HENNEPIN COUNTY RESOURCE RECOVERY PROJECT

DRAFT ENVIRONMENTAL IMPACT STATEMENT

PART 1: THE PROPOSED RESOURCE RECOVERY PROJECT

For Purposes of Public Meetings on

January 15 and 16, 1986

Metropolitan Council of the Twin Cities Area
300 Metro Square Building, 7th and Robert Streets
St. Paul, Minnesota 55101 Tel. 612 291-6359

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1. PROJECT DESCRIPTION

1.1 Resource Recovery Facility

Hennepin County has proposed to construct a 1000 tons per day resource recovery facility and a system of four solid waste transfer stations. The resource recovery facility would be located in Minneapolis, MN at Seventh Street and Sixth Avenue North at a location known as the Greyhound site. The resource recovery facility will be a mass burn type and will cogenerate steam and electricity from the burning of solid waste. The transfer stations will be located at sites in Bloomington, Brooklyn Park, Hopkins and Minneapolis (see Fig. 1.1-1).

This section describes the design and operational features of the proposed resource recovery facility. Information provided includes a discussion of the development of the site, a description of the processes involved, process control methods, operational procedures, mass, energy, and water balances, and environmental control features.

1.1.1 Site Development

Greyhound Site Location and Description

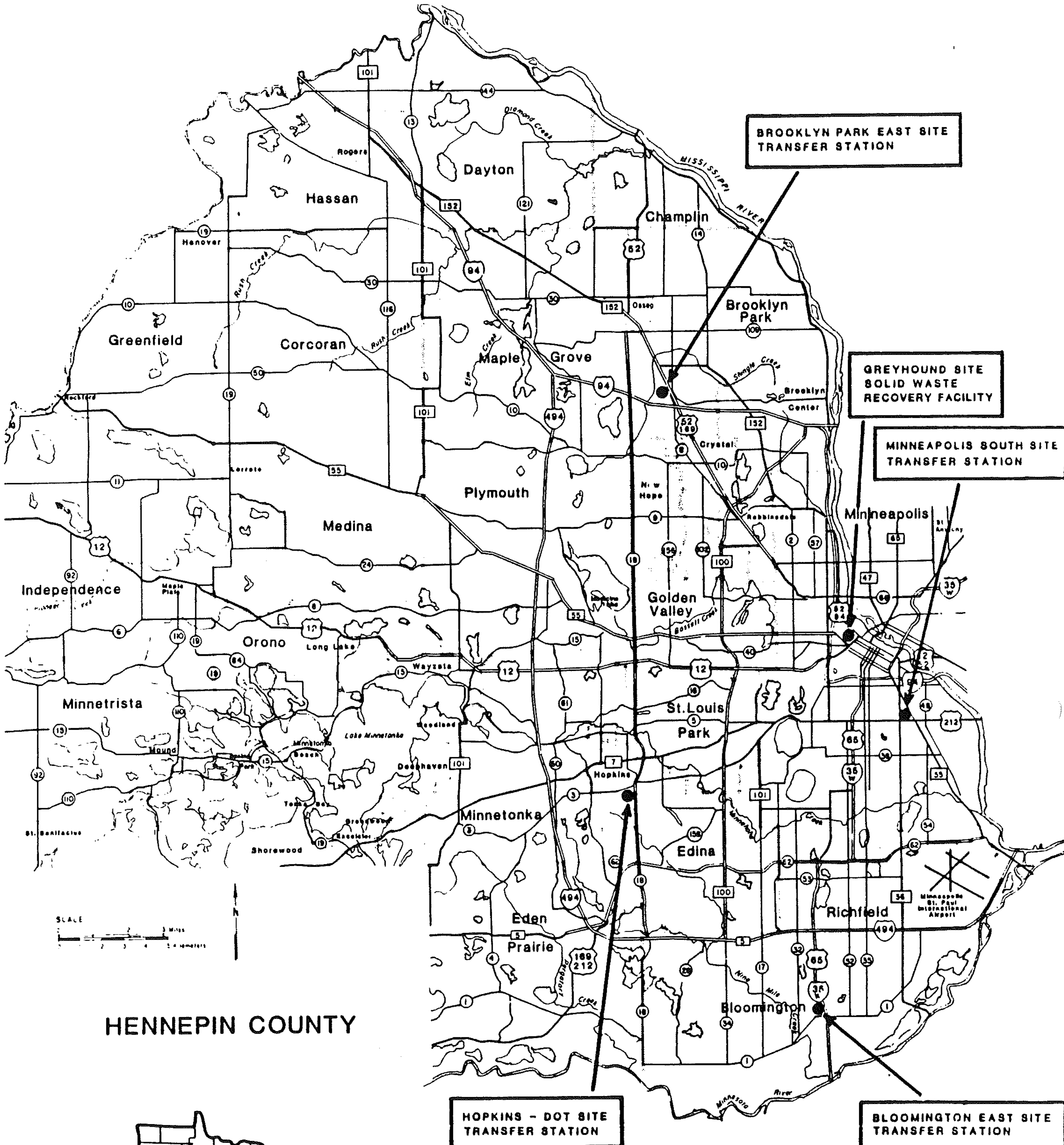
The proposed facility will be located between Fifth Street North and Seventh Street North and between Sixth Avenue North and the operating Burlington Northern railroad tracks (see Fig. 1.1-2). The site, now used by Greyhound, covers 14.6 acres and varies in elevation from about 830 to 855 feet. The site is currently occupied by a 56,000 square foot office building (Insty Print), the Greyhound garage facility and a railroad spur. While the bus garage will be removed, the office building will be retained and used for administrative purposes. Existing access to the site is via Sixth Avenue North.

Access Roadways

A permanent entry driveway for all vehicles will be located at a traffic signal on Sixth Avenue North, opposite the Metropolitan Transit Commission (MTC) garage entrance. The access road will be approximately 26 feet wide, 1,100 feet long, and will be reinforced concrete paving on compacted base and subbase designed for 20% above the Minnesota Department of Transportation (DOT) axle load legal limits. There will be approximately 350 feet of queuing space between the facility entrance and the weigh station. Refuse truck maneuvering will be accomplished in a completely enclosed tipping hall. All other on-site driveways will be 12 feet wide per lane and will be asphalt pavement. Parking for employees plus ten visitor vehicles will be provided near the administration building.

Building Layout and Structure

The facility will be located centrally on the site. The existing office building in the northeast corner of the site will be used for administrative purposes.



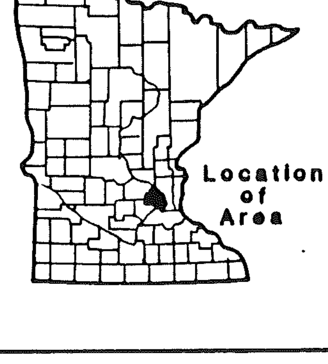


Figure 1.1-1

Hennepin County
Resource Recovery Project

Figure 1.1-2 Proposed Greyhound Location.

The facility will be a flat-roofed steel framed structure with concrete slab floors, steel grating platforms and walkways, steel deck roofs, and insulated metal wall siding panels. Interior walls and partitions will be insulated against thermal or sound transmission, where applicable. Suspended acoustical ceilings will be used in the finished administration areas. Architectural materials and equipment will be in accordance with established codes and methods.

Structures will be constructed on a system of pile supported foundations. In design and construction of the facilities, all applicable building codes will be met including the Minnesota State building code.

Heating, ventilation and air conditioning will be provided for personnel comfort and process needs. The tipping hall and refuse bunker will be continuously ventilated by drawing primary combustion air through the area. The boiler building will be ventilated by suction ducts and roof-mounted exhaust fans. Process area ventilation will be provided.

For fire protection, two 500 GPM water cannons will be installed in the bunker area and there will be an automated sprinkler system in the administrative support areas. The source of water for both systems will be connected to the main building fire water system. Further fire protection measures will include the following:

- six hose stations in the boiler house;
- a deluge type sprinkler system in the cooling tower;
- a halon fire suppression system in the central control room;
- fire extinguishers in selected areas as required by the National Fire Protection Association (NFPA)

All process, potable, and fire water will be supplied by the City of Minneapolis water distribution system. A single metered connection will be made to the 12-inch main along Sixth Avenue North or the 8 inch main along Fifth Street North.

1.1.2 Process Description

The proposed facility will consist of two waste processing lines, each capable of burning 606 tons of waste per day. The two process trains will operate independently and will include a combustion air system, grate system, boiler, flue gas economizer, spray drier, dry scrubber baghouse, induced draft fan, stack flue and auxiliaries required for operation. Both process trains will supply steam to a 37.5 Megawatt (MW) condensing turbine-generator set with controlled extraction capabilities to supply process steam for export purposes.

The boilers are designed for the combustion of municipal solid waste with heating values up to 6,500 Btu/lb and will generate 288,850 pounds per hour of steam at 630 pounds per square inch gauge (psig) and 752°F. Net electric energy produced will be distributed via the Northern States Power Company electric grid. The County also intends to produce steam for distribution to downtown Minneapolis users.

The facility is designed to operate continuously, 365 days per year, with the throughput capability to accept and process an average of 365,000 tons per year of municipal solid waste. Refuse will be received six days per week, Monday through Saturday (except for stipulated holidays). The resource recovery facility will be operated 24 hours a day, 7 days a week, including holidays.

Each of the major systems of the process is described below.

Solid Waste Receiving, Storage, and Handling

All vehicles will enter the facility from Sixth Avenue North. Municipal solid waste (MSW) collection trucks will proceed directly to the weigh station to be processed for record/billing purposes. Trucks will then proceed to the tipping hall to discharge their loads into the bunker. The only fuel used in the combustion units during normal operation of the facility is MSW. Identified Non-processible MSW will not be permitted to enter the tipping hall. Trucks containing this material will be redirected to a designated disposal site. There are nine tipping bays located within an enclosed tipping hall and truck maneuvering area. Drivers will be directed to selected bays.

Wastes will be discharged into a refuse bunker. The refuse bunker will be constructed of reinforced concrete. Truck exhaust and odors will be pulled into the refuse boiler by maintaining negative air pressure. The bunker will be designed for a holding capacity of about 3,000 tons of MSW below the tipping floor level. By stacking against the walls about 5,300 tons of additional refuse can be accommodated resulting in a total bunker capacity of 8,300 tons.

The refuse bunker will contain two full span, overhead traveling bridge cranes. Each crane will be operated from a remote air conditioned pulpit. Each crane will be equipped with a ten cubic yard grapple. The overhead crane will pick up refuse to be mixed and then conveyed to the boiler. The mixing will help to achieve a uniform combustible mixture. All normal furnace loading and refuse mixing operations will be performed by one crane. There will be a 100 percent capacity back-up crane available.

Combustion System

The facility will be equipped with two waterwall mass burning units, each sized to process 606 tons per day maximum capacity and 500 TPD annual average capacity of municipal solid waste.

Charging Hoppers and Chutes

The refuse cranes will discharge refuse into the grate feeding hoppers. The hoppers, together with cut-off gates and water cooled feeding chutes will form the refuse feeding system. The solid waste will flow by gravity from the feed hopper into the chute, which will hold a ready supply of solid waste to feed the grate. A ram feeder will push solid waste from the feed chute onto the grate. The ram feeder will then retract, and be ready to inject more solid waste onto the grate.

Furnace Grate System

Blount proposes to use the Widmer+Ernst massburn technology, imported from Europe. The Widmer+Ernst (W+E) technology includes a grate made of alternating rows of moveable and stationary overlapping bars. A forward and backward motion of the bars moves the waste along the grate at variable controlled speeds. Each alternating set of moveable bars operates in an opposite direction which results in the pushing of MSW along the grates. Because of this bar arrangement, the system is termed a double motion overthrust grate.

The technology includes double motion of the moveable grate bars, a high pressure drop across the grate bars, horizontal grate surface, and microprocessor control of the combustion process. The moveable grate bar rows work opposed as well as towards each other. This double motion results in a gentle tumbling of the waste material during incineration. The horizontal design provides for a controllable advance of the waste and prevents incompletely burned out material from passing through the furnace.

As waste moves along the grate, it passes through four distinct zones: the drying zone, the ignition zone, the combustion zone, and the post-combustion zone. When the rows of the grate bar move backward and away from each other, refuse and ignited particles sink into created voids. Subsequently, as the grate bars move toward each other, the refuse layer rises and ignites.

Combustion Chamber

The combustion chamber is designed to combust the waste. One of the most important functions is the blending of the flue gas mixture resulting from the combustion process. The facility is designed to maintain a temperature of 1800°F for a period in excess of two seconds in the combustion zone after the introduction of secondary air.

The W+E combustion chamber is designed to provide:

- Large chamber capacity in proportion to the heat released by the waste;
- Combustion chamber design to induce vortex mixing by providing a "vortex nose";
- Location of secondary air nozzles in front and rear wall;
- Provision for high velocity, high pressure secondary air;
- Air cooled sidewalls in high thermal load areas; and
- Flue gas guiding walls above post combustion and refuse feed zones.

The combustion chamber will be equipped with auxiliary burners to be used primarily for plant start-up and to aid in maintaining a temperature of 1800°F in the combustion chamber at lower operating levels. After the combustion chamber reaches a preset temperature, the burners will be shut off. Fuel will be reintroduced if the temperature drops. During normal operations auxiliary fuel will not be required to maintain temperatures at the 1800°F level.

Heat Transfer System

The flue gas will leave the combustion chamber above the grate and flow through three radiant boiler sections. The gas will make two 180° turns and flow from one radiation section to the next. The convection section of the boiler consists of the evaporator, superheater, and economizer surfaces. Deaerated and treated boiler feedwater will be pumped into the economizer section. From the economizer, it will enter the boiler drum from where it will flow to the convection evaporator. The steam-water mixture will return to the steam drum, from where dry steam will be routed to the superheater.

Salient features of the design will include:

- o Gastight boiler casing utilizing a waterwall design in the radiant and convection sections (except for the economizer);
- o Closely coupled combustion system and boiler;
- o Blending of flue gases and even temperature distribution through introduction of high velocity secondary air and multiple changes in flue gas direction;
- o Low flue gas temperatures at the convection section inlet to avoid corrosion and fouling;
- o Cleaning of heating surfaces by means of mechanical rapping;
- o Vertically hung convection sections for precipitation of fly ash from the flue gas; and
- o Access for inspection and maintenance.

Each boiler will produce 144,425 pounds per hour of superheated steam at 752°F and 630 psig, when fueled at a rate of 50,500 pounds per hour of 5200 Btu per pound (design) refuse. Higher boiler steam conditions could result in faster deterioration of the superheater sections.

Boiler auxiliary equipment will include demineralizers, condensate polishers and the feedwater system. The demineralizer consists of two trains of cation and anion exchangers, and will treat water prior to entry into the high pressure boilers. The nominal capacity of each train will be 75 gpm. In parallel operation, the combined capacity will be 150 gpm.

Condensate will be pumped from the hot well through the feedwater heaters to the deaerator and feedwater storage tank. The feedwater will be preheated in a low and intermediate pressure feedwater heater. Feedwater heaters will be equipped with bypass and safety equipment.

Ash Handling System

At the design firing rate, about 23,400 lb/hour of total residue (dry weight) will result. The residue is typically about 10 percent by volume and 25 percent by weight of solid waste from which it was produced. Less than 5% (by weight) combustible matter will be contained in the ash.

As the ash residue leaves the end of the grate in the combustion chamber, it will fall through a chute into a quench basin of the ash ram discharger where it will be cooled. A direct driven hydraulic ram will compress the ash and remove most of the water. The ash will be transferred by conveyors to an enclosed storage building.

Fly ash collected from the scrubber and captured in the baghouses will first be conditioned and then combined with the bottom ash on the transfer belt conveyor and further mixed within the residue storage building. A ferrous metal recovery station will separate the ferrous metal. About 3,600-4,500 lb/hour of ferrous metal is expected to be recovered from the residue.

The residue, bottom ash, and fly ash when combined are expected by the applicant to be chemically inert. Non-ferrous residue will be loaded by front end loaders into trucks and transported to an approved landfill for disposal.

Energy Production and Export

Energy recovered in the form of steam and not used as process steam will be converted into electrical energy in a conventional turbine-generator. The power generation facilities will include the following main components: steam turbine, generator and exciter, water-cooled condenser and condensate system, and steam bypass system to provide for occasions when the turbine-generator is out of service.

The condensing steam turbine will be provided with one controlled extraction port for export steam and deaerator steam, and two uncontrolled extraction ports for low pressure steam that will be used to preheat feedwater for the boilers. The turbine will have an electrical output capacity of 37.5 MW (gross) corresponding to the maximum steam flow generated by two boilers. Calculated values for the turbine are presented in Table 1.1-1 for normal full load operations. The generator will be a three phase, air cooled synchronous type, and will be connected to a segregated busbar system leading to the generator 15KV switchgear.

Power will be delivered to the Northern States Power Company (NSP) via an underground 13.8KV line which will connect to NSP transmission lines at the south corner of the site.

During turbine outage, steam produced by the boilers will be reduced in pressure and cooled in a steam desuperheating station, and then condensed in a bypass condenser, thus permitting the boilers to remain on-line and refuse to be processed. Turbine generation will be of a design which would allow the production and sale of steam to downtown markets.

Environmental Control Technology

Air Pollution Control System and Stack

The facility will be designed to meet all regulatory requirements of the Minnesota Pollution Control Agency (MPCA) and the U.S. Environmental Protection Agency (EPA). The air pollution control system for each process train will include a spray dryer, dry scrubber, a high efficiency baghouse collector, an induced draft fan and a flue. The two flues will be contained in a common stack. The emission control system will be designed to remove at least 99.7% of the generated particulate emissions; 95% by weight of the hydrochloric acid (HCL); and 90% of the sulfur dioxide (SO_2) at the design conditions.

TABLE 1.1-1

TURBINE OPERATING CRITERIA

	Maximum Continuous Rating	
Power Output	31.4	MW (net)
Steam Mass Flow	288,250	lb/hr
Number of Steam Extractions	3	
Live Steam Pressure	620	psia
Live Steam Temperature	750	°F
Preheating System of Feedwater	3	stage
first Extraction Pressure	315	psia
First Extraction Steam Flow	9,555	lb/hr
Second Extraction Pressure	26.6	psia
Second Extraction Steam Flow	17,652	lb/hr
Third Extraction Pressure	7.6	psia
Third Extraction Steam Flow	15,417	lb/hr
Exhaust Pressure	1.23	psia
Exhaust Steam Flow	245,626	lb/hr
Rotor Speed	3,600	RPM

Source: Proposal to Hennepin County Minnesota, for finance, design, construction and operation of the Hennepin County Large Scale Energy Recovery Project. Volume 2, Blount Energy Resource Corp., April, 1985.

Acid flue gases leaving the economizer section of the boilers at a temperature of 320°F will be treated with hydrated lime droplets for neutralization. The hot flue gases will evaporate the water in the droplets, resulting in a dry powder residue which will flow into the particulate control device for removal.

A baghouse will be employed to achieve the required particulate removal from the flue gas prior to emission. Flue gases, partially neutralized in the spray dryer, will be further neutralized by the unreacted lime contained in the particulate layer on the bags of the baghouse collector.

The baghouses contain multiple modules for processing the gases. Normally, all modules are in operation; however, for maintenance purposes one can be taken out of service and the remaining modules can adequately accommodate the gas volume and maintain the desired emission control level.

Induced draft (ID) fans located after the baghouses will provide suction to move the gases through the radiation chambers, boiler sections, and flue gas treatment system and discharge them out of the stack.

Each combustion train will have its own flue approximately 6 feet 4 inches in diameter. Both flues will be housed in a single stack. The stack shell will be constructed of steel or reinforced concrete. It will be 213 feet high and will project 102 feet above the highest building elevation. The flue gas exit velocity will be about 60 feet per second at maximum continuous rating. Sampling stations will be located in the stack flues to allow for monitoring of emissions.

Water Quality

There will be two wastewater discharge systems: one for storm water, and the other for sanitary wastewater. Storm water will be collected from roof drains and paved areas and will be routed to the storm sensor system for control of outflow from the site. Sanitary wastes will be discharged directly to the City of Minneapolis sanitary sewer system. Sanitary wastewaters will include: domestic wastewater; floor drain wastewater passed through grit collectors and an oil separator; condensate losses and excess cooling tower blowdown.

Boiler blowdown water will be used as quench water for make-up to the ram dischargers. Wastewater from the regeneration process will be piped to a tank where it will be neutralized. Neutralized demineralizer wastewaters and a portion of the cooling tower blowdown water will also be used as make-up to the ram dischargers. The reuse of these wastewaters will conserve water and minimize the load on the sanitary sewer system.

All regulatory standards for pH and all other limits for wastewaters discharged to the numerical sanitary system will be met.

Odor and Vector Control

Odor and vector control will be incorporated into the design of the tipping area and the combustion systems and various operational controls. Dust and odors from the tipping area will be controlled by continuous withdrawal of air from above the refuse bunker. Odors are destroyed at temperatures above 1400°F. The flue gas in the combustion chamber will be maintained or above 1800°F in excess of two seconds. Scattering of refuse will be prevented by making provisions for washing down the tipping floor to prevent its accumulation.

Noise

The principal noise sources include the cooling tower fans and pumps, the induced draft fans, and the stack. Other noise sources such as safety valves or boiler rapping devices will be equipped with silencers or sound dampening enclosures.

1.1.3 Mass, Energy, and Water Balance

Mass Balance

When processing 101,000 lb/hr of solid waste, 288,850 lb/hr of steam will be generated at 630 psig and 752°F. At this design rate, about 23,400 lb/hr of total residue (dry weight) is expected to result. About 3,600 to 4,500 lb/hr of ferrous metal (dry weight) is expected to be recovered from the residue.

Energy Balance - Nominal Conditions

A simplified energy balance is provided, based on the maximum design capacity of the boilers of 1,212 TPD. The balance is summarized below.

SIMPLIFIED ENERGY BALANCE SUMMARY

Item	Unit
Load	100%
Boilers	2
Boiler Feedwater Temperature	266°F
Turbine Throttle Flow	288,250 lb/hr
Turbines	1
Turbine Back Pressure	1.23 psia
Turbine Output	31.4 MW

The thermal cycle selected for the facility will employ a turbine-generator, water-cooled condenser, condensate pumps, one low and intermediate pressure heater, dearator, and boiler feedwater pumps. The turbine will have one extraction port to supply steam for the dearerator and process steam consumer(s) and two extraction ports for low pressure feedwater heating.

Heat removed from the turbine exhaust steam will be dissipated to the atmosphere via a cooling water system. In the event of turbine outages, steam will bypass the turbine and condenser and will be sent directly through a pressure reducing and cooling station to serve the process steam consumers. The remaining steam will serve in-plant needs and supply condensate for reintroduction into the cycle via a bypass condenser. The use of a bypass condenser system will allow the plant to continue processing refuse while allowing maintenance of the turbine generator, if needed.

Water Balance

All water from the facility is expected to be obtained from the City of Minneapolis water distribution system. A 6,000 gallon storage tank will supply potable water and all other process water needs, such as boiler makeup, demineralizer feedwater, washdown, and other miscellaneous plant services. The balance is summarized in Table 1.1-2.

1.1.4 Operating Practices

The facility will be operated in a manner similar to other power stations, 24 hours a day, 7 days a week, processing refuse, producing steam, and generating electricity. Since the refuse-fired steam generators will be operated around-the-clock, personnel will be assigned to four crews for three operating shifts. The facility maintenance staff will be on duty during the day shift, also called the first shift.

The main gate house, scales, and refuse tipping hall generally will be open to receive MSW by refuse collection trucks from 7:00 a.m. to 6:00 p.m., (scale house operation could be 16 hours per day) Monday through Saturday, excluding designated holidays. The hours for MSW delivery may be extended to aid the community in cleanup efforts, such as when natural disasters occur.

A maintenance program designed to enhance the availability and proper operating condition of the process trains and auxiliary systems will be established. Scheduled maintenance activities will be carried out during the life of the facility following prescribed procedures for inspection and maintenance. The maintenance procedures for this facility are of four basic types: preventive maintenance, major overhauls, procedures carried out during scheduled equipment outages, and emergency procedures for unplanned outages.

The facility is designed to accommodate routine preventive maintenance without disrupting MSW processing and power generation. Preventive maintenance procedures will be defined by the requirements and duty cycles of individual pieces of equipment such as grates, particulate collection devices, cranes, and conveyor parts. They vary in scope from daily and weekly inspection of lubricants and water levels to small parts replacement and packing of valves and pumps. Routine preventive maintenance generally includes plant cleanup such as removing ash from various equipment sections and washing down the tipping hall floor. Preventive maintenance will be carried out normally on the first shift, five days a week. Major overhauls will be executed on an as-required basis. To insure that all necessary spare parts are available at the planned maintenance intervals, inspection and fire side cleaning will take place at least three to four months before the planned maintenance shutdown. Maintenance overhaul normally requires a shutdown of each unit for a period of three to four weeks. Two independent units ensure that the plant output is capable of receiving and processing MSW during maintenance periods if the remaining unit is operated at its maximum capacity and refuse is stockpiled in the bunker. The annual maintenance overhauls

TABLE 1.1-2

WATER BALANCE, INPUTS AND OUTPUTS

Water Inputs:	
Demineralizer and condensate polishing	13,150 gal/day
Washdown water	3,000 gal/day
Dry scrubber system	27,461 gal/day
Domestic use	2,000 gal/day
Cooling water make-up	793,740 gal/day
TOTAL WATER INPUT	839,351 gal/day
Water Outputs	
Cooling tower evaporation	661,450 gal/day
Cooling tower drift	16,536 gal/day
Water with residue	9,126 gal/day
Water with ferrous material	2,761 gal/day
Evaporation from ram discharger	4,767 gal/day
Evaporation from dry scrubber	22,691 gal/day
Water with dry waste	4,770 gal/day
Condensate and plant losses	6,075 gal/day
Cooling tower excess blowdown	106,175 gal/day
Washdown	3,000 gal/day
Domestic use	2,000 gal/day
TOTAL WATER OUTPUT	839,351 gal/day

Source: Proposal to Hennepin County Minnesota for finance, design, construction, and operation of the Hennepin County Large Scale Energy Project. Volume 2, Blount Energy Resource Corp., April, 1985.

for the process trains will be scheduled during periods that have historically proven to be low in delivered refuse. Operating the remaining refuse unit at maximum capacity during these outages and should provide for minimum or no bypass of garbage.

A maintenance inventory program for spare parts and equipment will be developed with established procedures for procurement. These provisions will help to insure uninterrupted facility operation and minimize any prolonged equipment outage. Equipment redundancy, delivery time of critical components, and anticipated equipment reliability dictate the extent of the spare parts maintained in the facility inventory. Replacement or refurbishment of some equipment and systems beyond ongoing maintenance and repair will be necessary. These major capital improvement refurbishments are dependent on operations and environmental factors.

Prior to startup of the facility, an employee safety orientation and training program will be implemented. The training program will cover: personnel safety equipment, equipment safety features, housekeeping procedures, first aid, and explosion and fire control. All company activities during the operation process will be directed toward the goal of protecting employees against occupational injuries and the public from any exposure to injury.

The operator will prepare and maintain detailed records and accounts of activities and transactions on the operation of the facility. The records and logs of plant performance will detail refuse and ash disposal activities, boiler and furnace performance, fuel consumption, turbine operator performance, power consumption and production, and water supply and use.

1.1.5 Facility Availability and Reliability

Boilers will alternately be taken off line during periods of low refuse delivery (January and February) for inspection and repair of the boiler along with major related process train components including the spray dryer, baghouse, and induced draft fan. The availability analysis, the percent of time that the facility will be operational, presented below.

AVAILABILITY ANALYSIS

Item	Time Required per Unit
Scheduled Boiler Downtime:	
Downtime for inspection	7 days
Scheduled downtime for annual overhaul, repair and cleaning	28 days

Item	Time Required per Unit
Periodic maintenance and repair:	29 days
Total Downtime per boiler	64 days

The gross burning capacity of both boilers is 606 tons per day per boiler, resulting in a capacity of 442,380 tons per year. Given a total allowable downtime of 128 days per year (64 for each boiler) plant availability is calculated as follows:

$$\frac{(365 \text{ days X 2 units - 128 days})}{365 \text{ days X 2 units}} = 82.5\%$$

Based on 82.5% availability, total tonnage processed is calculated as:

.825 X 442,380 tons = 365,800 tons/year

The experience with facilities utilizing Widmer+Ernst technology similar to that proposed for this project indicates availabilities greater than 85 percent.

Reliability

The facility will have two independent combustion trains. In the event of a shutdown of one unit, the other will be capable of processing MSW to at least its individual unit capacity.

One turbine generator will be provided which can handle 112% of steam flow. If an unscheduled turbine-generator shutdown should occur, in-house power will be purchased. A bypass steam condenser is provided which will be capable of condensing 100 percent of main steam flow when the turbine-generator is out of service.

Boiler availability should not be affected by a breakdown in the residue handling system. Auxiliary equipment will be provided.

In the event of unscheduled boiler outages, the facility blower systems will operate to vent any odors through the stack.

1.2 Transfer Stations

1.2.1 Introduction and General Facility Description

Transfer stations would be used to collect municipal refuse from short haul collection vehicles to larger transfer trailers for transport to one or more resource recovery facilities. The preliminary conceptual design of the four transfer stations is for a total design capacity of 1900-3600 TPD. However, it is not anticipated that the transfer stations will operate at this maximum design capacity. Additional capacity was included so that stations: 1) could handle peak truck delivery, 2) could expand operating capacity in the future and accept waste from another transfer station in the event of a facility closure. Parameters of the transfer stations are as follows:

Transfer Stations	Operating* Capacity	Design Capacity	Total Project Area (acres)	Cost $
Bloomington East	500 TPD	800 TPD	5	3.5 million
Brooklyn Park East	400 TPD	800 TPD	12	3.5 million
Hopkins-DOT	600 TPD	1200 TPD	5	4.5 million
Minneapolis South	400 TPD	800 TPD	1.2	3.5 million

*Operating capacity - annual average expected daily throughput.

A general description of a transfer station, its operating characteristics, and control technology follows. This general discussion is followed by preliminary information on the specific characteristics of each site.

Major components of a transfer station are an entrance/exit road, scale house with one or two incoming scales and an outgoing scale, a tipping area, an office, a parking area, and a truck storage area.

Transfer station layouts will provide for on-site stacking (queueing) of vehicles as possible (approximately 50 vehicles at a time) to avoid congestion on adjoining roads. All roads will have a turning radius of approximately 50 feet. Further, the proposed transfer stations will have a grade separation between tipping and loading levels. Grade differentials will be achieved by ramps leading vehicles up to the tipping floor of the upper level of the transfer station. Ramps will generally have grades of 6% or less. Embakments may be constructed on which the upper level of the transfer stations would be set. Building orientations will take advantage of site topography and any natural grades. In some instances, such as where there are space limitations, retaining walls may be necessary.

The throughput capacity of each facility will be a function of the number of loading bays, the hours of operation, the mode of facility operation, and space available for efficient execution of the required operations. It is generally assumed that a two-hopper transfer station will have an 8-hour capacity of 600-800 TPD if floor dumping is used. A three-hopper configuration will have a capacity of 900-1200 TPD.

To provide the incoming vehicles with an efficient and expeditious method of dumping at the facility, exterior maneuvering area will be desirable to allow the vehicles to back into a position perpendicular to the unloading area. Exterior moving space will also allow for reduction in the size of the buildings. A typical transfer station is approximately 35 feet high from the tipping floor.

Ancillary facilities at each transfer station will include rest-rooms, office space, employee and transfer trailer parking, lunch-room, equipment maintenance and storage space, and mechanical/electrical room. Several of these ancillary functions will be incorporated within the building structure, often below the tipping floor. Others will need to be incorporated elsewhere on the site.

Utility requirements will include a 6 to 8 inch water main for potable water supply and fire protection, and sewer lines capable of handling sanitary sewer flows of 100 gallons per day.

1.2.2 General Operating Characteristics

Each transfer station will employ between 5 and 10 administrative employees per eight hour shift. At larger transfer stations, packer trucks will deliver roughly 100 loads of refuse to the facility daily.

Drivers entering a transfer station in packer trucks will stop at the scale house to weigh their loads, and then follow a ramp uphill to the tipping area. From the tipping area, loads would generally be dumped into open-top transfer trailers waiting below. Trailer drivers will weigh their loads at the scale house on the way out, then haul their refuse to a combustion facility or directly to landfills. The transportation analysis assumed that transfer trucks would haul waste directly to landfills (a worst case assumption).

All wastewater will be discharged to the municipal system. Since solid waste transfer is essentially a dry process, water use will generally be limited to employee drinking and sanitary facilities.

1.2.3 Environmental Controls

Transfer stations would be used only to transfer raw solid waste from short haul collection vehicles to larger transfer trailers. Since no processing of waste occurs, these facilities do not generate air pollutants other than some dust and other airborne particulate matter from waste handling and emissions from traffic in and out of the facility. The potential for dust emissions will be controlled by enclosing the building, other than for door openings to the facility, where refuse is handled, and by covering all refuse vehicles which enter or leave the facility (the County will require the covering of all refuse vehicles).

Transfer stations are throughput facilities and are not used for long term storage of refuse. All portions of the facility (other than for door openings) will be enclosed.

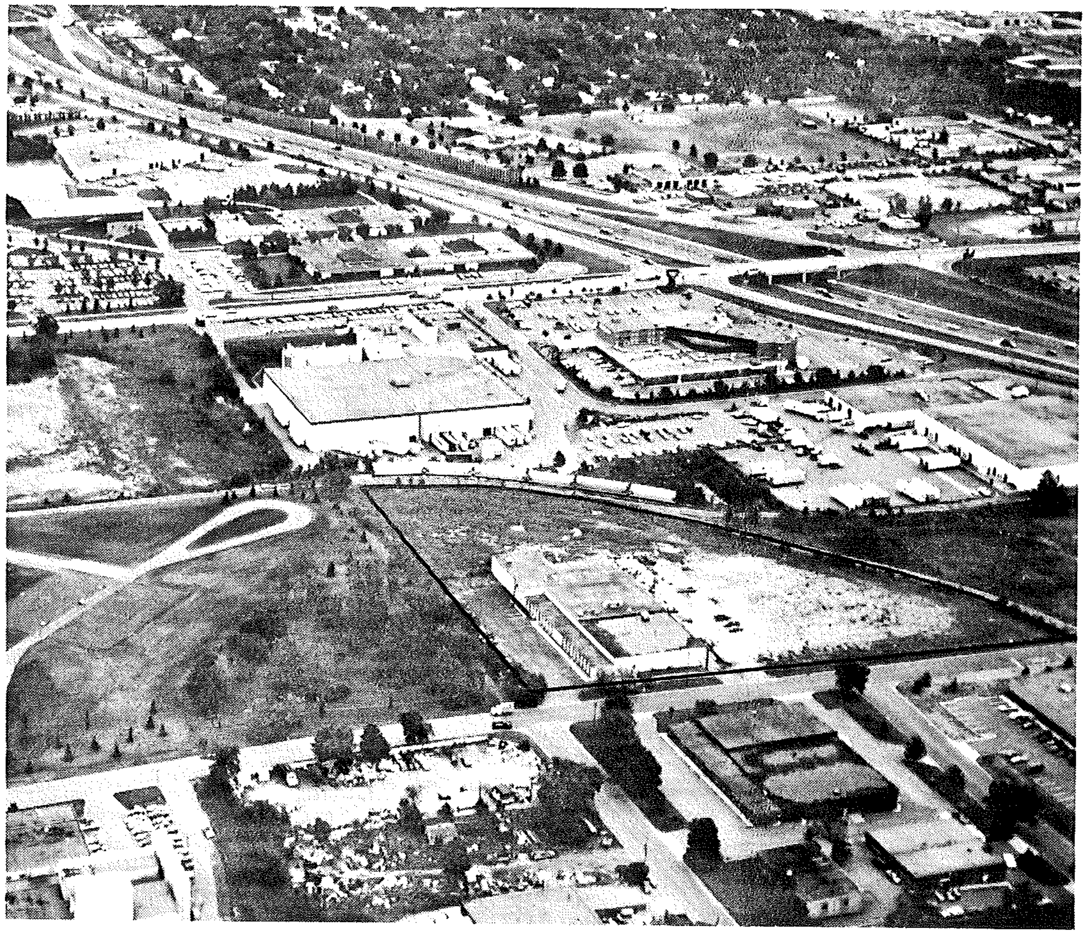
1.2.4 Individual Transfer Station Specifics

<u>Bloomington East</u>

The Bloomington East transfer station will be designed with two hoppers for a design capacity of 800 TPD and an operating capacity of 500 TPD, and would be located west of I-35W in Bloomington (see Fig. 1.1-3). The site is about 5 acres, bounded on the south by 96th St., on the west by James Ave., and on the north by 94th Street. The conceptual design provides for on-site queuing and external scale facilities. Ramp grades will generally less than 6% although the grade departing the tipping floor is greater than 10%. Turning radii are sharp. The limited site space would necessitate a retaining wall on the west side of the property and would not permit on-site trailer parking.

<u>Brooklyn Park</u>

The Brooklyn Park east transfer station will be designed with two hoppers for a total design capacity of 800 TPD of MSW and operating capacity of 400 TPD. The site is located on 12 acres of land west of



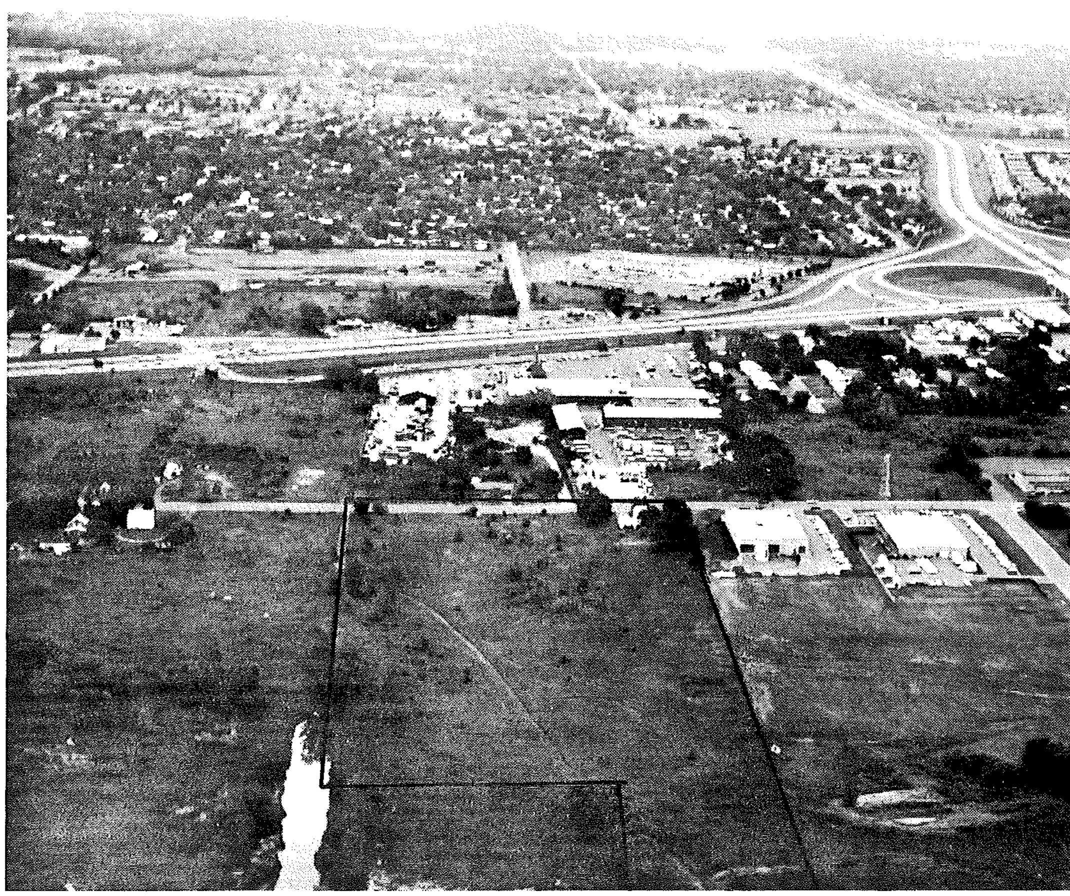


Figure 1.1-3 Above. Proposed Bloomington Transfer Station Location.
Figure 1.1-4 Below. Proposed Brooklyn Park Transfer Station Location.

Winnetka Avenue and northwest of the intersection of I-94 and U.S. Hwy. 169 (see Fig. 1.1-4). Access to the site is from Winnetka Avenue. A scale facility will be provided. All ramps will have grades of 6% or less, and turning radii will be within the general design goals of 50 feet. The site will require extensive grading to meet facility design needs. The only retaining structure required will be for the embankment to separate the upper and lower levels of the transfer station. There is a residential house located on the site which will have to be demolished. The facility will utilize interior maneuvering for a two-hopper facility.

Hopkins DOT

The Hopkins-DOT transfer station will be designed with three hoppers for a total design capacity of 1,200 TPD of MSW and an operating capacity of 600 TPD. The excess capacity will be provided to expedite truck ingress-egress. The proposed station is situated on 5 acres in the northwest corner of a 41 acre Hennepin County DOT operations and maintenance facility west of County Road 18 and south of County Road 3 (see Fig. 1.1-5).

Access to the site is from Fifth Avenue South. One scale house facility with two scales is activated. Ramp grades will be less than 6 percent; however, one retaining wall on the east will be needed. The site is relatively flat; therefore, material will be used to establish a grade separation between the tipping floor and the loadout floor. The layout is a three-hopper facility and allows for interior maneuvering. Ample area is available for on-site automobile and transfer trailer parking.

Minneapolis South

The Minneapolis South transfer station will be designed to handle 800 TPD of MSW at design capacity and 400 TPD at operating capacity. 800 TPD of MSW. The 1.2 acre site is located in the City of Minneapolis north of East 29the Street and 20the Avenue South (see Fig. 1.1-6).

The site is currently used as a 200-300 TPD solid waste transfer station by the city. The transfer station will be rebuilt to increase the handling capacity and minimize congestion. The area around the site is used predominantly for industrial and commercial purposes.

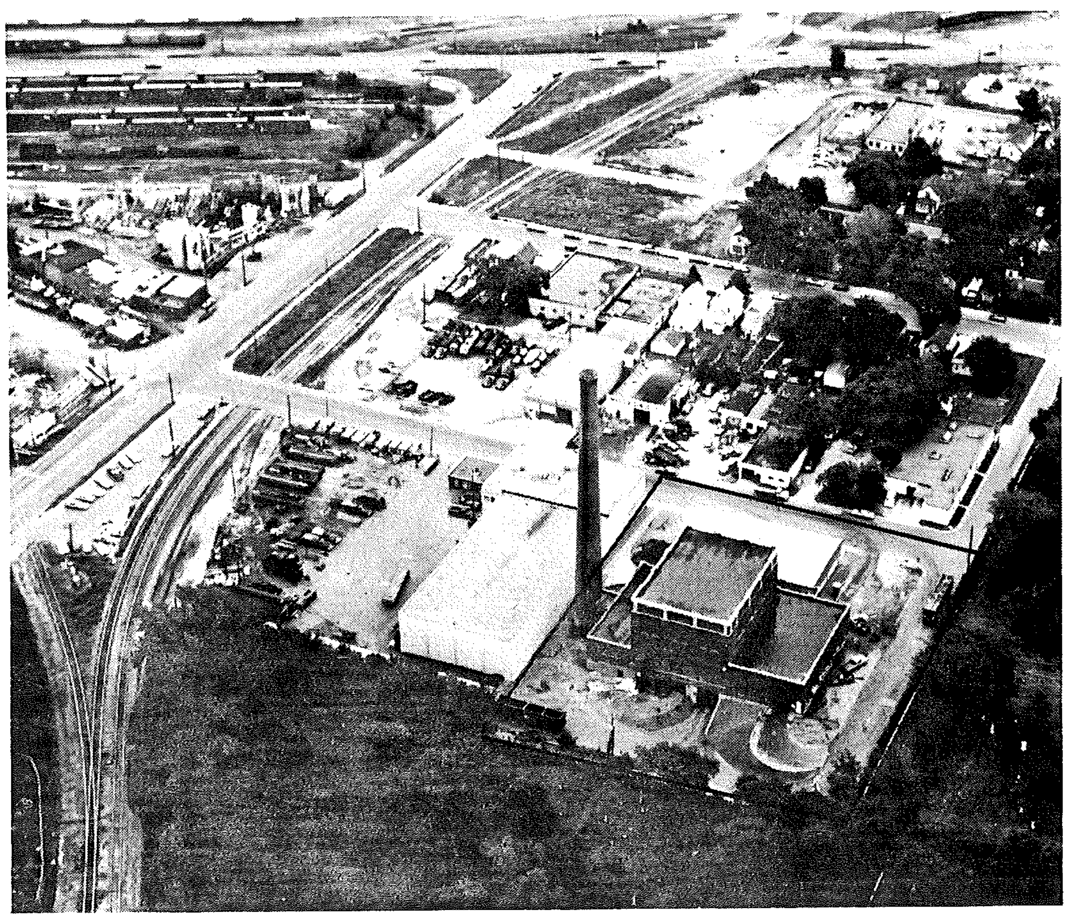


Figure 1.1-5 Above. Proposed Hopkins Transfer Station Location.
Figure 1.1-6 Below. Proposed Minneapolis South Transfer Station Location.

2. GOVERNMENTAL APPROVALS

2.1 Permits and Approvals

2.1.1 EIS Purpose

The purpose of the EIS is to disclose information about the significant environmental impacts of the proposed action. The document is not intended to justify either a positive or negative decision on the resource recovery project, but can be used as a guide in issuing or denying permits or approvals for the project and in identifying measures necessary to avoid or mitigate adverse environmental effects and to restore or enhance environmental quality.

Tables 2-1 and 2-2 list permits and approvals that are or may be required for the resource recovery project to be successfully implemented.

2.1.2 Record of Decision

For the permitting and approval decisions listed in Table 2-3, the EIS must be utilized. These permitting/approval agencies are required to provide a record of decision stating how the pertinent information in the EIS was used in reaching their decisions. The record must be provided to the Environmental Quality Board and any other person that requests the information.

