.

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

Storm Sewer Services

The City of Burnsville adopted an overall drainage plan in 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 Burnsville Sanitary 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-15). 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 17500 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: Walters Wildwood, Anderson Park, Hopkins Park, and Mounds Springs Park. Walters 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 BURNSVILLE SANITARY LANDFILL

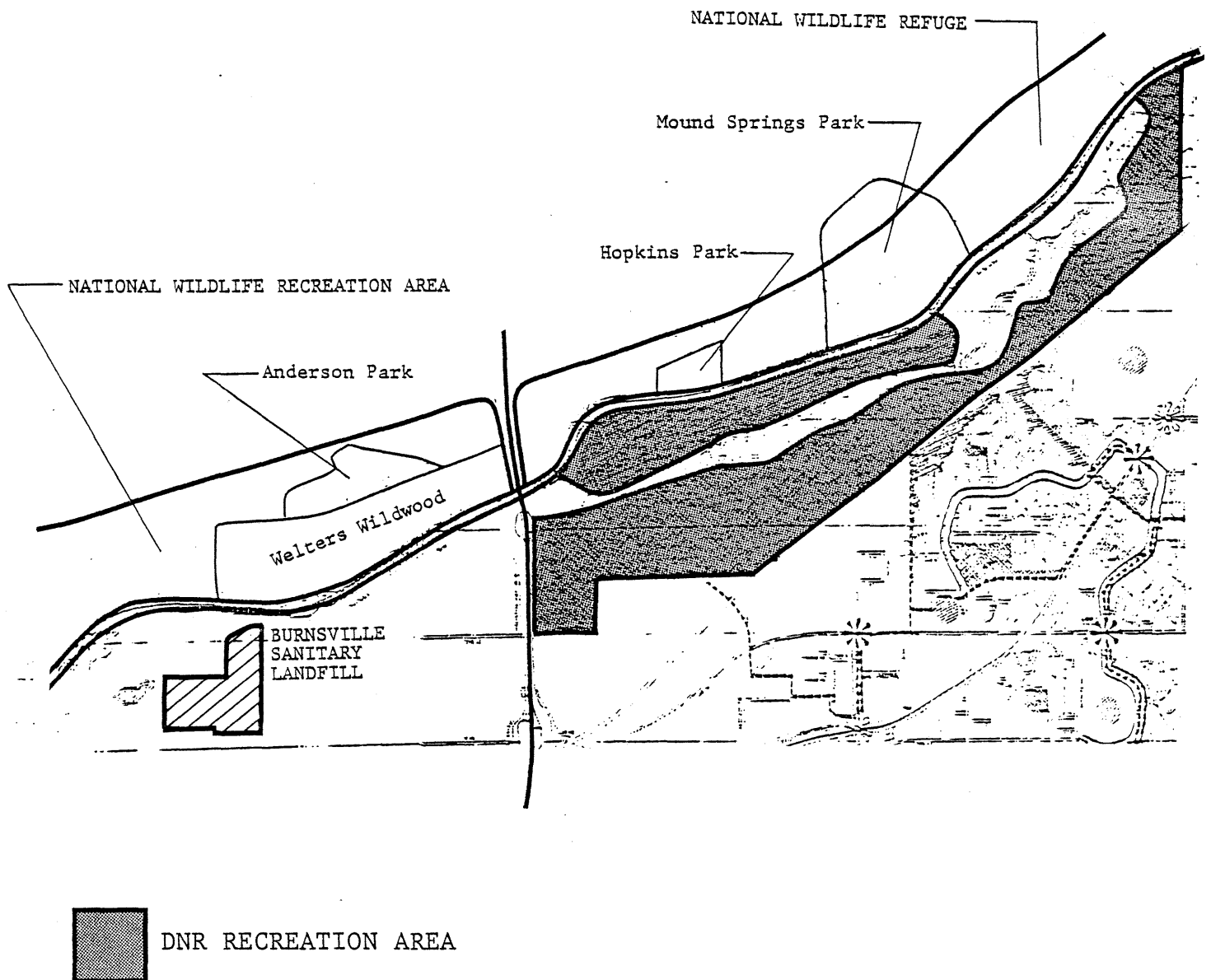


Figure III -15

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 continuous 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 storm water 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 Burnsville Sanitary Landfill. The state is pursuing the possibility of using land adjacent to the river and landfill for recreation purposes.

TRANSPORTATION

General

The Burnsville Sanitary Landfill watershed covers approximately 400 square miles and includes portions of Dakota, Scott and Hennepin Counties. Twelve municipalities, eight townships and the Fort Snelling area deposit refuse to varying degrees, at the landfill. As shown in Figure III-16, this landfill's watershed extends from the Minneapolis/Richfield boundary in the north to the southern tier of townships in Scott County and from Rosemount in the east to Jackson and Louisville Townships in the west. Approximately 80 percent of the 200,000 tons of refuse annually deposited at the landfill is generated in Dakota and Scott Counties. The principal contributing municipalities are Shakopee, Prior Lake, Savage, Burnsville and Lakeville. The remaining 20 percent originates mainly from Bloomington with minor amounts originating in Eden Prairie, Edina, Richfield and the Fort Snelling area.

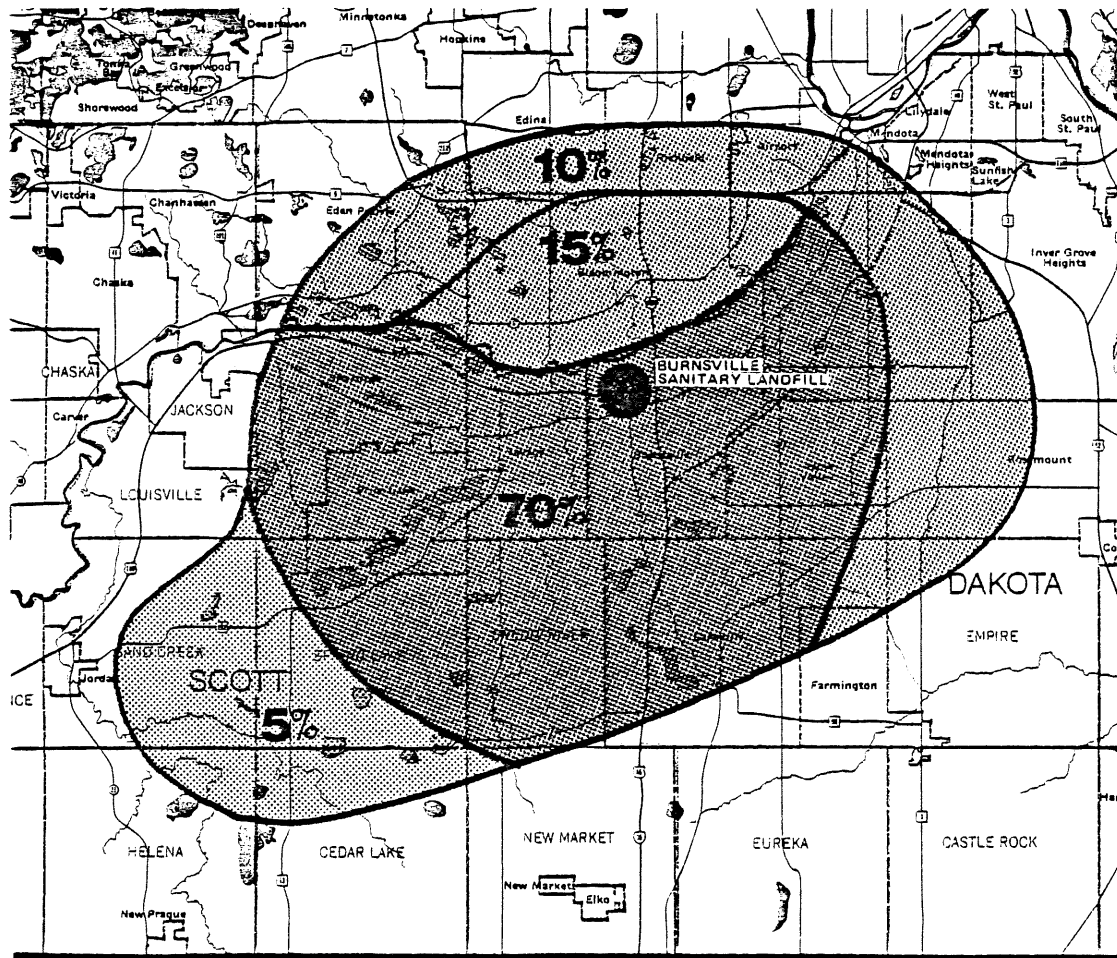
Principal Haul Routes

The principal haul routes to the landfill extend in the four cardinal directions from this site as shown in Figure III-17. The principal north-south haul route is I-35W. This route provides excellent direct access to the landfill from Bloomington, Burnsville and Lakeville. The principal haul route for the communities located east of this landfill site is TH 13/Cliff Road. For communities west of the landfill TH 101/TH 13/Dupont Avenue South is the principal haul route. Approximately 38 percent of annual total refuse deposited at the Burnsville Sanitary Landfill is hauled on I-35W and 60 percent on TH 101 and TH 13. The existing functional classification of both principal haul routes is shown in Figure III- 18

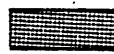
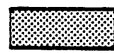
Existing Traffic Volumes in the Vicinity of Burnsville Sanitary Landfill

Burnsville Sanitary Landfill is located near I-35W (one of the heaviest traveled highways in the Metropolitan Area) and TH 101. Figure III-19 shows the 1978 average daily vehicle and truck trips on the principal haul routes located in the vicinity of the Burnsville Sanitary Landfill. Approximately 70,000 average daily vehicle trips occur at both the I-35W/Cliff Road and I-35W/TH 13 interchanges and approximately 30,000 average daily trips occur at the TH 13/Dupont Avenue South intersection. Average daily truck trips in the vicinity of the landfill range from 3650 on TH 13 to 4500 on I-35W. The present 220 average daily truck trips generated by the landfill represent from only five to six percent of the total truck trips and less than one percent of total vehicle trips on the principal haul routes.

BURNSVILLE SANITARY LANDFILL WASTESHED, 1980



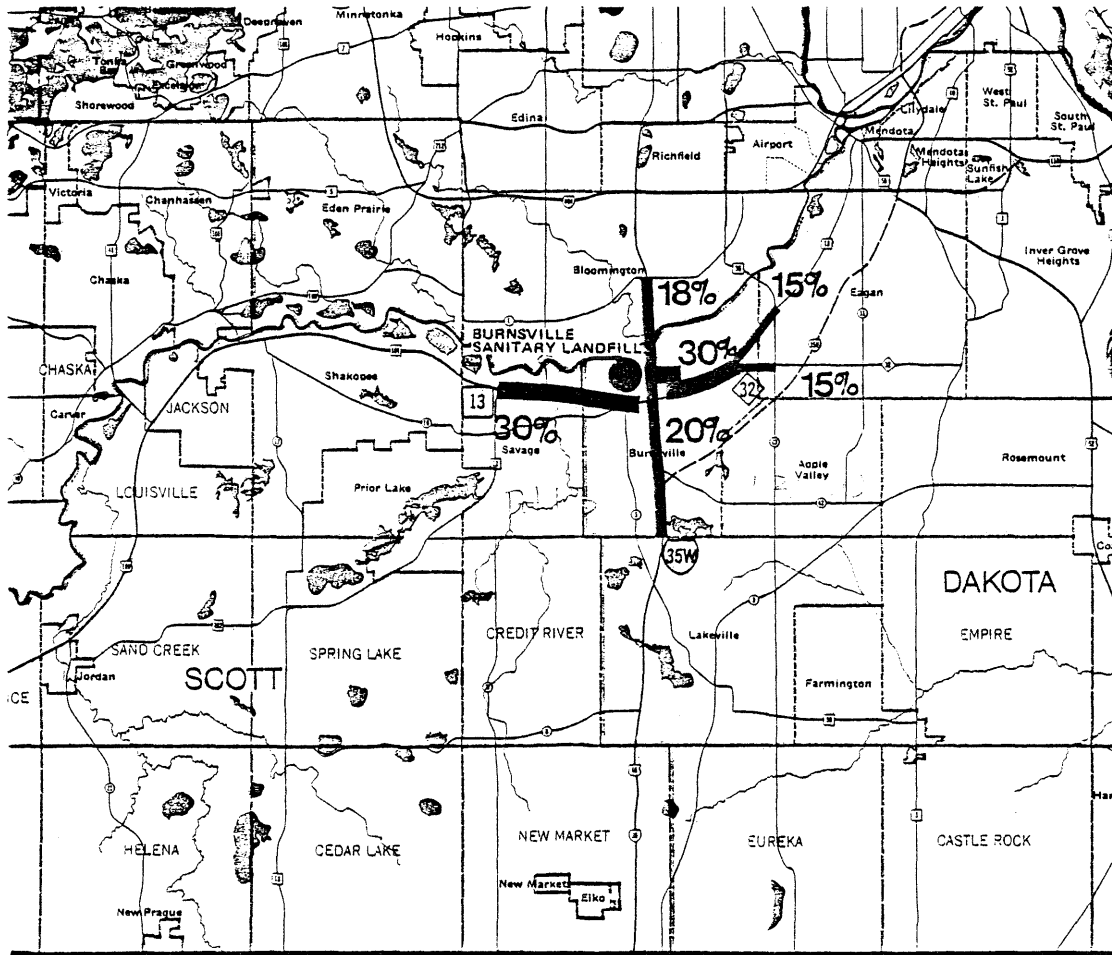
% - Estimated Relative Contribution of Designated Wasteshed to Total Refuse Deposited at Burnsville Sanitary Landfill (200,000 tons/year)

-  Primary Source Area
-  Secondary Source Area
-  Tertiary Source Area

Sources: Edward Kramer & Sons, Inc./Minneapolis Refuse, Inc./
Minneapolis Suburban Refuse Removal Association/
Metropolitan Council

Figure III -16

PRINCIPAL HAUL ROUTES TO BURNSVILLE SANITARY LANDFILL

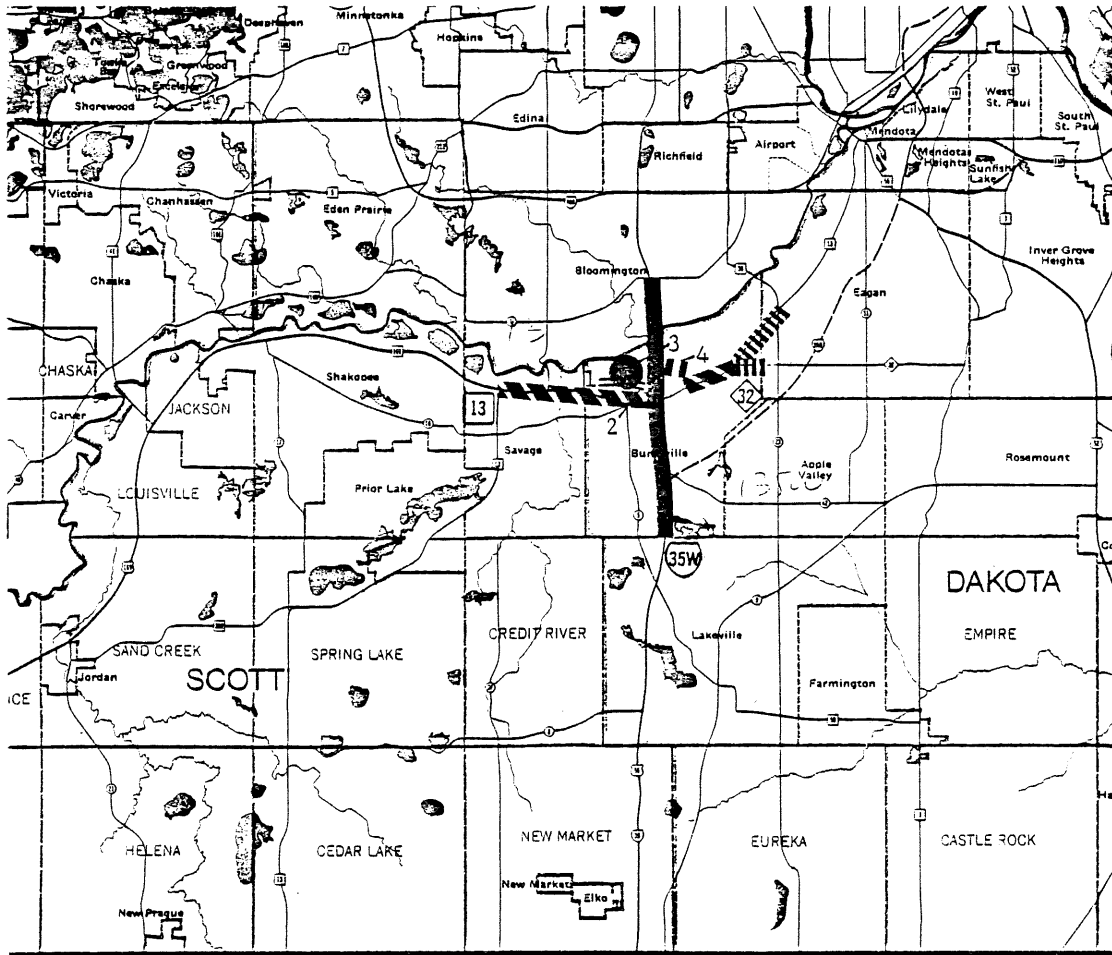


Principal Haul Route
 (Haul Routes Show Percentage of Annual Total Refuse
 Deposited at Burnsville Sanitary Landfill)
 % - Estimated Percentage of Annual Total
 Refuse Deposited at Burnsville Sanitary
 Landfill by Principal Haul Routes

Source: Edward Kramer & Sons/Metropolitan Council

Figure III -17

FUNCTIONAL CLASSIFICATION OF
PRINCIPAL HAUL ROUTES TO BURNSVILLE
SANITARY LANDFILL



- Principal Arterial
 - Intermediate Arterial
 - Minor Arterial
 - Collector (1. Undesignated Street, 2. Dupont Ave So.
3. 122nd Street, 4. Cliff Road)
- Source: Metropolitan Council

Figure III -18

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

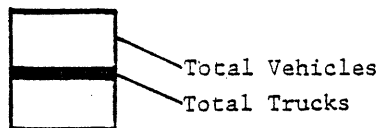
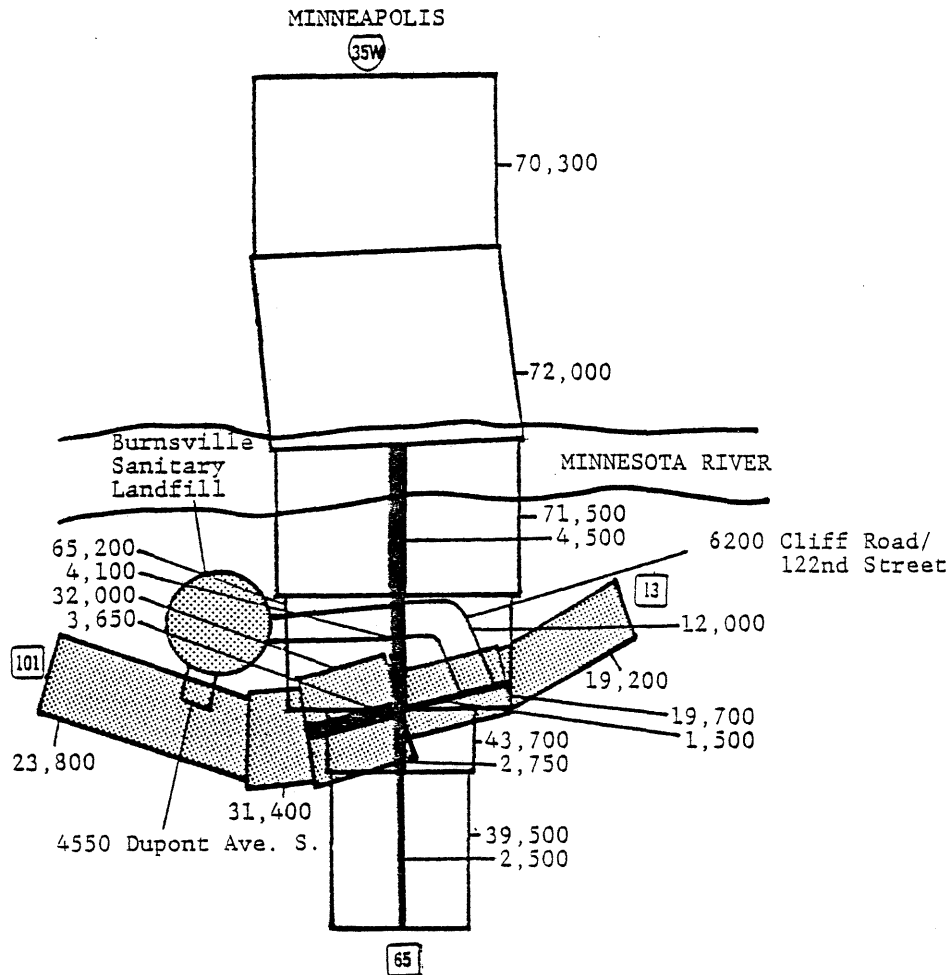


Figure III -19

Types and Number of Trucks Hauling to Burnsville Sanitary Landfill

Four types of trucks are used to haul refuse to the landfill. Their identification and capacities are given in Table III-24.