2.1.2 Development Schedule

Hennepin County proposes to develop the resource recovery facility and the Greyhound site as follows:

Limited preliminary design	Under way
Major detailed design	January-July 1986
Start construction	July 1986
Startup and shakedown	November 1988-May 1989
Begin commercial operation	June-July 1989

The following tentative development schedule has been identified for the transfer stations:

Phase I Conceptual designs	January 1986
Phase II Preliminary designs	May 1986
Phase III Finalize plans and specifications	April 1987
Begin construction	August 1987
Startup period	November 1988-May 1989
Begin operation	June-July 1989

Table 2-1

PERMITS REQUIRED FOR HENNEPIN COUNTY SOLID WASTE PROJECT

RESOURCE RECOVERY FACILITY

Agency	Permits/Approvals	Purpose	Authority
Minnesota Pollution Control Agency	Air emission facility installation/operating permit (includes PSD/non-attainment review)	To enable construction of any facility causing emissions	Minnesota Rules 7005.0200, Federal Clean Air Act and Regulations
	Solid waste incineration facilities permit*	To operate incinerator with capacity greater than 6,000 lbs/hr.	Minnesota Rules 7035.0600
Metropolitan Council	Permit review and approval	Statutory authority to review all solid waste facilities for conformity with the Metropolitan Council Solid Waste Policy Plan	Minn. Stat. 473.823, subd. 3
	Review of County Solid Waste Master Plans	The Metropolitan Council has the authority to review the County Solid Waste Master Plan to determine compatibility with the Metropolitan Council Policy Plan.	Minn. Stat. 473.803, subd. 2
	Review of Waste Supply and Processing Contracts	Review of contracts with terms in excess of 5 years.	Minn. Stat 473.813
	Designation Plan and Ordinance	Metropolitan Council must review and approve Designation Plan and Ordinance	Minn. Stat 115A.84, 473.8031c Minn. Stat. 115A.86
Minnesota Department of Transportation	Review	Verification of applicable load limits access streets.	
Minnesota Department of Labor & Industry	Certificate of Inspection for Boilers	Any construction or upgrading of boilers or steam lines requires approval and licensing from the Boiler Inspection Division, MDLI	Minn. Stat. 183.38, subd. 1

* This is considered in conjunction with air emission facility installation permit.

Table 2-1 continued

PERMITS REQUIRED FOR HENNEPIN COUNTY SOLID WASTE PROJECT

RESOURCE RECOVERY RACILITY

Agency	Permits/Approvals	Purpose	Authority
Metropolitan Waste Control Commission	Sewer system extension permit	MPCA may give review; primary review by City and MWCC.	Minnesota Rules 7070.1000
	Industrial discharge permit	To discharge to the municipal system.	Minnesota Rules 5900.2000
Federal Aviation Administration	Notice of object affecting navigable air space required.	FAA requires notification of any object 200 ft. or more above ground or surface of waterway to permit aircraft safety.	14 CFR Part 7
Local Municipalities	City of Minneapolis	Normal construction permits (i.e., plumbing, sanitation, electrical code, etc.)	State Building Code, Local Ordinances
	City of Minneapolis Conditional Use Permit	Minneapolis Zoning Commission requires a conditional use permit for the processing of garbage and trash in areas zoned M2-3.	Minneapolis City Ordinance § 542.670 (2)

Table 2-2

PERMITS REQUIRED FOR HENNEPIN COUNTY SOLID WASTE PROJECT

TRANSFER STATIONS

Agency	Permits/Approvals	Purpose	Authority
Minnesota Pollution Control Agency	Transfer station permit	To operate a solid waste transfer station.	Minnesota Rules 7035.2200
Minnesota Department of Transportation	Review	Verification of applicable load limits on access streets.	
Metropolitan Council	Permit review and approval	Statutory authority to review all solid waste facilities for conformity with the Metropolitan Council Solid Waste Policy Plan.	Minn. Stat. 473.823, subd. 3
	Review of County Solid Waste Master Plans	The Metropolitan Council has the authority to review the County Solid Waste Master Plan to determine compatibility with the Metropolitan Council Policy Plan.	Minn. Stat. 473.803, subd. 2
	Designation Plan and Ordinance	Metropolitan Council must review and approve Designation Plan and Ordinance	Minn Stat. 115A.84, 473.8031c Minn Stat. 115A.86
Metropolitan Waste Control Commission	Sewer system extension permit	MPCA may review; primary review by City and MWCC.	Minnesota Rules 7070.1000
Local Municipalities*	Cities of Minneapolis, Hopkins, Bloomington, and Brooklyn Park Permits	Normal construction permits (i.e., plumbing, sanitation, electrical code, etc.)	State Building Code, Local Ordinances
	City of Brooklyn Park Conditional Use Permit	Required for buildings higher than 40 feet, or for construction in a flood fringe.	Brooklyn Park City Ordinance §363.02, 364.23, 365.17, 366.13
	City of Hopkins Conditional Use Permit	Please see note.***	Hopkins City Ordinance §427.38
	City of Minneapolis Conditional Use Permit*	Minneapolis Zoning Commission requires a Conditional Use Permit for the processing of garbage and trash in areas zoned M2-3.	Minneapolis City Ordinance §542.670 (2)
	Bloomington Conditional Use Permit	Please see note.**	Bloomington City Ordinance §19.33
Hennepin County	Facility operating license	Governs operation of the facility.	Minn. Stat. 473.84

*Hennepin County with Metropolitan Council approval can override local municipal vetos of waste facilities. Minn. Stat. 473.823.

** City of Bloomington has not determined if a Conditional Use Permit would be required.

***Required f-- commercial/industrial structures exceeding $75,000 in value.

Table 2-3
PERMITS AND APPROVALS REQUIRING A RECORD OF DECISION

Agency	Permit/Approval
MPCA	Solid waste facility approval
MPCA	Air Quality Installation Permit
Metropolitan Council	Solid waste facility approval
Hennepin County	Facility operating license
Municipality where either transfer station or recovery facility is located	Required zoning approvals (conditional use)

3. AFFECTED ENVIRONMENT

This section of the environmental impact statement describes the existing environment that would be affected by the proposed project. The existing waste management system is discussed, along with physical and cultural resources. The pertinent regulatory environment is also discussed.

3.1 Existing County Solid Waste Program

3.1.1 Authority and Responsibilities

The seven metropolitan counties' solid waste management programs are governed by responsibilities and authorities promulgated under the state's Waste Management Act (WMA). The counties are required to prepare solid waste master plans that describe and govern existing and proposed solid waste activities, functions, and facilities of the counties and municipalities within their jurisdictions (Minn. Stat., Sec. 473.803). These plans are, in turn, governed by and required to be consistent with the Metropolitan Council's guide on solid waste management. Hennepin County's existing master plan was approved by the Council in 1981.

The Council and metropolitan counties have shared responsibilities in implementing a development process for waste reduction and resource recovery and solid waste landfill siting in the Metropolitan Area. The siting and reduction/recovery process is governed by and must be consistent with the Council's solid waste guide. The counties are required to amend their master plans in 1985 to implement waste reduction and resource recovery facilities and activities. A draft plan has been prepared by Hennepin County (October 1985) and it is expected it will be submitted to the Council in January 1986.

The metropolitan counties have authority to own and operate solid waste disposal facilities, and have various powers with respect to financing such facilities and executing contracts involving ownership and operation. Solid waste facilities are also governed by an elaborate permitting process. They must receive state permits that are reviewed and approved by both the Minnesota Pollution Control Agency (MPCA) and the Council. In addition, most of the counties, including Hennepin County, require licenses for these facilities. Municipal zoning requirements may also govern and control certain aspects of facility operation and location.

In some cases, the metropolitan counties can override local community vetoes of solid waste facility siting decisions. Such county actions require the approval of the Council. The counties also have authority to require that solid waste generated within their boundaries, or a service area thereof, be delivered to existing or planned resource recovery facilities they designate. In April 1985, the Council approved Hennepin County's waste flow designation plan, which includes the proposed resource recovery project. It is anticipated the county will be submitting to the Council in December 1985 a designation ordinance for review.

A key feature of the state's WMA is a 1985 amendment that requires, after Jan. 1, 1990, that landfills in the Metropolitan Area may not accept mixed municipal solid waste unless the waste has been transferred from a resource recovery facility identified by the Metropolitan Council. Although not part of the WMA, another feature of the state law is a limit on the average annual solid waste throughput of resource recovery facilities per site in Minneapolis to 1,000 tons per day.

3.1.2 Solid Waste Volumes and Composition

Solid waste is generated from residential, commercial and industrial sources within Hennepin County. The county's draft solid waste master plan shows a county-wide waste generation rate of 5.4 pounds per person per day and 958,026 tons generated in 1985, 1,019,306 tons in 1990, and 1,074,932 tons in 2000. These figures are based on: residential generation rates of 2.45 pounds per person per day in both urban and suburban areas and 2.20 pounds in rural areas; a commercial generation rate of 3.21 pounds per employee per day; and an industrial rate of 8.16 pounds per employee per day (Hennepin County, 1985b).

The amount of solid waste generated will be affected by seasonal variations. During spring and fall solid waste volumes will be highest, largely because of yard wastes that are generated. Solid waste volumes are lowest during the winter. Based upon data provided in Hennepin County's draft master plan and waste flow designation plan, it is estimated the county presently generates on average 2,625 tons of solid waste per day with a 22 percent seasonal variation (Hennepin County, 1984; 1985b). Assuming seasonal variations do not change much, the county's average solid waste generation should reach 2,945 tons per day in the year 2000.

In 1985, Hennepin County completed a comprehensive recycling study to determine the quantity of various recyclable materials being buried at landfills (Pope-Reid, 1985). Table 3.1-1 shows the composition of solid waste generated from the findings of the study.

Table 3.1-1
SOLID WASTE COMPOSITION

Material	Percent of Total (by weight)
Newspaper	8.39%
Corrugated	14.58
Office/Computer	10.74
Magazines/Other	11.09
Ferrous Scrap	
Food Containers	1.17
Bimetal Cans	1.05
Other Containers	0.57
Other Ferrous	1.57
Aluminum	
Beverage	1.24
Other	0.16
Other Nonferrous	0.27
Glass	3.52
Yard Wastes	7.98
Wood	5.99
Other Organics	26.18
Other Inorganics	5.50
TOTAL	100.00%

Source: Pope-Reid Associates, Inc., July 1985. Hennepin County Comprehensive Recycling Study.

The principal materials generated are paper at 45 percent; metal, 4.4 percent; aluminum, 1.4 percent; glass, 3.5 percent; yard wastes, 8 percent; wood, 6 percent; organics, 26 percent; and inorganics, 5.5 percent.

3.1.3 Solid Waste Collection and Disposal

Solid waste collection in Hennepin County has historically been the responsibility of local communities. There are 45 cities and one township in the county. According to the county's draft master plan, as of 1983, 35 communities let residents contract with private firms for their own collection services and 11 communities contract on behalf of the residents with private firms. All communities allow for privately contracted commercial waste pickup. The city of Minneapolis provides some residents municipal pickup and other residents private service under a contract with Minneapolis Refuse, Inc., an umbrella organization representing a number of private collection firms. About 150 solid waste collection firms serve the county. Most of the county's solid waste is collected on a weekly basis (Hennepin County, 1985b).

At the present time, all solid waste generated in the county, but not recycled, processed or composted, is disposed of at one of several landfills. There is limited data on the amount of waste disposed at each landfill that originates in Hennepin County. Two landfills that dispose of the largest quantities of the county's waste are the Flying Cloud Sanitary Landfill and Pine Bend Sanitary Landfill. Both landfills are operated by Browning Ferris, Inc. (BFI). Metropolitan Area landfills that serve Hennepin County are:

- Anoka County--Anoka Municipal Landfill
- Dakota County--Burnsville Landfill, Freeway Landfill, Pine Bend Landfill
- Hennepin County--Woodlake Landfill, Flying Cloud Landfill
- Scott County--Louisville Landfill

In addition, a small amount of the county's solid waste is disposed of at the Elk River and Lindenfelser Landfills located in Sherburne and Wright Counties, respectively (Hennepin County, 1985b).

Two transfer stations currently operate in Minneapolis, the North and South facilities. BFI has a contract to transport waste from the two transfer stations. The transfer stations handle approximately 16 percent of the county's waste. The Pine Bend Landfill receives the transferred waste (Hennepin County, 1985b).

3.1.4 Landfill Availability

The Metropolitan Council's solid waste guide provides information on landfill space availability in the seven-county region. Table 3.1-2 shows the capacities, use rate and approximate closure dates for landfills in the region. The remaining capacity of 11,909 acre-feet, as of January 1985, is being used up at a rate of about 1,710 acre-feet per year. The regional landfill system is estimated to have capacity until 1991-1993 (Metropolitan Council, 1985a).

Table 3.1-2
SOLID WASTE LAND DISPOSAL SYSTEM, TWIN CITIES METROPOLITAN AREA[1]

Sanitary Landfill	Permitted Capacity (acre-feet)[2]	Remaining Capacity as of Jan. 1985 (acre-feet)[3]	Estimated 1984 Use Rate (acre-feet)	Approximate Closure Date
Anoka County				
Anoka Municipal	2,259	686	420	Dec. 1986
Dakota County				
Burnsville	8,121	2,553	80	Mid-1990s
Dakhue	482	199	50	1987
Freeway	1,962	140	50	1986
Pine Bend	9,963	6,724	440	Mid-1990s
Hennepin County				
Flying Cloud	3,109	177	440	1985
Woodlake	2,350	862	70	Mid-1990s
Scott County				
Louisville	2,296	568	160	Mid-1990s
METRO AREA TOTAL	30,542	11,909	1,710	1991-1993

[1]Based on information from MPCA, landfill operators, metropolitan counties and Metropolitan Council.

[2]Includes expansions approved since 1980 for Burnsville, Pine Bend, Woodlake and Louisville.

[3]Based on information from aerial photographs (taken November 1984) resulting in revised remaining capacity estimates for all landfills.

Source: Metropolitan Council, March 1985. Solid Waste Management Development Guide/Policy Plan.

The Flying Cloud and Freeway Landfills have applied for expansion permits of 5,644 and 1,860 acre-feet, respectively. The expansion permits are still pending approval. Both landfills are on the state's list of priority sites (Superfund List), and remedial investigation and feasibility studies will have to be done by the owners under consent agreements with the MPCA. In September 1985, the MPCA granted Flying Cloud Landfill an interim expansion permit for 500 acre-feet.

Hennepin County is in the process of preparing an environmental impact statement on four candidate landfill sites. The sites were located and approved in accordance with the landfill siting requirements of the WMA. The sites are located in the cities of Dayton, Corcoran, Greenfield and Independence. The Council's solid waste guide requires the county to develop one new landfill with at least 3,232 acre-feet of capacity. The guide calls for the site to be operational in 1991. Expansions of existing landfills may substitute for this capacity requirement (Metropolitan Council, 1985a).

3.1.5 Existing Recycling and Recovery Activities

There are numerous recycling and resource recovery activities already in existence in Hennepin County. Curbside multimaterial source separation programs now serve about half the population in the county. Ongoing and pilot curbside programs exist in Minneapolis, Mound, St. Louis Park, Hopkins, St. Anthony, Richfield and Excelsior. Materials such as newspapers, glass, metal cans, cardboard and used oils are collected. According to the county's 1985 comprehensive recycling study, these programs recover a total of over 750 tons of secondary materials each month. Most Hennepin County offices and service facilities have office paper recycling programs. In 1984, county government offices recovered 175 tons of office paper (Hennepin County, 1985b).

Dropoff recycling facilities are numerous in the county. The Metropolitan Council's 1985 Recycle-It directory shows 51 locations in the county where materials such as paper, corrugated cardboard, metals, aluminum and metal cans are collected. The county also operates leaf composting sites in Minneapolis, Hopkins, Eden Prairie and Maple Grove and, in cooperation with municipalities, has 27 compost distribution locations. In 1985, the county started accepting grass clippings at the sites in addition to leaves (Hennepin County, 1985b).

There is only one municipal solid waste energy recovery plant currently operating in the region, at the Richards Asphalt Refining Co. in Savage. The plant processes about 72 tons of municipal waste daily, of which about 50 percent originates in Hennepin County (Metropolitan Council, 1985a).

3.1.6 County Waste Flow Designation

3.1.6.1 Designation Plan

The Metropolitan Council, at its meeting of Apr. 25, 1985, approved Hennepin County's waste flow designation plan in accordance with the requirements of the WMA. The designation plan is considered an amendment to the county's existing solid waste master plan. With the plan's approval, the county has authority to proceed with implementation of a designation ordinance. The ordinance would require that solid waste generated within the county's boundaries, or a service area thereof, be delivered to resource recovery facilities and transfer stations serving recovery facilities the county designates. The county has drafted its designation ordinance, and it is anticipated the ordinance will be submitted to the Council in December 1985 for approval.

The WMA exempts from designation: 1) materials that are separated from solid waste and recovered for reuse in their original form or for use in manufacturing processes; and 2) materials that are processed at another resource recovery facility at the capacity in operation at the time the designation plan is approved. In addition, at the time the Metropolitan Council approves the designation plan, materials must be excluded from designation that will be processed at potential resource recovery facilities the Council is convinced will be substantially completed within 18 months and will have contracts for waste supplies and for the sale of recovered products. Operators or owners of proposed recovery facilities must file with the Council for the exclusion.

At the time Hennepin County submitted its designation plan to the Council for review, the plan was based on implementing more than one resource recovery facility. The county was proposing to implement a 1,000 ton-per-day mass burn or refuse-derived fuel (RDF) facility at the Minneapolis Greyhound site and either: a) RDF facilities developed in conjunction with Anoka and Dakota Counties and Northern States Power Co. (NSP) that would utilize 650 tons per day of the county's waste, or b) a mass burn or RDF facility that would utilize 650 tons per day of waste at a site on Washington Av. in Minneapolis, if recovery systems could not be negotiated with the two counties and NSP. The county used its most conservative waste generation estimate of 600,000 tons per year, or an average of 1,650 tons per day, to determine the maximum amount it could guarantee to resource recovery project vendors. The 600,000 ton-per-year projection was based on an average daily generation rate of 2,520 tons per day (generation rate for 1980) and taking into account a seasonal low generation rate of 1,971 tons per day and a waste reduction/recycling rate of 20 percent (Hennepin County, 1984). Resource recovery facility project vendors generally require from a public entity a long-term "put-or-pay" waste stream commitment (at least 20 years or longer), which means the county would pay substantial penalties in lieu of waste delivered. Financial advisors deem put-or-pay agreements to be a critical financing consideration. Without a put-or-pay agreement, the county likely could not attract a qualified vendor; nor could the county market its tax-exempt revenue bonds. Purchasers of the revenue bonds must be assured that a long-term revenue source exists to make timely payments on the bonds.

3.1.6.2 Exclusion Projects

At the time of the Metropolitan Council's approval of the county's designation plan, three resource recovery projects were given exclusions from the designation. The Council was convinced that these projects met the statutory criteria for exclusions and could be substantially completed within 18 months. The exclusion projects amount to a total of 622 tons per day. The three projects are:

1. Richards Asphalt Co., Savage, Minn.: Richards proposes to install a 72 ton-per-day Brule refuse incinerator at its asphalt manufacturing facility in Savage. The company currently has a similar type Brule incinerator that began operating in 1982. The incinerator is a modular mass burn system and provides steam for manufacturing products such as road oil, asphalt oil for felt paper, roofing shingles and roofing asphalt. The existing incinerator is currently operating at capacity and draws about half of its waste supplies from Hennepin County.

2. Waste Energy Systems, Edina, Minn.: Waste Energy Systems proposes to build a 200 ton-per-day modular mass burn incinerator in New Brighton. The project has been in the planning stages since 1982. Waste Energy proposes to install a Consumate Systems burner consisting of either four 50 ton-per-day units or three 75 ton-per-day units. The facility would generate steam for local industrial users. Waste Energy proposes to take 50 tons per day from Anoka County and 150 tons per day from Hennepin County.

3. Reuter, Inc., Hopkins, Minn.: Reuter is proposing a 600 ton-per-day processing facility at a site in Eden Prairie. The plant would operate at 400 ton-per-day capacity. The plant is expected to produce densified refuse-derived fuel (dRDF), as well as separate metals, glass, plastics and heavy organics. Twenty tons of the waste received daily are expected to be non-

processable and will be landfilled. Other materials are to be recovered, processed or composted for sale or reuse. Construction of the facility is expected to start in 1985, and the plant is expected to be operational in September 1986. Reuter expects to draw its entire waste supply from Hennepin County.

With the Council's approval of the exclusion requests, Hennepin County terminated its negotiations with Anoka and Dakota Counties. The county felt it no longer had sufficient waste supplies to provide long-term guarantees to projects other than the Greyhound facility. The Council is monitoring closely progress with the exclusion projects. Monthly reports are being made to the Council's Environmental Resources Committee on the status of the projects. The Council, under the WMA, may rescind the exclusion(s) when it approves the county's designation ordinance if, in its judgment, the excluded materials will not be processed at the proposed projects.

3.1.6.3 Designation Ordinance

Hennepin County has released its draft designation ordinance (see Appendix C). It is expected the ordinance will be approved by the county board on Dec. 10, 1985, and will be submitted to the Council for its review. The ordinance specifies the terms and conditions for requiring delivery of solid waste to the county's Greyhound resource recovery project. The ordinance requires all designated waste to be delivered to one of the four transfer stations or, if permitted by the county, directly to the Greyhound facility. The ordinance also specifies which materials are exempt from the designation, and acceptable and unacceptable wastes for the resource recovery facility and transfer stations. The ordinance requires all refuse-handling businesses serving the county to be licensed with the county (Hennepin County, 1985a).

3.1.7 Solid Waste Projects Outside of Hennepin County

Major resource recovery projects are being developed in counties adjacent to Hennepin County. The farthest along is the refuse-derived fuel (RDF) facility being developed by the Northern States Power Co. (NSP) for Ramsey and Washington Counties. This project is a 1,000 ton-per-day facility and will be located in Newport. RDF will be taken to NSP's power plant in Red Wing. The two counties are imposing waste flow designation to supply waste to the Newport facility. The Metropolitan Council has approved a designation plan and ordinance for the project, and NSP has secured the necessary permits and approvals to begin construction. The project broke ground in July 1985 and is expected to be operational in 1987 (Alders, 1985).

Dakota County is proposing to also send waste to the Newport facility. An additional processing line of at least 500 tons per day is under consideration for the facility. The county is proposing that RDF be provided to NSP power plants. The county is currently negotiating its proposal with Ramsey and Washington Counties. Waste flow designation would probably be imposed to supply the county's waste to the facility.

Anoka County is also proposing to construct a large-scale resource recovery facility. Up to a 1,500 ton-per-day RDF facility is under consideration in conjunction with NSP. The county is expecting to issue bonds in December 1985 to finance the facility. Ground breaking would probably occur sometime in 1987, and the project would be operational in 1989 or 1990. The county had a waste flow designation plan approved by the Council in August 1985. The project will have potential for taking additional waste supplies from other counties (Schiferl, 1985)

3.2 Air Quality

3.2.1 Regulatory Review

New stationary sources and modifications to existing sources must follow a new source permitting procedure in accordance with the requirements of the Clean Air Act. The Minnesota Pollution Control Agency (MPCA) and the U.S. Environmental Protection Agency (EPA) have promulgated air quality regulations that define ambient air quality standards, and impose design constraints on new or modified facilities, in order to achieve and maintain these ambient standards. Of these regulations, the proposed Hennepin County Large Scale Energy Recovery Project may be subject to the following:

- National Ambient Air Quality Standards (NAAQS),
- Prevention of Significant Deterioration (PSD) regulations,
- Nonattainment (NA) area regulations,
- New Source Performance Standards (NSPS),
- National Emission Standards for Hazardous Air Pollutants (NESHAPs),
- MPCA Air Pollution Control Regulations.

These rules and regulations are discussed in the following paragraphs as they apply to the licensing of the proposed resource recovery facility.

3.2.1.1 Ambient Air Quality Standards

The Clean Air Act mandated that the EPA identify pollutants which may reasonably be anticipated to endanger public health or welfare and to issue air quality criteria for them. These air quality criteria are to reflect the latest scientific information regarding all identifiable effects a pollutant may have on public health or welfare. Subsequently, EPA promulgated regulations which set National Ambient Air Quality Standards (NAAQS) for such pollutants as sulfur dioxide (SO_2), total suspended particulates (TSP), nitrogen dioxide (NO_2), carbon monoxide (CO), nonmethane hydrocarbons (NMHC), photochemical oxidants and lead (Pb). Two classes of ambient air quality standards were established: (1) primary standards define levels of air quality which the EPA has judged as necessary to protect public health and (2) secondary standards define levels for protecting the public welfare, e.g., soils, vegetation, and wildlife. The Clean Air Act Amendments of 1977 established timetables for periodically reviewing the existing NAAQS and adopting new standards. The NAAQS for photochemical oxidants has been reviewed and, in 1979, was restated as ozone (O_3), whereas the NAAQS for nonmethane hydrocarbons, after review, was revoked in 1983. A new standard for inhalable particulates (PM_{10}) has recently been proposed.

Pursuant to the Clean Air Act and subsequent amendments of 1977, states were required to adopt plans to attain and maintain the NAAQS. The State of Minnesota has established ambient air quality standards for the criteria pollutants which are essentially the same as the NAAQS. Table 3.2-1 lists the state and national ambient air quality

TABLE 3.2-1

SUMMARY OF NATIONAL AMBIENT AIR QUALITY STANDARDS (NAAQS) AND MINNESOTA STATE STANDARDS[1]

Pollutant	Averaging Time	NAAQS (PPM[2]) Primary	NAAQS (PPM[2]) Secondary	Minnesota Standards (PPM[2]) Primary	Minnesota Standards (PPM[2]) Secondary
Carbon monoxide	8 hours	9	(same as primary)	9	(same as primary)
	1 hour	35		30	
Lead	Calendar quarter	1.5	1.5	none	none
Nitrogen dioxide	Annual	0.05	(same as primary)	0.05	(same as primary)
Ozone[3]	1 hour	0.12	(same as primary)	0.12	(same as primary)
Particulate matter	Annual[5]	75	60	75	60
	24 hours	260	150	260	150
Sulfur dioxide	Annual	0.03	none	0.03	0.02
	24 hours	0.14	none	0.14	(same as primary)
	3 hours	none	0.50	0.50	(same as primary)
	1 hour	none	none	0.50	none
Hydrocarbons[5]	3 hours	none	none	0.24	(same as primary)
Hydrogen[6] sulfide	1/2 hour	none	none	0.05	none
	1/2 hour	none	none	0.03	none

1 National and Minnesota standards, other than those based on annual averages or annual geometric means, are not to be exceeded more than once a year (except where noted).

2 All values in parts per million--except particulate matter and lead values, which are in micrograms per cubic meter.

3 The ozone standard is attained when the expected number of days per calendar year in which the maximum hourly average concentration is above the standard is equal to or less than one.

4 Determined as geometric mean.

5 Maximum 3-hour between 6:00 and 9:00 A.M., corrected for methane.

6 The hydrogen sulfide standard of 0.05 PPM is not to be exceeded more than twice a year. The hydrogen sulfide standard of 0.03 PPM is not to be exceeded more than twice in any five consecutive days.

Sou[illegible] : Minnesota Air Pollution Control Rules, Chapter 7005.00[illegible] 1983; 40 CFR 50.4-50.12.

standards for the six criteria pollutants. [Short-term (24-hour or less) standards allow the concentration limit to be exceeded one time per year.] As can be seen from the table, in addition to the NAAQS Minnesota also imposes a primary one-hour and secondary annual average SO_2 standard along with a more restrictive one-hour average CO standard. Besides the criteria pollutant standards, Minnesota has also established ambient standards for hydrogen sulfide (H_2S) and hydrocarbons.

Section 107 of the 1977 Clean Air Act Amendments requires EPA to publish a list of all geographic areas in compliance with the NAAQS as well as those not attaining the NAAQS. Areas not in compliance with the NAAQS are termed nonattainment. Areas meeting the NAAQS are referred to as attainment and are subject to the regulations for the Prevention of Significant Deterioration (PSD), which limit the amount of possible deterioration in existing air quality. Areas which have insufficient data to make a determination are unclassified, but are treated as being attainment areas until proven otherwise. The designation of an area is made on a pollutant specific basis. The geographic regions established for designating the air quality status with respect to compliance with the NAAQS are known as air quality control regions (AQCR). The project area is located in Hennepin County within the Minneapolis - St. Paul Intrastate AQCR. The AQCR is designated as nonattaining the primary NAAQS for SO_2 and CO,* and for TSP in the cities of Minneapolis and St. Louis Park within Hennepin County, and unclassified or better than the NAAQS for NO_2 and ozone.

3.2.1.2 PSD Requirements

The owner or operator proposing a major new source, or major modification to an existing source, located in an attainment or unclassified area, must obtain a PSD permit before construction may commence. A major stationary source, as defined by the PSD regulations, is any source belonging to a list of 28 specified categories which has potential emissions of 100 tons per year (tpy) or more of any pollutant regulated under the Clean Air Act. Any source not included on the list, but which has potential emissions of 250 tpy or more of any regulated pollutant, is also considered a major stationary source. Potential to emit is based on the maximum design capacity of a source and takes into account pollution control efficiency. The proposed facility is classified as a municipal incinerator capable of firing greater than 250 tons per day (tpd) of MSW and, as such, is included in the list of 28 categories. Since potential emissions of certain regulated pollutants from the proposed facility will exceed 100 tpy, the proposed facility is classified as a major source.

The proposed site of the resource recovery facility is located in an area that is currently designated by EPA as either unclassified or attaining for NO_2 and O_3, and nonattaining for SO_2, CO and TSP.

*The MPCA has requested that the metropolitan area be redesignated to attainment for SO_2 (except for the Pine Bend area which will be handled separately) and CO (except for the intersection of Snelling and University in St. Paul). This action is now under review by EPA.

The proposed facility will be subject to the requirements of the PSD regulations for all such regulated pollutants which the facility will emit in significant quantities, defined by de minimis emission rates (see Table 3.2-2).

In general, a PSD permit application must contain the following basic components:

- o an evaluation of alternative control devices and techniques demonstrating that Best Available Control Technology (BACT) will be applied to the new source;
- o an analysis of existing ambient air quality in the vicinity of the new source;
- o a modeling analysis demonstrating that emissions from the new source in conjunction with other nearby sources will not cause a violation of ambient air quality standards or PSD increments;
- o an assessment of the source's impact on soils, vegetation, and visibility; and
- o an analysis of the air quality impacts associated with indirect growth created by the new source.

The basic components of a PSD permit application are discussed below as they apply to the proposed Hennepin County Large Scale Energy Recovery Project.

Best Available Control Technology

The basic control technology requirement for new sources is the application and evaluation of BACT, defined as follows:

> An emission limitation based on the maximum degree of reduction for any regulated contaminant emitted from or which results from any regulated facility which the Department (MPCA) on a case-by-case basis, taking into account energy, environmental, and economic impacts and other costs, determines is achievable for such facility through application of control of production processes and available methods, systems and techniques for each such contaminant.

According to the MPCA, BACT must be applied to all new major sources for those pollutants for which there will be a net "significant" increase in emissions. A significant increase in emissions is defined by the de minimis emission rates established by EPA.

The Guidelines for the Evaluation of BACT were published by the EPA in December 1978 to assist states or regional EPA offices in making BACT determinations. The BACT requirements are intended to ensure that the control systems incorporated in the design of a proposed facility reflect the latest in control technology used in a particular industry in keeping with local air quality, energy, economic, and other environmental considerations. Compliance with NSPS or applicable state emission standards may indeed be deemed application of BACT. Nevertheless, an evaluation of the proposed air pollution control system is required, including an analysis of alternative control systems "capable of a higher degree of emission reduction."

TABLE 3.2-2

DE MINIMIS POLLUTANT EMISSIONS

Pollutants	Emission Rate (tpy)
Carbon monoxide	100.0
Nitrogen oxides	40.0
Particulates	25.0
Sulfur dioxide	40.0
Ozone	40.0*
Lead	0.6
Mercury	0.1
Berryllium	0.0004
Asbestos	0.007
Fluorides	3.0
Sulfuric acid mist	7.0
Vinyl chloride	1.0
Hydrogen sulfide	10.0
Total reduced sulfur (including hydrogen sulfide)	10.0
Reduced sulfur compounds (including hydrogen sulfide)	10.0

*As volatile organic compounds (VOC)

Source: 40 CFR 52.21.

Ambient Air Quality Analysis

Generally, an application for a PSD permit must contain an ambient air quality analysis for each pollutant a major new source, or major modification, would have the potential to emit in greater than de minimis amounts. Air quality data are obtained from a preconstruction monitoring program or, under certain conditions, from existing monitoring sites. Existing air quality may be used in lieu of preconstruction monitoring if:

- o the data are representative of the proposed facility's impact areas;
- o the data are of similar quality as would be obtained if the applicant monitored according to the PSD requirements; and
- o the data are current, that is, collected in the two-year period preceding the permit application, provided the data are still representative of current conditions.

The ambient air quality analysis requirements of the PSD program may be waived on a pollutant-by-pollutant basis by the reviewing authority (here the MPCA) if either of the following conditions are met:

- o the emissions of pollutants subject to PSD review will cause minimal ambient impacts as defined by the de minimis monitoring concentrations established by EPA (see Table 3.2-3); or
- o existing air quality in the source impact area is below the de minimis levels.

Hennepin County has requested and received a PSD air monitoring exemption from the MPCA based on a preliminary air quality modeling analysis which demonstrated predicted impacts below de minimis thresholds for all regulated pollutants emitted from the Greyhound site. The County has agreed to perform limited monitoring for some criteria and noncriteria pollutants, but such monitoring is not a prerequisite to permit issuance. [Pollutant emissions from the transfer sites are well below significant emission rates, and thus are not subject to PSD review.]

The MPCA currently operates numerous monitoring sites in the Hennepin County area. A discussion of existing air quality data measured in the vicinity of the proposed facility is presented in Section 3.2.3.

Air Quality Impact Analysis

The PSD regulations limit the amount that air quality can be degraded above baseline levels. These allowable increases in concentrations (PSD increments) have been established for SO_2 and TSP only. As shown in Table 3.2-4, the PSD increments are a function of area categorization:

TABLE 3.2-3

DE MINIMIS MONITORING CONCENTRATIONS ($\mu g/m^3$)

Pollutant	Concentration (averaging time)
Carbon monoxide	575 (8-hour)
Nitrogen dioxide	14 (annual)
Sulfur dioxide	13 (24-hour)
Total suspended particulates	10 (24-hour)
Ozone	*
Lead	0.1 (3-month)
Asbestos	**
Beryllium	0.001 (24-hour)
Mercury	0.25 (24-hour)
Vinyl chloride	15 (24-hour)
Fluorides	0.25 (24-hour)
Sulfuric acid mist	**
Total reduced sulfur (including H_2S)	**
Reduced sulfur (including H_2S)	**
Hydrogen sulfide	0.2 (1-hour)

*All cases where emissions of VOC are less than 100 tons per year.

**No satisfactory monitoring technique available at this time.

Source: 40 CFR 52.21.

TABLE 3.2-4

FEDERAL PSD INCREMENTS (μg/m^3)

Pollutant	Averaging Period	Class I	Class II	Class III
SO_2	3-hour	25	512	700
	24-hour	5	91	182
	Annual	2	20	40
TSP	24-hour	10	37	75
	Annual	5	19	37

Notes:
1) All 3- and 24-hour Class II and III increments can be exceeded once per year.
2) Initial classification of PSD areas follow the scheme given below:

o Mandatory Class I:
  - International parks
  - National wilderness areas (more than 5,000 acres)
  - National memorial parks (more than 5,000 acres)
  - Existing national parks (more than 6,000 acres)
  - Other currently designated Class I areas.

o Remainder of the country is Class II unless area is in noncompliance with NAAQS.

Source: 40 CFR 52.21.

- o Class I - areas where almost any deterioration of air quality is undesirable and little or no major industrial development is allowed.
- o Class II - areas where moderate, well-controlled energy or industrial growth is desired while complying with NAAQS.
- o Class III - areas where substantial energy or industrial development is intended and NAAQS are not violated.

The project site is located in a Class II area. The nearest Class I area is the Rainbow Lake Wilderness Area which is located approximately 125 miles (200 kilometers) northeast of the proposed site. There are no Class III areas to consider.

The modeling analysis must demonstrate that emissions from the proposed facility plus other increment consuming sources will result in concentrations that are less than the PSD increments. Increment consuming source emissions are those which result from:

- o emission increases at major stationary sources constructed after January 6, 1975, and
- o emission increases at all stationary sources occurring after the baseline date has been "triggered".

The baseline date is "triggered" in a Section 107 area (a listed geographic area used to determine compliance with the NAAQS) when the first completed PSD application for that area has been submitted, or the 107 area is significantly impacted by allowable emissions associated with a completed PSD permit application in another 107 area.

Once compliance with PSD increments has been determined, compliance with the NAAQS must be demonstrated. Total air quality levels are determined by combining the projected concentrations with existing background levels. Background can be estimated through modeling of existing sources, from existing ambient measurements, or a combination thereof.

The EPA has defined a set of impact levels used to determine whether a major new source or modification will "significantly" affect an area (see Table 3.2-5). These concentration thresholds are generally based on the Class I increments and are interpreted by EPA and MPCA as representing the <u>minimum</u> amount of ambient impact that is significant. In general, the EPA and MPCA do not intend to analyze the impact of a major new source beyond the point where its contribution falls below those levels indicated in Table 3.2-5.

A comparison of the values presented in Tables 3.2-5 and 3.2-1 shows that the significant impact levels (SILs) are substantially below the ambient standards. For example, the SILs for SO_2 are less than 2% of the ambient standards for all averaging periods. Therefore, just because a source is predicted to cause an air quality impact above the SIL (hence, a "significant" impact) does not mean that emissions from the source will threaten the health of the public. Rather, the facility's impact plus the impact of other background sources are compared to the NAAQS to determine if the health of the public is expected to be endangered.

TABLE 3.2-5

SIGNIFICANT IMPACT LEVELS ($\mu g/m^3$)

Pollutant	Averaging Period 1-Hour	3-Hour	8-Hour	24-Hour	Annual
SO_2	--	25	--	5	1
TSP	--	--	--	5	1
NO_2	--	--	--	--	1
CO	2,000	--	500	--	--

Note: These levels are not to be exceeded.

Source: Appendix S to 40 CFR 51 and PSD Workshop Manual, U.S. EPA, Oct. 1980.

The primary purpose of comparing modeled concentrations with the SILs is to establish a source's significant impact area for each pollutant. Major background sources located in the proposed source's pollutant-specific significant impact area are generally modeled as part of the air quality impact analysis. Therefore, the SILs are merely a regulatory tool and are not of themselves measures of adverse health impacts.

Because the short-term (averaging period of 24-hours or less) NAAQS and PDS increments can be exceeded at each receptor once per calendar year, the highest predicted short-term concentration at each receptor is not used to determine if the proposed source is in compliance with the standards. Rather, the highest of the second-highest, short-term concentrations over all the receptors predicted for a calendar year is used to determine compliance. The highest predicted long-term (3-month and annual) concentrations must be below the standards/increments at all receptors for each year. Therefore, the highest of the second-highest short-term and highest long-term modeled concentrations are used in determining compliance with ambient standards.

The air quality impact analysis demonstrating compliance with ambient air quality standards and PSD increments and the assessment of the source's impact on soils, vegetation, and visibility are documented in Section 4.2.

3.2.1.3 Nonattainment Area Regulations

A major new stationary source, or major modification to an existing source, located in a nonattainment area, must obtain new source permits in accordance with the EPA Emission Offset Interpretative Ruling. The new source review of a source located in a nonattainment area requires: (1) the achievement of the lowest achievable emission rate (LAER), (2) certified compliance by all other sources in the state, (3) emission offsets greater than one-for-one (or as otherwise provided in an approved SIP), and (4) emission offsets providing a net air quality benefit to the nonattainment area. Major sources are subject to review under the Offset Ruling only if they emit in major amounts, i.e., 100 tons per year, the pollutant(s) for which the area is designated nonattainment. Similarly, only if a modification increases emissions of a pollutant for which the source is major, and for which the area is designated nonattainment (NA), do nonattainment regulations apply.

The proposed facility is located in a NA area for SO_2, CO and TSP, and thus, would be subject to review for those NA pollutants for which it would be classified as a major source. Nonattainment review requirements for TSP will not apply to this facility as the emissions (37 tons per year) are estimated to be below the 100 tons per year major source criterion. Because SO_2 and CO emissions are both estimated to be greater than 100 tons per year, nonattainment review requirements for SO_2 and CO will apply to the facility, unless the requested redesignation of the area for SO_2 and/or CO is approved by the EPA.

3.2.1.4 New Source Performance Standards

The Clean Air Act mandated that the EPA promulgate New Source Performance Standards (NSPS), a set of national emission standards for stationary sources of air pollution. These standards are applicable to specific categories of sources and apply not only to new sources, but also to modified or reconstructed existing sources of air pollution. As stated in the 1977 Amendments to the Clean Air Act, these standards "shall reflect the degree of emission limitation and the percentage reduction achievable through application of the best technological system of continuous emission reduction (taking into consideration the cost of achieving such emission reduction, any non-air-quality health and environmental impact and energy requirements) the Administrator determines has been adequately demonstrated."

Consequently, the EPA promulgated NSPS for incinerators in June 1974 (40 CFR 60, Subpart E). These standards impose an emission limitation on particulate matter. Specifically, incinerators with a charge rate in excess of 50 tpd may not discharge flue gases that contain particulate matter in excess of 0.08 grains per dry standard cubic foot (gr/dscf) corrected to 12% carbon dioxide (CO_2). Monitoring requirements include daily charge rates and hours of operation. The EPA reviewed the NSPS for incinerators and reported its findings on November 27, 1979 (44 FR 67938). The recommendations reported therein included investigation of a more restrictive particulate matter limitation and establishment of an opacity standard. The support document for this review concluded that available technology generally can meet a particulate emission rate of 0.05 gr/dscf at 12% CO_2.

On June 19, 1984, the EPA proposed NSPS for nonfossil-fuel-fired boilers with a heat input greater than 100 MMBtu/hr (45 FR 67938). These proposed standards would limit particulate emissions from MSW-fired boilers to 0.1 pound per million Btu (lb/MMBtu), which is equivalent to an outlet grain loading of approximately 0.044 gr/dscf at 12% CO_2. In addition, these draft standards would impose a limitation on opacity of 20%. The Hennepin County boilers are each rated at 145 MMBtu/hr. The proposed project would generate emissions of 0.01 gr/dscf which is approximately equal to 0.022 pounds per million Btu; which is well within limits.

3.2.1.5 National Emission Standards for Hazardous Air Pollutants

Section 112 of the Clean Air Act requires the EPA to publish a list (to be periodically revised) including hazardous air pollutants for which National Emission Standards for Hazardous Air Pollutants (NESHAP) would be developed. Emission standards have been promulgated in 40 CFR 61 for asbestos, beryllium, mercury, and vinyl chloride. To date, the NESHAP do not apply to the design or operation of resource recovery facilities.

3.2.1.6 MPCA Air Pollution Control Regulations

Emission Limitations

MPCA Control Rules (1983, Chapter 7005.0620) restrict the outlet grain loading from new municipal incinerators to 0.08 gr/dscf corrected to 12% CO_2. The same rules limit the visible emissions from air pollution sources to not more than 20% opacity at any one time. Performance testing is required to demonstrate compliance with these limitations. MPCA rules do not contain specific emission limits for any other pollutants.

MPCA policy is to perform continuous (in-stack) emission monitoring of O_2, CO, CO_2 and temperature for resource recovery facilities. Periodic (in-stack) tests are also performed for heavy metals, particle size (once per year), acid gas (once per year for at least two years) and dioxin (once every five years). The purpose of this testing is to ensure that the incinerators have an adequate hydrocarbon destruction efficiency.

Odor Emission Limits

Minnesota has developed regulations for the control of odors in the ambient air. These regulations have taken the form of odor emission limits and ambient odor testing. Emission limits are set forth by regulation APC-9 as follows.

(1) Odor sources emitting from well-defined stacks 50 feet or more above grade elevation and with adequate dispersion characteristics as determined by the Agency shall not emit odors in greater than 150 odor concentration units*.

(2) Odor sources of less than 50 feet elevation above grade or otherwise failing to create good dispersion conditions as determined by the Agency shall not emit more than 25 odor concentration units.

(3) No odor source shall have an odor emission rate in excess of 1,000,000 odor concentration units per minute.

(4) No odor source shall emit air contaminants into the ambient air which cause odor outside the alleged polluter's property line in excess of the following limitations:

- o One odor unit in areas zoned residential, recreational, institutional, retail sales, hotel or educational;
- o Two odor units in areas zoned light industrial;
- o Four odor units in areas zoned other than those above.

*Odor concentration unit shall mean the number of standard cubic feet of odor-free air needed to dilute each cubic foot of contaminated air so that at least 50 percent of the odor concentration test panel does not detect any odor in the diluted mixture.

Odor testing is conducted by a panel under the supervision and advisement of the MPCA.

APC-9 specifically states that compliance with odor concentration units/limits does not obviate the existence of a public and/or private nuisance problem.

Permit Requirements

As required, the proposed resource recovery facility must obtain a permit to construct from the MPCA prior to initiating construction. Generally, the information supplied as part of the PSD process is sufficient for the MPCA permit. The permit application must include site information, plans, descriptions, specifications, and drawings showing the design of the facility, the nature and amount of emissions, and the manner in which it will be operated and controlled.

3.2.2 Climatology

The Minneapolis-St. Paul area has a continental-type climate which is characterized by wide variations in temperature, ample summer rainfall, and light to moderate winter precipitation. Mean seasonal temperatures range from approximately 16°F in winter to 70°F in summer. Temperature extremes show a marked contrast with a recorded minimum of -34°F and maximum of 104°F. High and low pressure systems moving across the area cause frequent (and often rapid) changes in temperature, particularly in winter and spring. Maximum seasonal precipitation occurs during spring and summer. From May through September, the average total rainfall is about 17 inches, which accounts for approximately 65 percent of the annual total precipitation of approximately 27 inches. Winter precipitation consists mostly of snow, which averages about 46 inches a season. Thunderstorms are the principal source of precipitation in spring and summer. Thunderstorms accompanied by hail, and other severe storms (such as tornadoes, glaze, and blizzard conditions), occur often enough to warrant consideration in facility design and construction. Monthly mean temperature and precipitation data for the Minneapolis-St. Paul area are given in Table 3.2-6.