Table III-24.
TYPES AND CAPACITIES OF HAUL TRUCKS TO
BURNSVILLE SANITARY LANDFILL

<u>Type</u>	<u>Capacity (Cubic yards)</u>	<u>Percent of Daily Truck Trips</u>
Open top semi	100	0
Roll-off	10 to 40	10
Tandem	25 to 35	5
Front-end loader	25 to 35	0
Packer	17 to 18	80
Dump	5 to 15	5

Source: Edward Kraemer & Sons, Inc.

The majority (80 percent) of daily truck trips to the landfill are made by 17-18 cubic yard packers followed by 10-40 cubic yard roll-off (10 percent); 25-35 cubic yard tandems (5 percent) and 5-15 cubic yard dump trucks (5 percent).

The total number of average daily truck trips to the landfill is 110. Cars and pick up trucks account for an additional 10 trips per day.

Identified Issues Relating to Refuse Hauling to Burnsville Sanitary Landfill

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

1. Traffic congestion in vicinity of landfill.
2. Traffic operations deficiency at I-35W/Cliff Road Interchange.
3. Litter on local streets in vicinity of landfill.

Table III-25 summarizes the findings of this survey.

IDENTIFIED ISSUES RELATING TO REFUSE HAULING
TO BURNSVILLE SANITARY LANDFILL

Municipality	Issue	Interviewee
Bloomington	None	Russell Langseth Director of Public Works
Richfield	None	Thomas Morgan Public Safety Director
Burnsville	Traffic congestion at T.H. 13/ Dupont Ave. South intersection resulting partly from landfill hauling	Charles Siggerud City Engineer
	Traffic operational deficiency at I-35W/Cliff Road Interchange	
	Litter on local streets (i.e., Dupont Avenue, 122nd Street & nondesignated street at west entrance to landfill)	
Lakeville	None	James Robinette Director of Public Works

Transportation-related emissions and noise from vehicles using the landfill are not considered to be significant problems due to the relatively few vehicles involved, the extended spacing of trips (approximately 20 "in/out" trips per hour) and compatible adjoining land uses. Regional access to the landfill could be interrupted from the north via I-35W due to periodic 100-year floods on the Minnesota River. However, as shown in Figure III-19, a large majority of refuse hauled to the Burnsville Landfill is generated south of the Minnesota River thereby not being affected by major Minnesota River flows.

COLLECTION AND MANAGEMENT SYSTEM COSTS

See the Pine Bend Sanitary Landfill Environmental Impact Statement for a discussion on Metropolitan Area solid waste collection and management system costs.

HISTORIC/ARCHAEOLOGICAL

Upon reviewing the Burnsville Sanitary 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.

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 vegetative 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.

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

BURNSVILLE SANITARY LANDFILL EXPANSION

SECTION IV

ENVIRONMENTAL IMPACTS OF THE PROPOSED ACTION

METEOROLOGY/CLIMATOLOGY, AIR QUALITY

AND NOISE

METEOROLOGY/CLIMATOLOGY

Primary Impacts

The construction and operation of the vertical and horizontal expansion areas at the Burnsville Sanitary Landfill will have no effect on the large scale (macro-climate) meteorological 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 areas 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-closure activities associated with the proposed new expansions 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 expansions 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 areas.

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 expansions 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 expansions will have no cumulative impacts.

AIR QUALITY

Primary Impacts

Fugitive Dust -- The construction, operation, maintenance, closure and post-closure activities associated with the proposed expansions will generate fugitive dust. 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 dust impacts from the new expansions will not vary significantly in magnitude from those resulting from the existing landfill since the nature and level of dust generating activities will be similar to existing conditions. The potential impact zone may shift somewhat when filling the horizontal expansion area because the area of dust emissions will be moved to this area.

No significant adverse dust impacts are expected.

Methane Gas -- The proposed expansion area has the potential for adverse methane gas impacts. Since an additional 1.6 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 2.2 billion cu. ft. of methane gas can be expected from the landfill including the proposed expansion areas. 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.

Odors -- The proposed new expansion areas 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 not demonstrated odor problems.

Other Air Pollutants -- The operation of equipment and the movement of refuse trucks into the expansion areas 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 expansions 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 expansions 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 expansions 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 areas will also generate fugitive dust in similar quantities to that produced by the existing landfill. Such activities 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.

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. 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 areas. 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 Burnsville Sanitary landfill should prevent such impacts from occurring at 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 areas.

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 areas 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 areas 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.

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.

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

The closest sensitive receptor (home) to the proposed expansion areas is located approximately 2,900 feet from the southern border of the proposed expansion areas. 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 areas 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 areas 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 areas.

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 areas 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 areas.

SO001B

WATER QUALITY

GROUND WATER QUALITY

Primary Impacts

The average annual rate that leachate will be generated from the proposed expansion facility was estimated by Barr (1980) in the same manner as for existing conditions in Section III. The average annual infiltration rate for the proposed expansion is estimated to be 5.9 inches per year during operation and at 3.2 inches per year after closure. These estimates are based on the proposed operating procedures, final contours, cover, and vegetation which will exist during operation and after closure of the expanded facility. Table IV-1 summarizes the average annual infiltration rate for the proposed facility. The infiltration rates in Table IV-1 indicate that there will be about a 10 to 20 percent increase in the average rate of leachate generation from the proposed expansion as compared to the existing facility.

Since refuse in the expanded landfill will not reach field capacity until after closure, the maximum leachate production rate from the expanded facility is estimated at 3.2 inches per year which is equivalent to 27.2 acre-feet per year or 0.037 cubic feet per second from the 102-acre expanded site.

The construction, operation, closure or post-closure of the proposed expansion will have no significant impact on the ground water hydrology of the landfill site. Ground water gradients and the movement of ground water beneath the site are not expected to change significantly from what they are under existing conditions.

The primary ground water impact from the proposed expansion will be the effect of leachate on surrounding ground water quality. Based on present gradients, the area of ground water potentially influenced by leachate from the existing landfill is shown in Figure III-10. The ground water potentially influenced by leachate from the proposed landfill expansion is shown in Figure IV-1. The movement of leachate northwest of the landfill is controlled by the water level in the parcel north of the 17-acre expansion area that is owned by Cargill. The northwestern limits of the ground water impact area shown in Figure IV-1 is based on the "worst case" assumption that water will not be allowed to accumulate in the Cargill area north of the 17-acre expansion area. The quality of the leachate is not expected to change significantly because of the expansion.

SITE SPECIFIC WATER BALANCE
Proposed Landfill Expansion

<u>LANDFILL CONDITION</u>	<u>Estimated Average Annual Infiltration Rate</u>
Proposed Expansion (During Operation)	5.9"/yr.
Proposed Expansion (After Closure)	3.2"/yr.
<u>SUB-AREA CONDITIONS</u>	
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%)	9.8"/yr.

Table IV-1

ENVELOPE FROM 20 PRIVATE WELLS

POTENTIAL LIMIT OF GROUND WATER INFLUENCE OF LEACHATE FROM PROPOSED LANDFILL

EXISTING LANDFILL LIMIT

PROPOSED EXPANSION

ENVELOPE OF INTERCEPTED FLOW

MINNESOTA

Port Cargill

WILDWOOD RIVER

CHICAGO

Savage

QUARRY

BURNSVILLE

0 1000 2000
Scale in Feet

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Refuse in the existing landfill has likely not reached field capacity. It is estimated that once the existing landfill reaches field capacity, the average leachate production potential will be 21 acre-feet per year with an estimated quality shown on Table III-20. The proposed expansion is anticipated to increase the average annual production of leachate by approximately 30 percent to an estimated rate of 27 acre-feet per year. This increase in leachate production will increase the mass loading of potential pollutants to the local ground water system.

Direct or Indirect Effects Which Cannot be Avoided

If the existing landfill is closed after the permitted capacity is reached, it has the potential to impact the ground water in the area shown in Figure IV-1. If water does not accumulate in the Cargill area north of the west arm of the existing landfill, 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 local ground water quality unless leachate is completely cut off by an impervious seal and leachate is collected over the entire landfill site.

Irreversible and Irretrievable Commitment of Resources

The presence of the landfill restricts the use of the ground water as a water supply in the vicinity of the landfill in the potential impact area shown in Figure IV-1. The use of the ground water as a water supply in this area is also precluded by the fact that the major portion of this potential impact area is designated as a floodway which precludes any type of development. Municipal water serves the potential impact area to the south. The potential impact area between the landfill and the river that is not in the floodway is owned by Cargill. Cargill has no plans to develop this area.

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 ground water quality. The expansion will allow the landfill to operate for an additional 6 to 7 years and provide a method for safely disposing of municipal refuse and other refuse currently deposited in the landfill.

Cumulative Impacts

There are no cumulative impacts from the leachate on the ground water. Impacts of the ground water on the Minnesota River are discussed in the next section.

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 17-acre horizontal expansion area of the proposed facility is located in the 100-year frequency flood fringe and will remove approximately 260 acre-feet of flood storage from the flood fringe of the Minnesota River. According to the Burnsville Floodplain Ordinance, this flood fringe area can be filled or otherwise encroached upon without causing a significant increase in flood levels. Upstream flood protection levels have been based on the assumption that the flood fringe including the proposed horizontal expansion area will eventually be filled.

A flood control dike will protect the 17-acre horizontal expansion area from the 100-year frequency flood. The flood protection dike will be located as shown in Figure II-10. The proposed dike will have a minimum top width of 15 feet with 3 (horizontal) to 1 (vertical) side slopes and a top at Elevation 722.5. This provides approximately four feet of freeboard above the actual 100-year frequency flood elevation and three feet of freeboard above the regulatory flood level. The flood control dike will effectively remove the horizontal expansion area from the 100-year frequency floodplain and will protect refuse from being carried downstream by flood water.

The ground water influenced by the leachate from the landfill can potentially affect the quality of the Minnesota River. The method used for quantifying the effect of the expanded landfill on the Minnesota River is the same as the method used in Section III to quantify the impact of the present landfill on the Minnesota River. Tables IV-2 and IV-3 summarize the results of the analysis used to determine the impact of the proposed landfill expansion on Minnesota River quality. The results indicate that concentrations of ammonia, BOD, phenols, COD and barium are predicted to increase the most, in that order, due to the expansion. All the parameters are not expected to increase immeasurably above levels of the existing landfill. Even using this "worst case" dilution model, the added quantity of leachate should not cause violations of any water quality standards. Even the levels of ammonia in the River are increased by only 0.06 mg/l (seven percent) over previous concentrations attributable to the permitted landfill.

In summary, there is no significant impact from the expanded landfill on Minnesota River quality. Most parameters show no appreciable change from the impact of the existing landfill calculated in Section IV.