The joint frequency distributions of wind direction and speed (wind rose) from surface data taken at Minneapolis-St. Paul International Airport for the 15 year period, 1958-1972 are shown in Figures 3.2-1 through 3.2-4 for each of the four seasons. Winds from the northwest to north are most frequent in winter and spring, occurring about 30 percent of the time, whereas south to southeast winds are most frequent in summer and fall, occurring slightly less than 30 percent of the time. Outbreaks of polar and Arctic air moving southward from Canada into the Great Plains result in the north to northwest flow. Southeast to south winds result from a return flow on the rear of high pressure cells centered over the eastern Great Lakes-New England region, or from flow ahead of storm systems which move over and to the north of the area.

Thus, the general weather systems that influence Minnesota are characterized by winds primarily from the northwest to north during the winter months and southeast to south during the summer months.

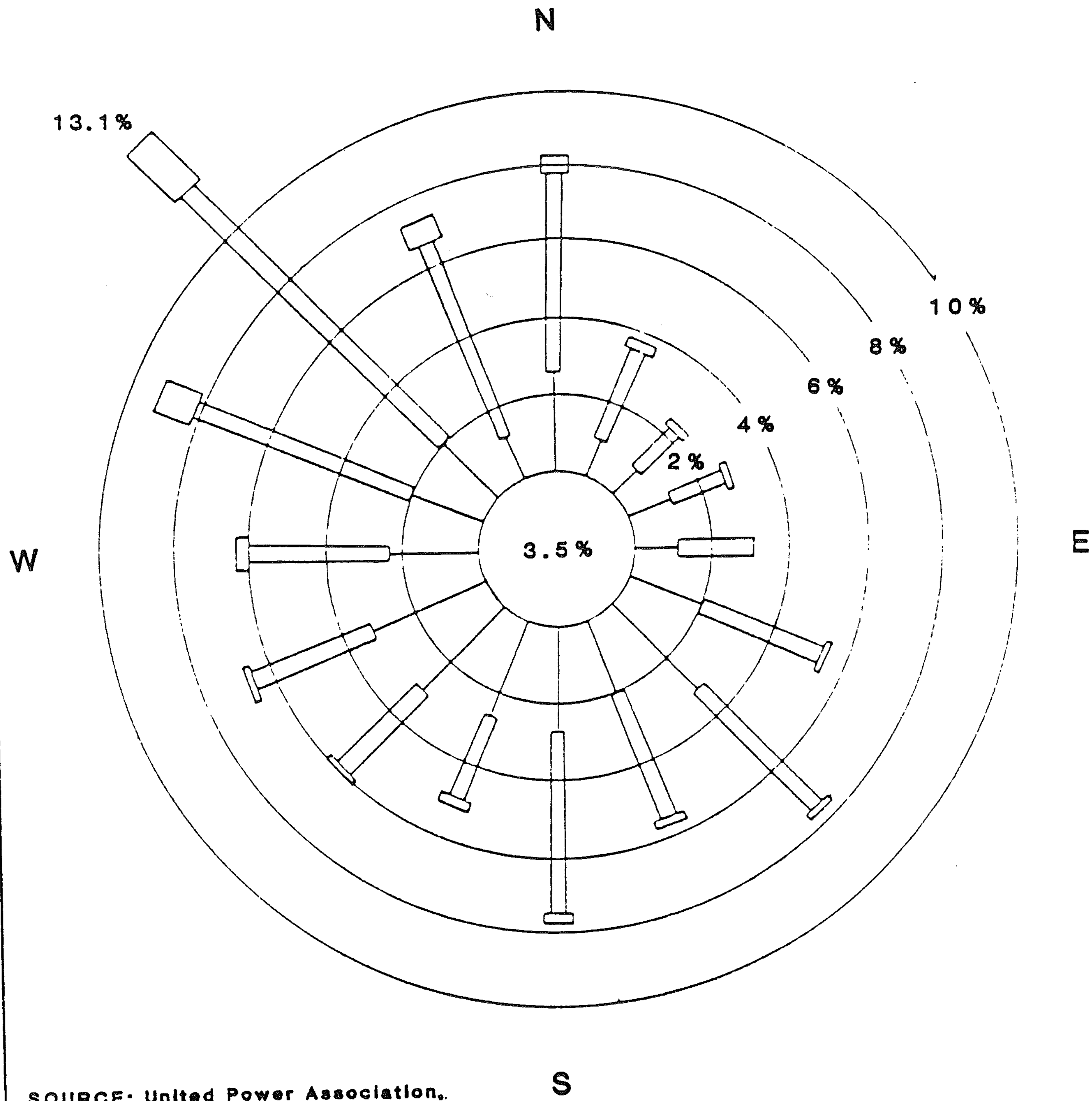
TABLE 3.2-6

SUMMARY OF MEAN MONTHLY CLIMATOLOGICAL CONDITIONS:
MINNEAPOLIS-ST. PAUL AREA, 1939-1978

Month	Mean Temperature (°F) [1]	Precipitation (inches) [1]	Snowfall (inches) [2]
January	12.9	0.82	9.1
February	16.8	0.85	8.2
March	29.7	1.53	10.6
April	45.9	2.12	2.5
May	58.0	3.37	0.2
June	67.9	4.14	0.0
July	73.1	3.44	0.0
August	70.6	3.26	0.0
September	61.5	2.86	0.1
October	49.9	1.98	0.4
November	33.0	1.36	6.1
December	19.3	0.91	9.2
Annual Mean	44.9	26.64	46.3

[1] From 1891.
[2] From 1939.

Source: The Weather Almanac, 1981.



SOURCE: United Power Association, October 1977. "Elk River Steam Plant Coal Conversion: Air Dispersion Modeling." Elk River, Minnesota.

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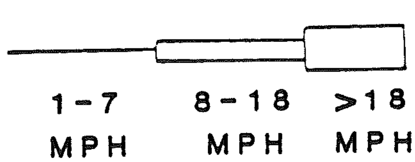
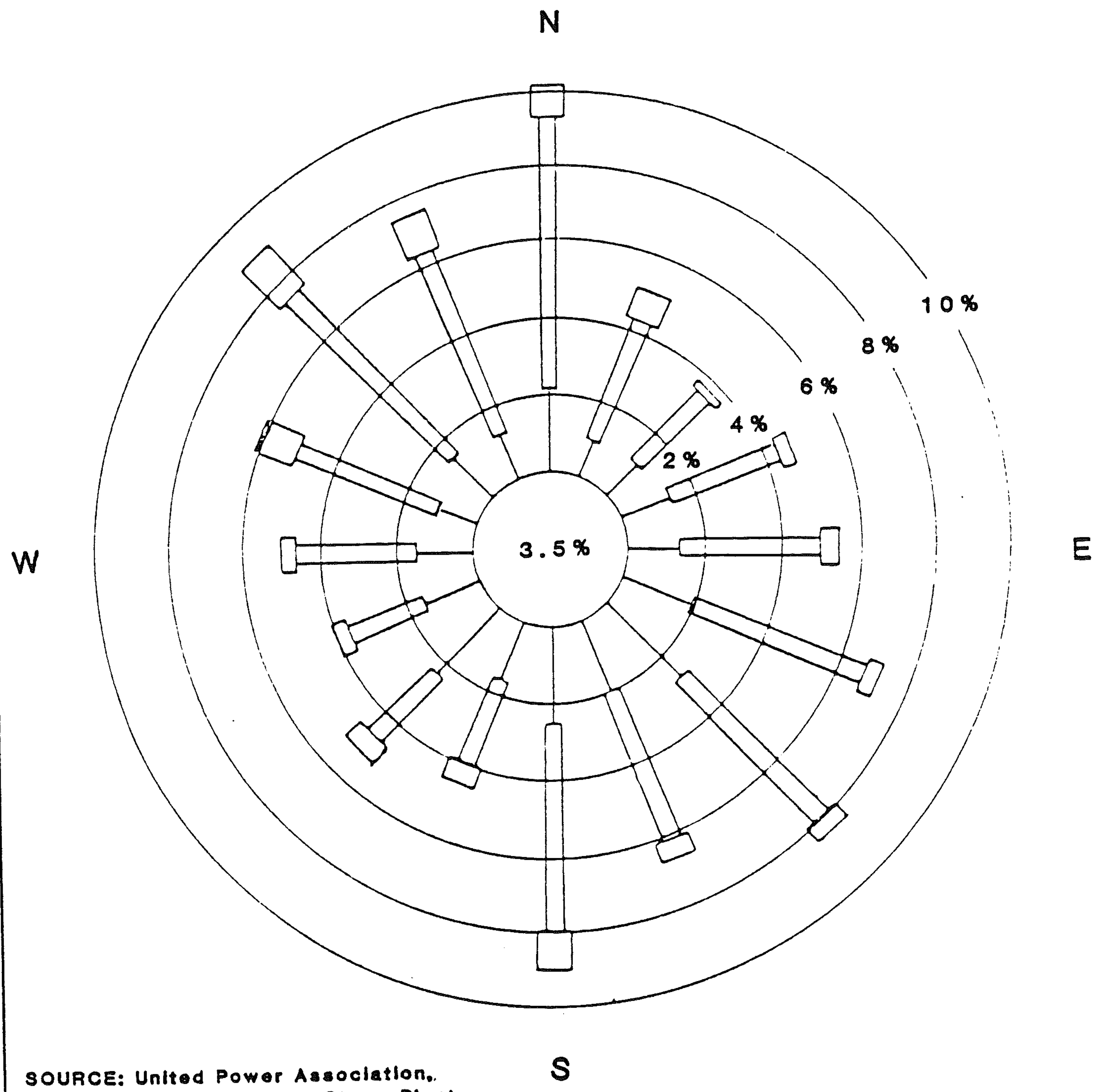


Figure 3.2-1 Minneapolis-St. Paul International Airport Winter Wind Rose (Dec. - Feb. 1958-1972)



SOURCE: United Power Association, October 1977. "Elk River Steam Plant Coal Conversion: Air Dispersion Modeling." Elk River, Minnesota.

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ENVIRONMENTAL IMPACT ANALYSIS

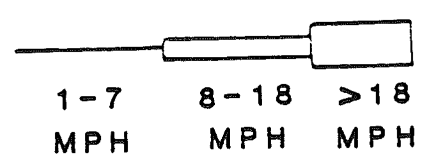
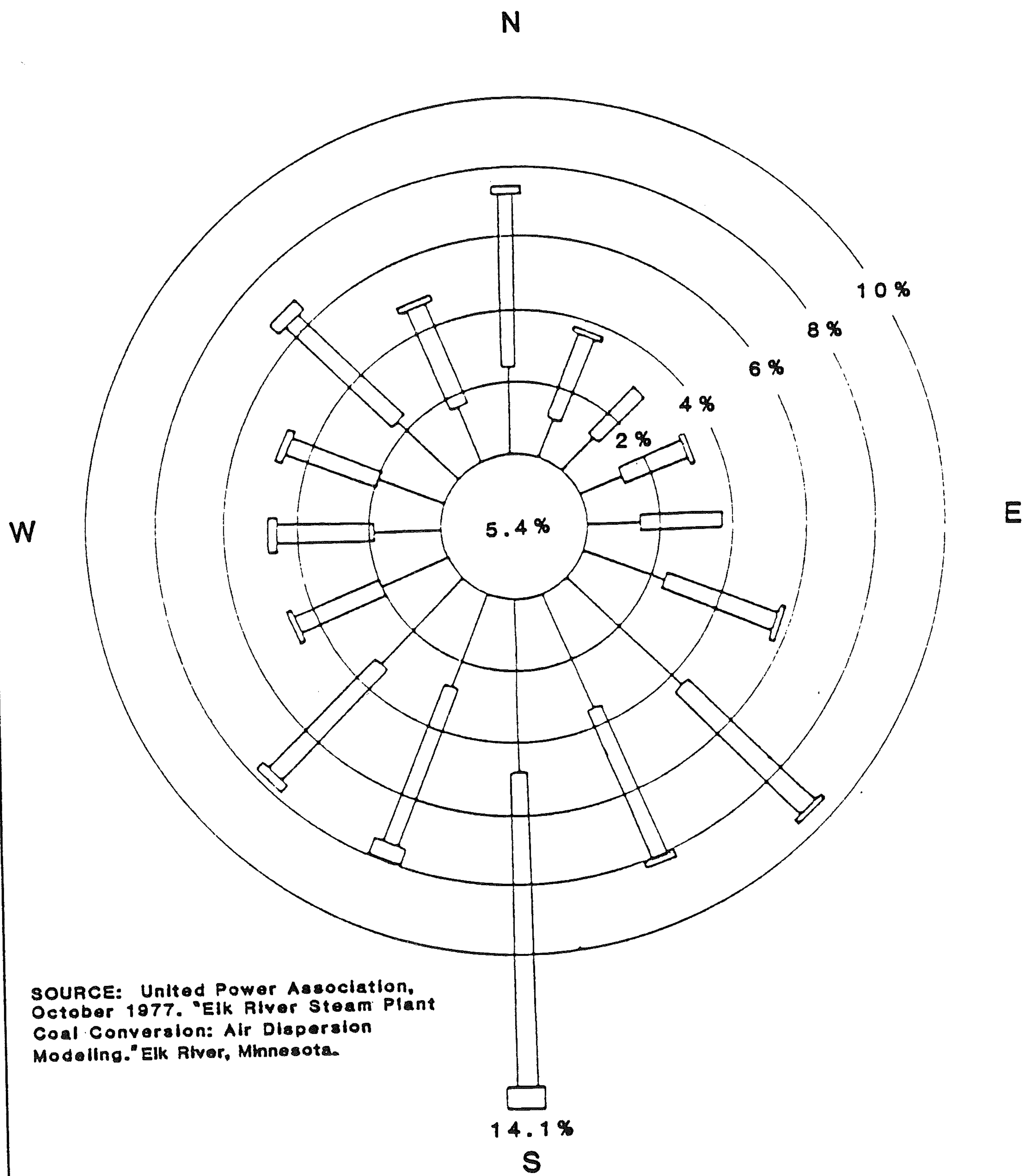


Figure 3.2-2 Minneapolis-St. Paul International Airport Spring Wind Rose (Mar. - May 1958-1972)

8510069



SOURCE: United Power Association, October 1977. "Elk River Steam Plant Coal Conversion: Air Dispersion Modeling." Elk River, Minnesota.

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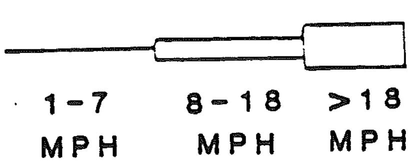
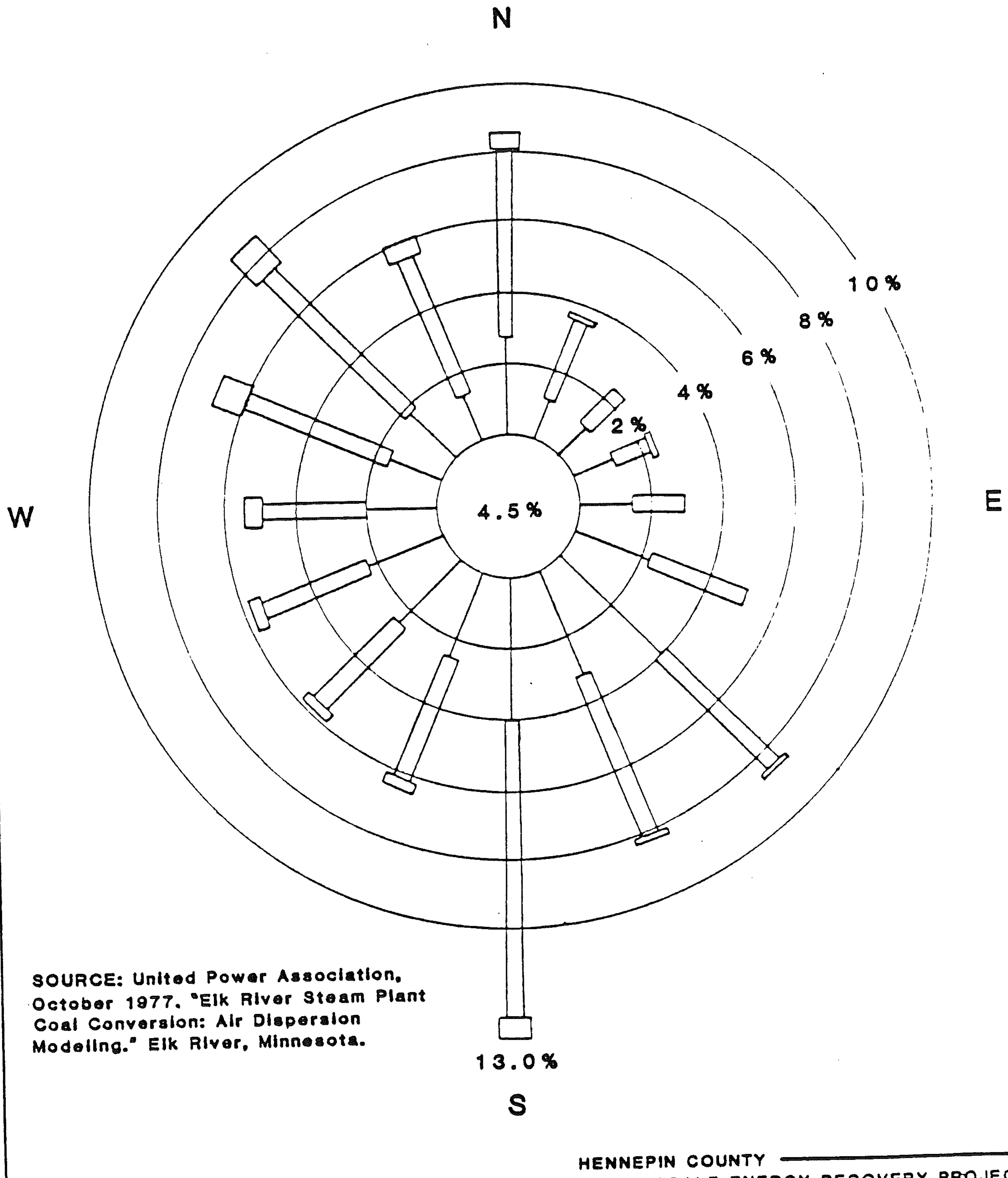


Figure 3.2-3 Minneapolis-St. Paul International Airport Summer Wind Rose (Jun. - Aug. 1958-1972)

8510070



SOURCE: United Power Association, October 1977. "Elk River Steam Plant Coal Conversion: Air Dispersion Modeling." Elk River, Minnesota.

HENNEPIN COUNTY
LARGE SCALE ENERGY RECOVERY PROJECT
ENVIRONMENTAL IMPACT ANALYSIS

Figure 3.2-4 Minneapolis-St. Paul International Airport Fall Wind Rose (Sep. - Nov. 1958-1972)

8610071

Precipitation concurrent with northwest-north winds in the colder months occurs primarily in the form of snow. High wind speeds, occasionally reaching blizzard proportions, occur with large-scale storm systems. During late spring and summer, the predominance of shower and thunderstorm activity is associated with fronts or squall lines that move through the area.

3.2.3 Existing Ambient Air Quality

The MPCA operates six air quality monitoring stations within the Minneapolis central business district (CBD). These stations provide data sufficient to characterize the existing air quality of the project site. These stations, and the pollutants measured, are listed in Table 3.2-7 and shown on Figure 3.2-5. The monitoring station at 7th St. and Hennepin Ave. is located near the resource recovery facility site, about 750 meters to the southeast, and provides representative CO and SO_2 data. The monitoring station at 300 Nicollett Mall is located about 1,000 meters to the east-southeast of the site and provides TSP, Pb and PM_{10} data. NO_2 measurements are taken at 143 13th Ave. Northeast, approximately 2,250 meters to the north-northeast of the site. Continuous monitoring data are obtained for SO_2, CO, and NO_2 at the above sites. TSP and Pb are sampled for 24-hour periods every six days. At present, there is only limited monitoring of PM_{10} (particulate matter less than 10 microns in diameter), but several additional PM_{10} monitors will be placed in Minneapolis by the end of 1985. Appropriate annual and highest and second-highest short-term concentrations for each pollutant monitored in the CBD during the last three years (1982 through 1984) are listed in Table 3.2-8. Ambient pollutant concentrations at the four proposed transfer station sites are expected to be at or below levels measured in the CBD due to the fewer number of pollutant sources.

<u>Sulfur Dioxide (SO_2)</u>

Ambient air quality standards for SO_2 have been established for four averaging periods; National Ambient Air Quality Standards (NAAQS) cover annual, 24-hour and 3-hour periods and the MPCA has established a 1-hour standard. Annual, as well as highest and second-highest 24-hour, 3-hour and 1-hour average SO_2 concentrations for the 7th St. & Hennepin Ave. and 1829 Portland Ave. South. monitors are given in Table 3.2-8. Second-highest values are presented for the short-term averaging periods ($\leq$24 hours) because the standards allow one exceedance per calendar year. Annual average concentrations over the period are no more than a third of the 0.03 ppm primary NAAQS and one-half of the 0.02 ppm Minnesota standard. The second-highest 24-hour average concentrations are less than sixty percent of the 0.14 ppm primary NAAQS, whereas the second-highest 3-hour average concentrations are less than thirty-five percent of the 0.50 ppm secondary NAAQS. The second-highest 1-hour average concentrations are also less than thirty-five percent of the 0.50 ppm Minnesota 1-hour standard. Allowing for year-to-year variations, the general trend in SO_2 concentrations at these monitoring sites over the past three years is downward with concentrations being well within ambient standards.

TABLE 3.2-7

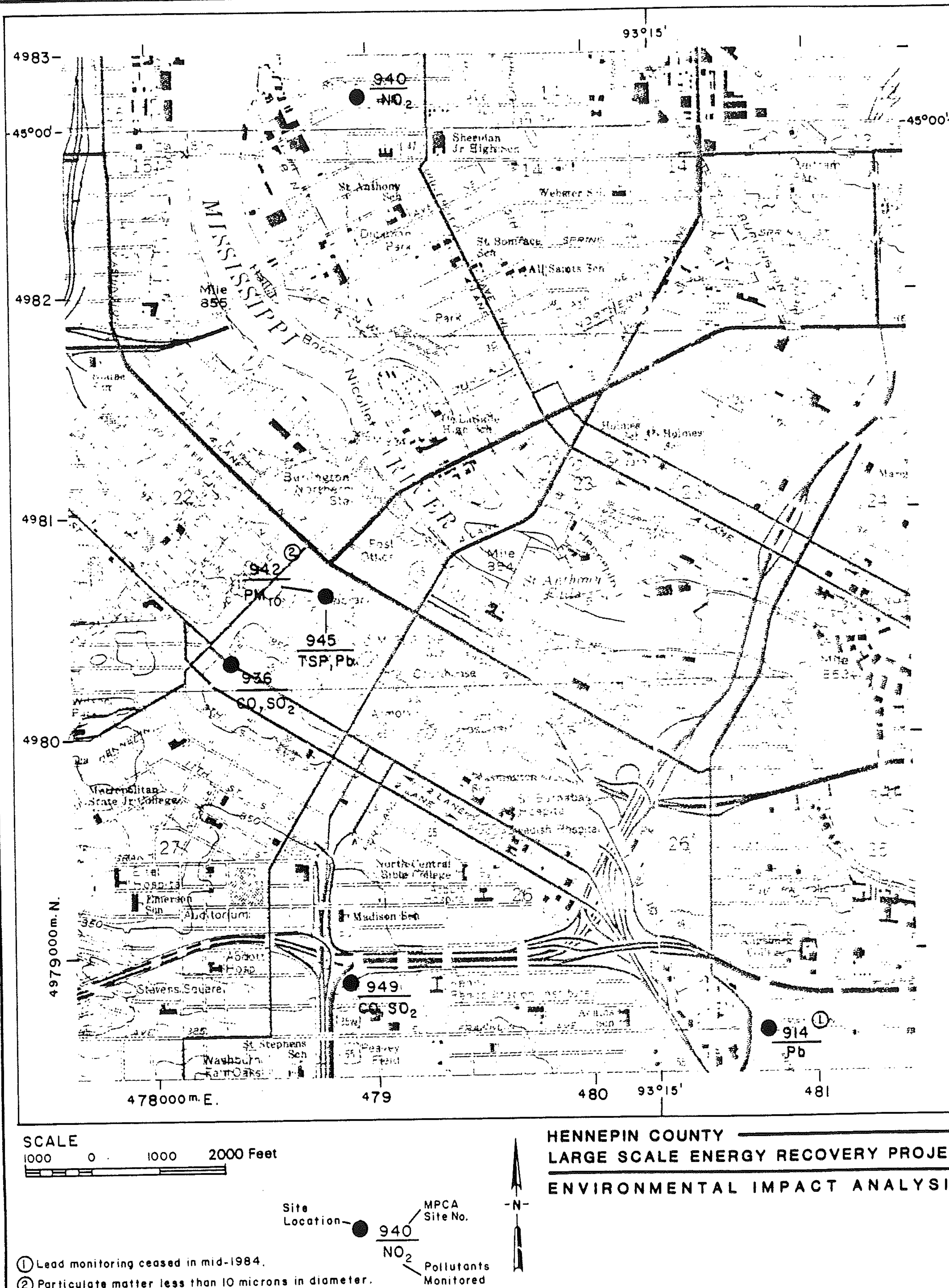
MPCA AIR QUALITY MONITORING SITES
IN THE MINNEAPOLIS CENTRAL BUSINESS DISTRICT

MPCA Site No.	Site Location	Pollutants Monitored
914	2000 East Franklin Ave.,	Pb [1]
936	7th St. & Hennepin Ave.	CO, SO_2
940	143 13th Ave. Northeast	NO_2
942	300 Nicollet Mall	PM_{10} [2]
945	300 Nicollet Mall	TSP, Pb
949	1829 Portland Ave. South	CO, SO_2

[1] Lead monitoring ceased in mid-1984.

[2] Particulate matter less than 10 microns in diameter.

Source: MPCA, 1985



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ENVIRONMENTAL IMPACT ANALYSIS

(1) Lead monitoring ceased in mid-1984.
(2) Particulate matter less than 10 microns in diameter.

Figure 3.2-5 Minneapolis CBD MPCA Air Monitoring Sites

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TABLE 3. 3

AIR QUALITY MONITORING DATA FOR THE MINNEAPOLIS CENTRAL BUSINESS DISTRICT OVER THE THREE-YEAR PERIOD 1982 THROUGH 1984

Pollutant	Averaging Time	MPCA Monitoring Station No.	Concentration (parts per million)					
			1982		1983		1984	
			Highest	2nd Highest	Highest	2nd Highest	Highest	2nd Highest
Sulfur dioxide	1-hour	936	0.203	0.169	0.156	0.147	0.092	0.084
		949	0.152	0.109	0.138	0.133	0.096	0.075
	3-hour	936	0.170	0.167	0.126	0.107	0.070	0.069
		949	0.085	0.078	0.114	0.107	0.047	0.044
	24-hour	936	0.121	0.079	0.068	0.050	0.026	0.024
		949	0.048	0.037	0.064	0.058	0.030	0.030
	Annual	936	0.007	--	0.010*	--	0.006*	--
		949	0.006	--	0.007	--	0.004	--
Nitrogen dioxide	Annual	940	0.017*	--	0.017	--	0.015*	--
Carbon monoxide	1-hour	936	14.6	13.2	22.6	15.3	13.3	13.3
		949	19.8	15.7	14.7	8.4	17.8	12.3
	8-hour	936	9.0	8.3	9.7	8.4	8.1	8.0
		949	7.7	6.6	5.6	5.5	8.7	6 3
Particulate** matter	24-hour	942	176	146	172	166	227	147
		945	163	119	140	125	153	133
	Annual	942	55.1	--	57.8	--	56.9	--
		945	56.5	--	55.7	--	60.9	--
Lead**	Quarterly	914	0.26	--	0.36	--	0.32*	--
		945	0.23	--	0.28	--	0.25	--

* Data capture below 75 percent. A data capture of at least 75 percent over the averaging period is required by EPA in order for a measurement to be valid.

**Concentrations in micrograms per cubic meter.

Source: MPCA, 1985

Total Suspended Particulates (TSP)

Annual, highest and second-highest 24-hour TSP concentrations for the two stations at the 300 Nicollett Mall monitoring site are shown in Table 3.2-8. Annual concentrations are less than eighty-five percent of the 75 $\mu g/m^3$ primary NAAQS and at or below the more restrictive Minnesota and federal secondary standard of 60 $\mu g/m^3$. The second-highest 24-hour concentrations over the past three years are less than 65 percent of the 260 $\mu g/m^3$ primary NAAQS, but were above the 150 $\mu g/m^3$ secondary NAAQS during 1983. The three measured concentrations that exceeded the secondary standard during 1983 are less than 15 percent above this standard. Therefore, TSP concentrations at this monitoring site over the past three years have been well within the primary NAAQS, but with levels occasionally above the secondary standards.

Carbon Monoxide

Ambient standards for CO are set at 9 ppm for 8-hour average concentrations and 35 ppm for 1-hour average concentrations by the EPA (NAAQS). The MPCA has a more restrictive 1-hour standard of 30 ppm. Table 3.2-8 gives the highest and second-highest 8-hour and 1-hour average CO concentrations over the past three years for the 7th St. & Hennepin Ave. and 1829 Portland Ave. South monitors. The second highest 8-hour average concentrations are less than 95 percent of the primary NAAQS, whereas the second highest 1-hour average concentrations are no more than 45 percent of the primary NAAQS and 55 percent of the more restrictive Minnesota 1-hour standard. Elevated CO concentrations are primarily due to vehicular traffic on major roadways near the monitors, rather than emissions from major stationary point sources.

Nitrogen Dioxide (NO_2)

The ambient standard for NO_2 is 0.05 ppm averaged over an annual period. Annual average NO_2 concentrations for the past three years are given in Table 3.2-8 for the 143 13th Ave. NE monitor. At 35 percent of the standard, these concentrations are well below the primary NAAQS.

Lead (Pb)

The ambient standard for lead is 1.5 $\mu g/m^3$ averaged over a three-month period. Quarterly average lead concentrations for the past three years are given in Table 3.2-8 for the 300 Nicollett Mall and 2000 East Franklin Ave. monitors. These concentrations are less than 25 percent of the primary NAAQS.

Ozone (O_3)

No monitors within the CBD measure ozone. The closest O_3 monitoring site is located in Roseville, about seven miles to the northeast, at 1935 West County Road. The second highest 1-hour average O_3 concentration at this site over the past three years of 0.094 ppm is less than 80 percent of the 0.12 ppm primary NAAQS.

Conclusion

In summary, pollutant concentrations measured at monitors within the Minneapolis CBD show air quality in the area to be generally good. Sulfur dioxide, nitrogen dioxide and lead levels are well below the ambient standards, whereas carbon monoxide and ozone concentrations are somewhat more elevated but at levels still below these standards. Although particulate concentrations are well within primary standards, concentrations occasionally reach levels that are above the secondary standards.

Although there are no ambient monitors located in the vicinity of the four proposed transfer stations, ambient pollutant concentrations at these locations are expected to be at or below levels measured in to CBD due to the fewer number of pollutant sources.

3.3 Geology & Soils

3.3.1 General Information

3.3.1.1 Regional Geology

The five sites of the proposed project are located in the Central Lowland Physiographic Province, near its border with the Superior Physiographic Province. The Central Lowland Province is a geologically stable platform area which borders the Canadian Shield, the "core" of the North American continent.

The Twin Cities metropolitan area is located at the center of a spoon-shaped structural trough having a north - trending axis. This structural trough, which is commonly called the Twin Cities basin, is located in the Hollandale embayment of the ancestral Forest City Basin. As a result of several marine advances and retreats during the early Paleozoic Era (570-450 million years ago) up to 1,000 feet of sandstone, carbonate (limestone and dolomite), siltstone and shale were deposited in the Twin Cities basin. The youngest bedrock present in the Minneapolis - St. Paul area is the Decorah Shale, which is Ordovician in age. There is no rock record of geologic events which occurred in the Twin Cities area during the nearly 450 million years from the Ordovician to the Pleistocene age. A more detailed description of the bedrock formations in the Twin Cities basin follows in the section on Regional Geologic Formations.

During the Pleistocene age, which concluded approximately 10,000 years ago, several lobes of glacial ice traversed the area. This glaciation had a profound effect on the configuration of the land surface. The Superior lobe and the Grantsburg sublobe of the Des Moines lobe scoured the bedrock surface, and in places incised deep valleys. A variable layer of glacial drift was deposited over the entire area. Irregular knobs and hills were created as clay- to boulder-sized particles were deposited at the edge of and underneath the glacial ice. Extensive flat areas resulted where braided streams of glacial meltwaters deposited large quantities of outwash. Bedrock valleys were buried, and chains of lakes formed above them. The land surface was subsequently modified by erosion and deposition, largely attributable to the two major rivers which converge in the area, the Mississippi and the Minnesota.

The Twin Cities metropolitan area has been divided into twelve geomorphic regions by the University of Minnesota Department of Soil Science (1974). All five of the sites proposed for the Hennepin County's waste-to-energy facility and ancillary transfer stations are located in either the Mississippi or the Minnesota Valley Outwash geomorphic regions. These are nearly level terraces and plains in contact with the major rivers and tributaries, and are characterized by soils which are sandy and gravelly.

Much of the Twin Cities area is urbanized, and the native surface soils have been disturbed and/or covered with buildings and pavement. Surface waters drain into storm sewers, and then into nearby streams and rivers. Water table elevations are often irregular, due to the geometric variability of fine- and coarse-grained soil deposits, laterally as well as vertically. Locally, perched water table conditions are a common occurrence. Both confined and unconfined aquifers are present beneath the areas of interest.

The sites are located at elevations which range from approximately 800 to 900 feet above mean sea level datum. The total vertical relief of the land surface within the individual site areas is in the range of 10 to 25 feet. The relatively level ground surface on the sites sometimes contrasts sharply with adjacent areas, which are characterized by steep-sided landforms formed in response to glaciation and subsequent natural processes.

3.3.1.2 Regional Geologic Formations

Glacial Deposits

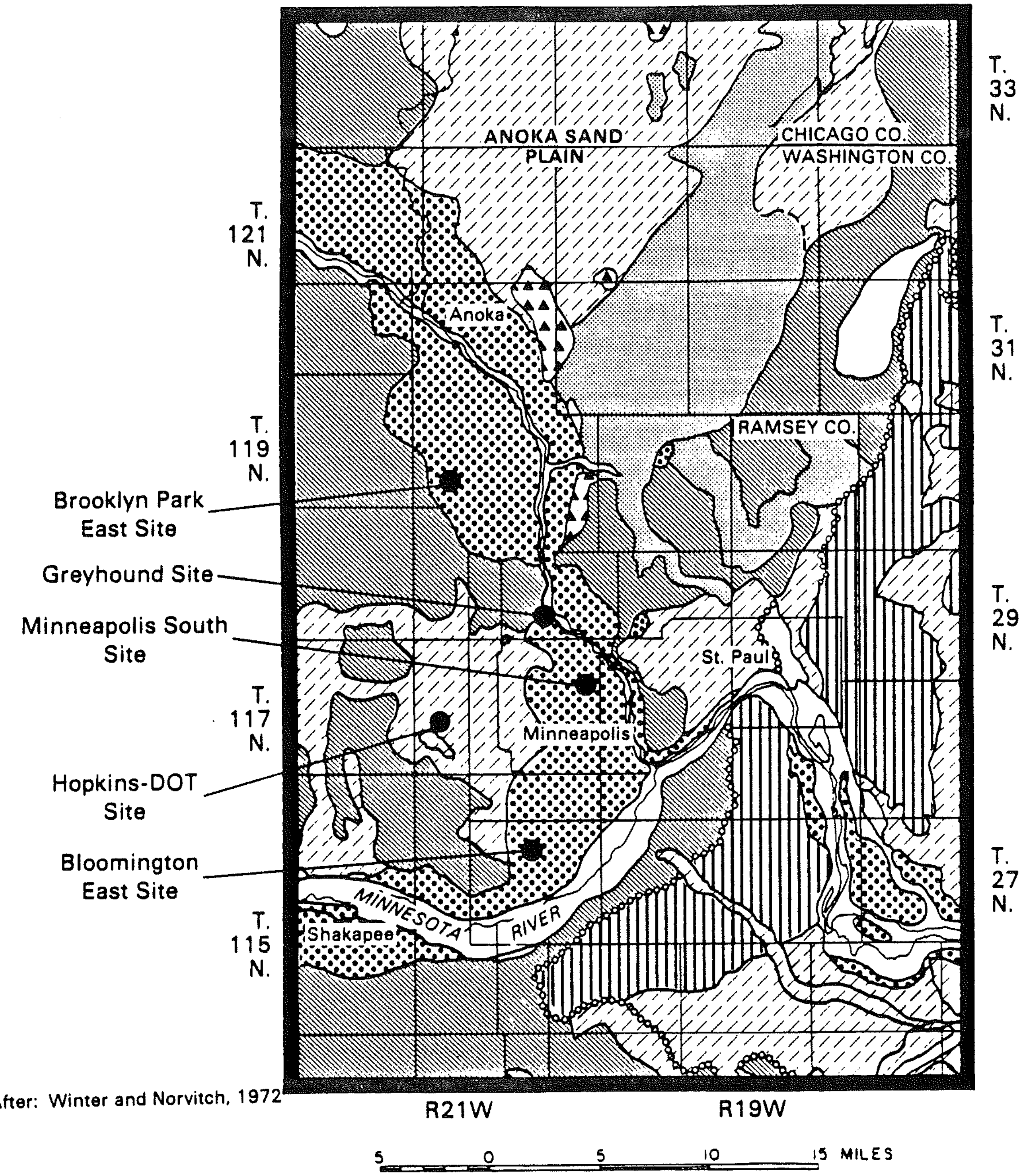
A variety of overburden units are mapped throughout the Twin Cities metropolitan area, each having a distinctive geomorphic expression and collectively referred to as "drift". Figure 3.3-1 is a map of the surficial geology in the Minneapolis - St. Paul Area. The five sites of interest to this study are situated on deposits laid down during glacial-ice meltwater deposition. Their present-day geomorphic expression is characteristically level terraces upon which urban development has occurred. Compositionally, these deposits are largely sand and gravel with minor lenses of fine-grained sediments. The thickness of these overburden deposits typically exceeds 100 feet. Although the sands and gravels generally are well-drained, locally perched water table conditions are also present. A static water table elevation exists within the drift as unconfined aquifer conditions. Over-bank flooding occurs in proximity to the major surface drainage systems, namely the Mississippi and Minnesota rivers.

Bedrock

The Twin Cities basin contains a number of sedimentary rock sequences which underlie the drift deposits. Figure 3.3-2 is a bedrock geologic map of the Twin Cities area. The water-yielding units are referred to as aquifers. Intervening rock layers that do not readily transmit and/or store ground water are confining sequences. Figure 3.3-3 is a schematic geologic cross section through the metropolitan area, illustrating the major aquifers and confining units in the Twin Cities basin.

The upper-most rock sequence in parts of the Twin Cities basin is the Decorah - Platteville - Glenwood confining beds of Ordovician age. It is composed of shale, shaly dolomite and limestone, and dolomitic limestone. Average thickness of the rocks in the area is 50 feet and they cover nearly 4,800 square miles in southeast Minnesota.

The St. Peter aquifer, of Ordovician age, is fine to medium-grained, well sorted, friable, quartzose sandstone. The aquifer has an average thickness of 100 feet throughout the area and covers about 6,300 square miles. Movement of water in the St. Peter is primarily through intergranular spaces, however, fracture flow is also evident in some portions of the basin. Hydraulic conductivity values range from 3 to 33 ft/day. The basal St. Peter confining bed consists of shale and silty sandstone in the Twin Cities basin where a thickness of nearly 80 feet has been found.

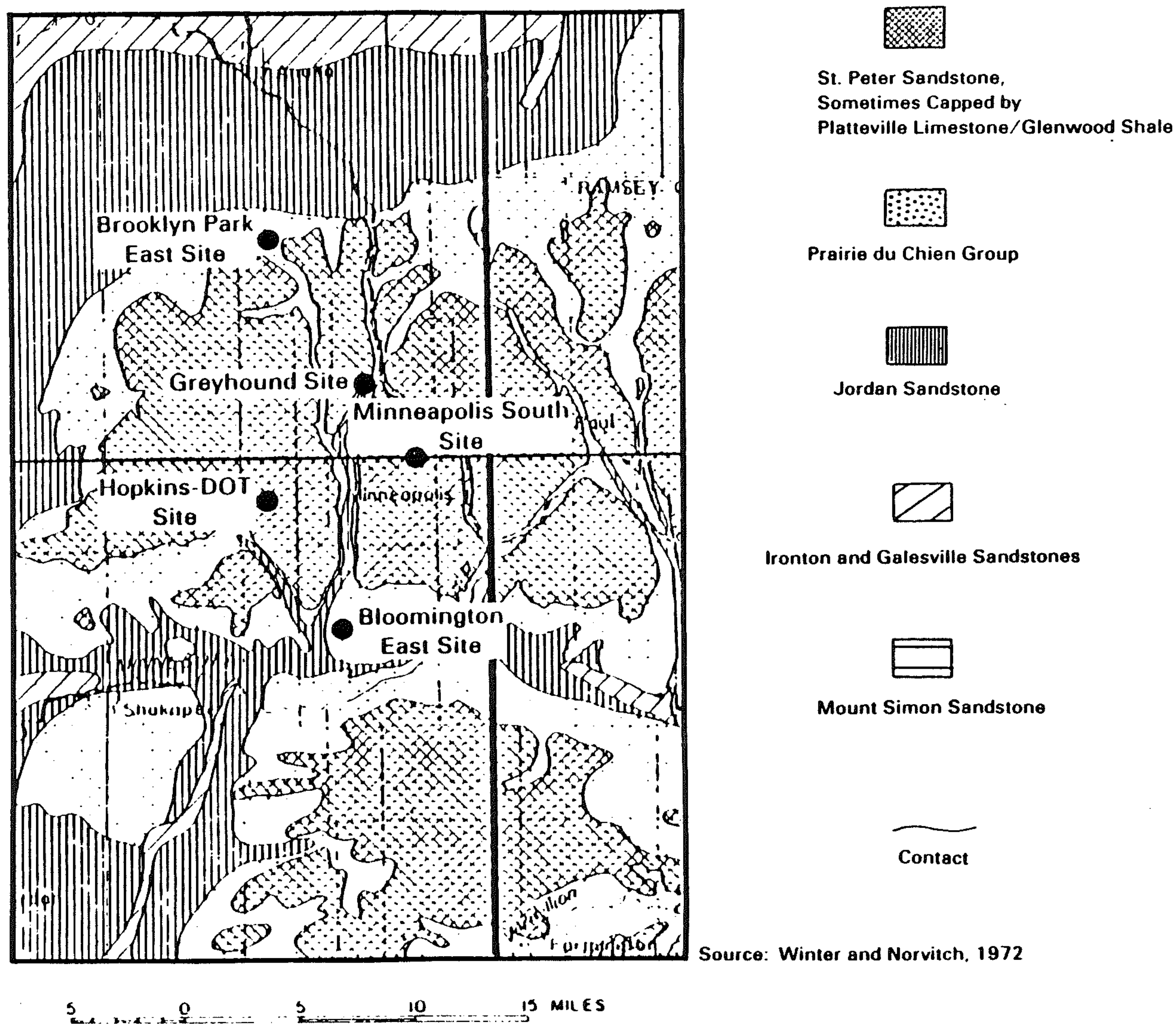


After: Winter and Norvitch, 1972

EXPLANATION

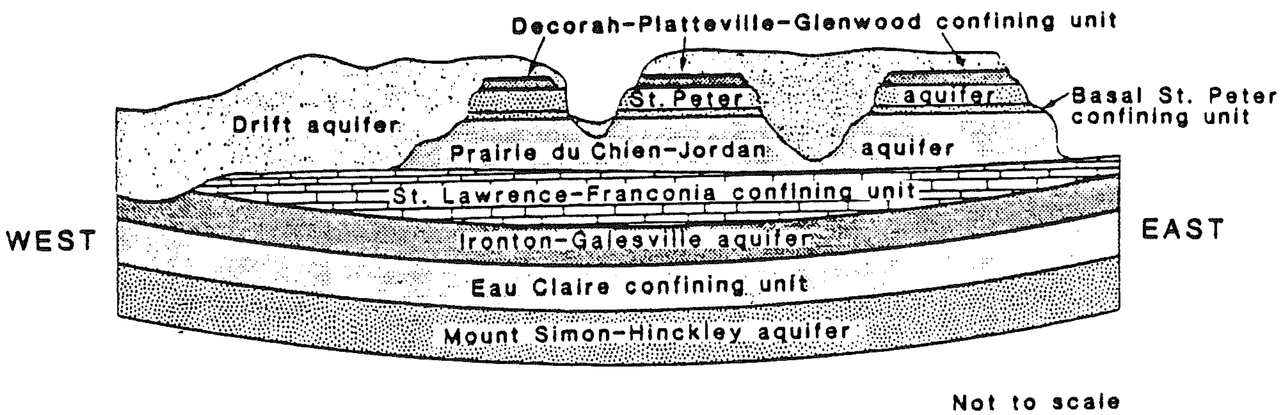
Outwash	Glacial drift, undifferentiated
Valley train	Alluvium
Till	Wind deposits
Lake and swamp deposits, undifferentiated	Limit of glacial ice advance

Figure 3.3-1 Generalized Surficial Geology in the Minneapolis-St. Paul Area



Source: Winter and Norvitch, 1972

Figure 3.3-2 Subcrops of Selected Bedrock Units in the Minneapolis St. Paul Area



Source: Schoenberg, 1984

Figure 3.3-3 Schematic Hydrogeologic Section Through the Twin Cities Metropolitan Area

The Prairie du Chien-Jordan aquifer is composed of the dolomitic Prairie du Chien Group of Ordovician age and the Jordan sandstone of Cambrian age. The Prairie du Chien Group is predominantly a sandy, thin to thick-bedded dolomite. Movement of water in the Prairie du Chien is primarily through fractures, joints, and solution channels. The underlying Jordan sandstone is a quartzose, friable to well-cemented, fine to coarse-grained sandstone. Flow in the Jordan is predominantly intergranular. The aquifer covers about 10,500 square miles and is about 240 feet thick in the Twin Cities basin. Hydraulic conductivity values range from 5 to 67 feet/day.

The St. Lawrence-Franconia confining bed of Cambrian age consists of shale, fine-grained dolomitic sandstone, and dolomitic siltstone. The confining bed covers about 12,800 square miles and has an average thickness of 200 feet. Although the Franconia Formation is regionally considered a confining bed, the Mazomanie member of the formation yields sufficient quantities for domestic wells in Scott, Carver, Anoka, and western Hennepin Counties.