Table IV-2
IMPACT OF PROPOSED LANDFILL ON MINNESOTA RIVER QUALITY
7-Day Duration - 10-Year Frequency Low Flow

PARAMETER	Minnesota River		Burnsville Landfill		Minnesota River	
	UPSTREAM CONCENTRATION	LOADING AT 7-DAY 10 YEAR LOW FLOW LBS./DAY	LEACHATE CONCENTRATION ¹	LANDFILL LOADING LBS./DAY	DOWNSTREAM CONCENTRATION	MPCA WATER QUALITY STANDARD
Copper µg/l as Cu	12	3,409	50	0.010	12.0	10
Turbidity NTU	76.6	21754 ³	130 ⁶	26 ³	76.7	25
Conductivity µmhos/cm @25 deg. C.	730 ²	134758	6100 ²	789	734	1000
Chloride mg/l as Cl	45	12780	1610 ⁶	320	46.1	100
PH	8.1	--	6.0 ⁶	8.1	8.1	6.5-8.5
Ammonia mg/l as N	0.70	199	350 ⁶	70	0.95	1.5
Total Dissolved Solids mg/l	573	162732	5346	1063	576	700
Total Alkalinity mg/l as CaCO ₃	258	73272	1225	244	258.8	305
Sulfate mg/l as SO ₄	123	34932	1080 ⁶	214	123.7	10
Total Hardness mg/l as CaCO ₃	368	104512	1600 ⁵	318	369.1	250
Sodium mg/l as Na	34.3	9741	357	71	34.55	122 ⁴
Cadmium mg/l as Cd	10	2.840	30	0.006	10.0	10
Lead µg/l as Pb	11	3.124	100	0.020	11.1	50
Arsenic µg/l as As	8.6	2.442	ND ⁵	--	8.6	50
Selenium µg/l as Se	2.8	0.795	ND ⁵	--	2.8	10
Fluoride mg/l as F	0.32	90.88	0.4	0.08	0.320	1.5
Phenols µg/l	0.004	1.136	0.77	0.153	0.0045	0.1
Chromium mg/l as Cr	0.007	1.988	0.05	0.010	0.0070	0.05
Barium mg/l as Ba	0.16	45.44	2.25	0.45	0.163	1
Boron mg/l as B	0.16	45.44	3.0 ⁶	0.60	0.162	0.5
Cyanide mg/l as CN	0.4	113.6	0.028	0.006	0.40	0.02
Silver µg/l as Ag	<10	0.284	10	0.0002	<10	50
BOD, mg/l	5.3	1505	1500	298	6.3	--
COD, mg/l	42.5	12070	4490	892	45.6	--

1. Median values from data in Clark & Piskins, Environmental Geology, Volume 1, 1977, unless otherwise noted.
2. $0.65 \times \text{specific conductance} = \text{total dissolved solids (mg/l)}$.
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.

Table IV-3
IMPACT OF PROPOSED LANDFILL MINNESOTA RIVER QUALITY
7-Day Duration - 2-Year Frequency Low Flow

PARAMETER	Minnesota River		Burnsville Landfill		Minnesota River	
	UPSTREAM CONCENTRATION	LOADING AT 7 DAY, 2 YEAR LOW FLOW LBS./DAY	LEACHATE CONCENTRATION ¹	LANDFILL LOADING LBS./DAY	DOWNSTREAM CONCENTRATION	MPCA WATER QUALITY STANDARD
Copper µg/l as Cu	12	7.128 ₃	50 ₆	0.010	12.0	10
Turbidity NTU	76.6	45500	130 ₆	26 ₃	76.64	25
Conductivity µmhos/cm	²					
@ 25 Deg. C.	730	281853	6100 ₆ ²	789	732	1000
Chloride mg/l as Cl	45	26730	1610 ₆	320	45.5	100
pH	8.1	-----	6.0 ₆	-----	8.1	6.5-8.5
Ammonia mg/l as N	0.70	415.8	350 ₆	70	0.82	1.5
Total Dissolved Solids mg/l	573	340362	5346	1063	575	
Total Alkalinity mg/l as						700
CaCO ₃	258	153252	1225 ₆	244	258.4	305
Sulfate mg/l as SO ₄	123	73062	1080 ₆	214	123.4	
Total Hardness mg/l						10
CaCO ₃	368	218592	1600	318	368.5	250
Sodium mg/l as Na	34.3	20374.4	357	71	34.4	122 ⁴
Cadmium µg/l as Cd	10	5.94	30	0.006	10.0	10
Lead µg/l as Pb	11	6.534	100 ₅	0.020	11.0	50
Arsenic µg/l as As	8.6	5108.4	ND ₅	-----	8.6	50
Selenium µg/l as Se	2.8	1663.2	ND	-----	2.8	10
Fluoride mg/l as F	0.32	190.08	0.4	0.08	0.320	1.5
Phenols mg/l	0.004	2.376	0.77	0.153	0.0042	0.1
Chromium mg/l as Cr	0.007	4.158	0.05	0.010	0.0070	0.05
Barium mg/l as Ba	0.16	95.04	2.25	0.45	0.161	1
Boron mg/l as B	0.16	95.04	3.0 ₆	0.60	0.161	0.5
Cyanide mg/l as CN	0.4	237.6	0.028	0.006	0.40	0.02
Silver µg/l as Ag	<10	5.94	10	0.0002	<10.0	50
BOD ₅ , mg/l	5.3	3148	1500	298	5.8	--
COD, mg/l	42.5	25245	4490	892	44.0	--

1. Median values from data in Clark and Piskins, Environmental Geology, Volume 1, 1977, unless otherwise noted.
2. $0.65 \times \text{specific conductance} = \text{total dissolved solids (mg/l)}$,
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 be equal to 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, 1970.

The 17-acre landfill expansion would have two direct impacts on wetlands in the area. Since it is probable that there is some leachate contamination of wetland areas presently, any horizontal expansion would increase the amount of leachate seeping from the landfill, therefore, increasing wetland area contamination. The second impact is that the small wetland area WI, located on the expansion area will be filled in. Any wetland habitats supported by WI will be eliminated when WI is filled in.

Direct or Indirect Effects That Cannot be Avoided

As a result of the proposed expansion there may be a minor increase in the rate of leachate discharge to the Minnesota River, a direct effect that cannot be avoided. 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 holding capacity. Given attenuation of the leachate by dilution in the river, the effect of leachate on the river, including minor increases in its rate of discharge, will be negligible.

The River and adjacent 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 adjacent 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 these 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 adjacent wetlands may be impacted by the filling activities of the landfill operation, including those associated with the filling of the proposed expansion area. 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. Future use of the wetlands should be carefully determined. Other long-term impacts on surface water resources should not result from the activities of the landfill including those associated with the proposed actions.

Cumulative Impacts

There will be some minor cumulative impacts on the water quality of the Minnesota River due to very small added pollutant loadings from the expansion. However, due to the overall poor quality of the River and the relatively insignificant contribution of the expansion, no substantial cumulative impacts are predicted.

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 ground water intercepted by existing water supply wells as well as the ground water predicted to be potentially influenced by the expanded landfill are shown in Figure IV-1. There will be no impacts on local water supplies from the proposed expansion since the ground water potentially impacted by the landfill expansion does not intersect the envelopes of flow intercepted by water supply wells.

The area potentially impacted by leachate from the expanded landfill is currently restricted from use by two factors. Most of the area between the landfill and the river is designated as floodway. No development in the floodway is allowed and therefore no wells will be placed in this area. In addition, 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 Interstate 35W and within the downtown area of Savage. The expansion of the Burnsville water supply wells is planned to occur east of Interstate 35W and Savage has no plans for expanding its water supply system. The area between the river and the landfill that is not in the floodway is owned by Cargill and there are no plans to develop this area.

The proposed expansion will not impact any existing water supply wells at their current pumping rates. The potential does exist for impacting water supply wells if 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 and the area between the landfill and the river that is not in the floodway is owned by Cargill and no development is expected.

Direct or Indirect Effects Which Cannot be Avoided

The existing landfill and the proposed landfill expansion have the potential to impact the local ground water in the vicinity of the landfill as shown on Figure IV-1. This portion of the ground water aquifer, therefore, is precluded from being used as a water supply.

Irreversible and Irretrievable Commitment of Resources

The area impacted by leachate from the landfill will be precluded for use as a local water supply.

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

Precluding the use of the area shown on Figure IV-1 from use as water supply will allow the safe disposal of refuse at this location for six to seven years.

Cumulative Impacts

There are no cumulative impacts on the local water supply from the proposed action.

S0001M

TERRESTRIAL AND AQUATIC ECOLOGY

VEGETATION AND WILDLIFE

Primary Impacts

Construction activities associated with the proposed actions include preparing the expansion areas (horizontal and vertical) for refuse disposal, construction of an access road to the horizontal expansion area, and the construction of a flood protection dike around the horizontal expansion area. In effect, all existing vegetation in the proposed horizontal expansion area and revegetated portions of the existing landfill will be removed by these activities. This will eventually include the removal in the horizontal expansion area of approximately one-half to one acre of wetland, one-half to one acre of mixed trees and 15 acres of intermediate shrubs/grassland. This compares to 85 acres of vegetation already removed by the existing landfill operation. Some of this area, however, has been revegetated.

Wildlife populations associated with area plant communities are likely supported by vegetative cover on revegetated portions of the existing permitted landfill, the horizontal expansion area and surrounding area. Vegetation provides a limited food source for deer and rodents and nesting areas for a variety of small song birds. These and other species utilizing the horizontal expansion area and revegetated portions of the existing landfill will be displaced during the construction stage of the proposed actions. The movements of deer, fox, weasels and other mammals will also be restricted during construction activities, primarily during daylight hours.

The indigenous vegetation and associated wildlife species located on the proposed expansion areas 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 horizontal and vertical expansions will not result in significant direct impacts on terrestrial populations.

The operating phase of the landfill with respect to the proposed expansion areas 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 horizontal and vertical expansion area operations.

The closure phase of the horizontal and vertical expansion areas 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.)

Direct or Indirect Effects That Cannot Be Avoided

Construction activities associated with the proposed horizontal and vertical expansion area, particularly the excavation and fill procedure, will unavoidably eliminate vegetation on the areas involved. Reduction of vegetation will, in turn, decrease the habitat of associated wildlife populations. This action will also have a minimal effect on areawide predator populations faced with a decrease in their food supply. While considerable time will lapse between replanting and full restoration of a vegetative cover, and consequent reintroduction of associated wildlife species, impacts are generally not substantial.

Filling of the horizontal expansion area will have an additional direct impact; it will eliminate the lowland topography which currently exists and create a highland topography. This will in turn eliminate some wildlife populations which currently exist in the lowland from this area permanently.

Irreversible and Irretrievable Commitments of Resources

During construction activities, various tree stands, intermediate shrubs and grassland areas will be removed mostly in the horizontal expansion area. Mixed stands consisting of aspen, willow, elm and poplars represent the climax vegetation for the site. A climax population is not replaceable in a short amount of time. Elimination of these stands would not, however, be a significant impact upon the area's vegetative resources.

No significant irreversible or irretrievable commitments of vegetation or wildlife resources are associated with the operational, closure and post-closure phases of the proposed horizontal and vertical expansions.

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

The primary short-term impact associated with the proposed expansion activities will be the removal of vegetation from the horizontal expansion area and vegetation on previously completed areas of the 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.

Filling of the proposed horizontal expansion area eliminates approximately 17 acres from natural ecological production. Operation of the facility with both the horizontal and vertical expansion, however, should result in secure disposal of an additional 2,400 acre-feet of refuse over a period of six to seven years.

No significant short-term impacts are expected due to closure and post-closure activities of the horizontal and vertical expansions. Beneficial long-term impacts would include the designation of approximately 107 acres for open space and light industrial purposes after the facility's closure.

Cumulative Impacts

The proposed horizontal expansion will add 17 acres to an existing acre landfill. Although the horizontal expansion area contains several types of habitat communities, the relative impact will be minimal compared to destruction of the surrounding vegetation that has already occurred on existing permitted areas of the landfill. Essentially, both habitat and feeding areas for most mammals and some birds will be eliminated.

No significant cumulative impacts are expected from operation of the horizontal and vertical expansion areas or during the closure and post-closure periods associated with the expansion areas.

AQUATIC ECOLOGY

Primary Impacts

The most significant water body which might be affected by leachate from the proposed expansion is the Minnesota River. The impact analysis calculations from the dilution model indicated that levels of ammonia, BOD, phenols, COD and barium may increase slightly due to the leachate from the expansion. However the relative increase from the leachate will not cause violations of the water quality standards. The greatest increase is by ammonia which may change by as much as seven percent during "worst case," low flow conditions.

Most fish and other mobile organisms 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.

There is no aquatic ecology data on the small ponds adjacent to landfill to determine if any primary impacts will occur in these oppn water bodies.

Direct or Indirect Effects Which Cannot Be Avoided

The most significant effect of the expansion on aquatic ecology is leachate contamination of the River.

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 low amount 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. Although only very minor increases in pollutant levels are predicted due to 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 water is also a long-term advantage of the expansion.

Cummlulative 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

The wetland area located in the horizontal expansion area will be eliminated with the filling of that area. The wetland areas surrounding the landfill (see Figure III-12) will be maintained according to present plans. There is the potential for soil erosion from the activities of the proposed horizontal and vertical expansions; however, the impact on surrounding wetlands appears to be negligible.

Leachate and landfill gas production will occur during operation, closure and post-closure activities associated with the proposed horizontal and vertical expansions. 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, final cover should substantially reduce leachate quantities.

Direct or Indirect Effects that Cannot be Avoided

The wetland area in the horizontal expansion area will be filled in if the expansion is approved, a direct effect that cannot be avoided. However, elimination of this small wetland area would not have a significant impact on the areas. The size of this wetland is small in comparison to the total available wetland resources in the area.

Irreversible and Irretrievable Commitments of Resources

The wetland area in the horizontal expansion area will be filled in if the proposed expansion is approved, an irreversible commitment of a wetland resource. Wetlands play a vital role in retention and release of water and stabilization of streamflow and lake levels. During periods of flooding, wetlands act as storage basins by impounding water in open ponds and storing water in their organic soils. Wetlands also play a role in upgrading runoff water quality acting as a soil filter; nutrients absorbed by the organic soils are then assimilated by the highly productive vegetation. These nutrients are retained as production exceeds decomposition in a wetland. Finally wetlands function as a settling system by remaining suspended matter from runoff.

As discussed above, elimination of the small wetland in the horizontal expansion area would not have a significant impact on wetland resources. The size of this wetland is very small in comparison to the total available wetland resources in the area.

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

In the short term, the wetland area in the horizontal expansion area will be minimally stressed by activities of the proposed expansion before it is filled in. The use of appropriate mitigative measures will limit short-term and long-term impacts on the surrounding wetlands. No significant adverse impacts are expected.

Cumulative Impacts

The proposed horizontal expansion will extend the landfill area adjacent to the wetland area WII (see Figure III-12). Surface water runoff from this expansion area would drain into WII. However, some surface drainage from the present landfill operation already drains to this area. The lack of significant impacts of this area by the existing landfill operation is apparent from the abundant productivity of wetland WII. Additional impacts from the horizontal expansion would not be significant.

RARE AND ENDANGERED SPECIES

Primary Impacts

There are no rare or endangered species in the landfill area, with the exception of some bald eagle sitings in the Minnesota River Basin area. No significant impacts will occur on-site or in the surrounding area as no bald eagles have been sited on or very close to the landfill area.

Direct or Indirect Effects That Cannot be Avoided

There are no bald eagles 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 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.

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SOCIO-ECONOMICS

LAND USE, ZONING

Primary Impacts

A significant impact of the proposed action on future land use is the delay of Burnsville'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 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 expansions 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 horizontal and vertical expansion areas will have no significant impact on the short-term uses of man's environment. Upon the landfill's closure, the site could be used for light industrial or open space recreational purposes which will enhance the long-term productivity of the area.

Cumulative Impacts

The proposed actions 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 and horizontal expansion areas 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 6.5 million cubic yards of municipal refuse and thereby eliminate the need for alternative disposal methods.

Cumulative Impacts

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

TRANSPORTATION

Primary Impacts

The proposal expansion will result in extending the use span of the landfill rather than to accommodate greater annual volumes of refuse. Also, the existing watershed 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:

- 1) Traffic congestion in vicinity of landfill,
- 2) Traffic operations deficiency at I-35W/Cliff Road interchange,
- 3) Litter on local streets in vicinity of landfill.

Direct or Indirect Effects that Cannot be Avoided

The proposed action will extend the existing principal haul routes by approximately six years.

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 six-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 six-year extended use of the established haul routes resulting from the proposed action will have no significant cumulative impact.

COLLECTION AND MANAGEMENT SYSTEM COSTS

Primary Impacts

Filling of the proposed expansion area will extend the life of the Burnsville Sanitary Landfill by about six years. Area haulers that 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 Burnsville. Disposal charges presently at the landfill are higher than surrounding competing landfills (see Section III, Socio-Economics, Pine Bend Sanitary Landfill Environmental Impact Statement).

Filling of the proposed expansion area will also extend the timeframe for the need to develop new landfills in the Region (see Section VI, Alternatives Pine Bend Sanitary Landfill Environmental Impact Statement). Hennepin County (1979) found, for example, that it will cost between \$3.5 and \$4 million to develop a 120-acre 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 Burnsville expansion 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 areas.

Direct or Indirect Effects that Cannot be Avoided

Filling of the proposed expansion areas will extend the life of the Burnsville Landfill and subsequently 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 areas 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 actions.

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 actions.

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

The proposed actions 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 Burnsville as a result of using the expansion areas, is the extension of the Metropolitan Area's landfill capacity. The expansion will add about 11 months of life to the metropolitan disposal system. Filling the expansion areas 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 actions are 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 actions.

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 actions.

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 actions 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 areas will result in the landfill operating about 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 expansions will create an isolated mound virtually level with the opposing bluff top in Bloomington.

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 areas, a direct effect that cannot be avoided.

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 actions.

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.

BURNSVILLE SANITARY LANDFILL EXPANSION

SECTION 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.

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.

The following are other mitigative measures that might be undertaken to further reduce potential impacts from air pollutants.

- Provision of dust control via surface paving
- Reduction of dust generation via prompt revegetation

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.

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WATER QUALITY

GROUND WATER QUALITY

Ground water monitoring since 1971 has shown some degradation of ground water 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 Burnsville 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 and the additional cost to the project would be prohibitive.

SURFACE WATER QUALITY

Surface water monitoring has shown seasonal degradation of water quality in the drainage ditch east of the landfill. However, analysis of the impact of expansion on the surface water quality revealed only minimal changes in four parameters and no measurable change in the other 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.

Surface leachate in the form of toe seeps has been a problem. Mitigative measures for this problem have been practiced by the landfill operator. A trench has been constructed in the area of the seeps. Gravel is placed at the bottom of the trench, then the trench is filled with sand. As the sand becomes saturated with leachate, it is removed and deposited in the landfill and is replaced with clean sand. This is a bi-weekly occurrence during the 7 frost free months, April through October.

Another 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 will continue.

LOCAL WATER SUPPLY QUALITY

There is little potential for contamination of local water supply due to the expansion because of the distance to any local well. In addition, development is prohibited within the area of potential leachate influence between the landfill and the Minnesota River due to floodway designation. Therefore, no mitigative measures are recommended.

TERRESTRIAL AND AQUATIC ECOLOGY

CONSTRUCTION

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

OPERATION

Impacts associated with operation of the proposed horizontal and vertical expansion areas include impacts on vegetation, wildlife, and aquatic ecology as caused by surface runoff, leachate production and methane gas migration. A 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 noticeable.

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 areas will not produce any significant adverse effects on the existing land use or zoning. The expansions 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 actions will have no impact on public facilities in the landfill area. No mitigative measures are, therefore, necessary.

TRANSPORTATION

Only one (Burnsville) of the six municipalities most directly affected from the hauling of refuse to the landfill has identified existing adverse effects that might continue under the proposed action. These adverse effects and suggested mitigative measures are given in Table V-1.

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

<u>Identified Adverse Effect</u>	<u>Suggested Mitigative Measure</u>
Traffic congestion at TH 13/ Dupont Avenue South inter- section resulting in part from landfill hauling.	Recommend to City of Burnsville to study the general vehicle circulation pattern in the vicinity of the landfill and the continued need for three separate direct-access links (via city streets) to the landfill. Develop a haul truck routing plan.
Traffic operations deficiency at I-35W/Cliff Road inter- change	Recommend to the Minnesota Department of Transportation to study the traffic opera- tions and safety factors at the I-35W/Cliff Road inter- change. Identify and enforce use restrictions as necessary until identified.
Litter on local streets in vicinity of landfill.	Appropriate citation for inade- quately covered refuse trucks.

COLLECTION AND MANAGEMENT SYSTEM COSTS

The proposed actions 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 areas cannot have any influence on historical or archaeological considerations. Therefore, no mitigative measures are necessary.

AESTHETICS

The proposed actions 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.

BURNSVILLE SANITARY LANDFILL

SECTION 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.

Table VI-1

Base Data For Regional Landfill System

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	<u>245</u>	<u>0</u>	<u>245</u>	<u>40</u>
7-County Region Total	12,704	9,114	21,818	2,611

6. A subregional scenario was used to predict effects of other landfills' closing on Burnsville Sanitary Landfill. Louisville, Flying Cloud, Freeway and Pine Bend were determined to have the greatest impact on Burnsville'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.