The Ironton-Galesville aquifer of Cambrian age consists of fine- to medium-grained, poor to well sorted, quartzose sandstone with an average thickness of 70 feet. Areal extent of the aquifer is about 13,000 square miles. Flow in the aquifer is intergranular. Hydraulic conductivity values range from 4 to 33 feet/day.

The Eau Claire confining bed of Cambrian age consists of fine-grained sandstone and shale. The confining bed covers about 14,800 square miles and has an average thickness of 150 feet.

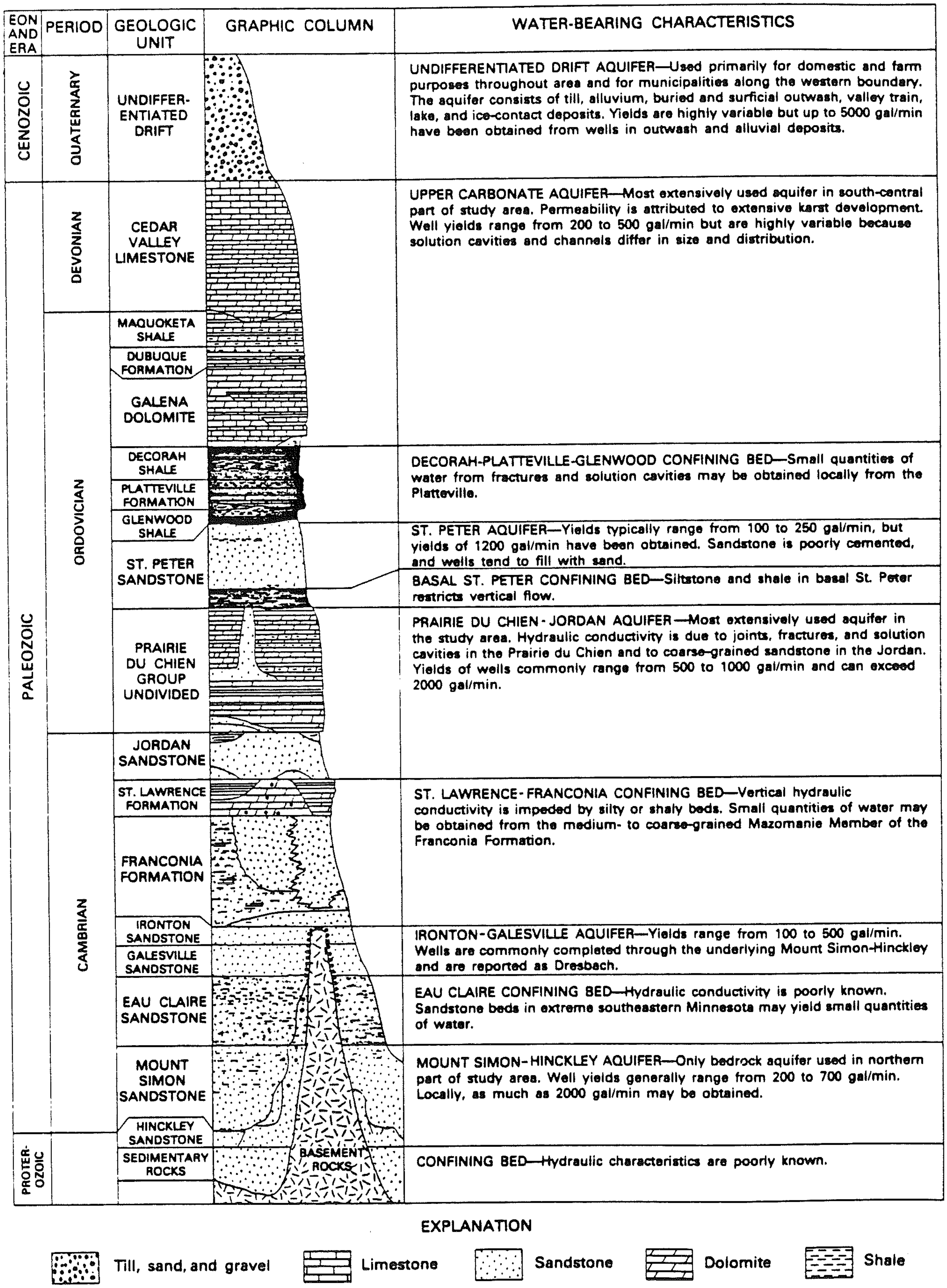
The Mount Simon - Hinckley aquifer, composed of the Mount Simon sandstone of Cambrian age and the Hinckley sandstone of late Precambrian age, is a fine- to coarse- grained sandstone containing interbedded siltstone and shale. The aquifer covers about 17,200 square miles and has a maximum thickness of about 500 feet. Movement of water in the aquifer is primarily intergranular. Hydraulic conductivity values range from 2 to 23 feet/day.

Interbedded siltstone, mudstone, shale, and fine-grained sandstone of late Precambrian age underlie most of the area. These are in turn underlain by crystalline basement rocks. The hydraulic characteristics of these rocks have not been extensively studied because adequate supplies generally can be obtained from shallower rocks or drift in the Twin Cities basin. Small quantities of water may be obtained locally from the sandstone, but the rocks are considered to be a confining bed throughout the northern Midwest.

3.3.1.3 Regional Groundwater

Aquifers

Numerous layers of different types of rock, as previously discussed, constitute the basinal framework. Many of these sedimentary rocks, such as sandstone and dolomite/limestone, have the ability to store and transmit large quantities of ground water. Five of these aquifers exist in the Twin Cities basin. Water is contained in four of these aquifers by confining units, or layers of rock that limit the movement of water vertically. Figure 3.3-4 is a generalized geologic column showing the sequence of aquifer and confining units in the Twin Cities basin.



Source: USGS Water-Supply Paper 2219, 1984

Figure 3.3-4 Generalized Hydrogeologic Column Showing Regional Aquifers and Confining Beds in Southeastern Minnesota

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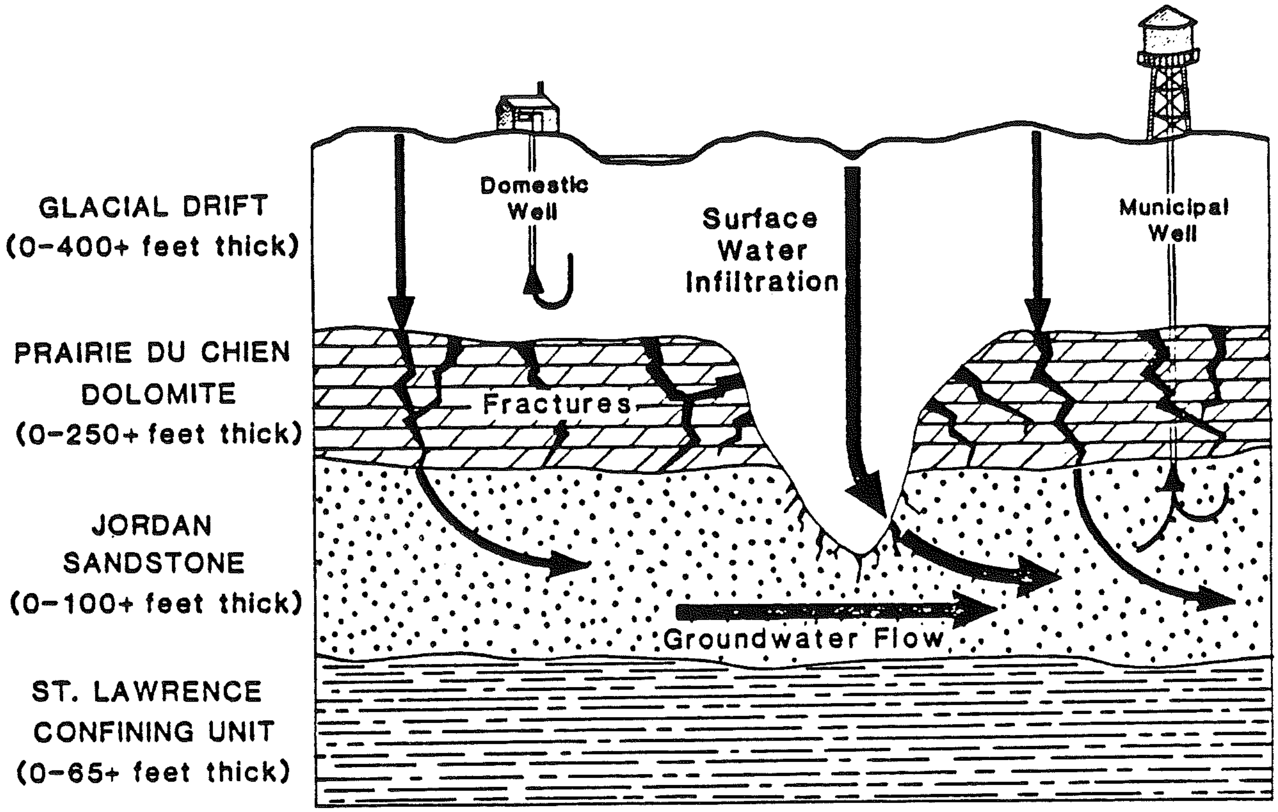
By far the most used water-bearing and supply aquifer is the Prairie du Chien-Jordan aquifer. This combination of two geologic formations supplies approximately 80 percent of the ground water used in the region. This massive aquifer, up to 300 feet thick, is capable of a 3,000 gallons per minute (gpm) yield. The quality of the aquifer's water is generally quite good, though hard, containing high amounts of dissolved minerals. This aquifer is comprised of the Prairie du Chien dolomites and the Jordan sandstones. The Praire du Chien dolomites are fractured and contain solution cavities/channels, both of which transmit ground water. Flow within the Jordan rocks is principally intergranular. Rocks of the Prairie du Chien and Jordan formations hydraulically function as a discrete aquifer system.

The Prairie du Chien-Jordan aquifer is particularly vulnerable to contamination for two reasons. First, the aquifer is often the first unit occurring below the drift and is in very good hydraulic connection with it. Given these geologic conditions, the infiltration of ground and near surface contamination can percolate into the aquifer where unimpeded by confining strata. Second, the aquifer has been incised by stream erosion creating valleys that have been subsequently filled with glacial outwash and till. These drift-filled valleys conduct water horizontally very well allowing mixing of valley-fill and adjacent bedrock waters (See Figure 3.3-5). The valleys generally do not alter the regional flow patterns, but do provide opportunities for the introduction of contaminants into the Prairie du Chien-Jordan aquifer system. Flow within this aquifer system generally corresponds well with surface topography. This behavior has been documented by the U.S.G.S. during its preparation of a regional model simulating ground-water flow.

The ground water in the Prairie du Chien-Jordan aquifer flows in response to hydraulic gradient away from high ground-water elevations located in northern Washington, central Hennepin, and southern Dakota and Scott Counties. The discharge locations are generally the major rivers, although some lakes and wetlands also serve as zones of discharge. Reversal of flow from the rivers to ground water, or recharge, can occur whenever the river level exceeds water table elevation. This condition occurs during very high river stage and when substantial pumping lowers ground water levels adjacent to the rivers.

The Mt. Simon-Hinckley aquifer is the deepest aquifer occurring in the Twin Cities basin and is laterally continuous throughout the region. This aquifer supplies about 10 percent of the ground water used in the region and is commonly regarded as a major supplemental source to the Prairie du Chien-Jordan aquifer. In the Metropolitan Area, some wells yield as much as 200 gpm. As with the Prairie du Chien-Jordan, the water is generally potable but hard, with locally high levels of iron and manganese.

The depth to the Mt. Simon-Hinckley and its isolation by the Eau Claire formation confining units have protected this aquifer from contamination. Within the region, the aquifer is not incised by any natural hydraulic boundaries such as rivers. Major recharge of the aquifer likely occurs in a large area outside (north) of the region where the aquifer is the first encountered bedrock layer beneath the glacial drift. Some recharge also occurs downward through the confining Eau Claire sandstone unit.



Not depicted: Decorah Shale, Platteville Limestone, Glenwood Shale and St. Peter Sandstone, all of which lie above the Prairie du Chien, but which underlay only small portions of the Twin Cities metropolitan area.

Figure 3.3-5 Typical Prairie Du Chien-Jordan Aquifer Buried Bedrock Valley (Source: Metro Council, Part III. Water Resources Management, 1985)

The three remaining aquifers, listed in order of use, are the glacial drift (six percent), the Franconia-Ironton-Galesville aquifer (three percent), and the St. Peter aquifer (one percent). The areas of glacial drift that yield the largest volumes of water are the sands and gravels having minimal matrix materials. The extent of these surficial and buried aquifers is largely unknown because of the extreme variability in their occurrence. Sustained yields from the drift can reach 1,000 gpm. The drift aquifer is most susceptible to contamination. Waste disposal sites have been situated on and within this aquifer. Drift, because of its permeable nature, allows for rapid infiltration and movement of contamination.

The Franconia-Ironton-Galesville aquifer yields low to moderate amounts of water, 40 to 500 gpm. It is an almost continuous aquifer with extensive exposure directly below the drift in the northern and western portions of the region. This exposure presents a good opportunity for recharge. Contamination has not been documented in the Franconia - Ironton - Galesville aquifer system.

The St. Peter is a very distinctive, quartzose sandstone that occurs in proximity to ground surface in large portions of the eastern two-thirds of the region. Its yield ranges from 100 to 250 gpm but use is very limited because of susceptability to contamination and because deeper aquifers generally yield far more water. Uncontaminated water from this aquifer is usually soft and of good quality.

Recharge

Replenishment of the ground-water system through infiltration of precipitation, or recharge, is a phenomenon not fully understood in the region. Except where precluded by impervious strata, natural or manmade recharge occurs via direct infiltration throughout the region. Areas with highly permeable soils allow more rapid infiltration than areas with tight, clayey soils. Clearly, areas where aquifer units lie directly beneath permeable soils receive more recharge than areas impeded by relatively impermeable confining units. The U.S.G.S. has determined that water moves downward through the extremely variable drift at an average of 0.004 feet per day, with a range of 0.00015 to 2.1 feet per day.

Flow within the shallow ground-water system either discharges into a surface water body, or recharges deeper ground-water systems. Deeper ground-water system recharge is retarded by confining strata but enhanced where incised bedrock valleys breach such confinement.

Supply Capability

Ground water as a regional resource is both abundant and generally potable. Given the multiple aquifer systems, generally there are several depths at which potential supplies of good quality water could be withdrawn, provided a well is properly sited, designed and constructed.

3.3.2 Resource Recovery Facility

The proposed resource recovery facility site totals 14.6 acres. It is located on the periphery of downtown Minneapolis, approximately

0.5 mile southwest of the Mississippi River and 0.3 mile north of Basset Creek. The site is bounded by Seventh Street North, Fifth Street North, and Sixth Avenue North on the southwest, northeast, and north respectively. It is bordered by a railroad right-of-way on the southeast.

The site is currently occupied by a Greyhound bus service garage and an Insty-Print building. Most of the 14.6 acres is covered by these buildings and pavement.

Topographic relief on the site is subdued, with a total vertical relief of less than 25 feet. Soil-boring surface elevation data indicate a gentle sloping toward a depression located in the center of the site, coincident with the bus garage. This is apparently a local feature, as a more general areal sloping to the northeast, toward the Mississippi River, is indicated on the USGS topographic map, Minneapolis South Quadrangle.

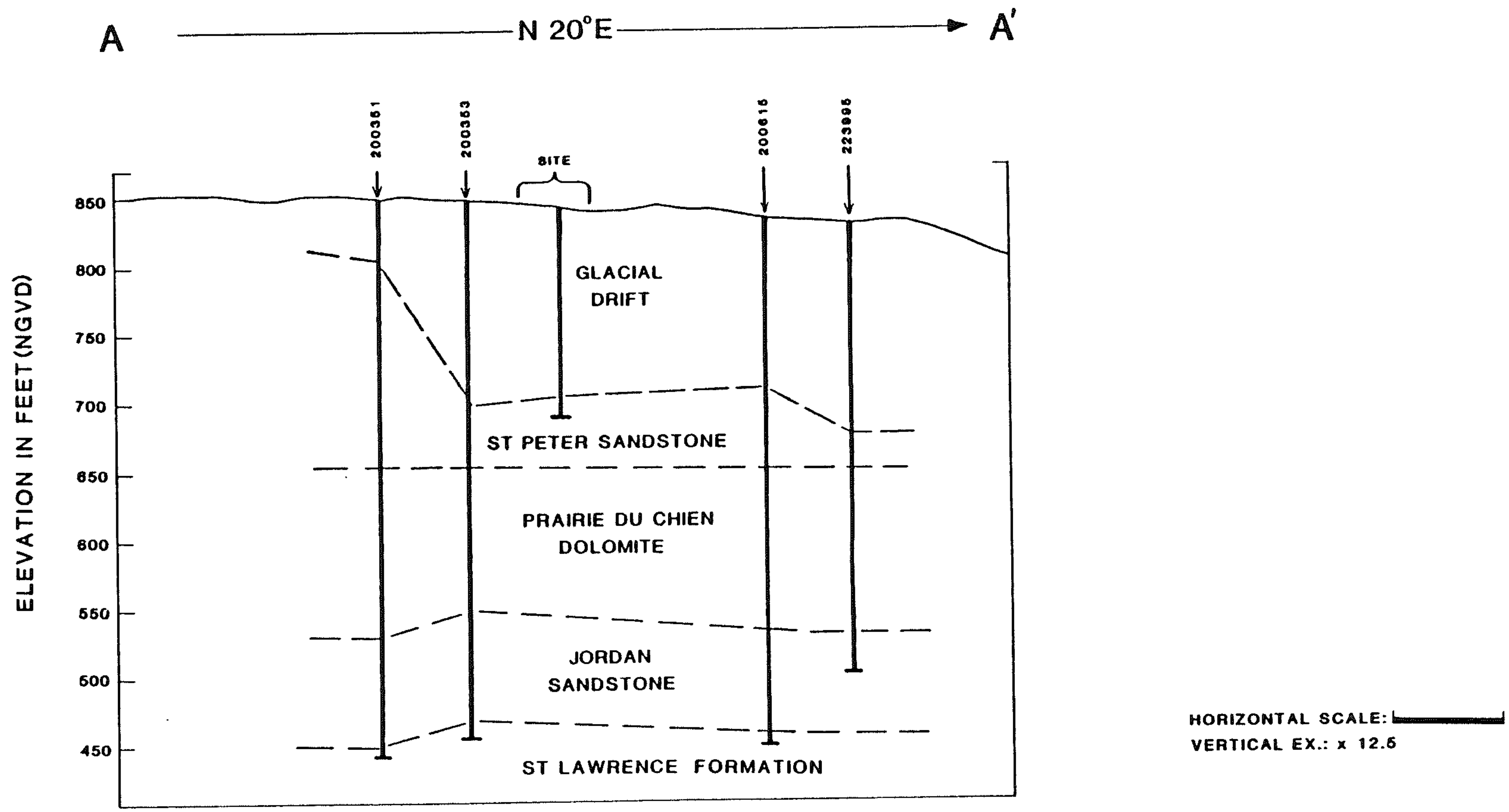
3.3.2.1 Bedrock

Data from the Minnesota Geological Society (MGS) well log files and one boring on site which penetrated bedrock indicate that the first bedrock encountered is St. Peter sandstone. The depth to bedrock beneath the site is approximately 130 to 150 feet. Within a one-mile radius of the site this depth varies from as little as 40 feet to more than 200 feet,inferring the existence of a buried river valley. Remnants of the Platteville limestone and Glenwood shale may exist overlying the St. Peter sandstone under part of the area. The thickness of the white, fine- to medium-grained, well sorted St. Peter sandstone layer varies from 20 feet northeast of the site to more than 170 feet south and west of the site. It is underlain by 110 to 125 feet of Prairie du Chien light brownish gray to buff dolomite and 70 to 75 feet of Jordan sandstone a white to yellowish, fine- to coarse-grained sandstone unit. Figure 3.3-6 is a geologic cross-section through the Greyhound site area.

3.3.2.1 Unconsolidated Sediment

The Greyhound site is located in the Mississippi Valley Outwash Geomorphic Province. The Twin Cities Metropolitan Area Sheet Map of Soil Landscapes and Geomorphic Regions published by the University of Minnesota Department of Soil Science (1974) indicates that sandy, well-drained soils predominate in the site area. However, natural soils of the site-area have been disturbed by industrial development and more accurate information can be obtained from soil borings (Soil Exploration Company Report, 1984).

Forty nine soil borings were drilled on the Greyhound site by Soil Exploration Company and Braun Engineering to evaluate soil and ground-water conditions. Figure 3.3-7 shows the boring locations. A review of the boring logs suggests a generalized subsurface soil profile consisting of 5 to 30 feet of variable fill materials underlain by 2 to 30 feet of swamp deposits. A thick sequence of water deposited silt and clay (fine alluvium), interbedded with sand



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DATA SOURCE: MGS Well Log Files

Figure 3.3-6 Geologic Cross-Section A-A': Greyhound Site

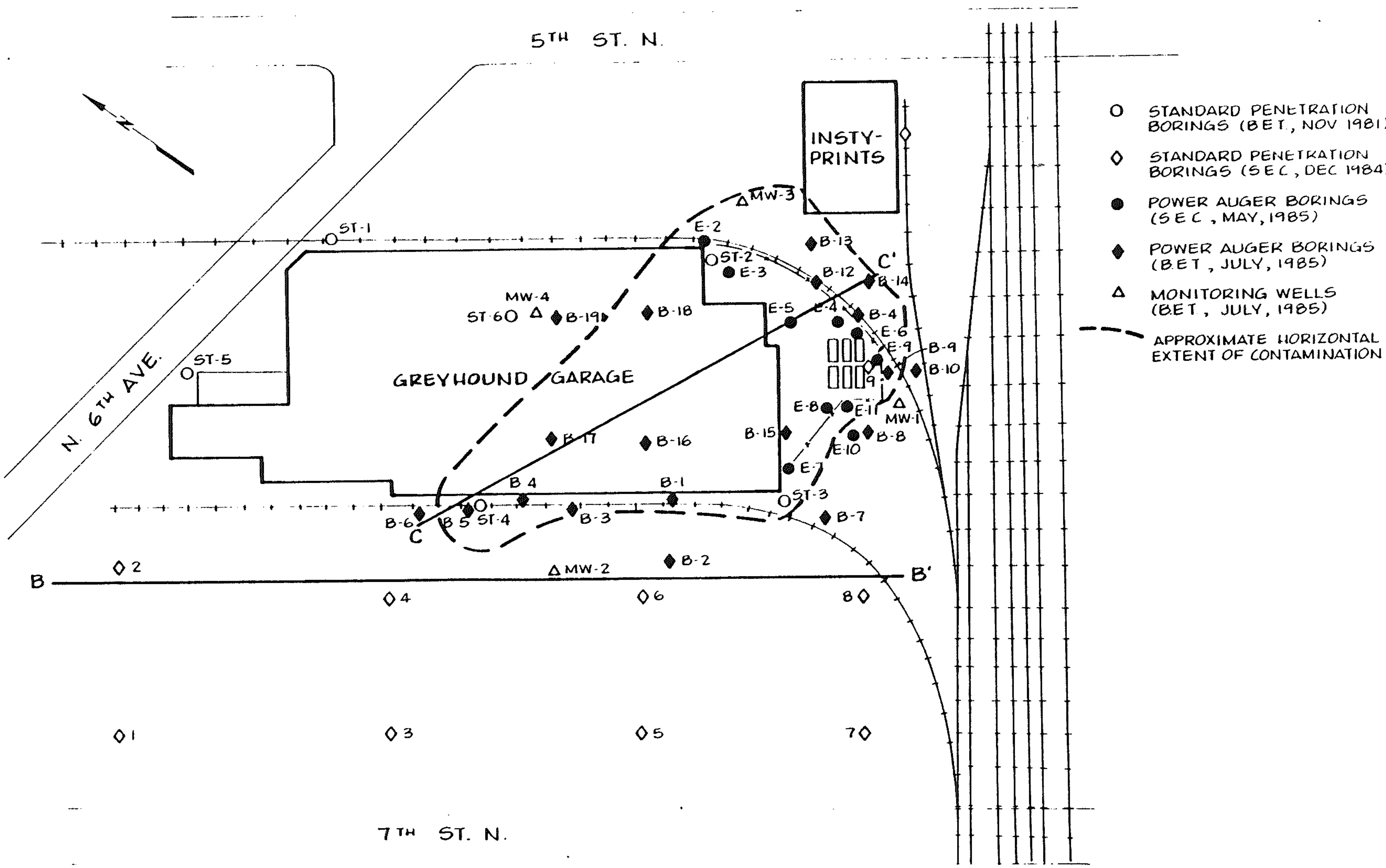

Figure 3.3-7 Site Map, Greyhound Site, Showing Locations of Existing Structures and Storage Tanks, Soil Borings and Monitor Wells, Soil Profiles B-B' and C-C' and the Approximate Horizontal Extent of Contamination (Data Source: Braun Engineering Report, July 25, 1985)

and gravel (coarse alluvium) was encountered below the swamp deposits. Some borings penetrated lenses of varved silts and clays (lacustrine deposits) within the alluvial sequence. Deeper borings on the site encountered dense, variable fill deposits at depths of 67 to 104 feet below grade. The till overlies or is interbedded with coarse, variable alluvial deposits in three of the deepest borings. Figure 3.3-8 is a soil profile through borings on the Greyhound site.

The fill is variable in composition, consisting primarily of granular soils with some lenses of clay and peat and a significant amount of construction debris. This debris includes concrete, brick, wood, glass and ashes. The density of the fill ranges from very loose to dense, with penetration resistence (N-values) ranging from 2 to 31 (blows/ft).

The swamp deposits consist of peat and muck. These organic soils are very loose to loose in density, with N-values ranging from 1 to 9.

The alluvial sequence is composed of interbedded fine- and coarse-grained deposits. The fine-grained alluvial clays and silts occasionally include thin seams of fine sand. These deposits are generally very soft to firm, although soils with N-values as high as 29 (very stiff) were encountered. The coarse-grained alluvium was primarily sand and silty sand, with penetration resistance N-values ranging from 7 to 62 (loose to very dense). Lenses of stiff, fine-grained lake deposits were encountered in three of the borings, and consist of varved silty clay and sandy silt soils.

A dense till layer was encountered in five of the borings. This variable deposit is composed primarily of clay, silty clay and silty sandy clay with some gravel and cobbles. N-values in the fill range from 13 to 71 blows/foot. Coarse alluvial deposits encountered within or beneath the till sequence consist of silty or clayey sand, with some gravel, cobbles, and boulders. These deposits are firm to very dense, with N-values as high as 126 blows/foot. The very high blow counts are indicative of boulders.

3.3.2.3 Hydrogeologic Conditions

Ground water was encountered in the majority of the borings at depths ranging from 4 to 15 feet below grade. The water table is irregular due to the compositional variability of the fill soils, which comprise the upper 5 to 30 feet of the soil profile in the site area. More accurate measurements of the ground-water level were obtained from four monitoring wells installed on the site. Ground-water elevations were 809.93, 806.96, 807.5, and 798.46 feet above mean sea level in monitor wells # 1, 2, 3, and 4 respectively. Monitor well #4 was set approximately 30 feet deeper than the other monitoring wells. The difference in ground-water elevations could indicate perched water conditions. Ground-water levels should be expected to fluctuate seasonally.

Based on the results of the ground-water measurements taken from monitoring wells #1 through #3, ground-water flow is in a north-northwest direction.

3.3.2.4 Soil and Ground-Water Contamination

In May, 1985, a boring program was conducted by Soil Exploration Company to assess soil and ground-water conditions at the southeast

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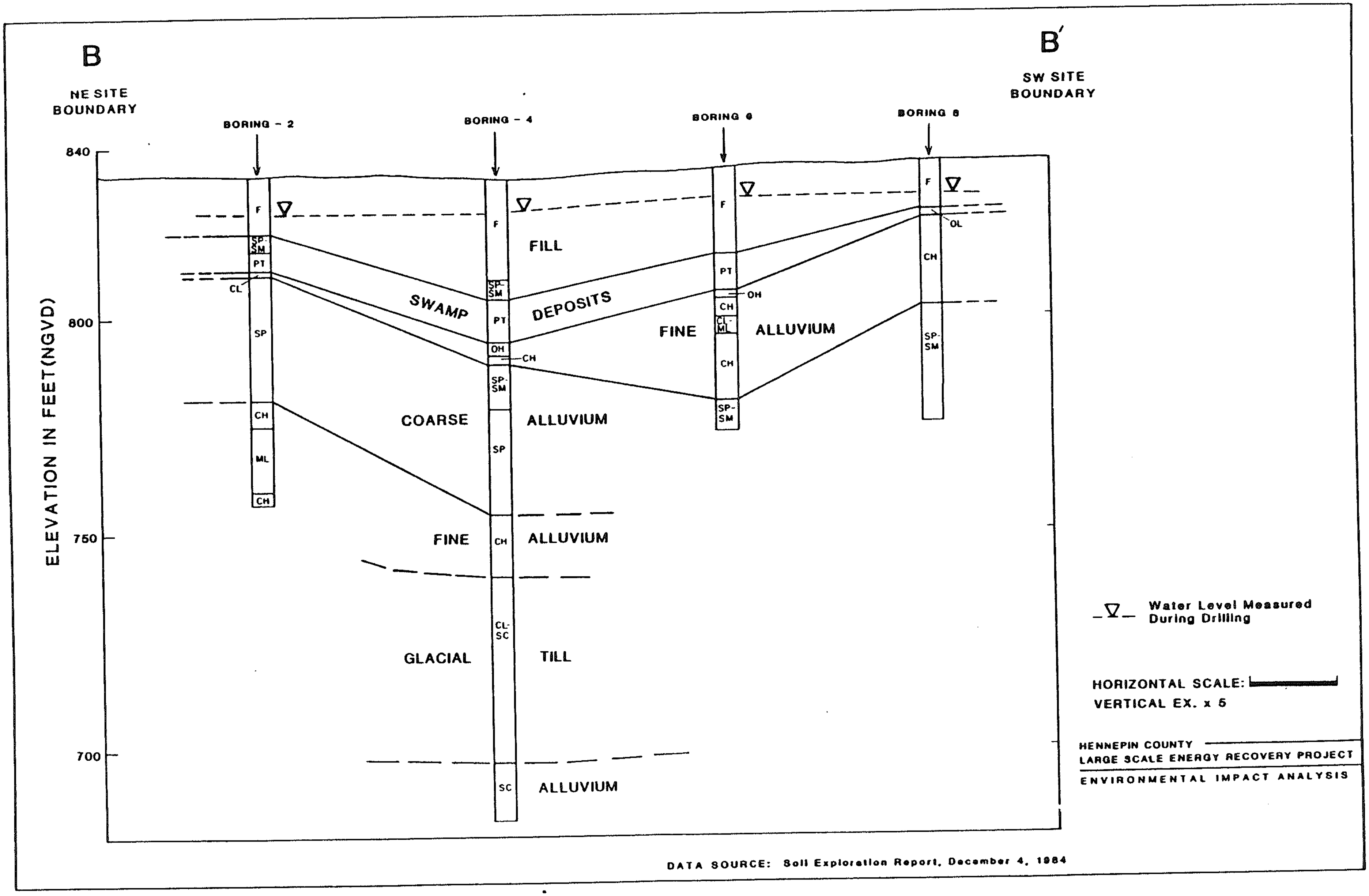

Figure 3.3-8 Soils Cross-Section B-B': Greyhound Site

end of the Greyhound Bus Service Garage, in the vicinity of several above ground and buried tanks used for the storage of petroleum products. The investigation revealed evidence of "potentially widespread soil and ground-water contamination". Subsequently, Braun Engineering Company drilled additional soil borings and installed monitor wells to further assess soil and ground-water conditions. The locations of these borings, as well as those previously drilled on the site for geotechnical assessment, are indicated on the site map (Figure 3.3-7). The results of this investigation indicate that an area of petroleum contamination exists covering approximately 24,650 square feet. The contaminants are concentrated in a soil layer located within the fill at or near the water table. The investigation and findings are discussed in more detail as follows.

The preliminary environmental assessment conducted by Soil Exploration Company in May, 1985, involved the drilling of ten soil borings, located near petroleum storage tanks at the southeast end of the bus garage. Soil samples were collected from the borings, and those exhibiting the greatest degree of contamination, based on visual appearance and odor, were subjected to laboratory chemical analysis. The laboratory test program included analyses to detect and quantify certain organic and inorganic constituents. Organic analysis consisted of a scan to detect and measure volatile organic compounds currently listed in the U.S. EPA Priority Pollutant List as well as an analysis to determine the nature and concentration of the fuel oil contamination observed in the field. Gasoline constituents were detected in two of the borings. The highest concentration was 58 parts per million (ppm). Benzene, toluene and xylene were detected in these samples. Soil samples from three borings contained concentrations of #2 fuel oil ranging from 0.7 to 15 ppm. Gasoline content could not be determined in these samples due to the high levels of fuel oil.

Soil samples from the borings were also analyzed for polychlorinated biphenyls (PCBs). Concentrations of PCBs were not detected in any of the samples.

Inorganic constituents analyses included lead, chromium, cadmium and mercury. All four of these metals were detected in the samples, although only the lead levels were high. The concentrations of lead detected in the samples ranged from 68 to 962 ppm.

In September, 1985, Braun Engineering drilled an additional 19 soil borings and installed four monitor wells to further define the extent of contaminant. Soil samples were collected, based on field observations of possible contamination, and subjected to laboratory chemical analysis. The ground water has not been sampled to date. The soil samples were analyzed utilizing a Tractor 565 gas chromatograph with a flame ionization detector. The resulting chromatograms indicate whether gasoline or fuel oil is present in the sample.

Results of the laboratory analysis indicate that contaminants are present in 7 of the 19 soil borings on the site. Concentrations of gasoline in the samples range from 27 to 680 ppm. Measured levels of fuel oil range from trace emounts to 2180 ppm.

Summary of Results of Investigation of Soil and Ground-Water Contamination

Based on the results of the borings and laboratory analysis, contamination is determined to be present in soils on the site, in the vicinity of petroleum product storage tanks at the southeast end of the bus garage, extending underneath much of the southern portion of the building and eastward into the neighboring Insty-Print parking lot. The contaminant composition is comprised of a mixture of no. 2 fuel oil, diesel fuel, gasoline, lead, and possibly other petroleum-based compounds. The contaminants are present in a soil zone at or near the water table. Figure 3.3-9 is a soil profile through the contaminated area. This profile exhibits the extreme variability of the fill layer. Because of the significant heterogeneity of the fill materials, compositionally and hydraulically, any forecast of the actual extent of soil contamination is difficult and should be considered as an interpretive approximation. Braun Engineering estimates that slightly over 5,000 cubic yards of contaminated soils exist on the site. This calculation is based on the assumption that the contaminated zone is 3 to 3.5 feet thick. The soil profile illustrates that this may be a conservative assumption. In addition, contaminants were detected in a deeper zone in borings ST-1 and MW-4. The extent of this contamination has not yet been defined.

Because it has been determined that contaminants are present in soils at the water table, it is likely that they have affected ground water in the area. Ground-water samples have not been collected and analyzed.

3.3.2.5 Geologic Hazards

The Minneapolis metropolitan area is underlain by a network of caves, tunnels, mines, cellars, shelters, pipes and sewers. Most of these are in the St. Peter sandstone. Natural caves form in this easily eroded sandstone when fracture openings are widened by ground-water flow and solutioning processes. Some of these caves are quite extensive, although a majority of them do not have entrances and they are only discovered when well drilling, quarrying, tunneling and excavating expose them. A potential for surface subsidence exists, although it is not regarded as a likely occurence.

The St. Peter sandstone is present in the site area, subcropping beneath the glacial drift. Caves are known to exist in the vicinity of the proposed site. The possible existence of hidden caves beneath the site should be considered.

No other geologic hazards, such as active faults, steep slopes or floodways, are known to exist on or adjacent to the site.

3.3.3 Bloomington East Transfer Station

The 5-acre site of the proposed Bloomington East solid waste transfer station is located in the City of Bloomington, approximately nine miles south of downtown Minneapolis, two miles north of the Minnesota River, and 0.7 mile east of Nine Mile Creek. The site is bounded by 96th street on the south, a Donaldson Company property on the west, and railroad right-of-way sidings on the north and east.

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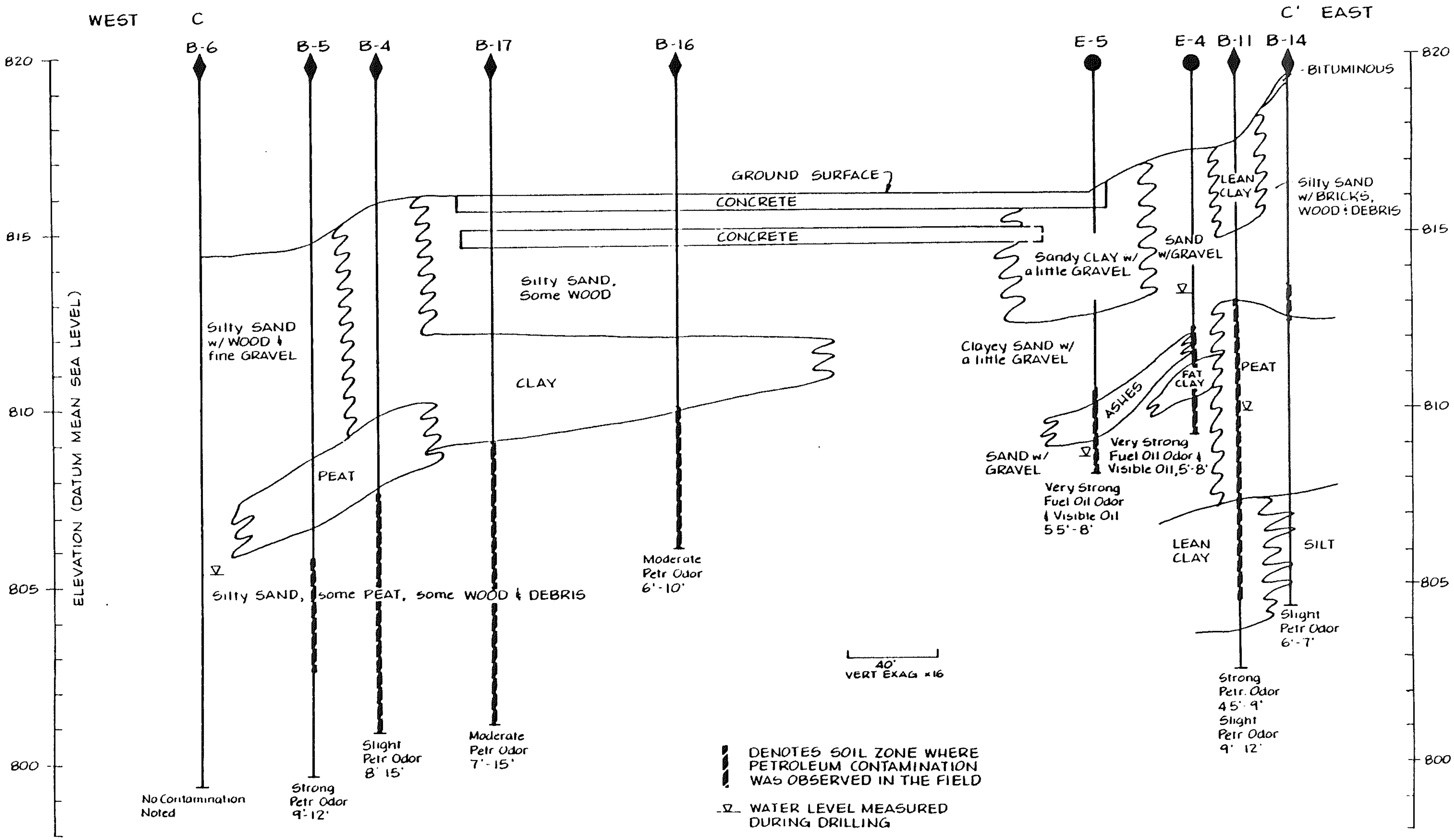


Figure 3.3-9 Soil Profile C-C': Greyhound Site (Data Source: Braun Engineering Report, July 25, 1985)

Approximately 40 percent of the site is covered by buildings and pavement. The remaining 60 percent is vacant land.

Surface elevations at boring locations on the site indicate that the site generally slopes downwards away from the existing building area, with a total vertical relief of approximately 7 feet. The USGS topographic map, Bloomington Quadrangle, indicates a more general areal sloping toward depressions located to the north and east of the site.

3.3.3.1 Bedrock

The interpretation of bedrock geology at the site is based on well log data from the MGS water well data files. Depth to bedrock at the site is 270 to 290 feet. The first bedrock encountered is a 10 to 20 foot-thick layer of lower Prairie du Chien dolomite overlying 80 to 90 feet of Jordan Sandstone. Figure 3.3-10 is a geologic cross-section through water wells in the site vicinity.

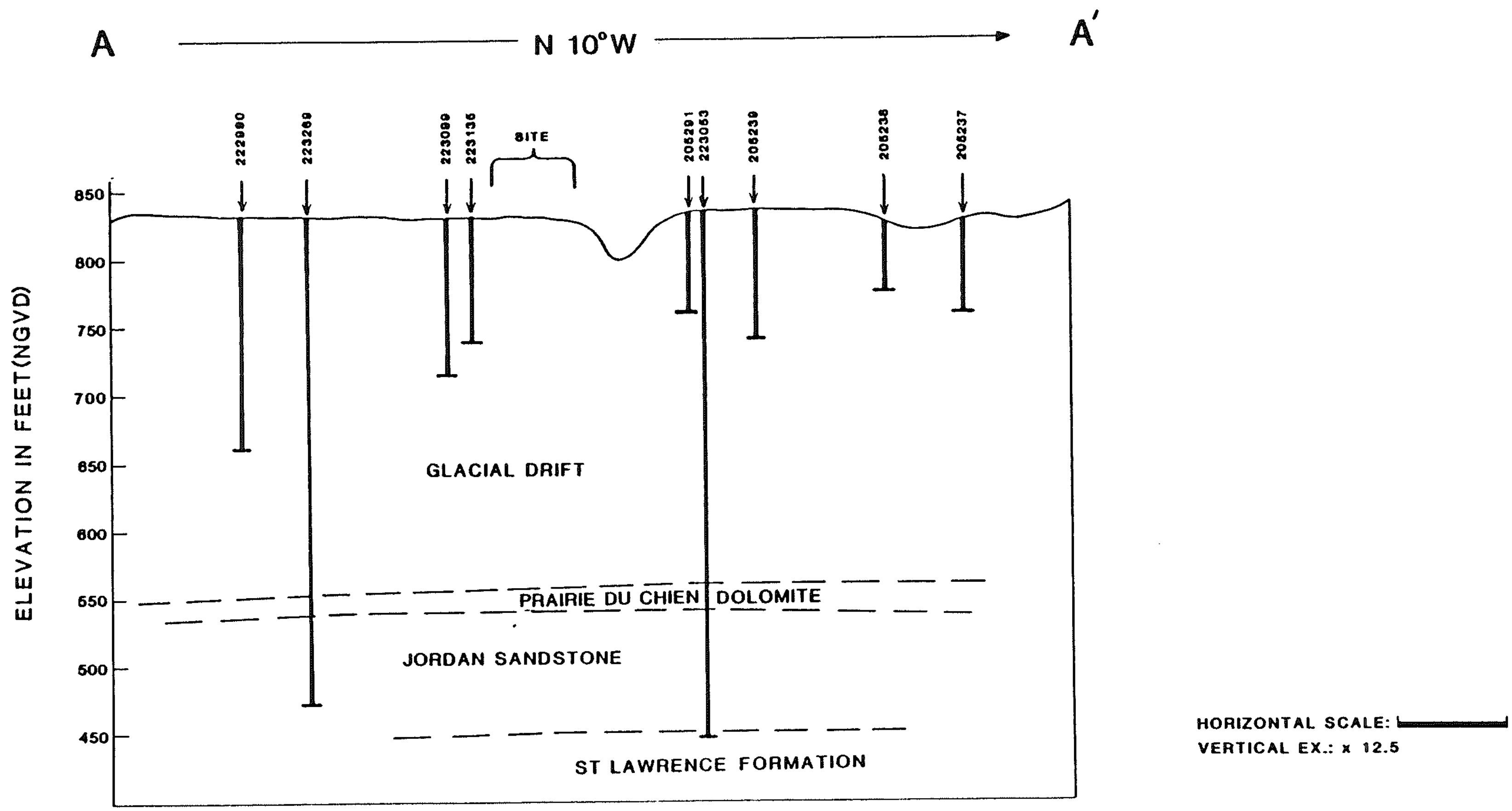
3.3.3.2 Unconsolidated Sediments

Approximately 270 feet of soils and unconsolidated glacial and post-glacial deposits are present on the site. The site is located in the Minnesota Valley Outwash geomorphic region, an alluvial plain area characterized by sandy, well-drained soils (University of Minnesota, 1974). Surficial geology maps indicate glacial deposits are mostly sand and gravel associated with glacial-fluvial deposition (Winter and Norvitch, 1972).

Ten soil test borings were drilled on the site by Soil Exploration Company in September, 1985 to evaluate soil conditions. The boring locations are indicated on the site map (Figure 3.3-11). Information from these borings provides more site-specific information regarding the soil profile. Varying thicknesses of fill lie beneath the ground surface. Thicknesses encountered in the borings range from 0.5 to 20.5 feet. The fill is generally thicker in the southeastern portion of the site, in the vicinity of borings #7 and #10. The other borings encountered less than 5 feet of fill materials. Fill soils are mostly a mixture of sand and silty sand with some clay and gravel. Traces of wood, concrete and cinders were logged in the fill interval for boring #10. Water-deposited fine- to medium-grained sands were encountered beneath the fill in all of the borings. These loose to very dense granular soils contain some silt and gravel, and occasional lenses of fine-grained material. Boring #3, the deepest boring on the site, penetrated six feet of sandy clay from a depth of 40 feet to the bottom of the boring at 46 feet below grade. The total thickness of this fine-grained deposit is not known. Figure 3.3-12 is a soil profile through borings on the site.

3.3.3.3 Hydrogeologic Condition

Ground water was encountered in two of the borings at depths of 38.5 and 30 feet below grade, corresponding to elevations of 61 feet and 62.6 feet, respectively. The elevations were referenced to the top of a hydrant located at the southwest corner of the site.