Results of this analysis are as follows. If all landfills, including Burnsville, are granted expansions, then Burnsville landfill will close in 1988. If Burnsville landfill is not granted the expansion, it will close in late 1982, approximately six years earlier. Figure VI-1 represents this subregional system in reference to Burnsville 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 Burnsville Sanitary 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.

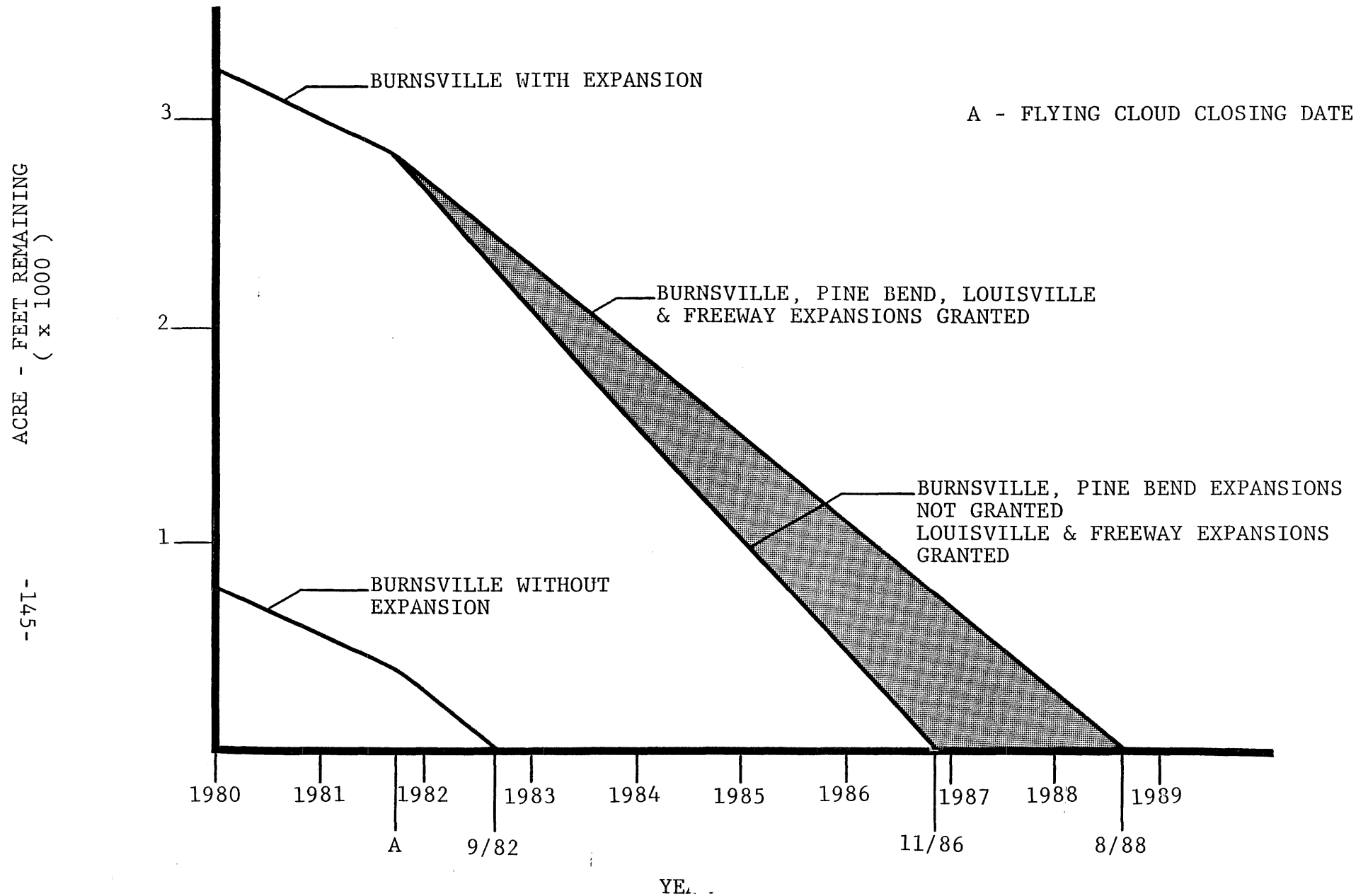
As noted earlier, if Burnsville is not granted the expansion, it will close in late 1982. The haulers using Burnsville Sanitary Landfill will then have to dump their loads at other landfills which are still open. This may result in increased nonproductive driving time for some haulers. Both labor and 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 2418 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.

Figure VI - 1

BURNSVILLE DISPOSAL CAPACITY PROJECTION



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.

If the entire site (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 one year 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 Burnsville Sanitary Landfill represents about five percent of the Region's landfill capacity needs without any expansions through the year 2000.

ENVIRONMENTAL IMPACTS

The expansion represents 2418 acre-feet of additional refuse material. This added quantity of refuse will increase the total leaching potential of Burnsville Sanitary 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 volume of refuse only.

SITE SPECIFIC DESIGN ALTERNATIVES

SURFACE WATER RUNOFF CONTROL

Surface water runoff control at a sanitary landfill is achieved by grading the final slopes to promote runoff and to minimize percolation, and by vegetating the side slopes to prevent soil erosion.

At Burnsville Sanitary Landfill, natural drainage is generally away from the fill. The drainage ditch to the east of the site carries surface water from the east and south sides of the fill to the Minnesota River. The west and north sides of the landfill drain directly to the Minnesota River.

The proposed project will expand the existing facility by 17 acres to the west and south. The drainage pattern already established by landfilling will not be appreciably affected by the proposed expansion.

No additional or alternative surface runoff controls other than those in the proposed site development plans are necessary.

LEACHATE CONTROL

The Burnsville Sanitary Landfill was converted from an existing dump site when permitted in 1971. At that time a determination was made that a liner beneath the refuse would not have to be installed. Ground water and surface water monitoring since 1971 have shown degradation of ground water and some seasonal degradation of surface water quality in the drainage ditch east of the landfill. However, the ultimate discharge of both ground water and surface water is the Minnesota River, which has not shown measureable contamination that can be attributed to the Burnsville Sanitary Landfill. Land use between the landfill and the Minnesota River is severely limited due to the floodway designation of the land.

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 not be visible and the additional cost to the project would be prohibitive.

Any leachate treatment system will vary depending on site conditions which influence flows and pollutant loadings. Capital costs for treatment facilities can vary from an estimated \$85,000 (for leachate with low strength pollutant loadings) to \$600,000 (for leachate with high strength pollutant loadings). The alternative to no liner and leachate control is continued extensive monitoring of ground water for possible effects during the active filling period and postmonitoring for a period (as yet unspecified) following final closure of the landfill.

Surface leachate in the form of toe seeps has been a problem. Mitigative measures for this problem have been practiced by the landfill operator. A trench has been constructed in the area of the seeps. Gravel is placed at the bottom of the trench, then the trench is filled with sand. As the sand becomes saturated with leachate, it is removed and deposited in the landfill and is replaced with clean sand. This is a bi-weekly occurrence during the 7 frost free months, April through October.

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

GAS CONTROL

The existing Burnsville Sanitary Landfill has no special gas control system installed, nor does the proposed lateral expansion contain a provision for such control. The landfill, to date, has had no

problems with gas or odor problems beyond the landfill site and no such problems are anticipated with the expansion. In addition, no permanent buildings are located on or near the landfill which would pose a problem due to landfill gas accumulation.

Burnsville Sanitary Landfill has not proposed installation of a methane gas recovery system in conjunction with the lateral and vertical expansion of the landfill. Such a system, if determined economically feasible, could provide for an energy resource from a waste source and supply methane gas to industrial facilities located nearby for an appreciable period of time.

For discussion of the following sections pertaining to alternatives to the proposed expansion, refer to Draft Environmental Impact Statement on the Pine Bend Sanitary Landfill Expansion, April 29, 1980 (available upon request of the Metropolitan Council):

SITE SPECIFIC DESIGN ALTERNATIVES (continued): Compaction,
Shredding, Bailing
WASTE REDUCTION
ENERGY RECOVERY

MATERIALS RECOVERY

Encompassed within this analysis of alternatives to the proposed expansion is the following discussion of materials recovery which provides for material-specific alternatives to any land disposal facility. Materials recovery systems probably are the only reasonable and prudent alternatives to the proposed action that presently exist.

The following information is a summary of the more complete Materials Recovery Alternative Analysis which is available from the Metropolitan Council upon request.

Given the estimate that the Region currently recovers seven to eight percent of the total waste stream, it is possible this recovery rate could be increased to as high as 30 percent utilizing the following systems: residential source separation - 20 percent, corrugated recovery - 5 percent, and leaf composting - 5 percent. This could be accomplished through: government support of existing recycling programs through involvement in public education, staged development of municipal source separation programs to compliment garbage collection, increased picking programs at transfer stations and landfills, and new leaf pick-up and composting programs similar to Roseville's system.

The Metropolitan Council's and MPCA's preliminary cost-benefit analysis of increased materials recovery indicates that there would be a net economic savings to the community if recycling, source separation and composting programs were expanded. This analysis included the total management costs such as: operating, capital transport, disposal and labor. In addition, the community would gain the following secondary benefits: conserved materials resources, conserved energy, increased public awareness of solid waste management problems and new jobs. However, the most important benefit may indeed be saved landfill space.

REFUSE TO ENERGY SCENARIOS

Based upon scenarios developed by the MICA (Metropolitan Inter County Association), refuse to energy facilities will come on line no earlier than mid-1985. Since Burnsville's projected closing date without the expansion is late 1982, there is essentially no possibility for refuse to energy facilities to utilize the refuse generated during that interim period of time.

BURNSVILLE SANITARY LANDFILL EXPANSION

SECTION VII

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

Refer to the Pine Bend Sanitary Landfill expansion environmental impact statement for a discussion of the impact on state government of any federal controls associated with the proposed action.

BURNSVILLE SANITARY LANDFILL EXPANSION

SECTION VIII

MULTISTATE RESPONSIBILITIES ASSOCIATED WITH THE PROPOSED ACTION

GENERAL STATEMENT

The Burnsville Sanitary 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 ground water system will eventually reach the Minnesota River and impact it accordingly. The Minnesota River is an interstate water body 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.

BURNSVILLE SANITARY LANDFILL EXPANSION

SECTION IX

IMPACTS ON COUNTY PLANNING

Refer to the Pine Bend Sanitary Landfill expansion environmental impact statement for a discussion on county solid waste planning.

BURNSVILLE SANITARY LANDFILL EXPANSION

SECTION 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.

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 Burnsville 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 Burnsvillesite 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.

For a further discussion on the Metropolitan Council's Solid Waste Policy Plan and the new Metropolitan Solid Waste Act of 1980, refer to the Pine Bend Sanitary Landfill environmental impact statement.

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 Burnsville 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 Burnsville 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. There are two all-weather, blacktop access roads to the landfill. The primary haul routes are Interstate Highway 35W with access at Cliff Road (formerly 122nd St.), and Highway 13 with access at an unnamed road from a controlled intersection on Highway 13.

The landfill expansion will require the construction of an access road to the horizontal expansion area in Phase 2 as shown in Figure II-8. The new access road will be an all-weather road with a minimum width of 30 feet and a crushed rock surface.

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 Burnsville 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 areas will result in the landfill operating 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.

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 constituents.

Ground water monitoring since 1971 has shown some degradation of ground water immediately underneath the landfill. However, ultimate discharge of ground water is to the Minnesota River, which has not shown measureable 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.

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.

The water quality portion of Section III discusses in detail the water monitoring program at the Burnsville Landfill. The current monitoring plan includes sampling of ground water wells for chemical oxygen demand, pH, chloride, ammonia, and specific conductance. The ground water level is also measured in each well prior to sample collection. The drainage ditch located east of the landfill is monitored for the same parameters at two locations shown in Figure II-7. The wells and drainage ditch are sampled once every three months. All information is reported to the MPCA.

The landfill expansion will require the placement of two new water quality monitoring wells. The new monitoring wells will be constructed using the procedures used to place existing monitoring wells W-2, W-3 and W-4. The wells will be constructed of PVC pipe and screen. The annulus around the well screen will be backfilled with clean sand and sealed at the surface to prevent the direct movement of surface water to the well screen. Well screens will be placed five feet below the ground water surface. The monitoring wells will be placed within two months after approval of landfill expansion unless approval comes during the period October 1 to April 1 in which case the new wells will be placed by June 1.

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.

Litter on the landfill site is controlled by litter control fences and a litter pickup crew. Two fences have been placed on the east edge of the landfill as shown in Figure II-7. One is located at the base of the refuse and the second is located at the top of the refuse. Beginning in the spring of 1980, a portable wind screen will be used near the working face to minimize the amount of windblown litter leaving the working face. Two attendants pick up paper and other litter that may be scattered on the site.

The landfill has been cited a number of times by the MPCA for litter violations.

The location of litter control fences may be changed during the course of the landfill operation; however, a fence will remain in

place along the east edge during the entire operation. Fencing will also be placed along the toe of the dike in the 17-acre horizontal expansion area.

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.

Access to the landfill is controlled by the attendant in the scale house during working hours and by locked gates during nonoperating hours. A night watchman is on duty when the landfill is closed. The landfill area, however, is not fenced and off-road access is possible.

REFERENCES

DESCRIPTION OF EXISTING LANDFILL AND PROPOSED ACTION

Barr Engineering Co. 1980. Application for Permit Modification and Technical Report. Prepared for Edward Kraemer and Sons Inc., Burnsville, Minnesota.

Barr Engineering Co. 1979. Permit Application and Technical Report. Prepared for Edward Kraemer and Sons Inc. Burnsville, Minnesota.

Lorincz, F.T.D. Van Epp, and W.K. Tusa 1980. Environmental Impact Statement for Woodlake Sanitary Landfill Expansion. Technical Work Paper No. 8. Fred C. Hart Associates. Prepared for Minnesota Pollution Control Agency, Roseville, Minnesota.

Metropolitan Council 1979. Solid and Hazardous Waste Management Development Guide/Policy Plan. St. Paul, Minnesota.

Pope-Reid Associates, Inc. 1980. Interim Summary I - Seven County Solid Waste Plan. Prepared for Metropolitan Inter-County Council, St. Paul, Minnesota.

METEOROLOGY/CLIMATOLOGY/AIR QUALITY AND NOISE

Barr Engineering Co. 1980. Technical Background Information on the Burnsville Sanitary Landfill. Prepared for Metropolitan Council, St. Paul, Minnesota.

Kelley, B. and G.M. Sunde 1980. Technical Background Information on the Pine Bend Sanitary Landfill. Prepared for Metropolitan Council, St. Paul, Minnesota.

Kuehmast, E.L., D.G. Baker, and J.W. Enz, 1975. Climate of Minnesota-Precipitation Patterns in the Minneapolis-St. Paul Metropolitan Area and Surrounding Counties. Technical Bulletin 301. University of Minnesota, Minneapolis, Minnesota.

McLaughlin, J.T., T.D. Van Epp, and W.K. Tusa, 1980. Environmental Impact Statement for Woodlake Sanitary Landfill Expansion. Technical Work Paper No. 3. Fred C. Hart Associates. Prepared for Minnesota Pollution Control Agency, Roseville, Minnesota.

Minnesota Pollution Control Agency, 1979. Suspended Particulate Concentrations from MPCA Site Nos. 375, 376, 377. Air Quality Division. Roseville, Minnesota.

U. S. Department of Commerce, 1974. Local Climatological Data, Annual Survey, Minneapolis, St. Paul, Minnesota. Washington, D. C.

Barr Engineering Co. 1980. Technical Background Information on the Burnsville Sanitary Landfill. Prepared for Metropolitan Council, St. Paul, Minnesota.

Metropolitan Council 1978. Leachate Generation Potential From Landfills in the Twin Cities Metropolitan Area. St. Paul, Minnesota.

Minnesota Pollution Control Agency 1972. Water Pollution Control Regulations. Roseville, Minnesota.

Minnesota Department of Health 1978. Public Water Supply Regulations. Roseville, Minnesota.

Minnesota Pollution Control Agency 1980. Metropolitan Area Landfills - Applicable Water Quality Standards. Internal Staff Memorandum Prepared by D. McMichael and B. Schade. Roseville, Minnesota.

Tehobanoglous, G., H. Theisen, and R. Eliassen 1977. Solid Waste-Engineering Principles and Management Issues. McGraw-Hill Book Co., New York.

U. S. Environmental Protection Agency 1979. Draft Environmental Impact Statement On The Proposed Guidelines For The Landfill Disposal Of Solid Waste. Prepared by Fred C. Hart Assoc. for Office of Solid Waste, Washington, D.C.

U. S. Environmental Protection Agency 1978. Draft Environmental Impact Statement-Proposed Regulation Criteria For Classification Of Solid Waste Disposal Facilities. Prepared by Emcon Assoc. for Office of Solid Waste, Washington, D.C.

Brunner, D.R. and D.J. Keller 1972. Sanitary Landfill Design and Operation. U.S. Environmental Protection Agency. Washington, D.C.

TERRESTRIAL ECOLOGY AND AQUATIC ECOLOGY

Brockman, F. C., 1968. Trees Of North America, Golden Field Guide Series. Golden Press, New York.

Brody, K J. M. Machuzak, T. D. Van Epp, and W. K. Tusa 1980. Environmental Impact Statement For Woodlake Sanitary Landfill Expansion. Technical Work Paper No. 5. Fred C. Hart Associates. Prepared for Minnesota Pollution Control Agency, Roseville, Minnesota.

Burt, H. W., R. P. Grassenheider, 1975. A Field Guide To The Mammals. 3rd ed. Houghton Mifflin.

Engel, J. 1980. Personal Communication. U.S. Fish and Wildlife Service.

Esson, J.A., 1979. The Ecological Feasibility of Reclaiming Sanitary Landfills For Wildlife Habitat In The Twin Cities Area (Draft). Prepared for the Metropolitan Council.

Esson, J. Biological Technician. Regulatory Functions Branch, Construction-Operation Division, U.S. Department of the Army Corps of Engineers. Personal Communications, February-March 1980.

Fernald, M.L., 1950. Gray's Manual Of Botany. American Book Co., New York.

Fuller, S.C. 1978. Fresh-water Mussels of Upper Mississippi River. The Academy of Natural Sciences of Philadelphia, No. 78-33.

Gleason, H.A., A. Granquist, 1963. Manual Of Vascular Plants. Dee Van Norstrand.

Henderson, Carrol L. Ningame Supervisor, Section of Wildlife, Minnesota Department of Natural Resources. Personal Communication, March 7, 1980.

Hickok, E.A. 1977. Baseline Environmental Inventory Twin Cities Metropolitan Area, Metropolitan Waste Control Commission.

Mark Hurd Aerial Surveys, Inc. Minneapolis, Minnesota. Site Photos. November 19, 1979.

Kucera, Thomas. Wildlife Biologist. Ecological Services Section. Minnesota Department of Natural Resources. Personal Communication. February 29, 1980.

Leone, I.A., F.B. Flower, E.F. Gilman, and J. J. Arthur, 1979. Adapting woody species and planting techniques to landfill conditions. Field and laboratory investigations. Cincinnati, U.S. Environmental Protection Agency.

Martin, A.C., H.S. Zim, A L. Nelson 1951. American Wildlife and Plants, A Guide To Wildlife Food Habits. Dover Publications, New York.

Metropolitan Council 1979. Solid and Hazardous Waste Management Development Guide/Policy Plan. St. Paul, Minnesota.

Minnesota Department of Natural Resources, 1975. The Uncommon Ones....., St. Paul.

Minnesota Statutes. Chapter 105. Pertaining to Public Waters.

M.S.A. 97-488. Protection of Threatened and Endangered Species.

Mauri, O.J. 1974. A Field Guide To Animal Tracks. Peterson Field Guide Series. Houghton Mifflin Company, Boston.

Parsons, W. D. Chief, Regulatory Functions Branch, Construction-Operations Division, U.S. Department of the Army Corps of Engineers. Personal Communication. March 11, 1980.

Peterson, R. and M. McKenny 1968. Field Guide to Wildflowers. Houghton Mifflin Co.

Peterson, A.R. 1975. Analysis of Composition of Fish Populations in Minnesota's Rivers and Streams. Minnesota Department of Natural Resources. Report 335a.

Petrides, G.A., 1972. A field guide to trees and shrubs. The Peterson Field Guide Series. Boston, Houghton Mifflin Co.

Reiner, Virginia. Hydrologist. Minnesota Pollution Control Agency. Personal Communication. February 8, 1980.

Robbins, C. S., B. Bruun, and H. S. Zim 1966. Birds of North America. Golden Press, New York.

Shaw, S. P., Fredine, C. G., 1971. Wetlands of the United States, Their Extent and Their Value to Waterfowl and Other Wildlife. Circular 39. USDI Fish and Wildlife Service.

Warner, D. 1979. Wildlife Inventory of Lower Minnesota River Valley, University of Minnesota.

Werth, L. et al., 1977. A Wetlands Survey of the Twin Cities 7-County Metropolitan Area. University of Minnesota.

SOCIO-ECONOMICS

Barr Engineering. Co. 1980. Technical Background Information on the Burnsville Sanitary Landfill. Prepared for Metropolitan Council, St. Paul, Minnesota.

Bloomington 1979. Zoning Map.

Bloomington 1973. City Park Plan. Bloomington, Minnesota.

Bloomington 1979. Preliminary Draft Comprehensive Plan - Community Facilities Element.

Burnville 1980. Draft Comprehensive Plan - Land Use Plan.