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DATA SOURCE: MGS Well Log Files

Figure 3.3-10 Geologic Cross-Section A-A': Bloomington East Site

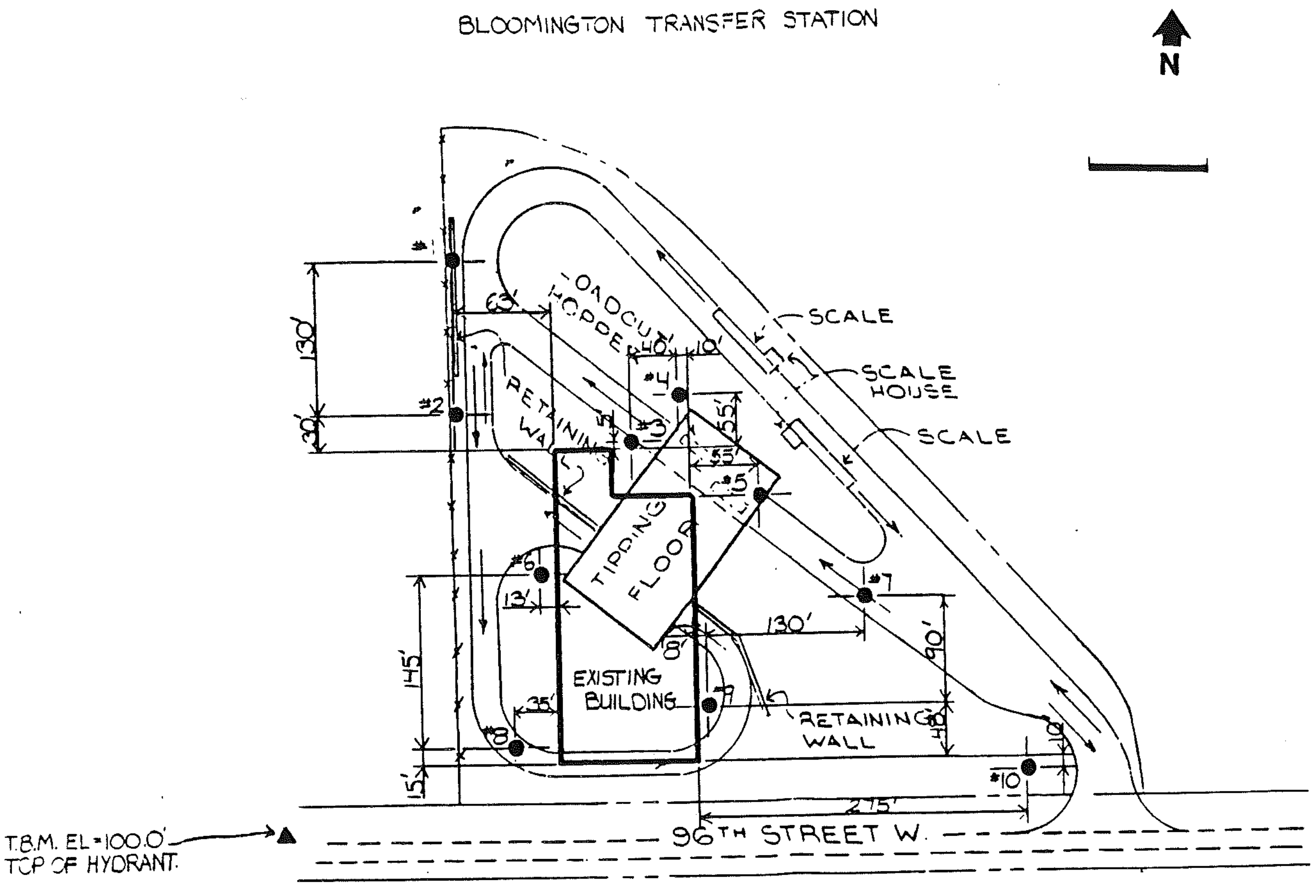

Figure 3.3-11 Site Map Showing Boring Locations: Bloomington East Site

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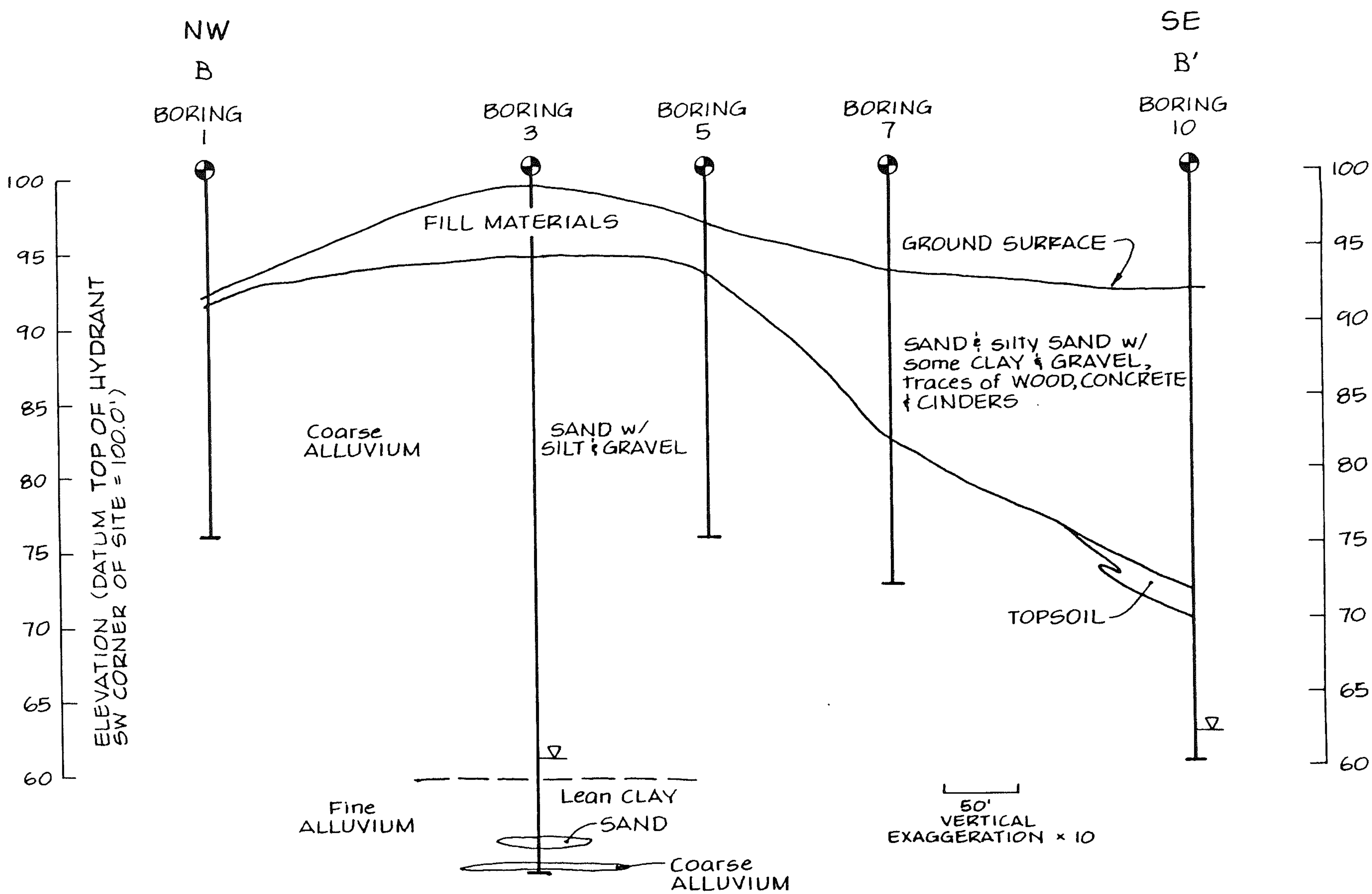

Figure 3.3-12 Soil Profile B-B': Bloomington East Site (Data Source: Soil Exploration Company Report, September 27, 1985)

Aquifers in the unconsolidated glacial deposits are a major source of ground water in the area surrounding the site. The site may be considered a recharge area for the Prairie du Chien-Jordan bedrock aquifer which subcrops the drift.

Geologic Hazards

No active faults, sinkholes, steep slopes, floodways, or other geologic hazards are known to exist on or adjacent to the site.

3.3.4 Brooklyn Park East Transfer Station

The proposed Brooklyn Park East solid waste transfer station site is located in the City of Brooklyn Park, approximately eight miles northwest of downtown Minneapolis. The 12-acre site is 0.2 miles east of Shingle Creek, and immediately adjacent to the Shingle Creek Conservancy District.

The northwest and southwest portions of the site are occupied by Department of Natural Resources - protected wetlands, and a two-story house is located in the southeast corner of the site. The remaining site area is vacant and covered with grasses and trees. The land surface is relatively level, and slopes very gently toward a shallow east-west trending depression located near the central sector of the site. This depression is an extension of the Shingle Creek Floodway. Total vertical relief on the site is about 12 feet. The land cover on the site is about 90 percent vacant land (grass with some trees), 9 percent wetlands and 1 percent buildings.

3.3.4.1 Bedrock

The interpretation of bedrock geology at the site is based on well log data from the MGS water well data files. Depth to bedrock beneath the site is approximately 100 feet. The first bedrock sequence encountered is 40 to 70 feet of silty dolomite within the lower Prairie du Chien group. This unit overlies about 40 feet of Jordan sandstone. The Jordan sandstone is underlain by progressively older sedimentary rocks. In order of occurrence (shallow to deep), these rocks are part of: the St. Lawrence formation, a 40-foot thick dolomitic siltstone and sandstone; the Franconia formation, a 140-foot thick silty to dolomitic sandstone; the Ironton and Galesville sandstones, a 50-foot thick unit; the Eau Claire formation, a 70-foot thick sandstone; and the Mt. Simon sandstone, a 140-foot thick rock unit. This entire bedrock sequence rests on Precambrian sedimentary and crystalline rocks. Figure 3.3-13 is a geologic cross-section through water wells in the site vicinity.

3.3.4.2 Unconsolidated Sediments

The bedrock surface in the site area is overlain by approximately 100 feet of glacial and post-glacial sediments. The Brooklyn Park East site is located in the Mississippi Valley Outwash geomorphic region. This region contains predominantly sandy, well-drained soils. A Soil Conservation Service soils map of the site area indicates the presence of Dickman and Isan sandy loams. The Dickman

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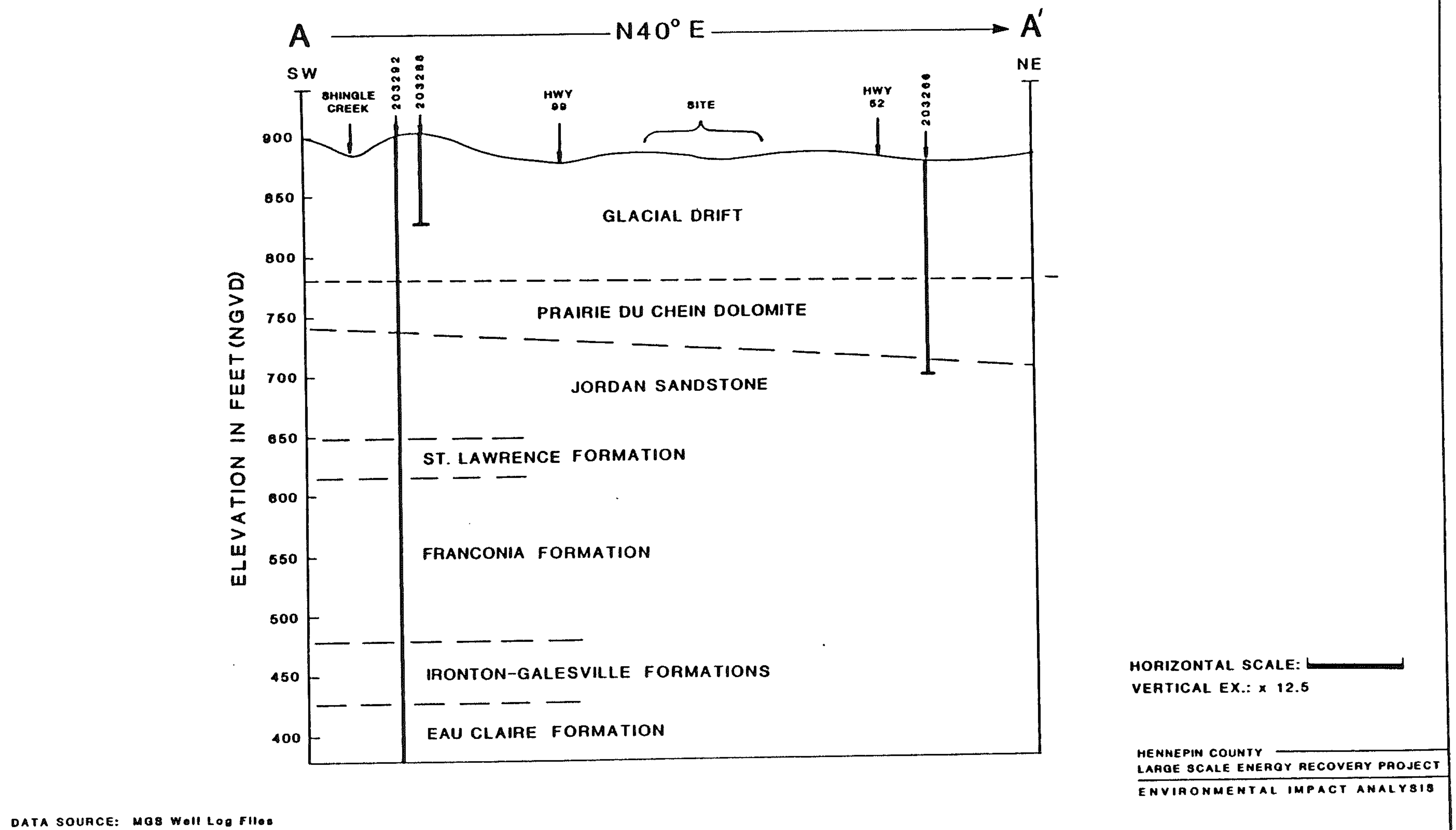


Figure 3.3-13 Geologic Cross-Section A-A': Brooklyn Park East Site

sandy loams are located peripheral to the topographic depression in the center of the site, and are well drained. Isan sandy loams, located in the depression, are poorly drained. The glacial deposits were mapped as valley train by Winter and Norvitch in 1972 (Figure 3.3-1). This is mostly sand and gravel associated with glacial stream deposition.

Fourteen borings drilled by Soil Exploration Company in 1984 provide a more reliable description of the site soils. Figure 3.3-14 shows the boring locations. One to five feet of silty sand fill soil are present on the northern and eastern parts of the site. One to two feet of topsoil are present either at the surface or beneath the fill over the entire site. This topsoil is a fine- to medium-grained, silty or clayey sand. The fill and topsoil are generally very loose to loose and soft (in a few cases firm), with blow count (N) values ranging from 2 to 13. The remaining unconsolidated deposits penetrated by the borings consist of coarse alluvium, with a few borings encountering thin beds of fine-grained and mixed alluvium. The coarse alluvium is composed of fine-to medium-grained sand with silt and some gravel. Penetration resistance (N) values indicate that the soil is loose to medium in density. Clay, silt and silty sand soils comprise the fine and mixed alluvium. These soils are soft to medium in consistency. Figure 3.3-15 is a soil profile through the site.

3.3.4.3 Hydrogeologic Conditions

Ground-water was encountered during the soil borings investigation at depths ranging from 6 to 14.5 feet below ground surface. Static water levels recorded during drilling in several shallow drift wells, 1/4-mile southeast of the site, ranged from 20 to 27 feet below the ground surface.

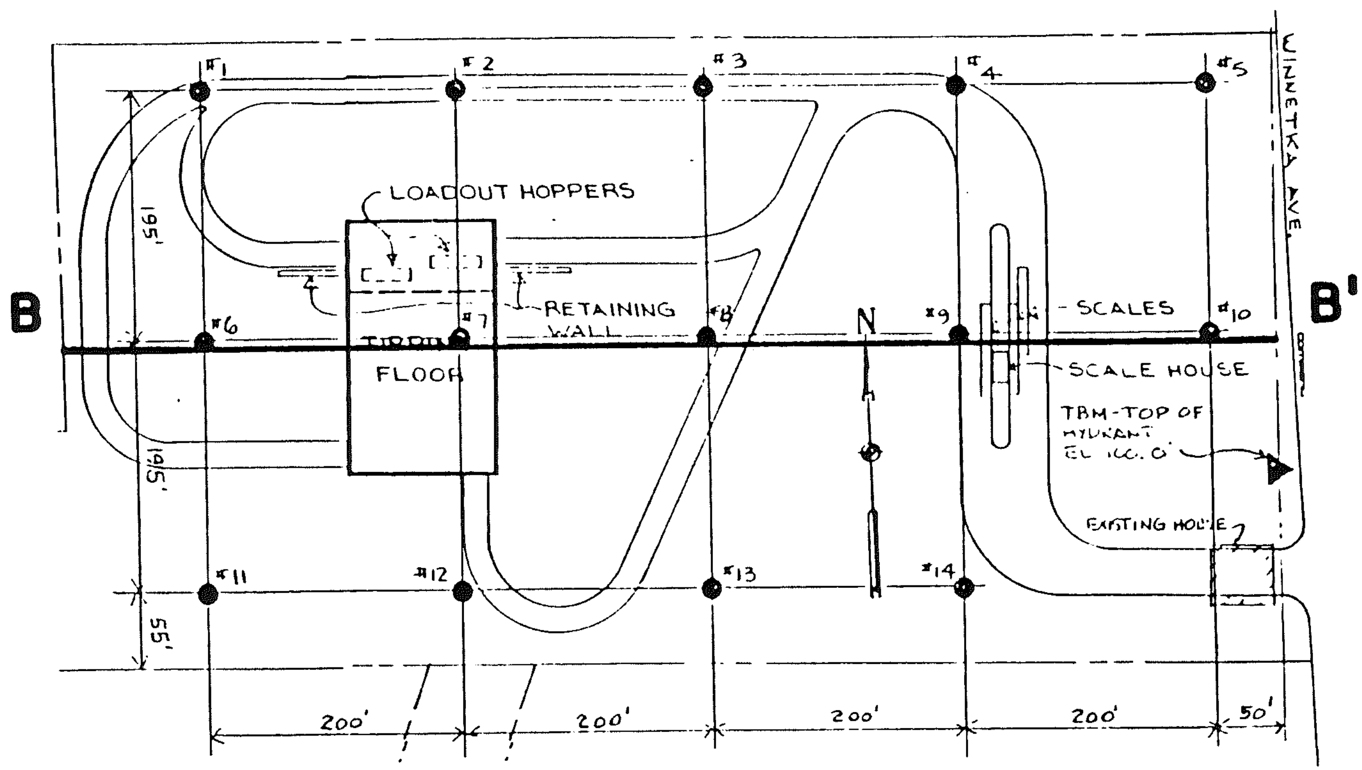
Water table elevations, based on data from the boring logs on the site, are irregular, no clear pattern of ground water flow is evident. This is probably due to the intermingling of coarse (permeable) and fine (relatively impervious) deposits within the soil. Perched conditions are likely.

The Prairie du Chien Group is a major source of ground water in the Minneapolis-St. Paul area. Because this rock unit subcrops beneath the unconsolidated deposits in the area, the site would be considered to be in a recharge area for the Prairie du Chien aquifer.

Geologic Hazards

The Brooklyn Park East site is located just east of Shingle Creek, and overlaps the Shingle Creek floodway and flood fringe. The northwest and southwest corners of the site, as well as the elliptical depression extending east-west across the center of the site, lie within the 100-year and 500-year floodplain of the creek. Approximately 25 percent of the land surface in the area of the site planned for development is in the floodway.

No other geologic hazards, such as active faults, sinkholes, or steep slopes are known to exist on or adjacent to the site.



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SOURCE: Soil Exploration Report, December 10, 1984

Figure 3.3-14 Locations of Soil Borings: Brooklyn Park East Site

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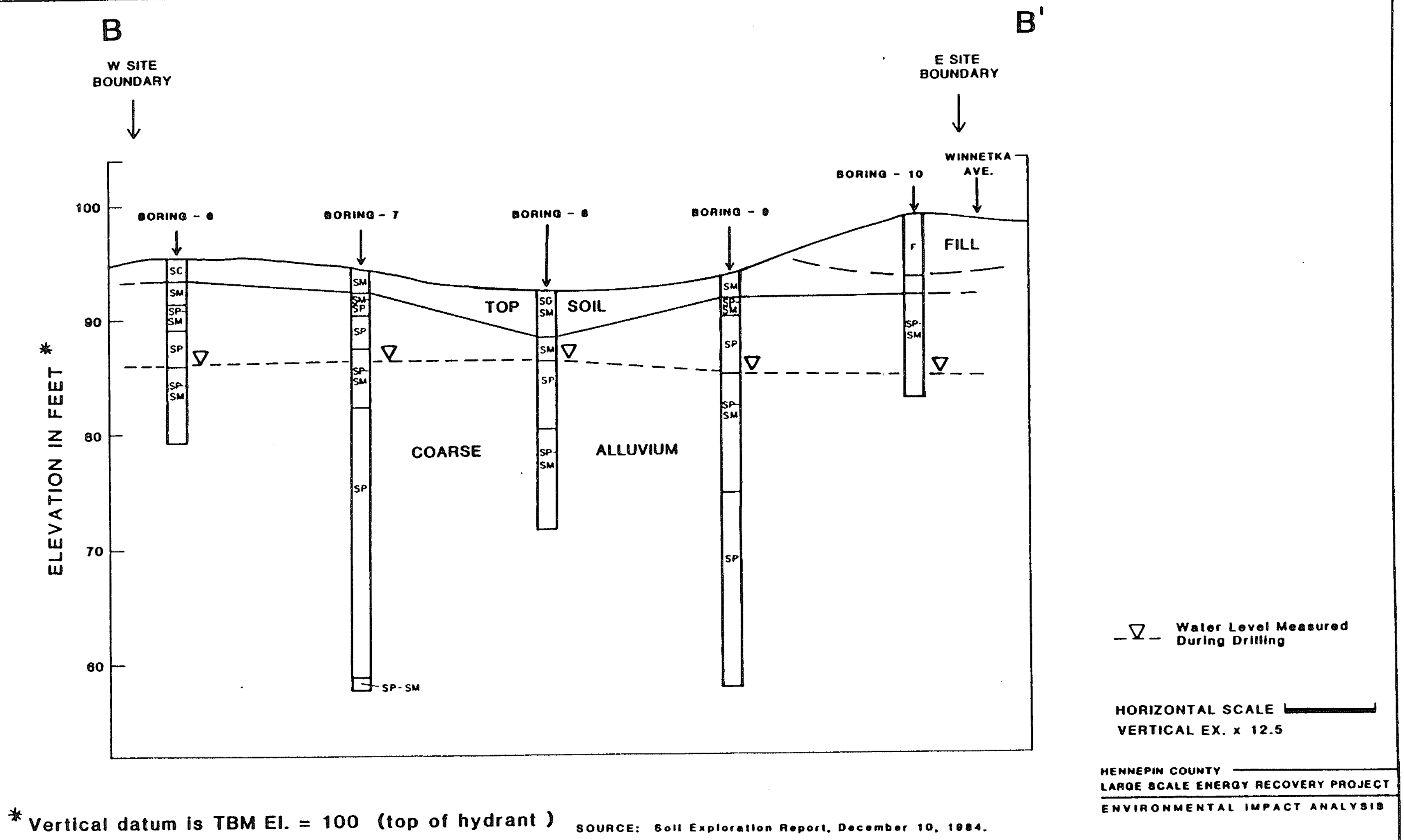


Figure 3.3-15 Soils Cross-Section B-B': Brooklyn Park East Site

3.3.5 Hopkins Transfer Station

The proposed site for the Hopkins-DOT Solid Waste transfer station is located in the city of Hopkins, approximately 8 miles southwest of downtown Minneapolis. The 5-acre site is approximately 0.5 miles northeast of Nine Mile Creek, and is bounded by a Hennepin County Department of Transportation (DOT) facility on the south and east, and by Sixth Avenue and Third Street South on the west and north respectively.

The site is currently used for the storage of DOT equipment and highway construction materials. Portions of a non-operating bituminous batch plant facility still exist on the site.

According to the USGS topographic map, Hopkins quadrangle and surface elevations of borings on the site, the land surface slopes gently to the west, with a total vertical relief on the site of approximately 15 feet.

3.3.5.1 Bedrock

The interpretation of bedrock geology at the site is based on well log data from MGS water well data files. The depth to bedrock beneath the site is approximately 100 feet, with depths ranging from 80 feet to more than 200 feet within a 1 mile radius of the site. The first bedrock encountered is the Platteville formation, consisting of 10 to 25 feet of dolomite and dolomitic limestone underlain by about 5 feet of Glenwood shale. The Platteville - Glenwood formational sequence is underlain by St. Peter sandstone which is about 150 to 175 feet thick in the area. Below the St. Peter sandstone are the Prairie du Chien, a 120 to 150-foot thick dolomite, and the 80-foot thick Jordan sandstone. The bedrock stratigraphy is illustrated in Figure 3.3-16, a cross-section through wells in the site vicinity.

3.3.5.2 Unconsolidated Sediments

The Hopkins-DOT site is in the Mississippi Valley outwash geomorphic region. Sandy, well-drained soils predominate in the region (University of Minnesota, 1974). It can be inferred from soils types adjacent to the disturbed areas that the site originally contained primarily Hayden loam and Heyder complex soils. These soils are deep, well drained sandy loams formed in loamy glacial till, with a water table below a depth of 5 feet in all seasons.

Seventeen soil borings were completed on the site by Soil Exploration Co. in 1985 and information from these explorations provides a more detailed, site-specific profile of the unconsolidated deposits. Figure 3.3-17 shows the boring locations. The borings varied in depth from 16.5 to 41.5 feet below the ground surface, but did not penetrate the entire ~100 feet of glacial and post-glacial deposits above the bedrock. Fill was encountered in all of the borings, and varied in thickness from 0.5 to 13 feet, with the thicker fill being generally on the western edge of the site.

The fill is a mixture of loose to dense silty sand, sand, clay, clayey sand and gravel, with blacktop and some brick, concrete and crushed limestone. Approximately one foot of lean clay topsoil is

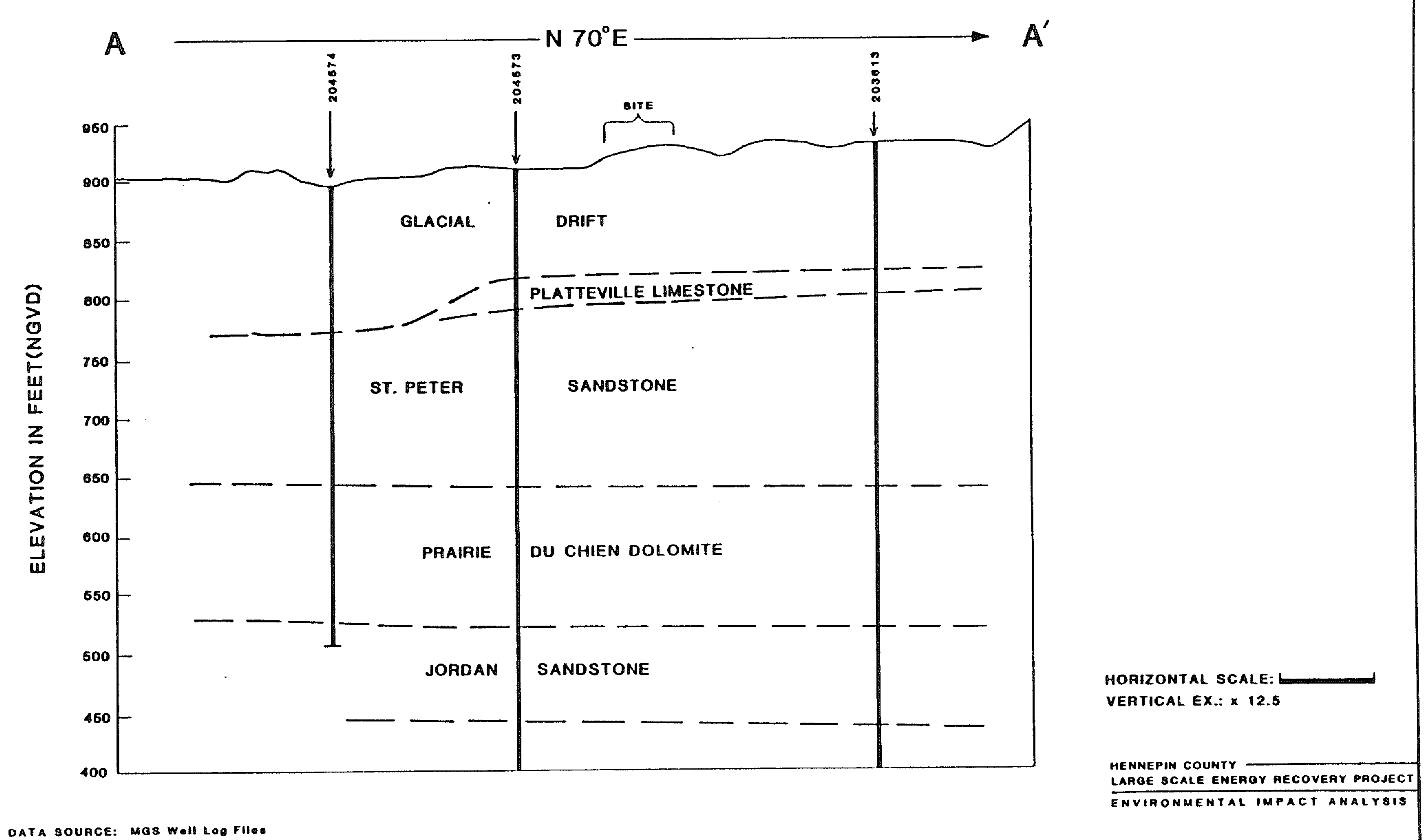
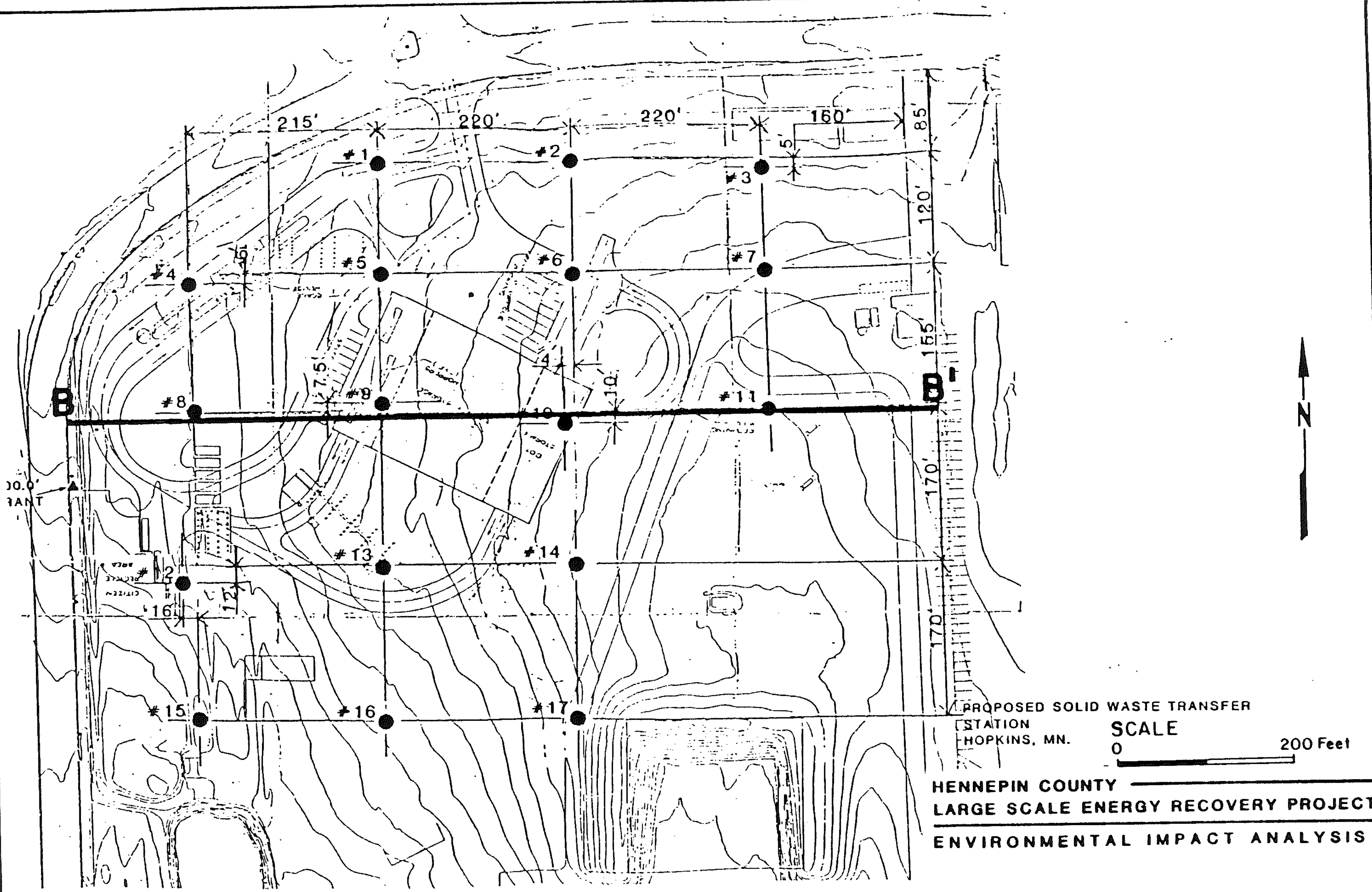


Figure 3.3-16 Geologic Cross-Section A-A': Hopkins DOT Site



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SOURCE: Soil Exploration Report, June 17, 1985.

Figure 3.3-17 Locations of Soil Borings: Hopkins DOT Site present in two borings beneath the fill. Topsoil was encountered in one other boring, and consists of silty sand with a little gravel. The remainder of the soils penetrated were interbedded fine- and coarse-grained alluvium and glacial till. The coarse alluvium is composed of sand and silty sand, with a little gravel and occasional lenses of clay. Penetration resistance (N) values range from 6 to 58 (loose to very dense). Fine-grained alluvium interbeds with the coarse alluvium in some of the borings. This deposit consists of very stiff to hard clays and silts. Glacial till was encountered in approximately half of the borings. This silty sand contains some gravel, cobbles and boulders, as well as lenses and layers of clayey sand and sand. Penetration resistance data indicates that these till soils are medium to dense. Figure 3.3-18 illustrates the soil profile in the site area.

3.3.5.3 Hydrogeologic Conditions

The water table was not encountered by most of the borings drilled on the site. A perched water table may exist along the western edge of the site, in a coarse-grained alluvial sand which overlies a relatively impervious layer of glacial till. Evidence for this is from an observed abrupt change in water table elevations on the site. Water was encountered in three of the western-most borings at a depth of 11-20 feet. The only other boring to intersect the water table was the deepest one drilled, located in the center of the site. This boring encountered ground water at a depth of 34 feet.

Geologic Hazards

No active faults, sinkholes, steep slopes, floodways or other geologic hazards are known to exist on or adjacent to the site.

3.3.6 Minneapolis South Transfer Station

The 1.2-acre site which has been proposed for the Minneapolis South transfer station is south of downtown Minneapolis, approximately 1.2 miles southwest of the Mississippi River and 0.7 miles northeast of Powderhorn Lake. The Pioneers and Soldiers Memorial Cemetary Park borders the site on the south and west. A construction company is located adjacent to the north edge of the site. The remainder of the site is bounded by 20th Avenue South and East 29th Street.

The site is currently occupied by a transfer station. Nearly all of the ground surface is covered with buildings or pavement.

Surface elevations on the site range from 94.6 to 102.4 feet above mean sea level. The variation in surface elevations is primarily due to grading during construction of the existing transfer facility. According to the USGS topographic map, St. Paul West quadrangle, the ground surface in the site vicinity slopes gently to the northeast.

3.3.6.1 Bedrock

The interpretation of the bedrock geology at the site is based on well log data from the MGS water well data files. Depth to bedrock beneath the site is approximately 60 feet, with depths ranging from

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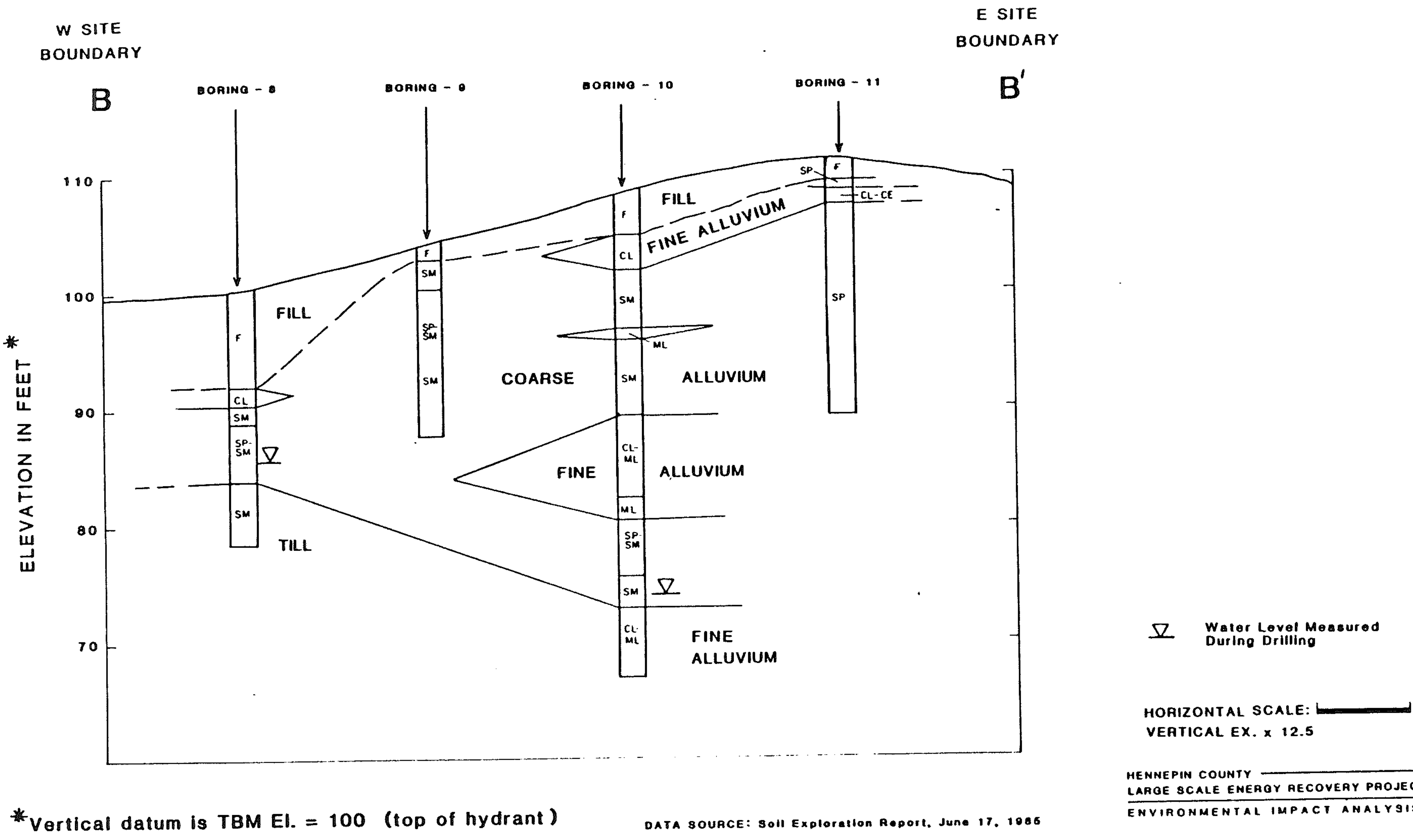

Figure 3.3-18 Soils Cross-Section B-B': Hopkins DOT Site

50 feet to 75 feet within a 1-mile radius of the site. The first bedrock encountered is Platteville limestone, consisting of 25 to 40 feet of dolomite and dolomitic limestone underlain by 2 to 5 feet of Glenwood shale. The Platteville-Glenwood formations are underlain by a 150 to 170-foot thick layer of St. Peter sandstone. Beneath the St. Peter sandstone are 140 feet of Prairie du Chien dolomite and 80 feet of Jordan sandstone. Figure 3.3-19 is a geologic cross section in the site area.

3.3.6.2 Unconsolidated Sediments

Approximately 50 to 70 feet of unconsolidated deposits overlie the bedrock on the site. The Minneapolis South site is located in the Mississippi Valley Outwash geomorphic region. Soil in the area is expected to be generally sandy and well-drained (University of Minnesota, 1974). The glacial drift in the area, according to a generalized surficial geology map published by Winter and Norvitch in 1972 (Figure 3.3-1), is expected to be mostly sand and gravel associated with glacial meltwater deposition.

Six soil borings were drilled on the site, and provide a more detailed representation of the soil profile in the site area. The boring locations are indicated on Figure 3.3-20. One to five feet of fill material are present below the ground surface on the site. These soils are mostly silty or clayey sand, with a layer of blacktop sometimes present at the surface. Some gravel and angular fragments of limestone were encountered within the fill layer. The fill soils have penetration resistance (N-values) ranging from 5 to 6. Coarse water-deposited soils underlie the fill in the borings. These fine and medium grained sands which contain varying amounts of silt and gravel, are very loose to dense, with N-values ranging from 2 to 44 blows per foot. The majority of the sands on the site were medium dense to dense. The deepest boring penetrated a till layer at a depth of 34 feet below grade. This glacial deposit was composed of stiff clayey sand and very dense silty sand. Figure 3.3-21 is a generalized soil profile through three of the borings.

3.3.6.3 Hydrogeologic Conditions.

The water table was penetrated by one boring on the site at a depth of 34.5 feet. The ground water encountered lies just above the relatively impervious glacial till, and therefore might be indicative of perched conditions.

The most significant source of ground water in the site area is the Prairie du Chien-Jordan aquifer, which underlies the surface at a depth of approximately 260 feet. The shallower St. Peter sandstone is a minor aquifer generally suitable only for domestic supply.

<u>Geologic Hazards</u>

No geologic hazards, such as active faults, steep slopes, or floodplains are known to exist on the site.