Citizens League 1975. Taking the Waste Out of Minnesota's Refuse. Committee on Solid Waste. Minneapolis, Minnesota.

Citizens League 1979. Refuse Collection Arrangements in Twin Cities Metropolitan Area. Committee on Solid Waste, Minneapolis, Minnesota.

Clark, R.M. et al. 1971. Cost of Residential Solid Waste Collection. Journal of the Sanitary Engineering Division. Proceedings of the American Society of Civil Engineers. Vol. 403, No. 5.

Harza Engineering Co. and Eugene A. Hickok and Associates. 1978. Environment of the Lower Minnesota River: Social, Administrative and Environmental Constraints. Prepared for the Metropolitan Waste Control Commission Southwest Area 201, St. Paul, Minnesota.

Hennepin County, 1979. Solid Waste Resource and Energy Recovery Study-Part A. Prepared by Ellerbe Associates Inc. and Camp, Dresser and McKee, Inc. Minneapolis, Minnesota.

Kelly B. 1980. Presentation Before Minnesota Legislative Committee on Solid Waste. St. Paul, Minnesota.

Metropolitan Council 1975. Metropolitan Development Guide-Development Framework. St. Paul, Minnesota.

Metropolitan Council 1975. Solid Waste Management Development Guide/Policy Plan. St. Paul, Minnesota.

Metropolitan Council 1979. Solid Waste Management Development Guide/Policy Plan. St. Paul, Minnesota.

Minneapolis Refuse Inc. 1979. Survey of Hauler's Collection Fees for the Twin Cities Metropolitan Area. Minneapolis, Minnesota.

Minneapolis Refuse Inc. 1980. Annual Projection of Rubbish Operation. Prepared by Olsen, Thielen & Co., Ltd. St. Paul, Minnesota.

Minnesota State Planning Agency 1978. Minneapolis-St. Paul: Municipal Expenditures-Refuse Collection. Office of Local and Urban Affairs. St Paul, Minnesota.

Nygaard, D.E. 1980. Solid Waste Collection Alternatives. St. Paul Public Works Department, St. Paul, Minnesota.

State of Minnesota, Dept. of Natural Resources and United States Dept. of Interior Fish and Wildlife Service 1980.

Minnesota Valley National Wildlife Refuge and Recreation Area Interim Report. St. Paul, Minnesota.

Texas Instruments Inc. 1979. 316(a) Demonstration for Black Dog Generating Plant. Prepared for Northern States Power Company, Minneapolis, Minnesota.

Tehobanoglous, G., H. Theisen, and R. Eliassen 1977. Solid Waste-Engineering Principles and Management Issues. McGraw-Hill Book Co., New York.

U.S. Environmental Protection Agency 1978. Draft Environmental Impact Statement-Proposed Regulation Criteria For Classification Of Solid Waste Disposal Facilities. Prepared by Emcon Assoc. for Office of Solid Waste, Washington, D.C.

ALTERNATIVES TO THE PROPOSED ACTION

Barr Engineering Co. and Gordian Associates, Inc., 1979. Minnesota Resource Recovery Plan. Prepared for the Minnesota Pollution Control Agency, Roseville, Minnesota.

Battelle Columbus Laboratories, unpublished data.

Brickner, R.H. and B. Harrison, 1980 "Smaller May Be Better," Waste Age, 11(3), 28-36.

Eifert, M.C., S.J. Levy, and G. Rigo, 1976. Draft Resource Recovery Plant Implementation Guidelines for Municipal Officials.

Ellerbe Associates, Inc., and Camp, Dresser and McKee, Inc. 1979. Solid Waste Resource and Energy Recovery Study - Part A Prepared for Hennepin County, Minnesota.

Pope - Reid Associates, 1980. Background Study for Solid Waste Master Plans, Interim Study I (Draft). Prepared for The Metropolitan Inter-County Council. St. Paul, Minnesota.

Pope - Reid Associates, 1980. Background Study for Solid Waste Master Plans, Interim Study II (Draft). Prepared for The Metropolitan Inter-County Council. St. Paul, Minnesota.

U. S. Environmental Protection Agency 1979. Assessment of the Impact of Resource Recovery on the Environment. Prepared by the Mitre Corporation, Metrek Division for the United States Environmental Protection Agency.

U. S. Environmental Protection Agency, 1978. Engineering and Economic Analysis of Waste to Energy Systems. Ralph M. Parsons, Co.

U.S. Environmental Protection Agency 1979. Draft Environmental Impact Statement On The Proposed Guidelines For The Landfill Disposal Of Solid Waste. Prepared by Fred C. Hart Assoc. for Office of Solid Waste, Washington, D.C.

U. S. Environmental Protection Agency 1979. Small Modular Incinerator Systems with Heat Recovery: A Technical, Environmental, and Economic Evaluation Prepared by Systems Technology Corporation for the Office of Solid Waste, Washington, D.C.

Appendix I

Legal Description

Existing Fill Area

Section 32 of Township 27 North, Range 24 West,

<u>1/4, 1/4 Sections</u>	<u>Parcel Numbers</u>	<u>Landfill Area (Acres)</u>
SE 1/4 of NW 1/4	02-03210-010-35	16.6
SW 1/4 of NE 1/4	02-03210-010-18	37.4
NW 1/4 of NE 1/4	02-03210-010-12	15.1
NW 1/4 of NE 1/4	02-03210-010-23	3.4
NW 1/4 of SE 1/4	02-03210-013-95	<u>11.7</u>
		84.2

Legal Description Proposed Fill Area

Section 32 of Township 27 North, Range 24 West

<u>40-Acre Tracts</u>	<u>Parcel Numbers</u>	<u>Landfill Area (Acres)</u>
SE 1/4 of NW 1/4	02-03210-010-35	28.1
SW 1/4 of NE 1/4	02-03210-010-18	31.4
NW 1/4 of NE 1/4	02-03210-010-12	5.6
NW 1/4 of NE 1/4	02-03210-010-23	3.2
NW 1/4 of SE 1/4	02-03210-013-95	<u>3.1</u>
		71.4

Appendix II.

Chronology of Significant Events - Inspection - Violations

BURNSVILLE LANDFILL

- July 9, 1969 - Letter from the Department of Conservation stating they did not have the authority to permit a landfill in a floodplain.
- October 7, 1969 - Prior to this date, the Lower Minnesota River Watershed issued a permit for a landfill.
- April 19, 1971 - Dakota County Commissioners question MPCA for allowing landfills in the floodplain.
- June 4, 1971 - Burnsville Environmental Council letter opposing landfills in a floodplain.
- June 8, 1971 - State Attorney General letter--Burnsville Landfill as proposed will violate SW Regulations 4 and 6.
- October 19, 1971 - Dakota County issued temporary permit for the operation of the Burnsville Landfill.
- October 19, 1971 - MPCA issued SW 56, a limited permit for the operation of the Burnsville Sanitary Landfill with a variance for municipal wells. This permit will expire on October 14, 1973.
- December 8, 1971 - Violation--dump area too large
 - toxic waste handling improper
 - poor operation
- March 17, 1972 - Violation--litter
 - no toxic waste
- May 19, 1972 - Violation--dump is too large
 - litter
 - surface drainage poor
 - daily cover
 - poor compaction
 - erosion
- June 6, 1972 - Violation--drainage from face
 - daily cover
 - working face too large
- July 10, 1972 - Violation--final cover
- September 22, 1977 - Violation--litter
 - salvaging
 - compaction
 - surface drainage

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- October 6, 1972 - Violation--salvaging
--working face too large
--surface drainage
--poor operation
- March 6, 1972 - Department of Natural Resources letter to MPCA requesting
suspension of the requirement for landfills in floodplain
be protected against flooding until a detailed study of
Lower Minnesota River floodplain is complete.
-
- April 24, 1973 - Violation--daily cover
--litter
--erosion
--salvaging
--dikes being constructed
-
- June 6, 1973 - Violation--working face too large
--salvaging
- November 13, 1973 - Violation--burning brush
--daily cover
--litter
--site maintenance
- April 27, 1974 - Violation--litter
--site maintenance
- July 22, 1974 - Violation--litter
--intermediate cover
--monitoring reports late
- September 17, 1974 - Violation--litter
- November 21, 1974 - Permit modification to allow for an additional 20' of fill,
elevation to 760.
- January 15, 1975 - Violation--litter
- January 30, 1975 - Violation--litter
- April 8, 1975 - Violation--litter
- May 12, 1975 - Violation--daily cover
--burning
--salvaging
--litter

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- June 25, 1975 - Violation--daily cover
--tires in the wetlands
- July 14, 1975 - Letter from the U.S. Fish & Wildlife Service. Objected to
the digging of the ditch and filling in a wetland.
- July 28, 1975 - Violation--monthly reports not in.
- August 8, 1975 - Letter from MPCA to U.S. Fish & Wildlife Service answering
these concerns: only demolition material is to be placed
in the wetlands and then covered; water in the wetlands
appears to be flood waters from the Minnesota River.
- November 5, 1975 - Violation--litter
- January 30, 1976 - Left height will be limited to 8', not 30'.
- March 16, 1976 - Violation (concerns
--final cover
--hazardous wastes storage room not locked properly
- April 14, 1976 - Violation--litter
--daily cover
- May 26, 1976 - Violation--daily cover
--litter control
--monthly reports
- February 1, 1977 - Violation--daily cover
--litter
--burning
--two working faces
- April 15, 1977 - Violation--burning
--litter
--terminal cover
- May 8, 1977 - Violation--daily cover
--litter
--final cover
--salvaging
- May 9, 1977 - Violation--daily cover
--working face too large
--ready-mix placed in ponds to the east
--vegetation

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- July 11, 1977 - Violation--daily cover
 - surface drainage
 - plan compliance
- August 4, 1977 - Violation--daily cover
 - working face too large
 - intermediate cover
 - salvaging
- September 26, 1977 - Violation--terminal cover
 - operating reports
 - plan compliance
- October 21, 1977 - Violation--litter
 - daily cover
 - plan compliance
- November 9, 1977 - MPCA approves plans for the dike construction
- July 19, 1978 - Corps of Engineers approves permit to construct the dike.
- December 26, 1978 - Violations--daily cover
 - working face too large
- January 17, 1979 - Violation--working face too large
- May 7, 1979 - Operational reports are 1½ years behind.
- April 20, 1979 - Violation--litter
 - cover
 - leachate
- May 3, 1979 - Violation--leachate
 - working face too large
 - daily cover
 - final cover
- June 1, 1979 - Violation--leachate
 - working face
 - daily cover
 - intermediate cover
- July 2, 1979 - Violation--daily cover
 - intermediate cover
 - final cover
 - leachate
- August 1, 1979 - Violation--leachate
 - daily cover
 - final cover
- September 5, 1979 - Violation--leachate
 - daily cover
 - intermediate cover
 - final cover
 - vegetation