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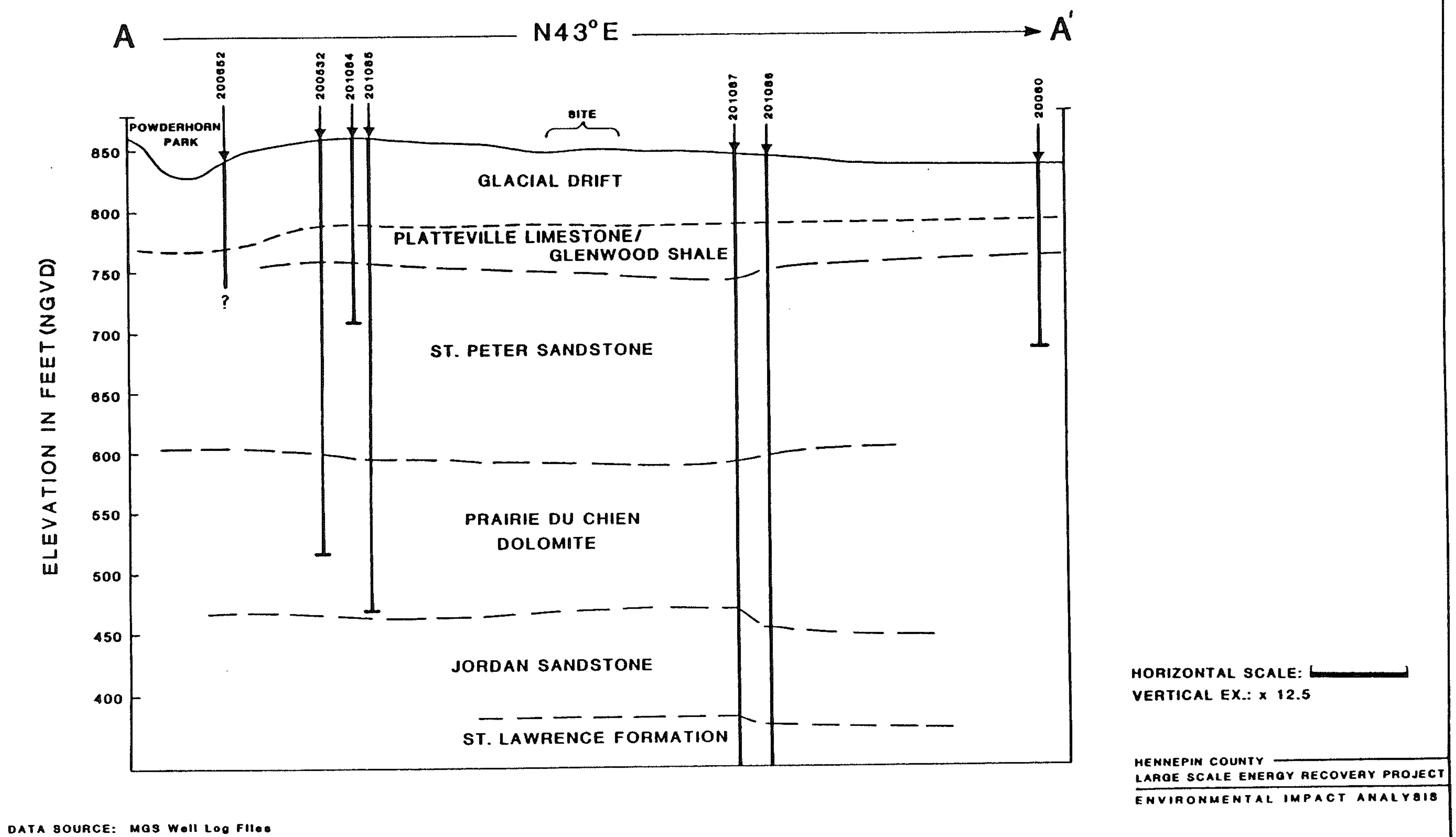

Figure 3.3-19 Geologic Cross-Section A-A': Minneapolis South Site

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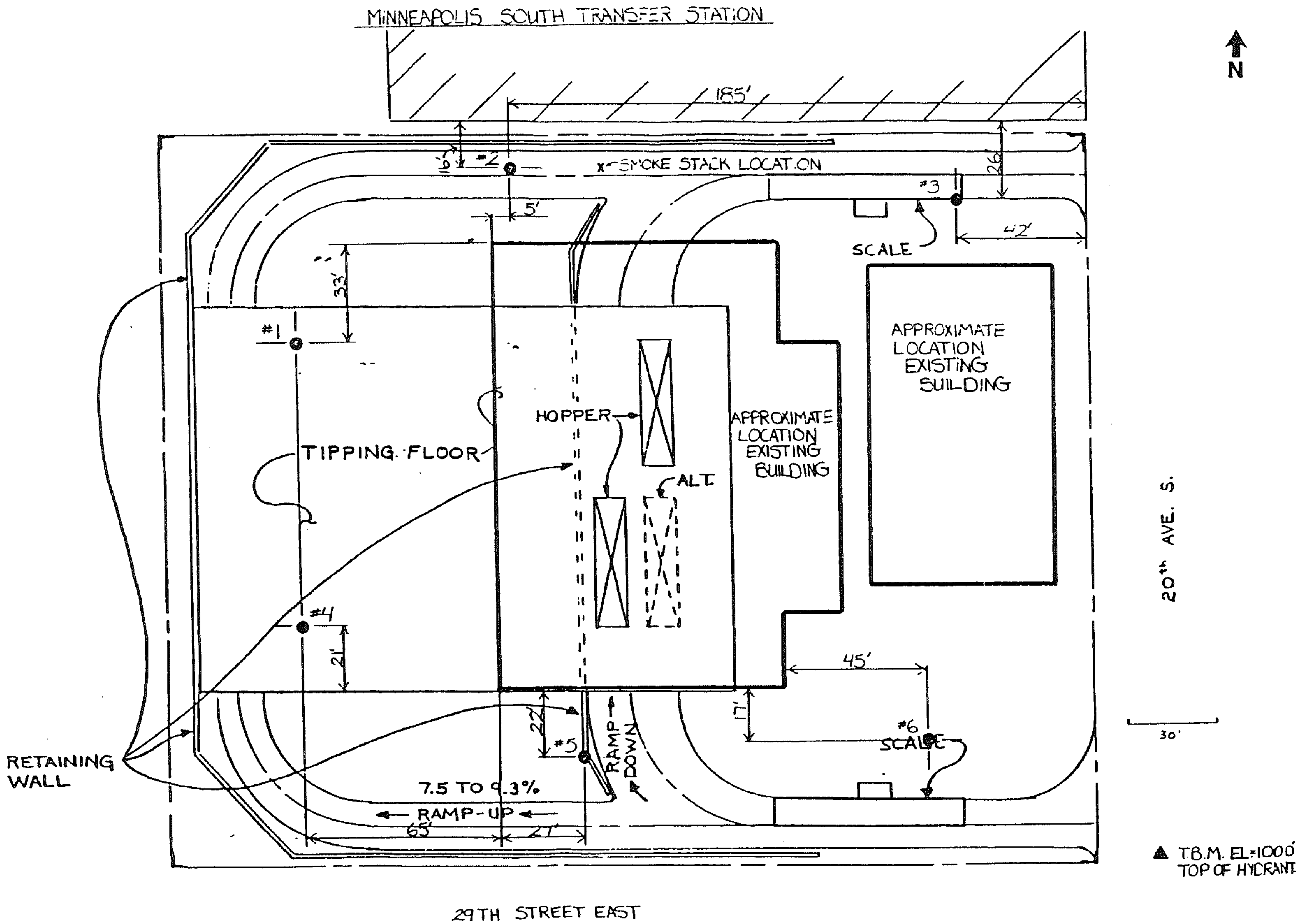

Figure 3.3-20 Site Map with Boring Locations, Minneapolis South Site

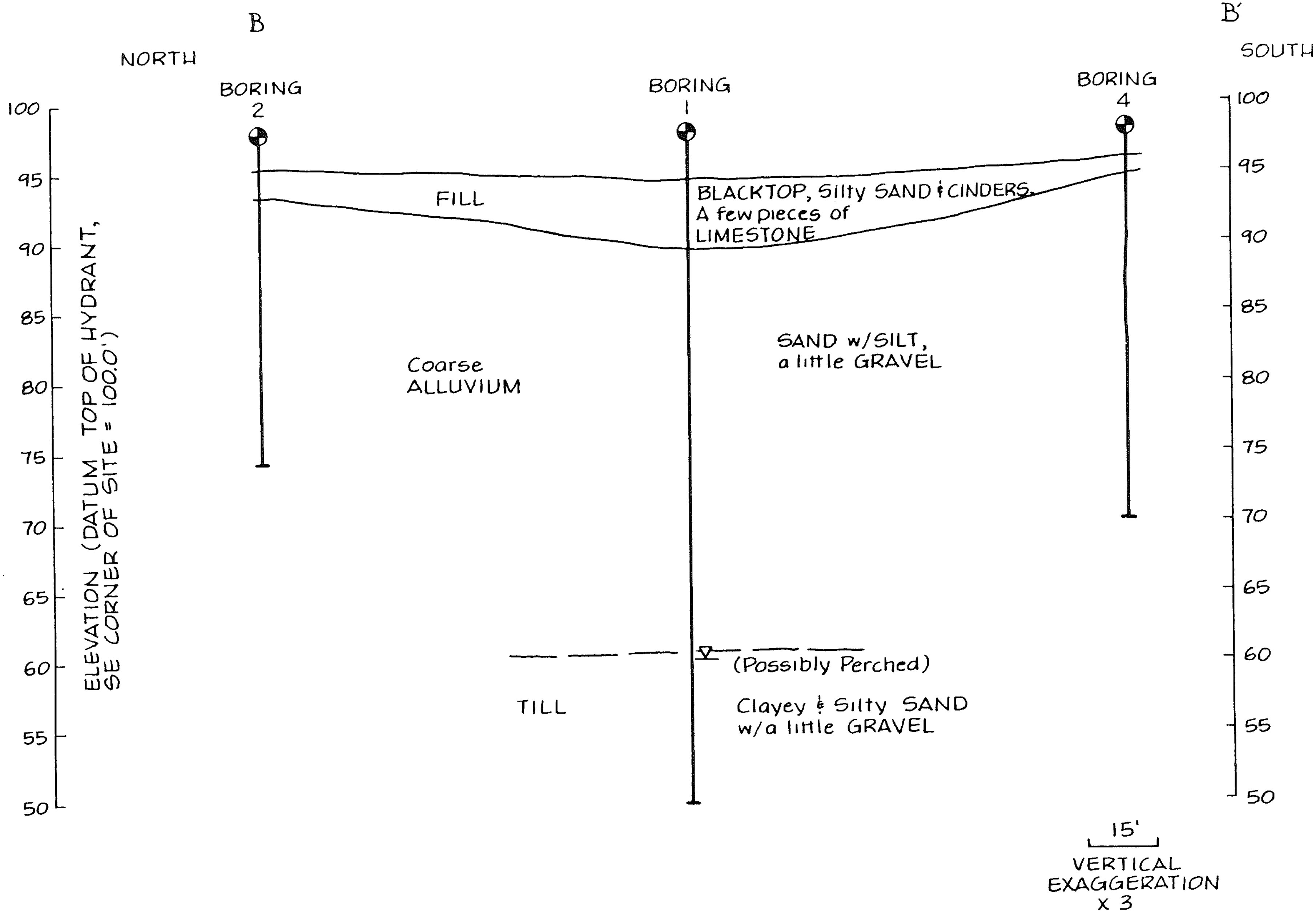

Figure 3.3-21 Soil Profile B-B': Minneapolis South Site (Data Source: Soil Exploration Company Report, September 27, 1985)

3.4 Surface Water

3.4.1 Resource Recovery Facility

3.4.1.1 Hydrology

The Greyhound site is located on the northern edge of downtown Minneapolis and approximately 0.6 miles southwest of the Mississippi River. Overland drainage on the site generally flows toward the west across moderately sloped to nearly flat terrain. The western and southern portions of the site are generally flat with a number of sunken and depressed areas where a few inches of standing water is not uncommon. At least 80% of the site is impervious area consisting of abandoned service roads, parking areas, the Greyhound bus garage and the Insty-Print commercial building. Soils found on the site consist of granular fill including sand, silty sand and clayey sand along with other cohesive soils.

3.4.1.2 Water Quality

Surface water runoff quality at the site can be affected by the normal motor vehicle parking and truck delivery activities which occur at the Insty-Print commmercial building. Localized runoff affected by vehicular emissions from this source would generally have relatively low significance, although it is expected that the accumulation of these pollutants in accumulated snow during the winter months would result in snowmelt runoff of generally poorer quality than normal rainfall runoff.

3.4.1.3 Surface Drainage

The site has runoff characteristics representative of impervious surfaces, as most of the site is either developed (parking, service roads, and buildings) or consists of soils which are poorly drained. Various catch basins located at or near the site collect rainfall runoff from the area and convey it through a 36-inch concrete storm sewer which flows westerly along 6th Avenue. From this point, flow is conveyed northerly to a 42-inch concrete storm sewer located along 5th Street North. This storm sewer flows in a northwesterly direction to the confluence with Bassett Creek Tunnel. Flow in the Bassett Creek Tunnel is to the northeast and discharges into the Mississippi River.

3.4.1.4 Wetlands

There are no designated wetlands or surface water bodies (lakes, ponds, streams or other flowages) on or adjacent to the site.

3.4.2 Bloomington East Transfer Station

3.4.2.1 Hydrology

The Bloomington East site consists of a 5 acre section of land which slopes gently to the northeast, with a total vertical relief of about 10 feet. Because most of the natural soils have been disturbed or removed as a result of development, the surface soils within the site consist mostly of granular fill, clay and sand. Approximately 40% of the site area consists of impervious surfaces (buildings and pavement) with about 60% composed of non-impervious vacant land. Some drainage from the site is served by an 18-inch reinforced concrete storm sewer located on West 96th Street. Stormwater flow is conveyed easterly along this line to where it ties into the I-35W storm sewer. This storm sewer flows southerly and eventually discharges to the Minnesota River.

3.4.2.2 Water Quality

Since there are no surface water bodies on or adjacent to the site, and as there is relatively little vehicular or other activity at the site at the present time, the quality of runoff which enters the municipal storm sewer system does not pose adverse environmental impacts.

3.4.2.3 Wetlands

There are no designated wetlands or water bodies on or adjacent to the site.

3.4.3 Brooklyn Park East Transfer Station

3.4.3.1 Hydrology

This 12-acre site is located in the central portion of the 44 square mile Shingle Creek Watershed. The watershed boundary encompasses the cities of Brooklyn Center, Brooklyn Park, Crystal, Maple Grove, Minneapolis, New Hope, Osseo, Plymouth and Robbinsdale. The Shingle Creek Watershed contains four creeks and thirteen lakes. The topography of the watershed varies from generally rolling in the upper portions of the watershed to extremely flat terrain along downstream reaches. General drainage for the Shingle Creek Watershed is from west to east. Brooklyn Park, the city where this site is located, is drained by a storm sewer leading to the Mississippi River and by small tributaries of the Mississippi River, principally Shingle Creek.

The topography of Brooklyn Park is flat to gently rolling with a maximum vertical relief of 130 feet. Periodic flooding normally occurs in the spring when snowmelt combines with spring rain. The proposed facility would be situated along the east side of the Shingle Creek conservancy district, which in the vicinity of the site is mostly Type 3 wetland. This marsh area contains the floodway and flood fringe of the Shingle Creek 100-year floodplain.

Although the majority of this floodplain area is located to the west of the site, there is a portion of floodplain that encroaches and projects eastward toward the center of the site along shallow lowland. This flood area represents approximately 25% of land surface within the site now planned for development. Stormwater runoff from the existing site drains overland toward the shallow lowland in the central portion of the site, then drains west to discharge to Shingle Creek. The total vertical relief of the site is approximately 12 feet. The upland portions of the site are primarily open fields with well-drained, sandy topsoil. The lowland portions (floodplain areas) of the site have soils which are sandy, but less well drained than the upland soils. A 78-inch concrete storm sewer which runs underground along the northern edge of the site and drains Winnetka Avenue and parts of U.S. Highway 169 east of the site conveys flow for a distance of about 850 feet from Winnetka Avenue to an outfall and drainage ditch that continues for another 550 feet to discharge into Shingle Creek.

3.4.3.2 Water Quality

The most important water quality impacts associated with the Shingle Creek Watershed and Brooklyn Park East Transfer Station involve stormwater runoff. Storm runoff discharge to Shingle Creek at the site vicinity includes street drainage from Winnetka Avenue as well as portions of U.S. Highway 169. Oil spills from transport vehicles or from motorized vehicles are potential contributors to the introduction of oil to stormwater runoff. Street litter is another potential source of storm runoff contamination.

3.4.3.3 Wetlands

Part of the Shingle Creek floodplain is designated by the DNR as a Type 3 protected wetland (DNR, 1984). In the Type 3 wetlands, soil is usually waterlogged during the growing season. Often it is covered with a few inches of water. Common vegetation includes cattails, sedges, rushes, arrowhead, burreed and smartweed. The northwest and southwest corners of the site are occupied almost entirely by common cattail, canary reed grass and sedges, with willow trees found along the perimeter. The wetland presently serves as a storage and siltation basin for precipitation runoff from a large portion of the site.

3.4.4 Hopkins Transfer Station

3.4.4.1 Hydrology

The site is located in the City of Hopkins and within the north branch of Nine Mile Creek Watershed. The north branch of Nine Mile Creek has its headwaters at County Road 3 and 15th Avenue North and travels southerly through South Hopkins. Over the years the creek alignment has been formalized and routed within city controlled strips of land for a distance of approximately 2,500 feet to where it crosses under County Road 18 into Edina. Storm water for the Hopkins DOT site is presently collected and handled by a settling/holding pond which is located in the southwest corner of the DOT property and south of the proposed transfer station site. The pond measures 96 feet by 155 feet and has available storage of 1.7 acre-feet of runoff. The total drainage area to the pond is 9.7 acres, of which 6.4 acres (66%) are impervious, and 3.3 acres (34%) are non-impervious. The non-impervious areas of the site generally contain a soil mixture of silty sand and gravel fill. Stormwater is conveyed south from the pond by an 18 CMP storm sewer which connects to a 36-inch municipal storm sewer on 5th Avenue South. Flow travels south on 5th Avenue

South and then east on 7th Street South to the outfall and drainage ditch which travels southerly to Nine Mile Creek through a series of retention ponds along the west side of Highway 18.

3.4.4.2 Water Quality

Local overland runoff within the site travels westerly and southerly to enter the existing holding/settling pond. Part of the site was once utilized for bituminous batch plant facilities, portions of which still exist on the site. The purpose of the holding/settling pond is to contain stormwater runoff to separate out any potential contaminants such as oil or grease and settle removed by skimming the surface) and settle out solids and sediment during the retention process.

3.4.4.3 Wetlands

There are no designated wetland areas on or adjacent to the proposed transfer station site. Nine Mile Creek, approximately 0.75 miles to the south is supported by a floodplain containing open uses such as parks, parking lots, community gardens, woodlands, pedestrian-ways and retention basins.

3.4.5 Minneapolis South Transfer Station

3.4.5.1 Hydrology

This is the site of an existing transfer station with typically urban drainage characteristics. Nearly 100% of this site is impervious area which drains rainfall runoff easterly onto 20th Avenue South. Flow is sent northerly along the curbside to where it is collected at a catch basin approximately 180 feet to the north of the northern property line. From the catch basin flow is sent easterly through an 18-inch RCP storm sewer along East 28th Street and southerly through a 15-inch concrete storm sewer to where it connects to the 6-foot 29th Street diameter storm drain tunnel. This tunnel sends flow easterly to Hiawatha Avenue where it becomes an 8-foot circular tunnel traveling northwesterly to East 29th Street. The East 29th Street Tunnel sends flow easterly to discharge at the Mississippi River.

3.4.5.2 Water Quality

Stormwater runoff quality at this site can be affected by activities taking place both on and off the site boundaries, primarily vehicular related pollution as well as common litter. Since there are no surface water bodies (lakes, ponds, streams, or other flowage) on or adjacent to the site, the quality of rainfall runoff and snowmelt runoff do not have significant impact in the vicinity of the site.

3.4.5.3 Wetlands

There are no designated wetlands or surface water bodies on or adjacent to the site. The nearest surface water bodies are the Mississippi River (1.3 miles to the northeast) and Powderhorn Lake (0.7 miles to the southwest).

3.5 Land Use

3.5.1 Resource Recovery Facility

The site for the proposed resource recovery facility is immediately north-northwest of the Minneapolis Downtown District. It is south of Sixth Avenue North and north of the Burlington Northern railroad tracks that form a the boundary between the downtown Minneapolis District and the industrial and commercial land uses further to the north. The site covers approximately 14.6 acres. A long, narrow Greyhound bus garage, an Insty Print commercial building, a railroad spur, a large parking area, and a small abandoned storage building occupy the site.

On the east, the site is bounded by Fifth Street North and the 10-story Hillcrest Development Building. The first block south of the site is used primarily for parking. Railroad tracks and Trucking, Inc., a large transportation facility are to the southeast. Further south (approximately 1/2 mile) are commercial and business activities that make up the Minneapolis Downtown District. Also to the south is the Basilica school and associated church. To the north is the recently completed 5-story Metropolitan Transit Commission (MTC) office building complex on Sixth Avenue North.

The site is bounded on the west by a number of light industrial and commercial land uses including Northwest Automatic Products Corporation, the Paper Depot, Columbia Venetian Blind Company, Firestone Tire Service and Gamble Robinson Company. I-94 is approximately 0.4 miles to the west. Beyond I-94, about 1/2 mile from the site, are a church, shopping center and a large residential and apartment complex. While lands to the east of I-94 are devoted to industrial and commercial activities, those to the west are dedicated to a mixture of land uses including heavy and light industrial, and low and medium residential development.

In general, the area north of the site (within one half mile) contains office space, warehouses, metal scrapyards, some commercial renovations, and some older, deteriorating buildings. The Blaine School, two churches and some residential apartments and units are located about 1/2 mile north. The site is separated generally from downtown and residential areas of the city by I-94, Olson Memorial Highway, Burlington Northern rail line, and U.S. 52 transportation corridors.

There are eleven planning districts, called communities, within the City of Minneapolis. Communities are further subdivided into neighborhoods. The proposed site is within the North Loop neighborhood of the Central community, which includes downtown west and downtown east, as well as Elliot and Loring Parks. Industrial activity occupies approximately 8 percent of the total land area within the city. Three of the nine major industrial areas identified in the city are within the Central community: these are the North Loop, the Central Business District and Industry Square.

The North Loop is designated as a light industrial area in the City's Plan for the 80's. According to the plan, "light industrial is envisioned as small in size, and contained within a single structure with little or no storage. It would not require major nearby transportation facilities, would employ a small labor force, create minimal heavy traffic, and be compatible with surrounding non-industrial uses." (City of Minneapolis, 1982).

The second industrial designation of the city is general industrial. This typically requires a large site, perhaps several structures, considerable open storage close proximity to major transportation facilities, would employ a large work force generating substantial traffic including heavy trucks, and may be visually unattractive. General industrial activities should be located in areas which have appropriate natural or man made buffer area.

The proposed facility site is zoned M2-4, limited manufacturing. M2-4 permitted land uses include those uses permitted in M1-1 to M1-4 districts which are delineated in Table 3.5-1. In addition, motor freight terminals, rail freight not including switching and classification yards, repair shops and roundhouses, and municipal animal pounds are permitted in M24 district. Conditional industrial uses which are permitted include those conditional uses permitted in M-1, as well as areas for dumping or disposal of refuse or trash. M-1 conditional uses include, but are not limited to (City of Minneapolis, 1984):

- airports
- air, railroad and water freight terminals
- automobile testing ground
- municipal sewage treatment plants
- planned manufacturing developments

M2-4 and M2-3 lands surround the proposed facility site to the north and northeast. M1-4 lands abut the site to the west and extend approximately 2000 feet before meeting residentially zoned lands. Approximately 500 feet south of the site boundaries, manufacturing zoned lands end, and the land is zoned B4C-1, B4C-2, and B4S-2. The B-4 zoning subsections are classified Central Retail District. This district is designed to accommodate central retail office and wholesale activities of citywide and regional significance.

3.5.2 Bloomington

The Bloomington East Transfer Station site is located west of I-35W, It is bounded on the south by West 96th St., on the west by Donaldson Company properties, and on the north and east by a fence. The site is located in an area of warehouses, commercial development and light manufacturing that is the central industrial area of the James Avenue municipal development district. The Bloomington Comprehensive Plan indicates that continued development in the industrial area bounded by 92nd St., I-35W, 98th St., and Penn Ave is expected. This area encompasses the proposed site and its environs.

The site is a 5-acre parcel of land, presently occupied by two private businesses: Hose Inc. and Conveyor Inc. which are held under common ownership. The site also abuts private lands owned by the Donaldson Company. Donaldson Company structures adjacent to the proposed site include almost 50,000 square feet of office and research and development facilities. These house an acoustical facility where mufflers, air filters, and air intake devices for heavy duty trucks are tested. Donaldson Company plans for future growth north of its existing facilities.

TABLE 3.5-1

CITY OF MINNEAPOLIS

PERMITTED USES IN M-1 DISTRICT

(1) Except for uses specifically enumerated, any production, processing, cleaning, servicing, testing, repair or storage or wholesaling of materials, goods or products which conform with performance standards set forth for noise, vibration, smoke, dust, toxic or noxious materials, odors, fires or explosive hazards, glare, or heat

(2) Auto laundries

(3) Automobile service stations

(4) Banks

(5) Bowling alleys and pool halls

(6) Building materials sales

(7) Cartage and express facilities

(8) Churches and schools, convents, monasteries, nunneries, rectories, parsonages and parish houses accessory thereto and missions

(9) Contractors' offices, shops and yards

(10) Municipal or privately owned recreation buildings or community centers

(11) Drugstores

(12) Dry cleaning establishments

(13) Dwelling units, rooming houses and motels, except that apartment developments of ten (10) units or more shall be subject to the concept plan review as detailed in Section 534.450

(14) Fuel and ice sales

(15) Garages, for storage, repair and servicing of motor vehicles and for the sale of motor vehicles when such sale operation is conducted in connection with and as a part of the garage business (See Section 542.470, paragraph (14) for body repair)

(16) Greenhouses, wholesale

(17) Highway maintenance shops and yards

(18) Laundries

TABLE 3.5-1 (Continued)

(19) Liquor

(20) Lodges

(21) Mail order houses

(22) Medical and dental clinics

(23) Offices, business and professional

(24) Packing and crating

(25) Parking lots other than accessory

(26) Printing

(27) Public utility and service uses as follows:

- (a) Bus stations, bus terminals, bus turnarounds (off-street), bus garages and bus lots
- (b) Fire stations
- (c) Police stations
- (d) Railroad passenger stations
- (e) Radio and television towers
- (f) Railroad rights-of-way
- (g) Telephone exchanges, telephone transmission equipment buildings and microwave relay towers.
- (h) Utility service substations, electric, gas, telephone and water
- (i) Waterworks, reservoirs, pumping stations and filtration plants

(28) Publishing

(29) Radar installation and towers

(30) Radio and television studies, stations and towers, transmitting and receiving

(31) Railroad labor rest houses, hotels and camps, consisting of sleeping, lodging, eating and related facilities provided for railroad personnel on railroad property

TABLE 3.5-1 (Continued)

(32) Restaurants

(33) Signs--As regulated

(34) Stadiums, auditoriums and arenas, open or enclosed

(35) Taverns

(36) Telephone booths

(37) Temporary building for construction purposes, for a period not to exceed the duration of such construction

(38) Temporary real estate tract offices, for the purpose of conducting the sale of lots.

Source: City of Minneapolis, Zoning Code, 1984

Additional land uses north of the site include Polytech D & W Plastics that is 200 feet from the proposed site boundaries, and Holiday Inn that is to the northeast. John Deere is an industrially oriented business located in the center of a large parcel of land across the street from the proposed site. Other businesses in the city include Larson Truck Industries; ITT Grinnel; Printed Circuits, Inc; Strout Plastics; and Delden. There are two private residences in this industrial area on 94th St. and James Avenue South (less than one-half mile northwest of the proposed site). The I-35 freeway is one block to the east.

The proposed site is zoned I-2, special Limited Industry, as are surrounding properties less than one-half mile from the facility to the north and west. A small area south of the site is zoned I-3, general industrial. The third industrial zone, I-1 is limited to industrial parks. Permitted uses in the industrial zones include (City of Bloomington, 1985):

- manufacturing, compounding, processing, packaging, treatment or assembly of products and materials
- offices
- research labs
- wholesale businesses
- warehouses
- public or public utility uses
- repairing, rebuilding or painting vehicles (I-3)
- dry cleaning and boundary processing

Conditional uses include heliports, planned industrial developments, stations, open storage (not including junk yards), and other uses listed in Table 3.5-2. Issuance of conditional use permits in industrial districts are allowed when (City of Bloomington, 1985):

- the nuisance generated by the use will not have an adverse effect upon existing and future development in adjacent areas; and
- the use provides an economic return to the community commensurate with other industrial uses for which the property could feasibility be used.

All buildings in I-2 districts should be of masonry construction or better. No building shall be constructed of sheet aluminum, asbestos, iron, steel, or corrugated aluminum or steel frame. In special industry zones (I-3), buildings of steel, reinforced concrete, type 3 construction, masonry construction or better are permitted.

Lands on the other side of the interstate are zoned commercial business. This is a zone in which orderly development in an older business area is encouraged. Across the railway, 1,500 feet south of the site, are residential zoned lands.

3.5.3 Brooklyn Park

The Brooklyn Park East Transfer station site is in the southwest corner of the city in one of the larger industrial areas. The site is undeveloped except for one residence located in the southeast corner

TABLE 3.5.2

CITY OF BLOOMINGTON

CONDITIONAL USES IN INDUSTRIAL ZONES

(1) Heliports

(2) Motels

(3) Restaurants

(4) Service stations

(5) Open storage as primary use (except in I-1 Industrial Park District, but not including junk yards or junk car disposal businesses)

(6) Excavation and removal of sand, gravel, black dirt, and other types of soil and mineral products, gravel crushing and screening operations and bituminous treatment plants as a temporary use

(7) Planned developments (industrial)

(8) Advertising signs in General Industry (I-3) Districts

(9) In General Industry (I-3) Districts, uses not specifically set forth herein which, in the opinion of the City Council, would be compatible with the area in which located and which would not constitute a public nuisance

(10) Animal hospitals in General Industry (I-3) Districts

(11) In Limited Industry (I-2) and General Industry (I-3) Zoning Districts, retail sales of heavy equipment, including industrial, manufacturing and construction machinery and equipment; and, in said districts, other retail sales which are a part of warehousing or wholesale business

(12) Junk car disposal businesses in General Industry (I-3) Districts, provided the business including all storage and dismantling or wrecking and display of parts for sale is conducted within a fire resistant building, provided that the entire premises is enclosed by screen fencing and provided the premises abut railroad trackage

(13) Clubs and lodges, nonprofit, in the Industrial Park (I-1) District

(14) Truck and/or trailer rental in the I-3 District

(15) Railroad lines

TABLE 3.5-2 (Continued)

(16) Repairing, rebuilding, and painting vehicles, machinery, and equipment when the use is within a completely enclosed building and when accessory to a permitted principal use in the I-1 and I-2 districts

(17) Vocational and industrial training schools

Source: City of Bloomington, Land Development and Zoning Regulations, 1985 of the parcel. One fourth of the parcel is within the Shingle Creek flood fringe. This thirteen acre site is bounded by Shingle Creek and the Shingle Creek Conservancy District to the northwest; Winnetka Avenue and U.S. 169 to the east; and a small industrial zone and I-94 to the south. A substantial amount of land around the site is vacant, but new industrial and commercial expansion is occurring throughout the area.

The Shingle Creek Conservancy District is designated by the Brooklyn Park Comprehensive Plan Update, 1980 as a future park. The Plan Update notes that the creek offers an opportunity for lunch hour relaxation, trails and inter-park pedestrian transportation alternatives. The Plan also notes that the creek is an often overlooked amenity for business locations, and that freestanding office buildings and offices within larger warehouse buildings should be encouraged to orient window views to the creek.

Further west of Shingle Creek is the Northland Industrial Park. This development, less than one-half mile from the proposed facility, is currently headquarters for almost 150 Twin Cities companies, which collectively employ 4000 people. The area represents a fast growing cluster of high technology industries and is expected to become an important focus of the Twin Cities electronic and computer industry.

Winnetka Avenue forms the site's eastern boundary. Across Winnetka Avenue from the site is a residence and a supply entrance to the Knox Lumberyard. Beyond Winnetka Avenue and is U.S. 169.

To the southeast of the site is Grace Lutheran Church and further east on 68th Avenue (less than one-half mile from the proposed site), is a residential area. This is identified as medium density in the city's Comprehensive Plan. South of the site on the west side of Winnetka Avenue are Chem Lawn, Storer Cable Communications, Brookpark Tennis and Racket Club, Inc., and I-94. North of the site (on both sides of Winnetka Avenue) are a few residences, Fraser Steel Company, Gotzian's Truck Repair, a church, and substantial new construction on the GRL Cold Storage facility. Further to the north on U.S. Highway 169 is the Oscar Roberts Cement Plant.

The City's zoning ordinance (City of Brooklyn Park, 1974) is consistent with the comprehensive plan. The proposed site is zoned I-1. This is a limited industrial district which permits a number of activities and operations associated with the sale, manufacture, fabrication, and processing of certain goods as identified in Table 3.5-3. Permitted land uses include machine shops, warehousing, engraving and printing, railroad spurs, and depots. Outside storage and all operations in the I-1 zone must be enclosed within an appropriate structure. Conditional uses in this zone include airports, concrete block plants, and wash plants. This I-1 zone encompasses not only the proposed site, but also lands 200 to 300 feet to the north and south. Lands to the north of the I-1 district are zoned I-2, general industrial. Permitted land uses within the I-2 zone are listed in Table 3.5-3, and include builders or contractor yards, sand and gravel sales, and bus or truck storage or maintenance shops. Conditional land uses include junkyards, steam or diesel power plants, and trucking terminals. Lands to the west are zoned CD,

TABLE 3.5-3

CITY OF BROOKLYN PARK

LIMITED INDUSTRIAL DISTRICT (I-1) PERMITTED USES

Permitted Uses:

Within and I-1 Industrial District no structure or land shall be used except for the sale, manufacturing, fabricating or processing of the following articles or operations:

1) Artificial limbs

2) Auto painting, upholstering, tire recapping, repairing, body and fender repairing

3) Apparel

4) Batteries

5) Bag, carpet and rug cleaning

6) Bakery goods

7) Bed springs and mattresses

8) Belting and chain conveyors

9) Bicycle and toys

10) Billboards and signs

11) Blacksmithing

12) Boat building, repair and storage

13) Building material yard -- contractors yard

14) Cabinet and carpentry shop, electrical, plumbing, heating, air condition shop

15) Camera and photography

16) Canning and packaging of food staff

17) Canvas and canvas goods

18) Ceramic products

19) Tobacco products

20) Cork products

TABLE 3.5-3 (Continued)

21) Creamery, dairy plants, and ice cream plants

22) Drugs, cosmetics, pharmaceutical and toiletries

23) Electric motors, generators, transformers and control

24) Engraving and Printing

25) Felt products

26) Products made of glass, cellophane, leather, plastic, wood

27) Heating, washing, cooking, drying, cleaning process

28) Television, radio and appliances

29) Laundry

30) Machine shop

31) Motor fuel stations

32) Packaging

33) Railroad sidings, spurs, depots, L.C.L. yards

34) Restaurants (Class I)

35) Rubber products

36) Sporting equipment

37) Trade Schools

38) Warehousing

TABLE 3.5-3 (Continued)

GENERAL INDUSTRIAL DISTRICT (I-2)
PERMITTED USES

Permitted Principal Uses:

Within any "I-2" Industrial District, no structure or land shall be used except for one (1) or more of the following uses:

1) Any use or structure as permitted and regulated shall be a permitted use except as herein amended.

2) Conducting any of the following uses: sale, manufacture, fabrication or processing of any of the following articles or operations

   a. Builders or contractors yards, farm machine sales, feed sales, bulk firewood sales, dirt sand, gravel and rock sales, heavy equipment sales, provided any such operations are enclosed by a solid wall or fence not less than six (6) feet in height and not located less than one hundred (100) feet from any "R" District

   b. Bus or truck storage or maintenance shops

   c. Concrete block plant, concrete mixing plant, asphalt mixing plant

   d. Heat treating and plating

   e. Stone, marble and granite grinding and cutting

   f. Manufacture of housing

Source: City of Brooklyn Park Zoning Ordinance, 1974

Conservancy District. These lands are less desirable for residential, commercial or industrial development due to flooding or poor drainage, slope, adverse soil conditions, or by reason of being designated a public park or common space area. Conditional uses are permitted, however, in the CD district.

Lands to the south of the I-1 district are zoned B-1. B-1 is a limited business district, which is intended to provide an area which is related to and may reasonably adjoin high density or other residential development. Southeast of the site lands are zoned R-4 and R-5. These are residential zones which permit two family dwellings and townhouses by conditional permits, and low density two story multiple family dwellings.

3.5.4 Hopkins

The Hopkins transfer station site is in the northwest corner of a 41-acre parcel currently used by the Hennepin County Department of Transportation (DOT) for storage and maintenance of vehicles, equipment, and construction materials. The actual site area is 5 acres. The parcel is located on Third Street South, west of County Road 18 (Washington Avenue), south of County Road 3 (Excelsior Boulevard), and east of Sixth Avenue South. It is in the middle of an industrial corridor that runs northeast to southwest, through the center of Hopkins along County Road 3 and the railway.

The 41-acre DOT site is used for equipment and materials storage, garage, and office buildings. The actual transfer station site contains the former asphalt plant area, aggregate stockpiles, and culvert storage area. The 1990 Comprehensive Plan for the city (City of Hopkins, 1980) identifies future land use for the site as industrial. The plan outlines the city goals for industrial land use.

- o To continue the development of an industrial land use base which provides employment to residents, augments the personal economy and is an economically stabilizing influence on the community.
- o Industrial land use within the City will be an attractive part of the cityscape and will be developed and operated as desirable neighbors.

The 5-acre transfer station site is bordered by industrial land. Whereas existing and proposed industrial land uses extend beyond the DOT parcel to the west and north, residential single family areas border the DOT parcel to the south and east. These lands include the Park Valley residential neighborhood about 600 feet south of the site, and residential neighborhoods in Edina east of County Road 18. There is also a small community park, Buffer Park, on Fifth Avenue South less than 700 feet from the proposed facility.

The parcel of land west of the site is slated for industrial growth in the City's Master Plan. Developable vacant land comprises less than 10 percent of the area of the city. Vacant lands are being developed at a rapid pace and are deemed significant for the increase in employment base which they bring.

Areas northeast and west, and a small area north of the site contain industrial warehouses and businesses, including lumberyards, building suppliers, general contractors, mill working, trucking terminals and maintenance shops. Additionally, the Super Valu food chain warehouses are 750 feet and 1000 feet from the site. The Red Owl and Country Club distributors are 2,400 and 100 feet, respectively, from the site boundary. Further north of this small industrial area are railroad tracks and County Road 3. Beyond there are high density residential neighborhoods. Finally, the Hopkins downtown redevelopment district extends to County Road 3, approximately 3/4 of a mile from the proposed site.

The proposed site is zoned I-2, General Industrial District (City of Hopkins, 1977). Lands west of the site are zoned I-1, Industrial. Permitted uses in each of these zones are presented in Table 3.5-4. Certain uses may or may not be suitable in a particular zoning district, depending on the circumstances. When suitable circumstances exist, a conditional use may be granted. Uses which are permitted after securing conditional use permit approval include but are not limited to:

- trucking or bus terminal with landscaping, lot size, parking, and lighting as prescribed;
- airports and helicopters;
- contractors yards;
- vehicle washing facilities;
- public utility structures; and
- junk yard.

The area south of the DOT parcel, across Fifth Street South, is zoned single family, high-density residential (R-1-B) and limited business (B-1).

3.5.5 Minneapolis South

The 1.5 acre Minneapolis South transfer station site is west of Hiawatha Avenue, east of Cedar Avenue South, and north of Lake Street on 20th Avenue South and East 29th Streets. At present, the site is occupied by a solid waste transfer station that has been modified from an old incinerator.

The site is located in the Southwest corner of an area designated as heavy industrial in the Minneapolis Plan for the 1980's (City of Minneapolis, 1982). Heavy industrial areas are those which typically require large sites; open storage; close proximity to major transportation corridors; a large work force; and which generate substantial traffic. This heavy industrial zone includes lands to the north and east.

The site is bordered on the west and south by Pioneers and Soldiers Cemetery. On the block east of the site, there is a mix of residential, business, and manufacturing uses. There are about eight occupied residences on Lyman Avenue, approximately 1/8 of a mile from the proposed site. Businesses located in this area and in the area north and northeast of the site include Stewart Chemical Inc., American Aluminum Foundry, Master Sandblasting, Dalsin and Son, Inc., Bitiminous Roadway, and South Foundry Company.

TABLE 3.5-4

CITY OF HOPKINS

PERMITTED USES IN I-1 AND I-2 ZONES

Permitted Uses	I-1	I-2
Food and eatable products	X	X
Apparel and textile products	X	X
Apparel from leather, plastic	X	X
Wood products	X	X
Furniture, fixtures	X	X
Paper products	X	X
Electric appliances, motor, etc.	X	X
Printing-publishing	X	X
Chemical and allied products	X	X
Rubber and plastic	X	X
Stone, clay, glass products	X	X
Offices (ord. #80-480 2/3/81)	X	X
Primary metal products	X	X
Metal fabricating	X	X
Petroleum storage	X	X
Blacksmithing-welding	X	
Boat mfg. repair, storage	X	
Auto reduction yard		X
Building contractors yard	X	
Ice, cold storage plant	X	X
Laundry	X	
Lumber yard-millworks	X	
Rental	X	
Restaurant	X	
Trade school	X	
Research Lab	X	
Building materials yard	X	X
Vehicle painting, body work, repair	X	X
Billboards and signs as provided in this Ordinance	X	X

Source: City of Hopkins Ordinance No. 427, 1977

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The site is zoned M-3, general manufacturing (City of Minneapolis, 1984). Uses permitted in this zone include any uses permitted in M1 and M2 zones as well as any production, processing, cleaning, servicing, testing, repair, and storage or materials, goods or products which conform to performance standards enumerated in the city zoning code. Lands east and north of the site are zoned manufacturing and business. The cemetery to the south of the site is zoned R-6, a general residential district. Within one half mile of the proposed site are the Corcoran School, the Irving School, and approximately eight churches. Approximately one-half mile northwest of the site are Deaconess Hospital, Phillips Jr. High School, a church and additional school.

3.6 Transportation

The proposed project will consist of a resource recovery facility and four transfer stations. Municipal solid waste collected by packer trucks will be delivered to the transfer stations for transport to the resource recovery facility in larger trailers. The purpose of the transfer stations is to minimize transportation costs by consolidating the refuse from the smaller packer trucks (typically capable of transporting 5-6 tons of waste) into the larger transfer trucks (typically capable of transporting 18 to 20 tons of waste).

The proposed resource recovery facility, privately owned and operated, will be located in Minneapolis, MN. The four transfer stations will be located in Hopkins, Bloomington, Brooklyn Park, and South Minneapolis. Figure 3.6-1 provides a regional perspective of the relative location of the proposed facilities.

This section describes the local and regional roadway network that would be used by vehicles from the resource recovery facility and transfer stations. The methods used in data collection and analyses are described. Detailed descriptions of baseline traffic volumes and capacity analyses are provided.

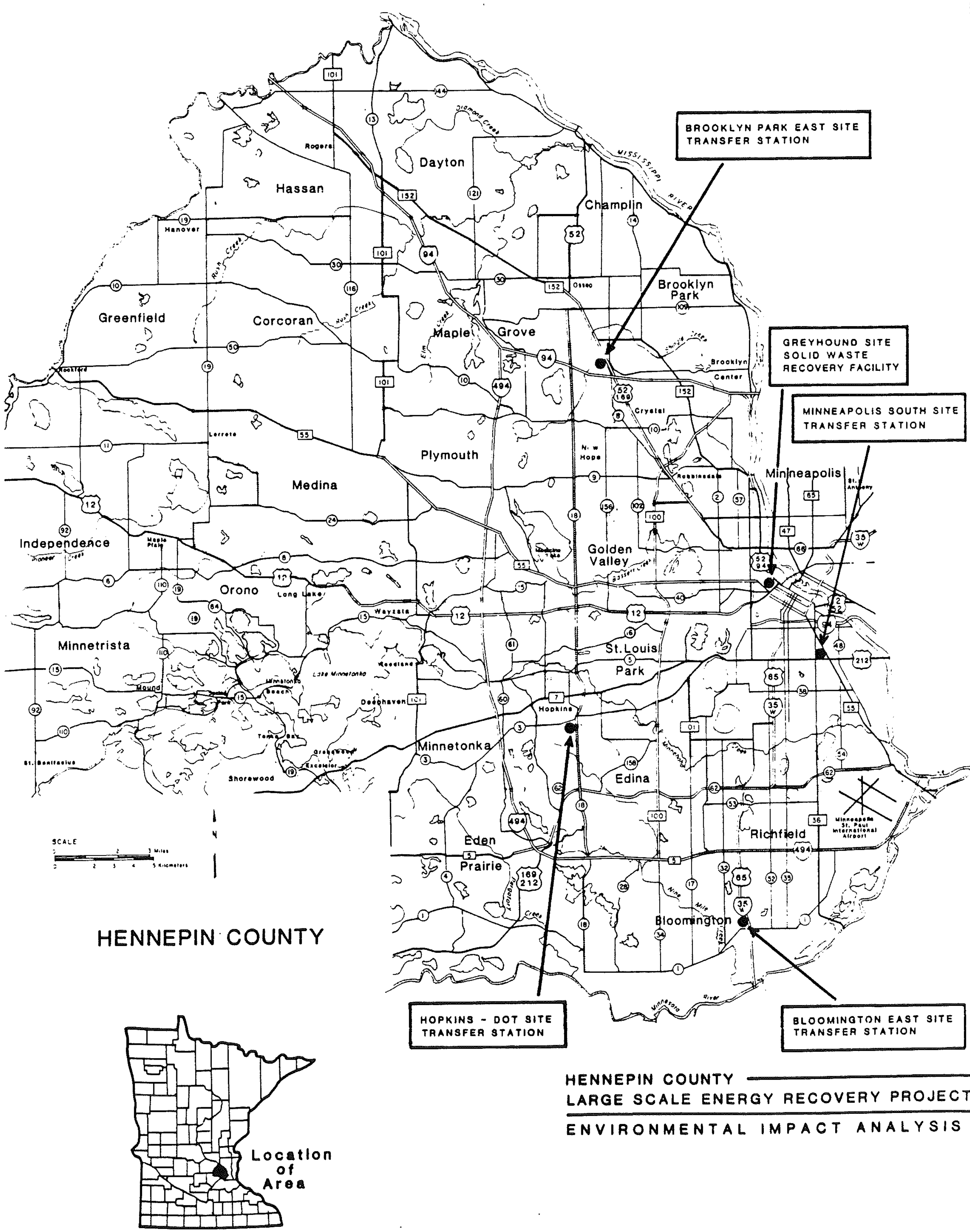
3.6.1 Resource Recovery Facility (Greyhound Site)

The proposed resource recovery facility will be located at what is called the Greyhound site. This site is located in northern Minneapolis. Access to the site is via Interstate 94, State Highway 55 (Olson Memorial Highway), and Seventh Street North (Figure 3.6-2). Primary access from the north and south is by Interstate 94 to Olson Memorial Highway to the site. Interstate 94 is three lanes in each direction in the site vicinity. Access to local streets is provided by West and East Lyndale, two lane one-way streets, to Olson Memorial Highway. Olson Memorial Highway is generally three lanes in each direction before terminating at the intersection with Seventh Street North. East of Seventh Street North, Olson Memorial Highway becomes Sixth Avenue North. Sixth Avenue North is two lanes in each direction.

Access to the site from the west is primarily via Olson Memorial Highway to Sixth Avenue North to the site. Access from the east is generally from Hennepin Avenue to Fifth Street North or Seventh Street North to Sixth Avenue North. Seventh Street North is a major arterial providing a connection to the south and east and downtown Minneapolis.

3.6.1.1 Baseline Traffic Volumes

Average Daily Traffic (ADT) counts for the major roadways around the project site were obtained from Hennepin County and MNDOT (HDR Technical Report). The ADT counts are generally for 1984 and are the most recent comprehensive data available. These counts show that approximately 25,600 vehicles per day travel on Olson Memorial Highway west of I-94; 14,500 vehicles per day on Olson Memorial Highway east of I-94; about 12,200 vehicles per day on Seventh Street North to the south of Olson Memorial Highway; and 9,250 vehicles on Seventh Street North to the north of Olson Memorial Highway.



HENNEPIN COUNTY
LARGE SCALE ENERGY RECOVERY PROJECT
ENVIRONMENTAL IMPACT ANALYSIS

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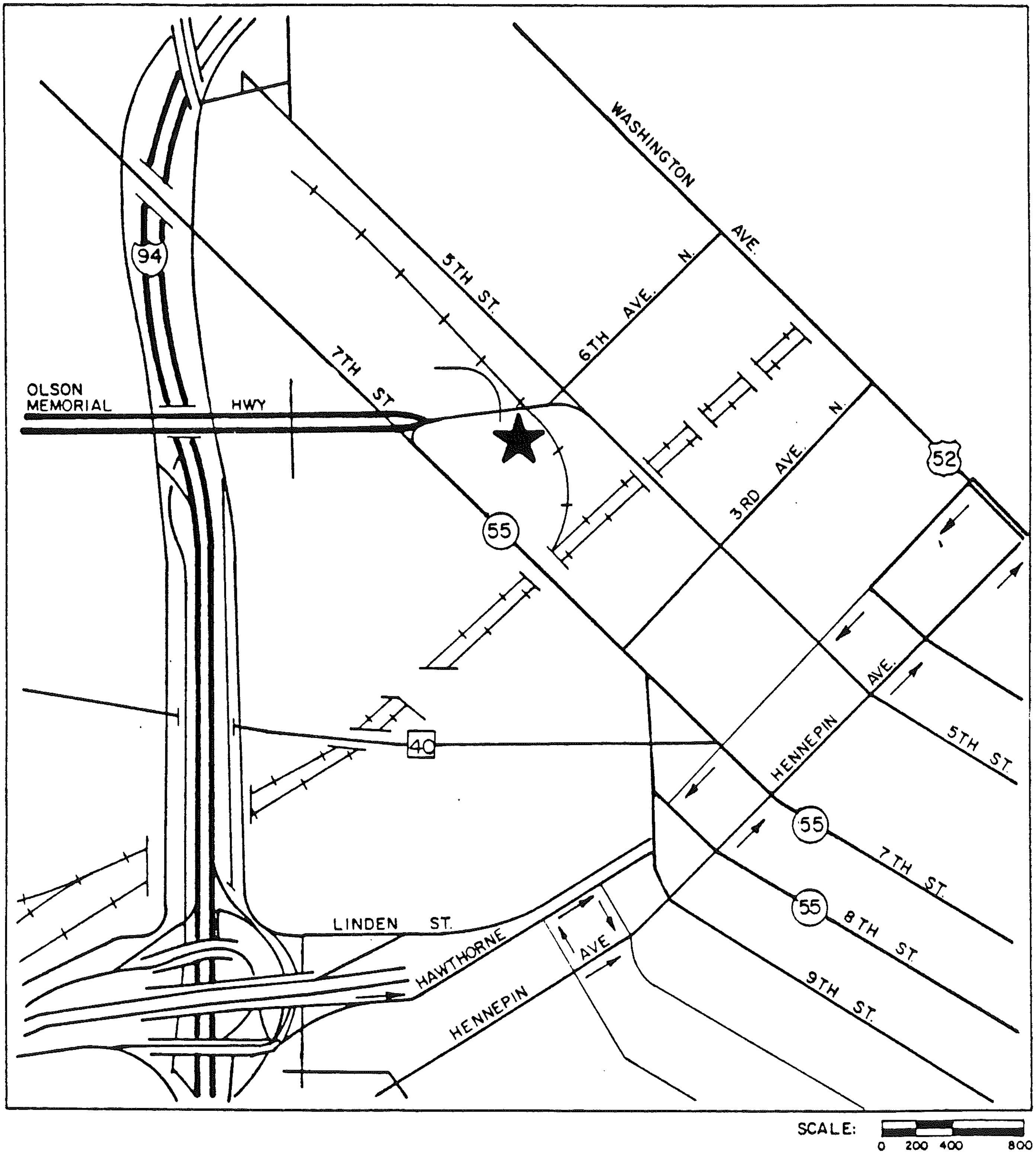
Figure 3.6-1 Locations of Proposed Project Facilities



HENNEPIN COUNTY
LARGE SCALE ENERGY RECOVERY PROJECT
ENVIRONMENTAL IMPACT ANALYSIS

★ – GREYHOUND SITE

SOURCE: HDR

Figure 3.6-2 Roadway Access: Greyhound Site

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To complement this data, ERT performed a series of traffic turning movement counts on September 16, 1985. Turning movement counts had also been conducted by HDR earlier in 1985. Key locations where turning movement counts were conducted were:

- o Sixth Avenue North at Fifth Street North
- o Olson Memorial Highway and Seventh Street North
- o Hennepin Avenue and Seventh Street North, and
- o Metropolitan Transit Commission Garage and Olson Memorial Highway

The counts were taken during 2 hour periods in the AM and PM. The AM period was from 7:00 to 9:00 AM, and the PM period was from 3:30 to 5:30 PM. The AM period corresponds to the time of day when commuters are traveling to work, and the PM period corresponds to the homeward bound commute. The turning movement counts also included an inventory of the truck traffic that passed through the key intersections. A truck is defined as any vehicle with three or more axles. The data shows that the AM peak hour generally occurs from 7 to 8 AM with the PM peak hour from 4:30 to 5:30 PM.

The intersection of Sixth Avenue North and Fifth Street North is stop sign-controlled. Sixth Avenue North in front of the site is two lanes per direction of travel. Approximately 1025 vehicles and 990 vehicles passed through this intersection during the AM and PM peak hours, respectively.

The intersection of Olson Memorial Highway and Seventh Street North operates under traffic signal control. This signal is pre-timed and coordinated with adjacent traffic signals. The Olson Memorial eastbound approach at the intersection consists of four lanes. The Seventh Street North northbound approach and the Sixth Avenue North westbound approach to the intersection are each three lanes. The Seventh Street North southbound approach is two lanes. Approximately 2,300 and 2,720 vehicles passed through this intersection in the AM and PM peak hours, respectively. The percentage of trucks was approximately 5.6 percent and 3.8 percent in the AM and PM peak hours.

The intersection of Hennepin Avenue and Seventh Street North operates under traffic signal control. Hennepin Avenue is generally three lanes eastbound with an exclusive bus lane and four lanes westbound with an exclusive left-turn lane. Seventh Street North is one way northbound and consists of four lanes in this area. This intersection is on the northern fringe of the downtown area and accommodates considerable traffic. Approximately 1,890 and 2,500 vehicles passed through this intersection in the AM and PM peak hours. The volume of trucks was about 11.1 and 14.2 percent trucks in the AM and PM peak hours, respectively.

The final intersection analyzed was the Metropolitan Transit Commission (MTC) garage at Olson Memorial Highway. This intersection operates under a demand actuated traffic signal. Olson Memorial Highway is two lanes per direction at the intersection. The MTC garage access drive is used primarily by busses and is approximately 63 feet wide. One thousand and 1,205 vehicles passed through this intersection in the AM and PM peak hours, respectively. Trucks and buses were about 5 percent of the traffic during both peak hour periods.

Figures 3.6-3 and 3.6-4 illustrate the AM and PM peak hour traffic demands on the roadway network. The turning movement data represents the existing 1985 conditions.

3.6.1.2 Capacity Analysis

Intersection capacity analyses were performed using the AM and PM peak hour traffic demands to determine the existing level of traffic flow efficiency on site access roadways. Capacity analyses measure the operating characteristics of an intersection and are based on physical conditions, vehicular volumes and existing traffic control. Measures of the quality of traffic flow are expressed by letter designations called levels of service (LOS). Levels of service range from level "A," stable flow, to level "E" which is capacity at unstable flow, or the theoretical maximum amount of traffic that can pass through the intersection. Conditions exceeding capacity are designated LOS "F." At this level traffic flow is severely hampered, resulting in congestion and frequent delays. Table 3.6-1 describes the traffic operating characteristics and level of service relationships for intersections. In general, a level of service 'C" stable flow condition is the desired operating standard for intersections.

Using procedures defined in the Highway Capacity Manual, 1965 and Transportation Research Board Circular 212, capacity analyses were performed for the intersections previously described. Although traffic volumes through several of the key intersections (particularly Seventh Street North at Olson Memorial Highway) are large, all of the intersections operate at LOS "B" or better during both peak hour periods. Little congestion was observed at these intersections, primarily due to the considerable capacity available (i.e. turning lanes, signal timing/advances). Table 3.6-2 summarizes the results of the capacity analyses for the four intersections analyzed.

Olson Memorial Highway (Sixth Avenue North) at Fifth Street North operates at LOS "B" during both the AM and PM peak hours. This corresponds to very good operations with some short delays, primarily due to lane changes at the intersection. Similarly, the traffic signal controlled intersection of Olson Memorial Highway and Seventh Street North operates at LOS "B" during the AM and PM peak hours. Again little congestion or delay was observed. The intersection of Hennepin Avenue and Seventh Street North functioned at LOS "A/B" in the AM peak period and LOS "B" in the PM peak period. Little delay was observed during either period. Finally, the signal controlled intersection of the MTC garage at Olson Memorial Highway (Sixth Avenue North) functions at LOS "A/B" during the AM and PM peak hours with little delay or congestion observed.

3.6.2 Bloomington Transfer Station

The Bloomington East transfer station site is served primarily by I-35W/U.S.65 as shown in Figure 3.6-5. Access to the site is via interchanges from I-35W to West 94th Street or alternatively to West 98th Street.

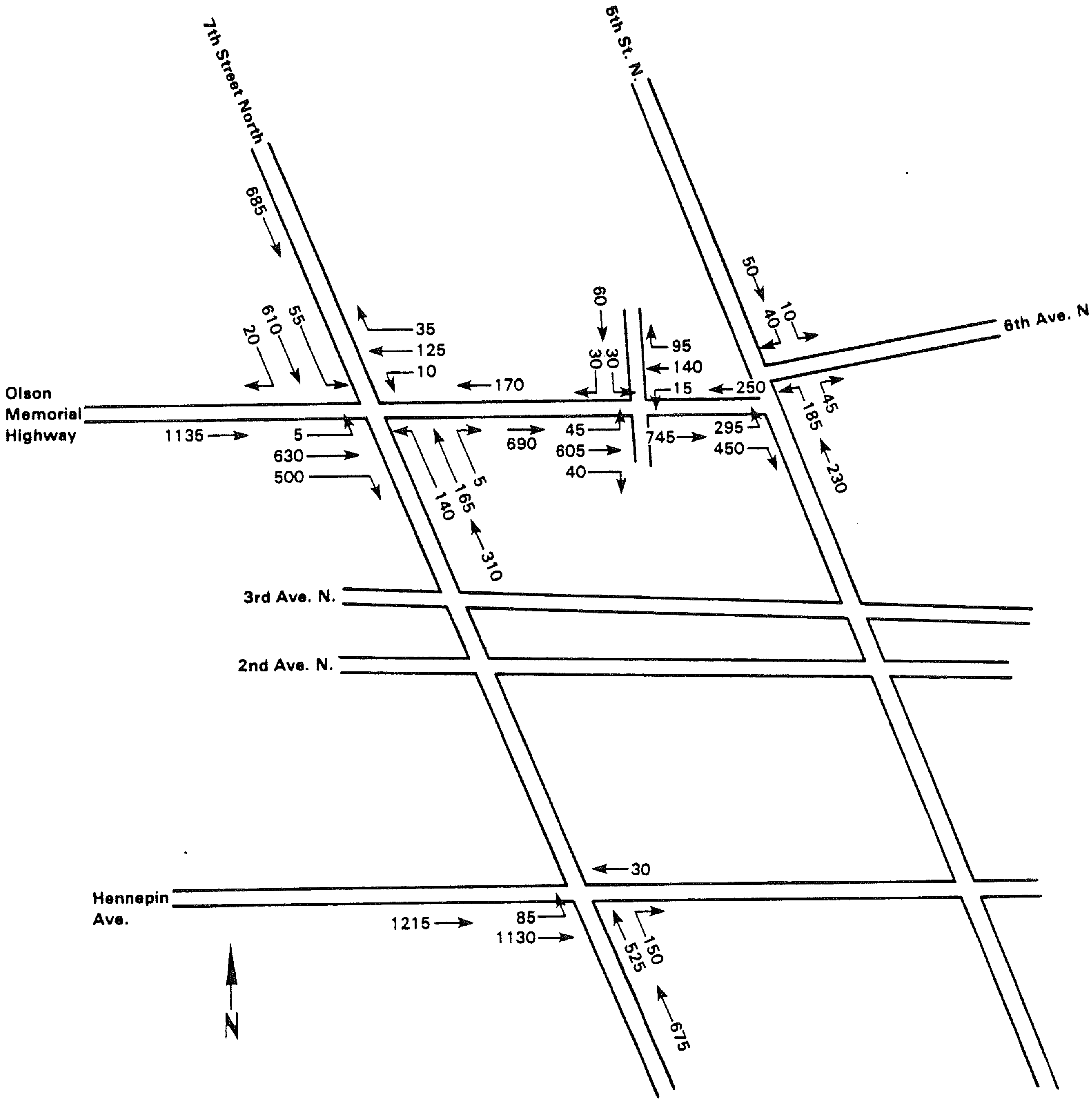

Figure 3.6-3 Existing Traffic Volumes, 1985 A.M. Peak Hour - Greyhound Site

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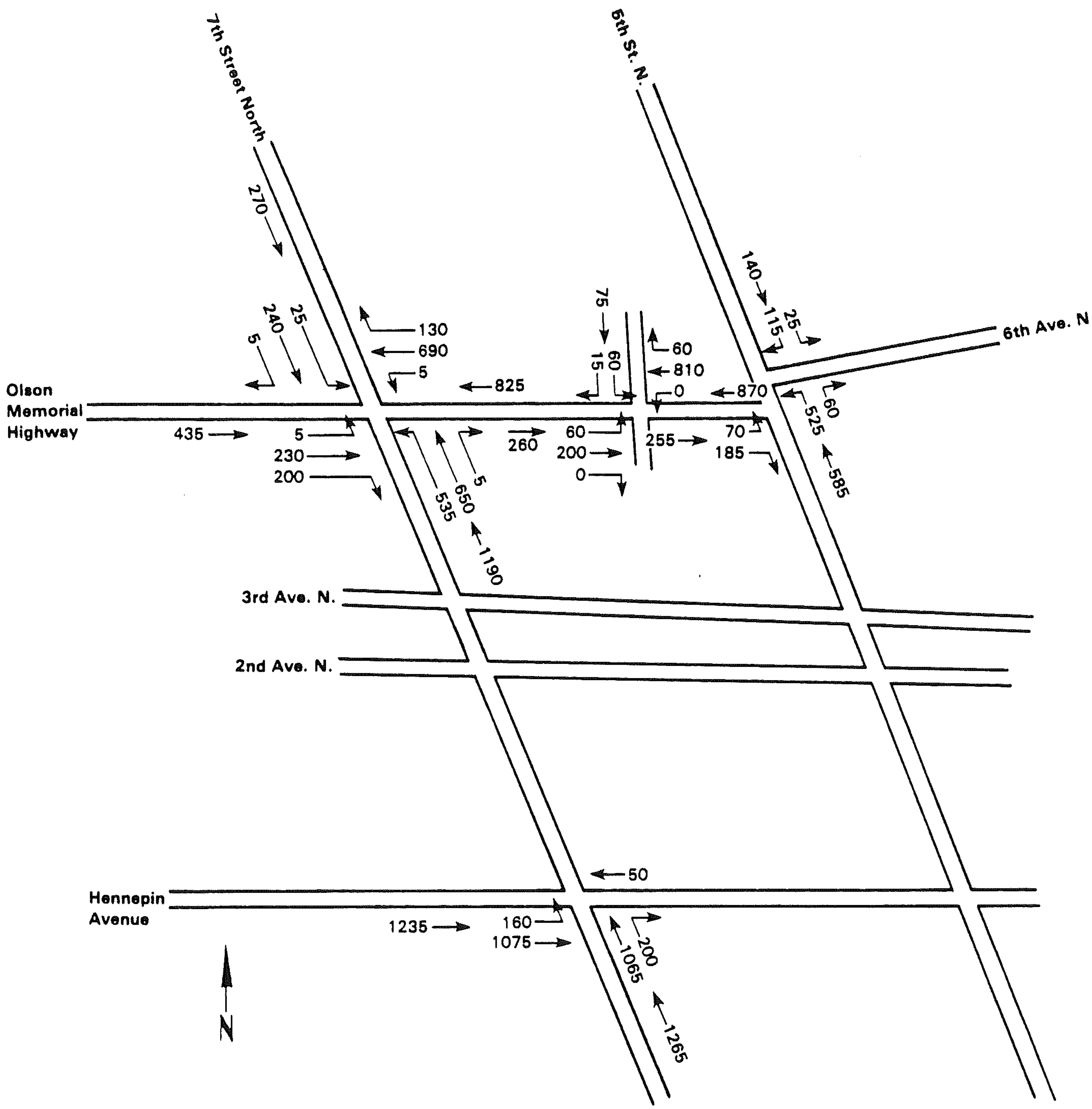

Figure 3.6-4 Existing Traffic Volumes, 1985 P.M. Peak Hour - Greyhound Site

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TABLE 3.6-1

LEVEL OF SERVICE DESCRIPTIONS

FOR SIGNALIZED AND UNSIGNALIZED INTERSECTIONS

Level of Service	Operating Characteristics
Signalized Intersections:	
A	Little or no delay. Excellent operation
B	Short traffic delays. No waiting through signal cycles. Very good operation.
C*	Average traffic delays. No waiting through signal cycles. Good operation.
D	Long traffic delays. Occasional waiting through more than one cycle. Fair operation.
E	Very long traffic delays. Delays up to several signal cycles. Poor operation.
F	Jammed conditions. Backups may block other intersections. Forced flow.
Unsignalized Intersections:	
A	Little or no delay.
B	Short traffic delays.
C*	Average traffic delays.
D	Long traffic delays.
E	Very long traffic delays.
F	Failure - extreme congestion.

Source: Transportation Research Circular; Number 212, January, 1980.
*LOS "C" is the accepted operating condition for both signalized and unsignalized intersections.

TABLE 3.6-2

EXISTING LEVELS OF SERVICE (GREYHOUND SITE)

Intersection	Level of Service AM	Level of Service PM
Sixth Avenue North at Fifth Street North	B	B
Olson Memorial Highway at Seventh Street North	B	B
Hennepin Avenue at Seventh Street North	A/B	B
Metropolitan Transit Commission Garage at Olson Memorial Highway	A/B	A/B

Source: ERT, Inc., 1985

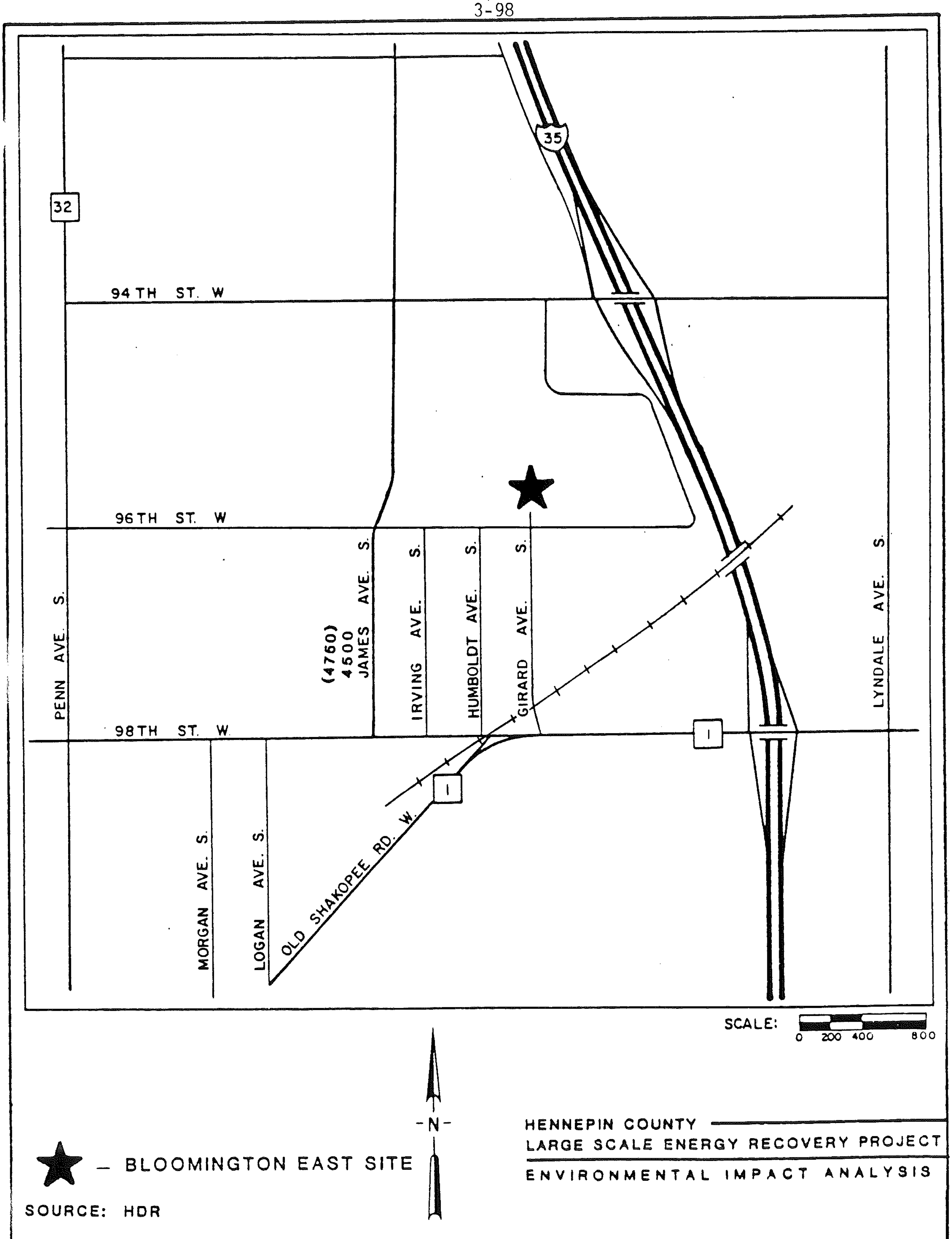

Figure 3.6-5 Roadway Access: Bloomington East Site

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I-35W is the major highway through the City of Bloomington. In this area, it is primarily two through-lanes in each direction that are separated by a 40 foot median. Connections between I-35W and West 94th Street and West 98th Streets are via diamond interchanges.

Direct access to the site is from West 94th Street and West 98th Street. These streets are undivided four-lane roadways that operate as minor arterials. Other than at the interchanges with I-35W (which are controlled by traffic signals), these streets are stop or yield controlled within the site vicinity.

Access from West 94th Street is primarily via James Street to West 96th Street, or alternatively via I-35W to Freeway Avenue to West 95th Street. Access from West 98th Street is primarily via Humboldt Avenue or James Avenue to West 96th Street.

3.6.2.1 Baseline Traffic Volumes

Average Daily Traffic Volumes (HDR Technical Reports) show that approximately 10,100 vehicles per day travel on West 94th Street in the site vicinity; about 25,400 vehicles per day on West 98th Street; and approximately 5,000 vehicles per day on James Avenue. Turning movement counts that included an inventory of truck traffic were conducted in 1985 by ERT and HDR at the following key intersections.

- West 94th Street and James Avenue
- West 96th Street and James Avenue
- West 98th Street and James Avenue
- Freeway Avenue and West 94th Street
- West 98th Street and Girard Avenue South
- West 98th Street, Humboldt Avenue South, and Old Shakopee Road

The data show that the AM peak hour generally occurs from 7 to 8 AM with the PM peak hour from 4:30 to 5:30 PM.

The intersection of West 94th Street and James Avenue is stop sign controlled. All four approaches to the intersection operate under stop-sign control and are two lanes in width. Approximately 845 and 1060 vehicles passed through this intersection during the AM and PM peak hours, respectively.

The intersection of West 96th Street and James Avenue is stop sign controlled. Adequate pavement width exists for two lanes of travel on all approaches to the intersection. During the AM and PM peak hours, about 445 and 550 vehicles passed through this intersection.

The intersection of West 98th Street and James Avenue is stop sign controlled. All four approaches to the intersection have adequate width for two lanes of travel. During the AM and PM peak hours, about 1,115 and 1,260 vehicles passed through the intersection.

The intersection of West 98th Street, Humboldt Avenue and Old Shakopee Road is stop sign controlled. There are two travel lanes per direction on West 98th Street with an additional left turn lane. Humboldt Avenue has adequate width for one lane of travel per direction. During the AM and PM peak hours, approximately 2,160 and 2,300 vehicles passed through this intersection.

The intersection of West 98th Street and Girard Avenue is also stop sign controlled. West 98th Street is two lanes per direction of travel. Girard Avenue is one lane per direction of travel. Approximately 2,320 and 2,325 vehicles passed through this intersection during the AM and PM peak hours, respectively.

Figures 3.6-6 and 3.6-7 illustrate the AM and PM peak hour traffic demands on the roadway network. The turning movement data are for existing 1985 conditions.

All of the intersections analyzed operate at LOS "C" or better. Little congestion was observed. Table 3.6-3 summarizes the results of the capacity analyses by intersection.

West 94th Street at James Avenue operates at LOS "A" during the AM peak hour and LOS "B" during the PM peak hour. This corresponds to very good operations with some short delays during the peak commuter period. West 96th Street at James Avenue functions at LOS "A" during the AM and PM peak hours. This equates to excellent operating conditions with only occasional minor delays to traffic. The intersection of West 98th Street and James Avenue operates at LOS "B" in the AM peak hour and LOS "C" in the PM peak hour. This corresponds to acceptable operating conditions with average delays to vehicular traffic. Freeway Avenue and West 94th Street operate at LOS "B" in the AM and PM peak hours. This corresponds to very good operations with only some short delays. The intersection of West 98th Street and Girard Avenue South functions at LOS "B/C" during the AM peak hour and LOS "C" during the PM peak hour. This equates to acceptable operating conditions with average delays to vehicular traffic. The intersection of West 98th Street and Humboldt Avenue South operates at LOS "B" in the AM and LOS "A" in the PM peak hour. This corresponds to very good operations with some minor short delays. Finally, the intersection of West 98th Street and Old Shakopee Road functions at LOS "B" in the AM and LOS "C" in the PM peak hour. This equates to acceptable operating conditions with average delays during the PM peak hour.

3.6.3 Brooklyn Park East Transfer Station

The Brooklyn Park East Site is located along Winnetka Avenue, north of I-94 and west of U.S. 169 (see Figure 3.6-8). Primary access to Winnetka Avenue from U.S. 169 is via West Broadway Avenue to 68th Avenue North.

U.S. 169, just east of the site, is a four lane roadway providing direct access to the north and south of the site. West Broadway Avenue is a two lane minor arterial that intersects U.S. 169 and connects with 68th Avenue North. The section of West Broadway immediately east of the site operates as a frontage road serving commercial and industrial land uses along U.S. 169. Winnetka Avenue and 68th Avenue North are two lane local streets with 35 and 40 foot cross-sections, respectively. There is also access to the site from U.S. 169 via 73rd Avenue North to Winnetka Avenue. In the site vicinity, 73rd Avenue North is a two lane local roadway approximately 25 feet wide. Within approximately one year, 73rd Avenue North is scheduled to extend west to link with Boone Avenue.

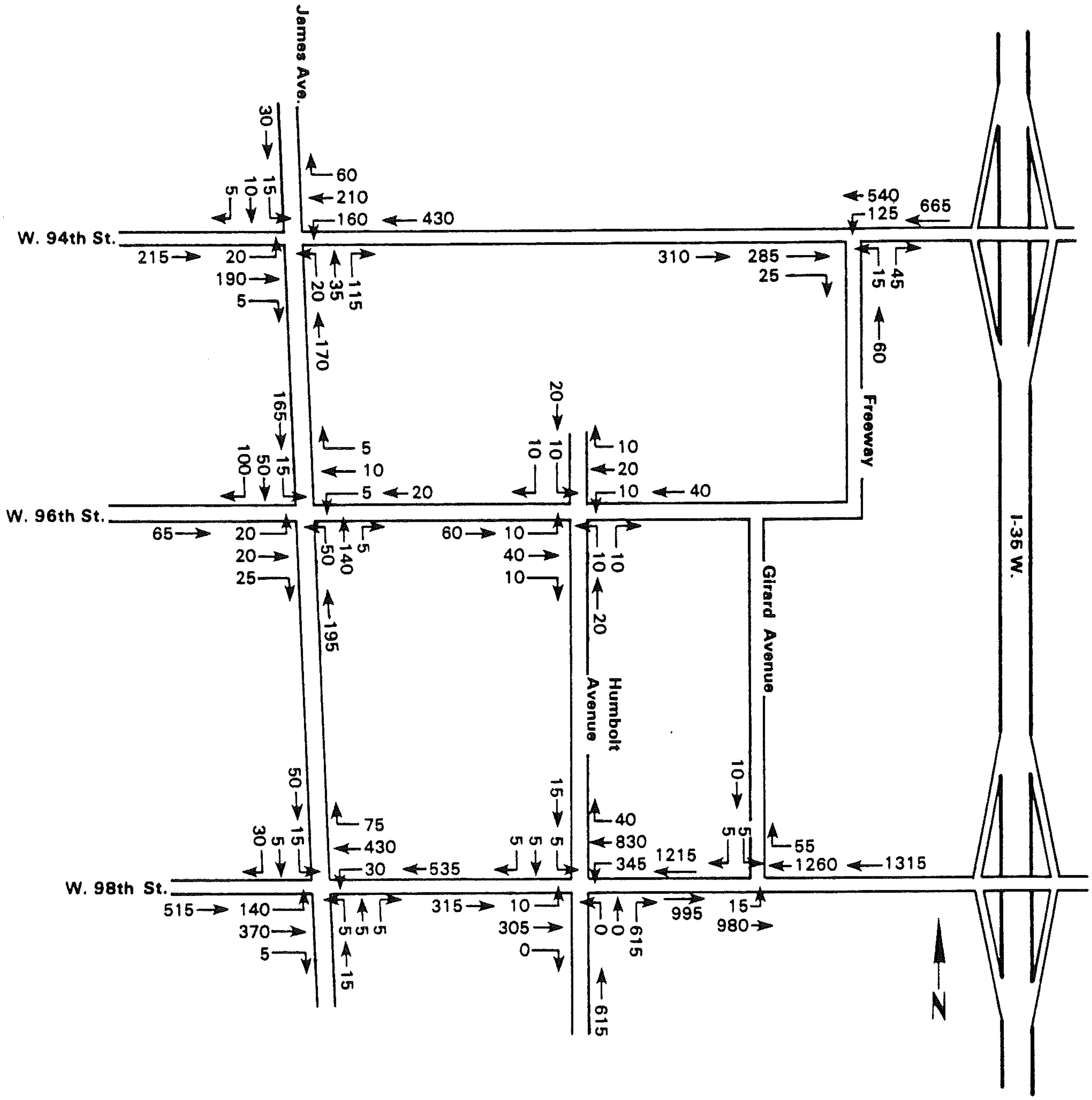

Figure 3.6-6 Existing Traffic Volumes, 1985 A.M. Peak Hour - Bloomington East Site

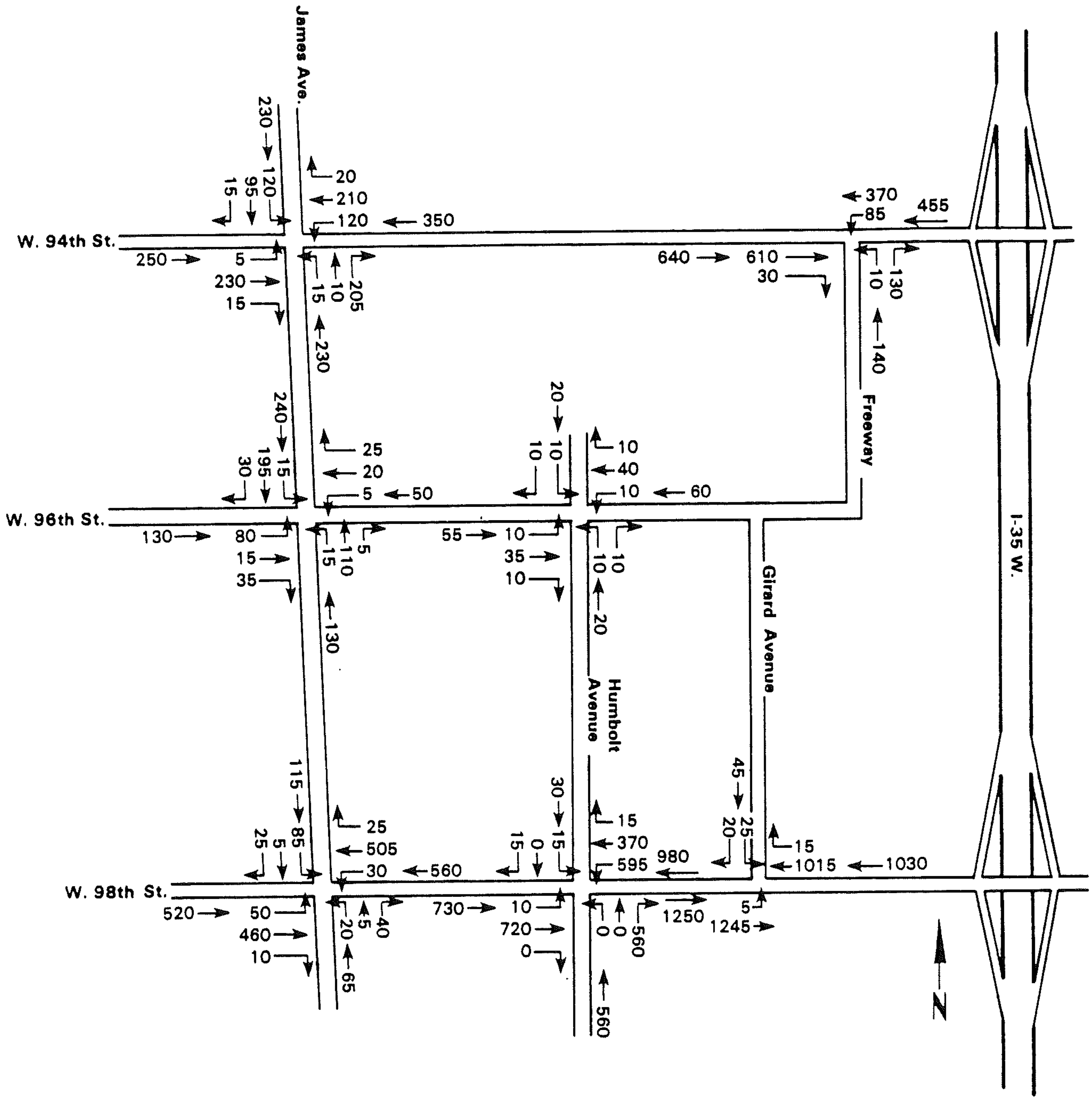

Figure 3.6-7 Existing Traffic Volumes, 1985 P.M. Peak Hour - Bloomington East Site

TABLE 3.6-3
EXISTING LEVELS OF SERVICE (BLOOMINGTON EAST)

Intersection	Level of Service AM	PM
West 94th Street and James Avenue	A	B
West 96th Street and James Avenue	A	A
West 98th Street and James Avenue	B	C
Freeway Avenue and West 94th Street	B	B
West 98th Street and Girard Avenue South	B/C	C
West 98th Street and Humboldt Avenue South	B	A
West 98th Street and Old Shakopee Road	B	C

Source: ERT, 1985

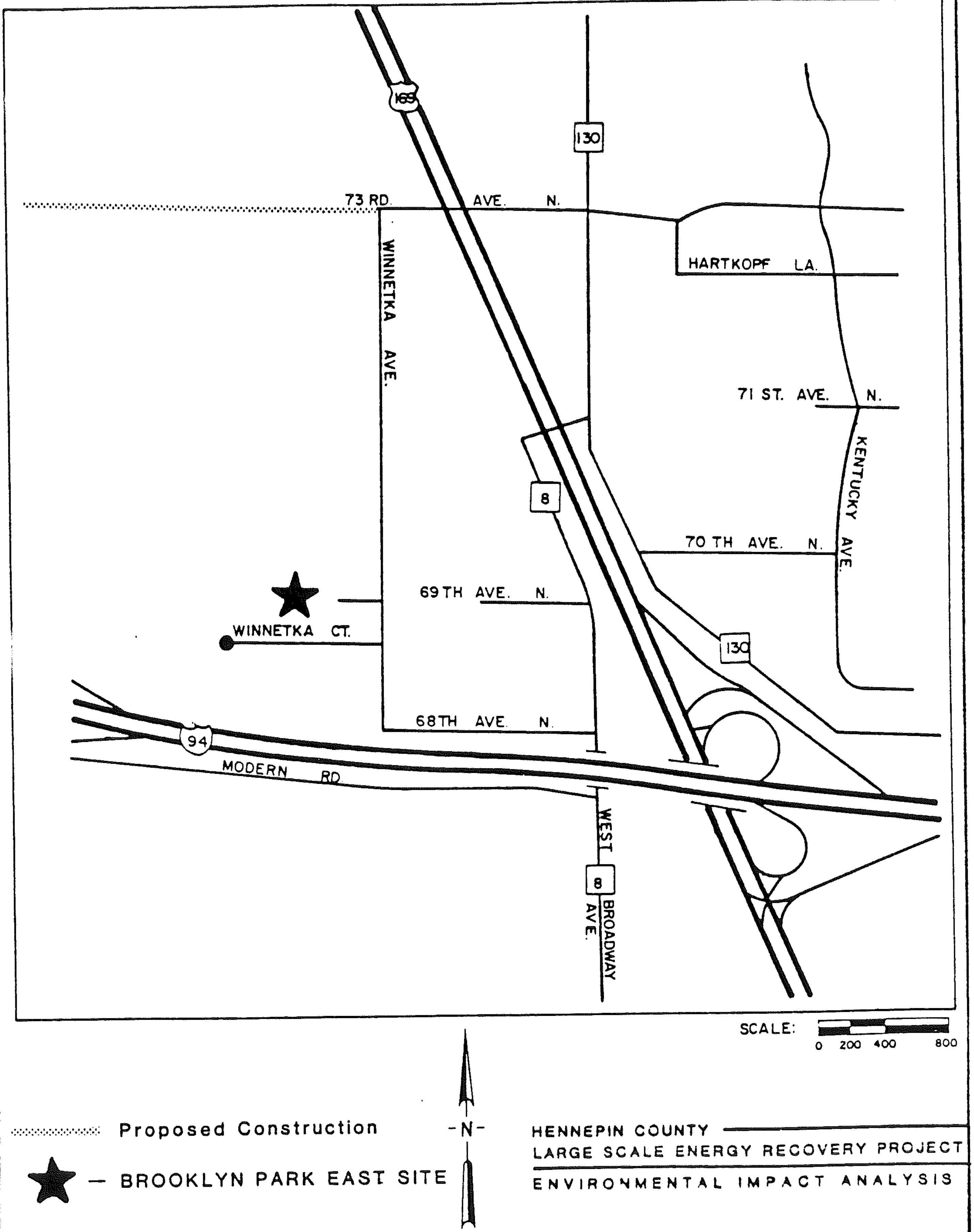

Figure 3.6-8 Roadway Access: Brooklyn Park East Site

3.6.3.1 Baseline Traffic Volumes

Average daily traffic volumes are approximately 1,000 vehicles per day on Winnetka Avenue and 68th Avenue North, 8,800 vehicles per day on West Broadway Avenue, and 22,000 vehicles per day on U.S. 169. Turning movement counts were taken at three intersections:

- U.S. 169 and 73rd Avenue North,
- West Broadway Avenue and 68th Avenue, and
- U.S. 169 and West Broadway Avenue.

The intersection of U.S. 169 and 73rd Avenue North is stop sign controlled. The 73rd Avenue North approaches are primarily one lane of travel per direction. The U.S. 169 approaches to the intersection each consist of two through lanes and a right turn lane. Approximately 2090 and 2310 vehicles passed through this intersection during the AM and PM peak hours.

The intersection of West Broadway Avenue and 68th Avenue is a T configuration that operates under stop sign control. All approaches to the intersection are one travel lane. During the AM and PM peak hours, about 825 and 1265 vehicles passed through this intersection.

West Broadway Avenue intersects with U.S. 169 to the east of the site. This intersection operates under three phase demand actuated traffic signal control. The West Broadway approaches to the intersection are each two lanes, while the U.S. 169 approaches consist of two through lanes, a left turn lane and a right turn lane. Approximately 3,480 and 4,355 vehicles passed through this intersection during the AM and PM peak hours.

Figures 3.6-9 and 3.6-10 provide details of the traffic volumes at the key intersections. The turning movement counts are for the AM and PM peak hours, respectively.

3.6.3.2 Capacity Analysis

Table 3.6-4 summarizes the results of the capacity analyses by intersection. West Broadway and 68th Avenue operate at LOS "A/B" in the AM peak hour and LOS "B" during the PM peak hour. This corresponds to very good operations with only occasional delays to traffic. The intersection of U.S. Route 169 and 73rd Avenue North functions at LOS "C" during both the AM and PM peak hours. This represents acceptable operating conditions with average delay to traffic. West Broadway at U.S. 169 operates at LOS "D" during both the AM and PM peak hours. This corresponds to fair operations with occasional long delays to traffic. LOS "C" conditions are considered desirable, with LOS "D" less than desirable.

3.6.4 Hopkins Transfer Station

The Hopkins transfer station site is located south of County Road 3 and west of County Road 18 in Hopkins (see Figure 3.6-11). Access from the north and south are via County Road 18 to County Road 3 to Fifth Avenue South to the site. An alternative access route is the more circuitous County Road 18 to Second Avenue South to Fifth Street South to Sixth Avenue to the site.

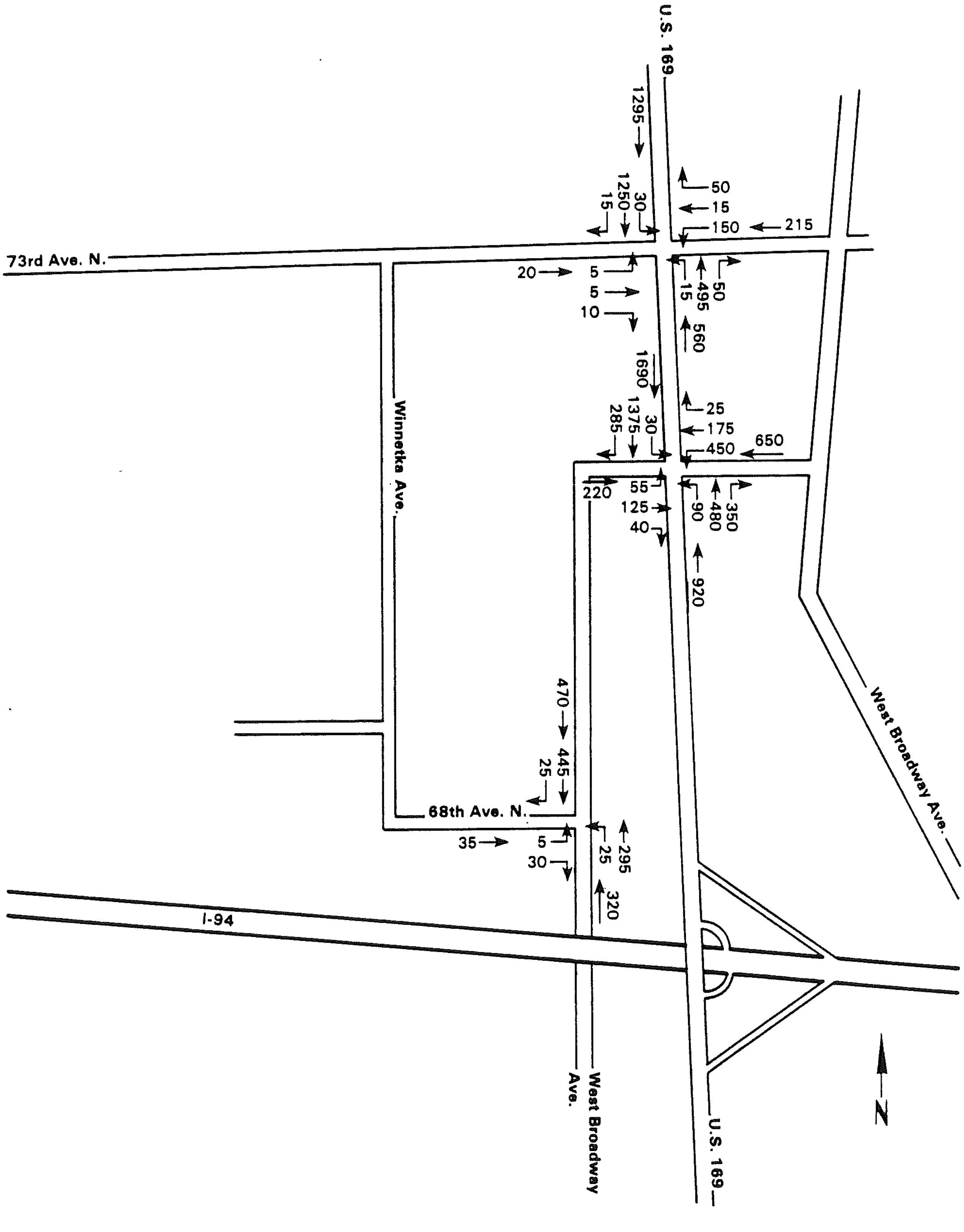

Figure 3.6-9 Existing A.M. Peak Hour Traffic Volumes - Brooklyn Park East Site

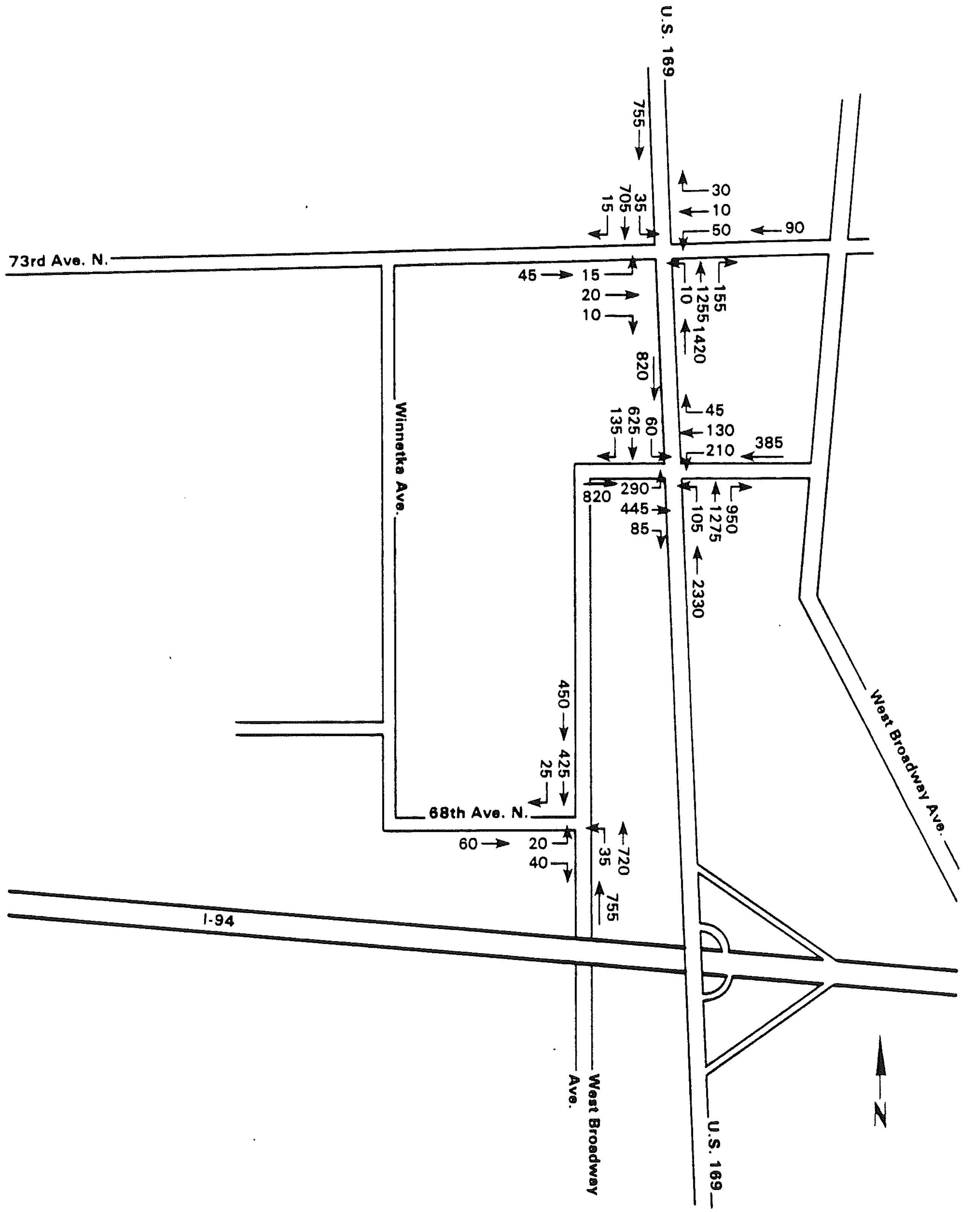

Figure 3.6-10 Existing P.M. Peak Hour Traffic Volumes - Brooklyn Park East Site

TABLE 3.6-4

EXISTING LEVELS OF SERVICE (BROOKLYN PARK EAST)

Intersection	Level of Service AM	PM
West Broadway and 68th Avenue North	A/B	B
U.S. Route 169 and 73rd Avenue North	C	C
West Broadway and U.S. Route 169	D	D

Source: ERT, 1985

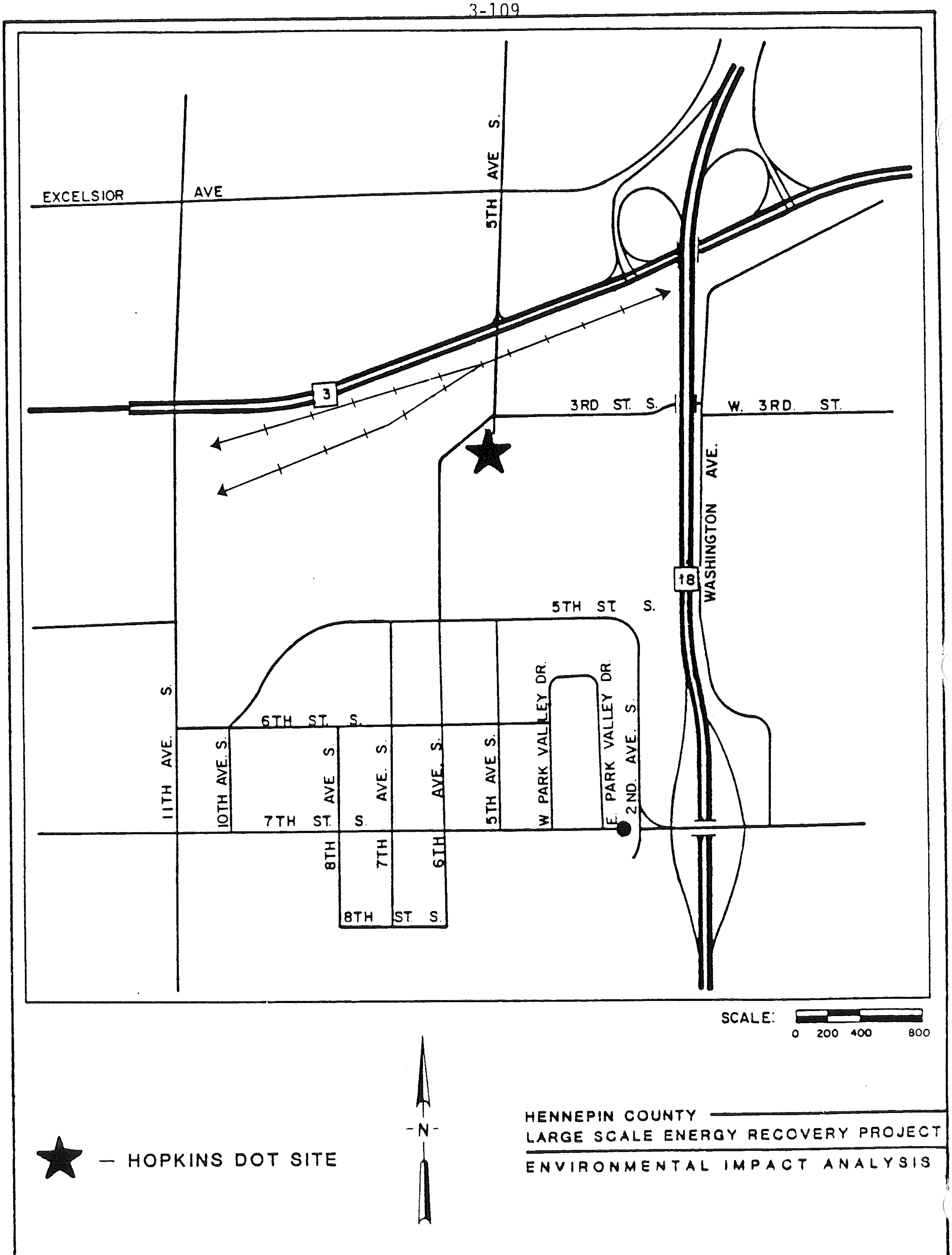

Figure 3.6-11 Roadway Access: Hopkins DOT Site

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County Road 18 is a four lane divided highway providing direct north-south access to the site. Access from County Road 18 to local streets is via interchanges with County Road 3. County Road 3 in the study area is a four-lane arterial. It provides an east-west route through the City of Hopkins that connects County Road 18 to the site.

Fifth Avenue, Second Avenue South, Sixth Avenue South, Third Street, and Fifth Street South are typically two lane roadways.

3.6.4.1 Baseline Traffic Volumes

Average Daily traffic volumes on area roadways are approximately 22,400 vehicles on County Road 3, 11,900 on Fifth Avenue, 3,000 vehicles on Sixth Avenue South, and 3,000 vehicles on Fifth Street South.

Turning movement counts were undertaken to inventory the traffic at three area intersections.

- o Fifth Avenue and County Road 3
- o Fifth Avenue and Third Street
- o Sixth Avenue and Fifth Street South

The intersection of Fifth Avenue and County Road 3 operates under four phase traffic signal control. The County Road 3 approaches consist of two through lanes, a left turn lane, and a right turn lane. The Fifth Avenue approaches consist of two through left turn lanes and a right turn lane. Approximately 2365 and 3175 vehicles passed through this intersection during the AM and PM peak hours.

The intersection of Fifth Avenue and Third Street is a T intersection. Both the Third Street and Fifth Avenue approaches are two lanes wide. During the AM and PM peak hours about 590 and 750 vehicles passed through this intersection.

The intersection of Sixth Avenue and Fifth Street South is stop sign controlled. All of the approaches to the intersection consist of a single traffic lane. The travel lane widths vary from 12 to 20 feet per lane. During the AM and PM peak hours about 665 and 730 vehicles passed through this intersection.

Figures 3.6-12 and 3.6-13 detail peak hour traffic volumes at the key intersections. The turning movement counts are for the AM and PM peak hours.

3.6.1.2 Capacity Analysis

All of the intersections analyzed operate at LOS "C" or better. Little congestion was observed to occur. Table 3.6-5 summarizes the results of the capacity analyses by intersection.

Fifth Avenue and County Road 3 operate at LOS "B" in the AM peak hour and LOS "B/C" in the PM peak hour. This corresponds to good operations with occasional average delays during the PM peak hour. The intersection of Fifth Avenue and Third Street functions at LOS "A" in the AM peak hour and LOS "A/B" during the PM peak hour. This represents excellent operating conditions with little or no delays. The intersection of Sixth Avenue and Fifth Street South functions at LOS "B" during the AM and PM peak hours. This equates to very good operations with only short delays to traffic.

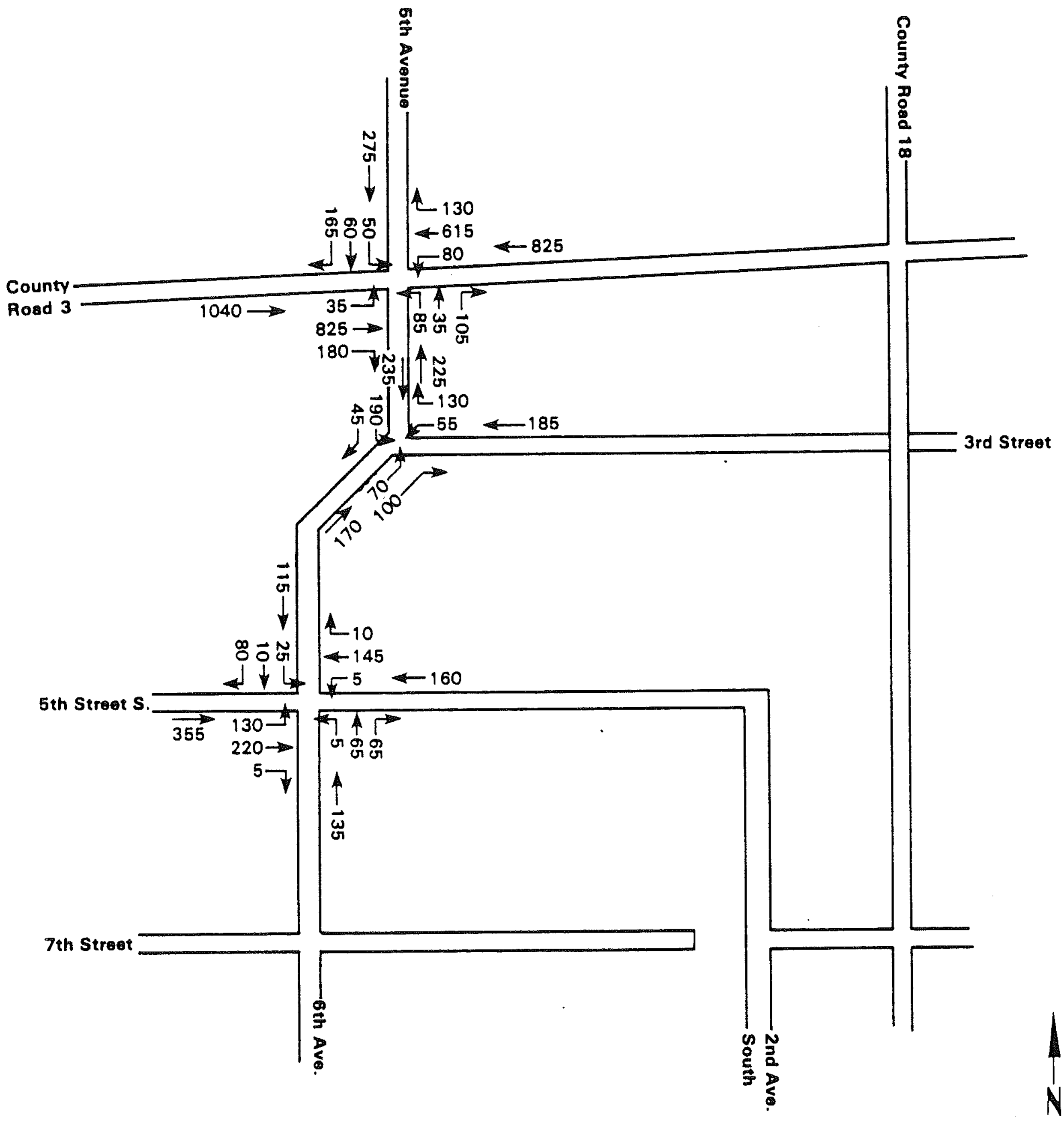

Figure 3.6-12 Existing A.M. Traffic Volumes - Hopkins DOT Site

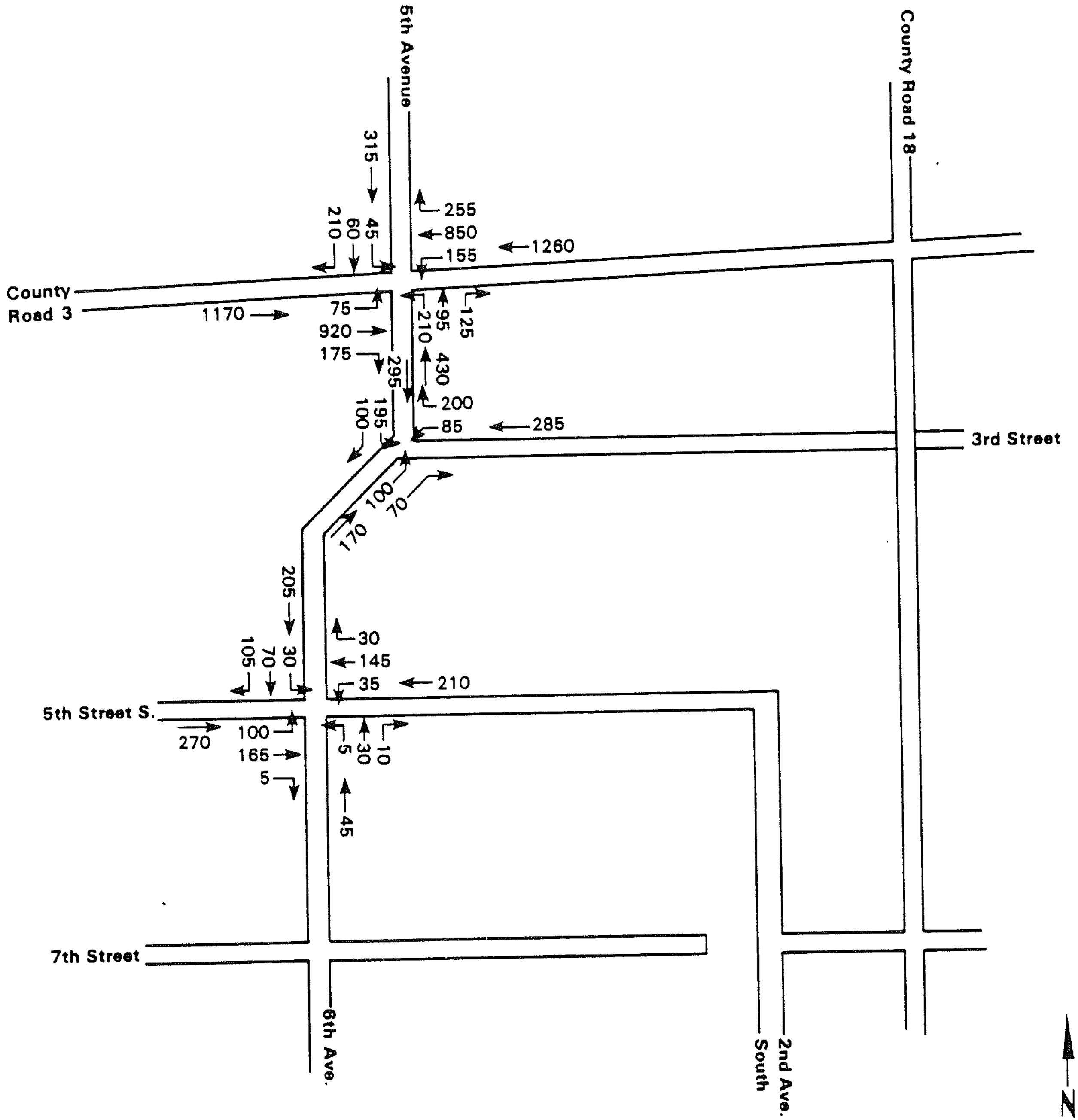

Figure 3.6-13 Existing P.M. Traffic Volumes - Hopkins DOT Site

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TABLE 3.6-5

EXISTING LEVELS OF SERVICE (HOPKINS DOT)

Intersection	Level of Service AM	Level of Service PM
Fifth Avenue and County Road 3	B	B/C
Fifth Avenue and Third Street	A	A/B
Sixth Avenue and Fifth Street South	B	B

Source: ERT, 1985

3.6.5 Minneapolis South Transfer Station

The Minneapolis South transfer station would be located at the site of the existing transfer station at East 29th Street and South 20th Avenue. Primary access to this site is via Hiawatha Avenue to East 28th Street to South 20th Avenue.

Hiawatha Avenue is a four lane undivided major arterial providing a connection to downtown Minneapolis and I-94. Currently this roadway is approximately 40 feet wide. East 28th Street is also a four lane collector approximately 48 feet wide. To the west of Cedar Avenue this road is one-way eastbound. South 20th Avenue is a two-lane local street approximately 48 feet wide. Cedar Street to the west of the site is a two lane collector. Figure 3.6-14 shows the roadway access to the site.

3.6.5.1 Baseline Traffic Volumes

Average daily traffic volumes are approximately 24,500 on Hiawatha Avenue, about 4500 vehicles on East 28th Street, and 72,300 on Cedar Avenue. Turning movement counts were taken at three intersections in the area:

- o East 28th Street at South 20th Avenue,
- o East 28th Street at Hiawatha Avenue, and
- o East 28th Street at Cedar Avenue.

These included an inventory of truck traffic. Data were collected during the AM and PM peak hours.

The intersection of East 28th Street and South 20th Avenue is stop sign controlled. East 28th Street approaches are both two lanes. The South 20th Avenue approach to the intersection is wide enough for two lanes of travel. During the AM and PM peak hours about 265 and 520 vehicles passed through this intersection.

The intersection of East 28th Street and Hiawatha Avenue is under two-phase traffic signal control. All approaches to the intersection consist of two travel lanes. During the AM and PM peak hours about 2505 and 2760 vehicles passed through this intersection.

The intersection of East 28th Street at Cedar Avenue operates under two phase traffic signal control. The westbound East 28th Street approach to the intersection consists of two travel lanes. The eastbound East 28th Street approach is one way with three travel lanes. The Cedar Avenue approaches are two-lanes. During the AM and PM peak hours approximately 1985 and 2450 vehicles passed through this intersection. Figures 3.6-15 and 3.6-16 show the peak hour volumes.

3.6.5.3 Capacity Analysis

Capacity analyses show that all intersections operate at LOS "C" or better. Little congestion was observed to occur. Table 3.6-6 summarizes the results of the capacity analyses.

East 28th Street and South 20th Avenue operate at LOS "A" in the AM and PM peak hours. This corresponds to excellent operating conditions. The intersection of East 28th Street and Hiawatha Avenue functions at LOS "B" during both the AM and PM peak hours. This

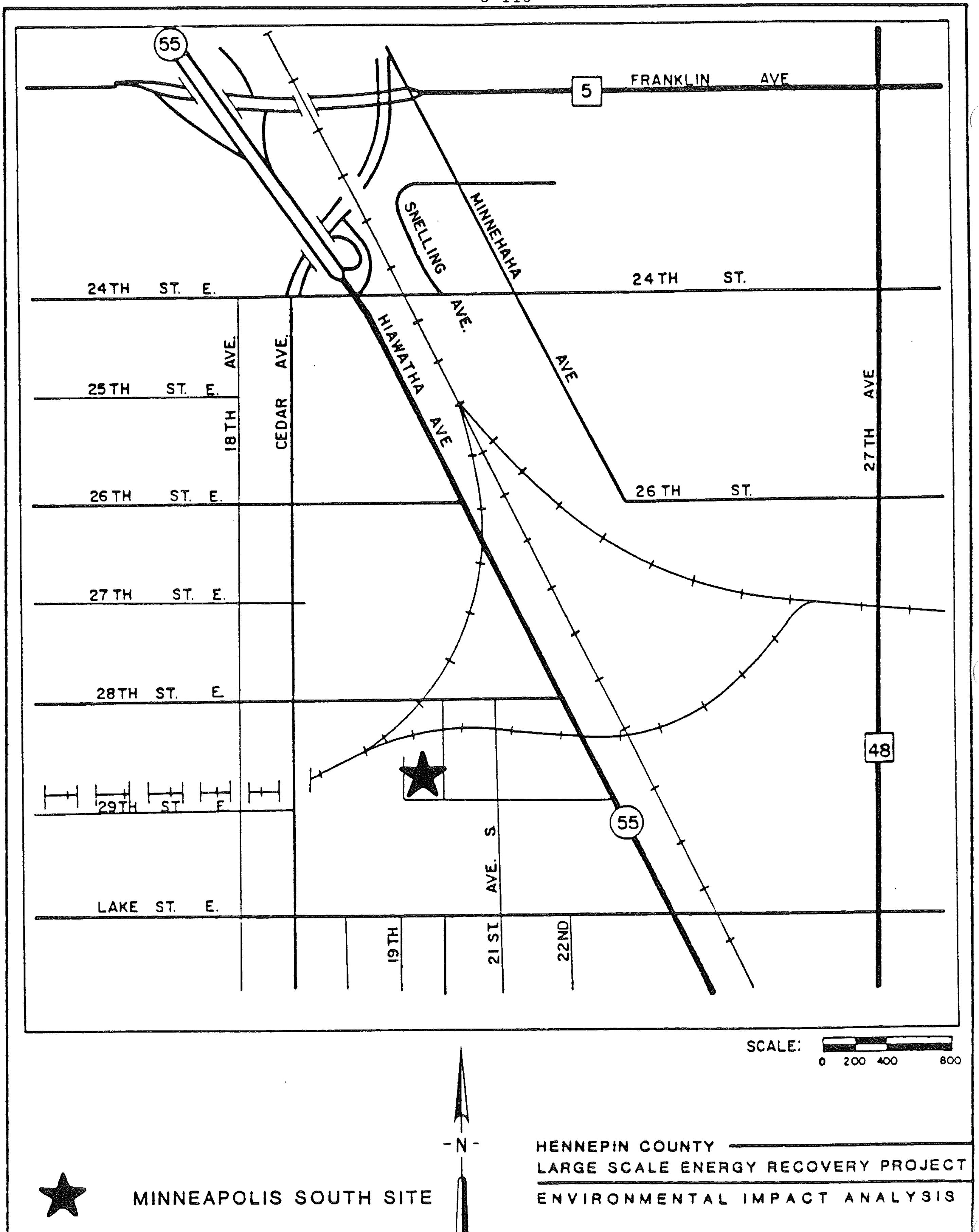

Figure 3.6-14 Roadway Access: Minneapolis South Site

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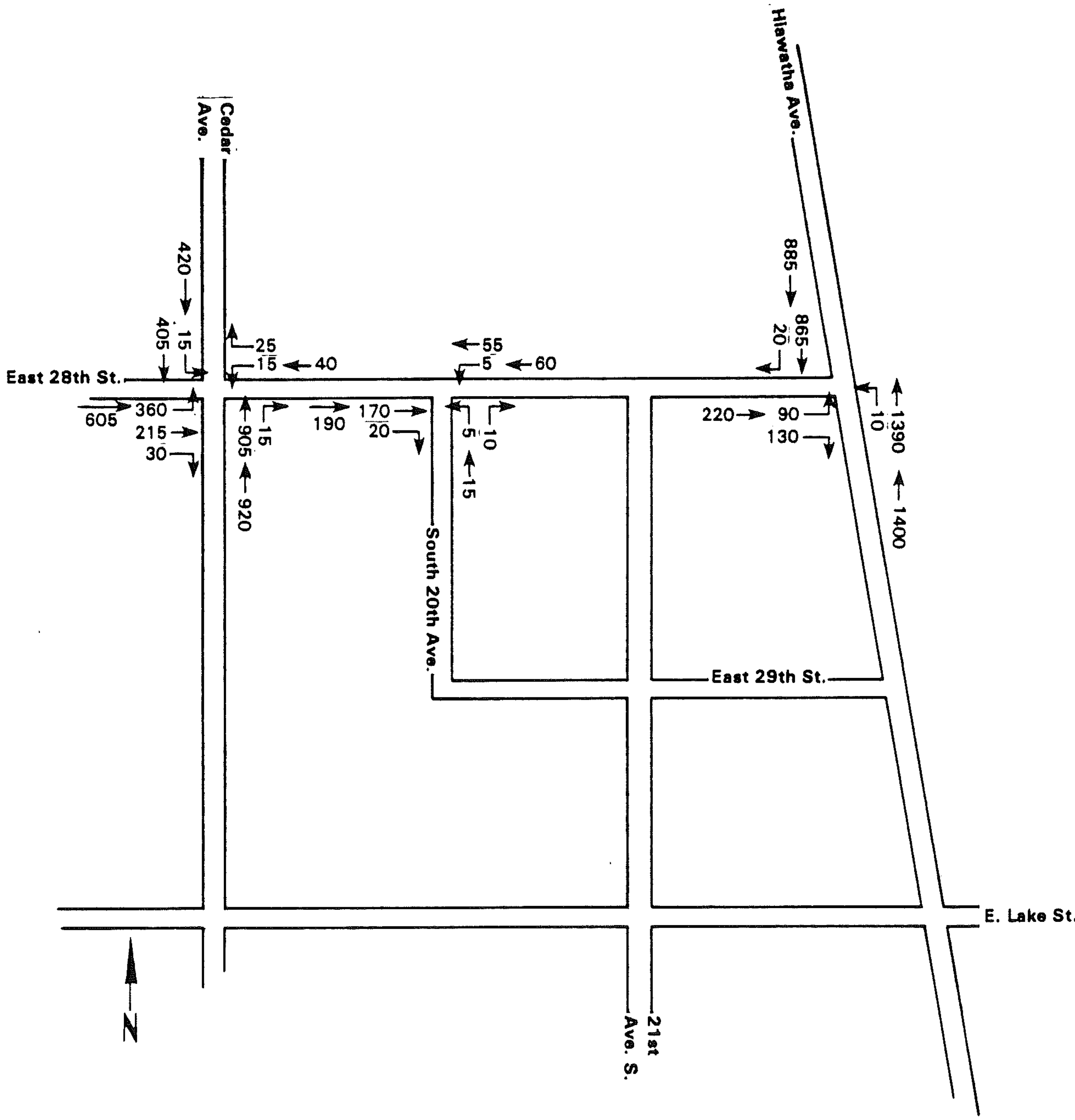

Figure 3.6-15 Existing A.M. Peak Hour Volumes - Minneapolis South

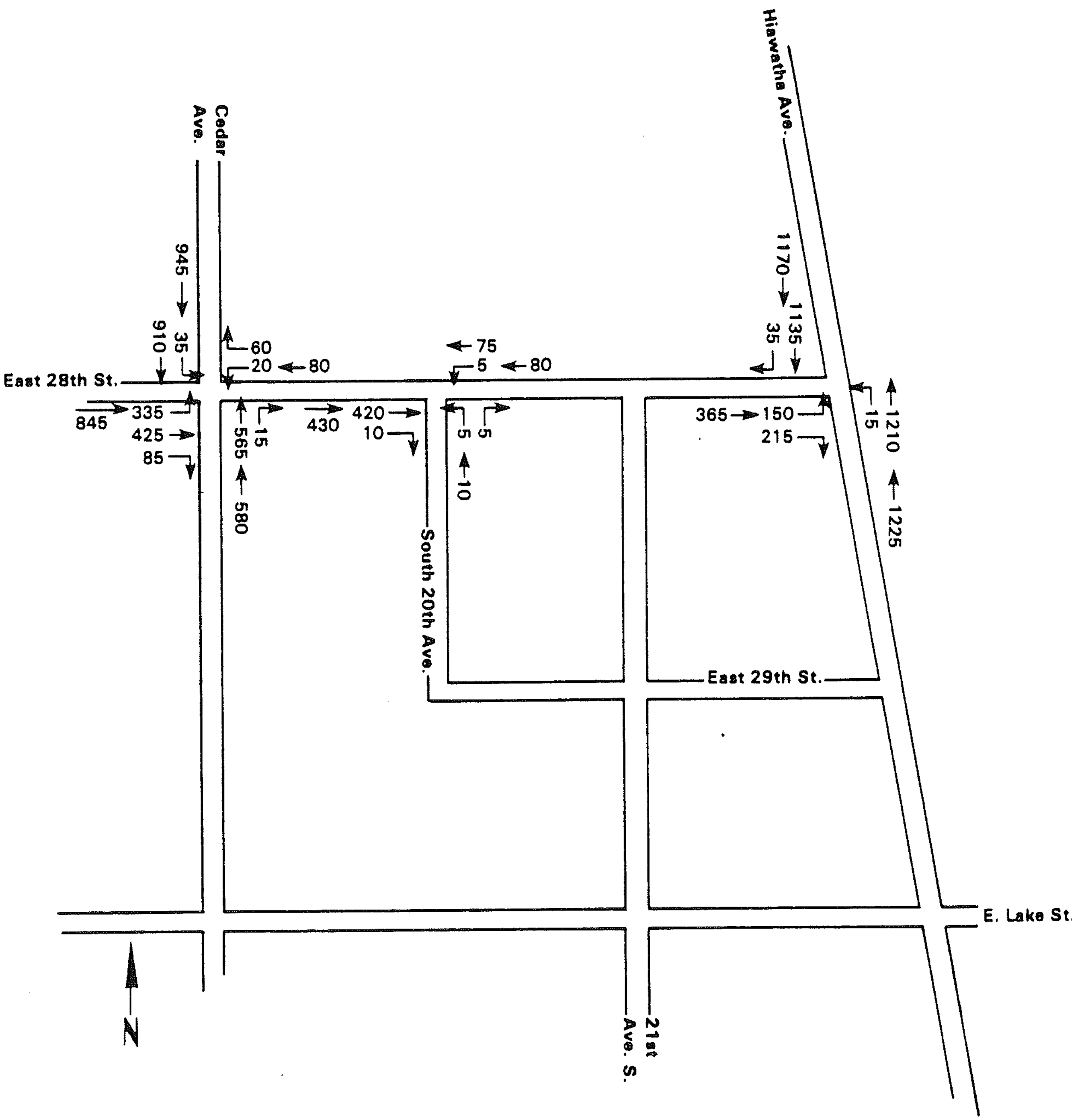

Figure 3.6-16 Existing P.M. Peak Hour Volumes - Minneapolis South

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TABLE 3.6-6

EXISTING LEVELS OF SERVICE (MINNEAPOLIS SOUTH)

Intersection	Level of Service AM	PM
East 28th Street and South Avenue	A	A
East 28th Street and Hiawatha Avenue	B	B
East 28th Street and Cedar Avenue	B/C	B

Source: ERT, 1985

equates to good operations with occasional short delays. East 28th Street and Cedar Avenue function at LOS "B/C" in the AM peak hour and LOS "B" in the PM peak hour. This corresponds with good to average conditions with average delays to traffic.

3.7 Noise

To adequately characterize the noise environment in a community, it is necessary to identify noise-sensitive receptors, noise sources, and noise propagation features, and to measure the noise levels. Noise-sensitive receptors are existing in those areas or land uses where people could be adversely affected by noise from the proposed project.

Noise data for the areas of the proposed resource recovery facility and the four transfer stations were collected during the period September 16-18, 1985 by ERT, and from May through July 1985 by Northern Sound of Minneapolis.

The measurement locations were selected to provide angular coverage about the proposed project sites with emphasis on proximity to noise sensitive receptors. All measurements were performed during dry, low wind (less than 12 miles per hour) periods. The instrumentation used by ERT consisted of a Vibro-meter Model 614 Noise Monitoring System and one-half inch GenRad microphone. Instrumentation used by Northern Sound consisted of an EDC Noise Exposure Analyzer Model NA40C and one-half inch microphone. Measurements were obtained at various times of day and night to obtain a total description of the noise environments in the potentially affected neighborhoods.

The noise parameters tabulated were based upon requirements of the existing and proposed MPCA standards. The existing standard employs L_{10} and L_{50} noise level values (the noise levels exceeded 10 and 50 percent of the measurement time, respectively.) The proposed standard (Minnesota State Register, March 19, 1985) is based upon L_{eq}, the average energy level. Also included, where appropriate, are "background" or L_{90} noise level data (the level exceeded 90 percent of the observation time). Although not part of the regulations, this background noise level provides an indication of the quietest sound levels at a given location.

Noise Standards

There are no federal noise regulations that apply to the operation of resource recovery facilities or transfer stations. Thus, only state regulations and local ordinances apply to the proposed project.

MPCA Noise Standards

Table 3.7-1 presents the current noise standards as established by the Minnesota Pollution Control Agency (MPCA) (Minn. Rules, Chapter 7010.0400, 1983). These standards describe the limiting levels of sound established to preserve public health and welfare. Acceptable sound pressure levels (dBA) vary according to three factors:

- o The time of day. Night standards (10 PM to 7 AM) are more stringent than daytime standards (7 AM to 10 PM).
- o The land use activity in the receiving area. Land uses are divided into four noise area classifications (NACs): NAC-1, NAC-2, NAC-3, and NAC-4. The land uses in each class are

TABLE 3.7-1
MINNESOTA POLLUTION CONTROL AGENCY
NOISE STANDARDS (DAY AND NIGHT)

Noise Area Classification (NAC)	A-Weighted Pressure Levels (dBA)			
	Day (0700-2200)		Night (2200-0700)	
	L_{50}	L_{10}	L_{50}	L_{10}
1	60	65	50	55
2	65	70	65	70
3	75	80	75	80
4[1]	--	--	--	--

[1]No standards are specified for NAC 4.

Source: Minnesota Rules, Chapter 7010.0400, 1983.

listed in Tables 3.7-2 through 3.7-5 (Minn. Rules, Chapter 7010.0500, 1983). Uses most sensitive to noise are classified as NAC-1 (typically residential in nature) and have the most stringent noise standards.

- The duration of the noise. The two duration descriptors are L_{10} and L_{50}. An L_{10} standard is a dBA level that cannot be exceeded for more than 10 percent of the time in a 1-hour survey. An L_{50} standard is a dBA level that cannot be exceeded more than 50 percent of the time in a 1-hour survey.

The MPCA standards are consistent with speech, sleep, annoyance, and conversation requirements for receivers within the applicable NAC classifications.

The noise area classifications combine land use activities according to sensitivity. These classifications are based on the Standard Land Use Coding Manual (SLUCM) numerical codes and descriptions. This coding manual was used during the original MPCA noise rules promulgation at the suggestion of the Minnesota State Planning Agency. These numerical codes are inclusive for each SLUCM.

The noise area classifications are not considered source standards, but receiver standards. For example, if a NAC-3 and NAC-1 activity are located side-by-side, the NAC-1 standards would be applicable to the receiver.

A proposal being considered by the MPCA would change Minnesota's noise regulations to an energy equivalent noise standard: L_{eq}. L_{eq} is a long-term A-weighted sound level which is equal to the level of a steady-state continuous noise having the same energy as the time-varying noise, for a given situation and time period (typically 1-hour).

The proposed standard is shown below. This standard, though not promulgated, is under review.

NAC	Daytime L_{eq}	Nighttime L_{eq}
1 (residential)	63	53
2 (commercial)	68	68
3 (industrial)	78	78

Local Ordinances

Most communities in the Minneapolis-St. Paul metropolitan area have their own noise ordinances. The ordinances relate primarily to limits on vehicle noise. Some also set limits on the time of day certain noise-generating activities can be conducted (limits on garbage pick-up, for example).

Refuse Collection

Bloomington limits this activity in residential zones to 7:00 AM to 10:00 PM on weekdays, and from 9:00 AM to 9:00 PM on weekends. Furthermore, Bloomington's ordinance states:

TABLE 3.7-2

LAND USE ACTIVITIES IN NOISE AREA CLASSIFICATION-1 (NAC-1)

SLUCM Numerical Code[1]	Land Activity
11	Household units (includes farm houses)
12	Group quarters
13	Residential hotels
14	Mobile home parks or courts
15	Transient lodgings
19	Other residential not elsewhere coded
397	Motion picture production
651	Medical and other health services
674	Correctional institutions
68	Educational services
691	Religious activities
71	Cultural activities and nature exhibitions
721	Entertainment assembly
7491	Camping and picnicking areas (designated)
75	Resorts and group camps
79	Other cultural, entertainment, and recreational activities not elsewhere coded

[1] These SLUCM codes for land use activities are designated in the Standard Land Use Coding Manual (U.S. Government Printing Office, 1969).

TABLE 3.7-3

LAND USE ACTIVITIES IN NOISE AREA CLASSIFICATION-2 (NAC-2)

SLUCM Numerical Code[1]	Land Activity
4113	Railroad terminals (passenger)
4115	Railroad terminals (passenger and freight)
4122	Rapid rail transit and street railway passenger terminals
4211	Bus passenger terminals (intercity)
4212	Bus passenger terminals (local)
4213	Bus passenger terminals (intercity and local)
429	Other motor vehicle transportation facilities not elsewhere coded
4312	Airport and flying field terminals (passenger)
4314	Airport and flying field terminals (passenger and freight)
4411	Marine terminals (passenger)
4413	Marine terminals (passenger and freight)
46	Automobile parking
4721	Telegraph message centers
492	Transportation services and arrangements
51	Wholesale trade
52	Retail trade--building materials, hardware, and farm equipment
53	Retail trade--general merchandise
54	Retail trade--food
55	Retail trade--automotive, marine craft, aircraft, and accessories
56	Retail trade--apparel and accessories
57	Retail trade--furniture, home furnishings, and equipment
58	Retail trade--eating and drinking
59	Other retail trade not elsewhere coded
61	Finance, insurance, and real estate services
62	Personal services
63	Business services
64	Repair services
652	Legal services
659	Other professional services not elsewhere coded
66	Contract construction services
67	Governmental services (except 674)
69	Miscellaneous services (except 691)
72	Public assembly (except 721, 7223)
73	Amusements (except (731)
74	Recreational activities (except 7491)
76	Parks

[1]These SLUCM codes for land activities are designated in the Standard Land Use Coding Manual (U.S. Government Printing Office, 1969).

NOTE: Land uses in this category are typically commercial or institutional.

TABLE 3.7-4

LAND USE ACTIVITIES IN NOISE AREA CLASSIFICATION-3 (NAC-3)

SLUCM Numerical Code[1]	Land Activity
21	Food and Kindred products--manufacturing
22	Textile mill products--manufacturing
23	Apparel and other finished products made from fabrics, leather, and similar materials--manufacturing
24	Lumber and wood products (except furniture)--manufacturing
25	Furniture and fixtures--manufacturing
26	Paper and allied products--manufacturing
27	Printing, publishing, and allied industries
28	Chemicals and allied products--manufacturing
29	Petroleum refining and related industries
31	Rubber and miscellaneous plastic products--manufacturing
32	Stone, clay, and glass products--manufacturing
33	Primary metal industries
34	Fabricated metal products--manufacturing
35	Professional, scientific, and controlling instruments; photographic and optical goods; watches and clocks--manufacturing
39	Miscellaneous manufacturing not elsewhere coded (except 397)
41	Railroad, rapid rail transit, and street railway transportation (except 4113, 4115, 4122)
42	Motor vehicle transportation (except 4211, 4212, 4213, 429)
43	Aircraft transportation (except 4312, 4314)
44	Marine craft transportation (except 4411, 4413)
45	Highway and street right-of-way
47	Communication (except 4721)
48	Utilities
49	Other transportation, communication, and utilities not elsewhere coded (except 492)
7223	Race tracks
731	Fairgrounds and amusements parks
81	Agriculture
82	Agricultural and related activities
83	Forestry activities and related services (including commercial forest land, timber production, and other related activities)

TABLE 3.7-4 (Continued)

LAND USE ACTIVITIES IN NOISE AREA CLASSIFICATION-3 (NAC-3)

SLUCM Numerical Code[1]	Land Activity
84	Fishing activities and related services
85	Mining activities and related services
89	Other resource production and extraction activities not elsewhere coded
--	All other activities

[1]These SLUCM codes for land activities are designated in the Standard Land Use Coding Manual (U.S. Government Printing Office, 1969).

NOTE: Land uses in this category are typically manufacturing or industrial.

TABLE 3.7-5

LAND USE ACTIVITIES IN NOISE AREA CLASSIFICATION-4 (NAC-4)

SLUCM Numerical Code[1]	Land Activity
91	Undeveloped and unused land area (excluding non-commercial forest development)
92	Non-commercial forest development
93	Water areas
94	Vacant floor area
95	Under construction
99	Other undeveloped land and water areas, NEC

[1]These SLUCM codes for land activities are designated in the _Standard_ Land Use Coding Manual (U.S. Government Printing Office, 1969).

NOTE: The land uses in this category are typically undeveloped land uses.

> ... in the event that a nuisance is declared, the hours of pick-up in all zones other than residential shall be limited to those allowed in residential zones ...

In Brooklyn Park, residential (or where dumpsters are within 300 feet of residential units) refuse collection is limited to the hours of 6:30 AM to 8:30 PM on any day and is prohibited on Sundays and legal holidays.

Construction

The City of Minneapolis restricts construction activities to the hours of 7:00 AM to 6:00 PM Monday through Friday. No construction is permitted on weekends. However, it is possible to obtain a permit to work outside these hours if the City finds it acceptable.

Noise Standards

Noise levels specified in the individual local ordinances are summarized below.

Hopkins. The noise levels are identical to those in the Minnesota standards. Daytime, however, is defined as the hours between 6:00 AM and 9:00 PM.

Bloomington. Unlike the Minnesota standards which are receiver oriented, the comprehensive Bloomington noise code focuses on the noise produced by various sources. The noise levels are measured at the property line of the source. For industrial sources, an L_{10} of 70 dBA cannot be exceeded at the property line of the facility. However, if the industrial noise source abuts residential property, the noise source cannot exceed an L_{10} level of 60 dBA and 50 dBA during daytime and nighttime hours, respectively. Furthermore, construction equipment cannot exceed an L_{10} noise level of 85 dBA at a distance of 50 feet.

Minneapolis. The original Minneapolis noise ordinance (City of Minneapolis, 1984) preceded the State standards, and it describes the violations criteria in a unique fashion. The limitations are presented in Table 3.7-6. The ordinance prohibits noise that exceeds the ambient noise level by more than 6 dBA and applies Category III limitations (Table 3.7-6) during all hours on Sundays, and State and Federal holidays.

This ordinance exempts from the above standards sounds emanating from motor vehicles on traffic-ways of the city, pile drivers, jackhammers, and other construction equipment. However, it prohibits, as discussed before, the use of construction equipment between the hours of 6:00 PM and 7:00 AM on weekdays or during any hours on Saturdays, Sundays and State and federal holidays except under a permit. It further states that no such equipment shall be operated at any time if the sound level from such operation exceeds 90 dBA.

Brooklyn Park. The Brooklyn Park ordinance deals exclusively with noise as a nuisance and does not set noise level requirements.

TABLE 3.7-6

CITY OF MINNEAPOLIS NOISE LIMITATIONS

Duration of Sound	Category I (dB)[1]	Category II (dB)[2]	Category III (dB)[3]
Less than 10 minutes	75	70	60
Between 10 minutes and 2 hours	70	60	50
In excess of 2 hours	60	50	50

[1]Category I is from 7:00 AM to 6:00 PM, all districts

[2]Category II is from 6:00 PM to 10:00 PM for residential districts and 6:00 PM to 7:00 AM for all other districts.

[3]Category III is from 10:00 PM to 7:00 AM for residential districts.

Source: City of Minneapolis Noise Ordinance, Chapter 389.60, 1984.

3.7.1 Resource Recovery Facility

3.7.1.1 Sensitive Receptors

The proposed location for the resource recovery facility is on the northern edge of downtown Minneapolis and within an area of industrial, commercial, and institutional land uses. The site is bounded by Seventh Street North on the southwest, Sixth Avenue North on the north, Fifth Street North on the northeast, and railroad tracks on the south.

The closest noise sensitive receptors in the area are the Metropolitan Transit Commission (MTC) building and the Insty Print building. Other potentially impacted facilities include the commercial buildings west of Seventh Street North, the Hillcrest Development Building (formerly Honeywell) east of Fifth Street north, and the Butler Square Building. These receptors are separated from the site by city streets and/or railroad tracks. The site is generally at a somewhat lower elevation than the receptors.

3.7.1.2 Noise Measurements

Noise measurements were conducted at the locations described in Table 3.7-7 and illustrated in Figure 3.7-1. Noise sources noted during the field work consisted of car and truck traffic on local streets such as State Highway 55 (Olson Memorial Highway) to the west; Interstate 94 to the west; rail traffic along the southern boundary of the site; vehicle noise from a trucking firm adjacent to the site on the south side of the railroad tracks; and occasional air traffic (2 to 7 commercial aircraft per hour).

Table 3.7-8 presents a comprehensive list of measured A weighted noise levels and observed sources of noise during each measurement sample. The lowest noise levels were obtained on Sunday morning (L_{50} = 50 dBA and L_{10} = 56 dBA) and the highest (L_{50} = 65 dBA and L_{10} = 75 dBA) during a weekday morning. Nighttime levels were typically lower than daytime values by from 5 to 7 decibels. These noise levels are representative of a high traffic volume, urban area.

Location GH1 is southeast of the proposed facility near the Butler Square Building. This location could be classified as an NAC-2 area due to its retail nature. The standard for NAC-2 is 65 dBA for L_{50} and 70 dBA for L_{10}. The data show that the highest monitored L_{50} level is 64 dBA, within MPCA standards. Similarly, the highest L_{10} level is 69 dBA, also within the MPCA standards. The monitoring shows that noise levels are generally very close to MPCA standards.

Location GH2 is at the intersection of 10th Avenue North and 5th Street North near a residential apartment building. This location could be classified NAC-1 due to its residential character. The standards for NAC-1 are 60 and 65 dBA for the L_{50} and L_{10} daytime levels, and 50 and 55 dBA for the L_{50} and L_{10} nighttime values. The highest monitored daytime levels are 62 and 67 dBA for the L_{50} and L_{10} metrics, which clearly exceed standards. Similarly, the nighttime monitored values of 57 and 61 dBA for the L_{50} and L_{10} also exceed standards. This area would be classified as a noisy urban setting.

TABLE 3.7-7

NOISE MEASUREMENT SITE DESCRIPTIONS

Measurement Site Number	Approximate Distance and Direction from Project Facility* (feet)	(direction)	Local Conditions
GH1	1100	SE	In parking lot @ S corner of 3rd Ave N and 5th St N (3 m from 5th St and 22 m from 3rd Ave)
GH2	2200	NW	At 10th Ave N and 5th St N (30 m from 10th Ave and 3 m from 5th St.)
GH3	1800	NE	Between 3rd St N and 5th St N (20 m from RR track and 3 m from 6th Ave N).
GH4	2000	SW	At SW corner of Border Ave and 3rd Ave N (3 m from roads).
GHA	900	NW	In front of MTC building, (50 ft N. of 6th Ave N.).

*Referenced to approximate center of proposed site.

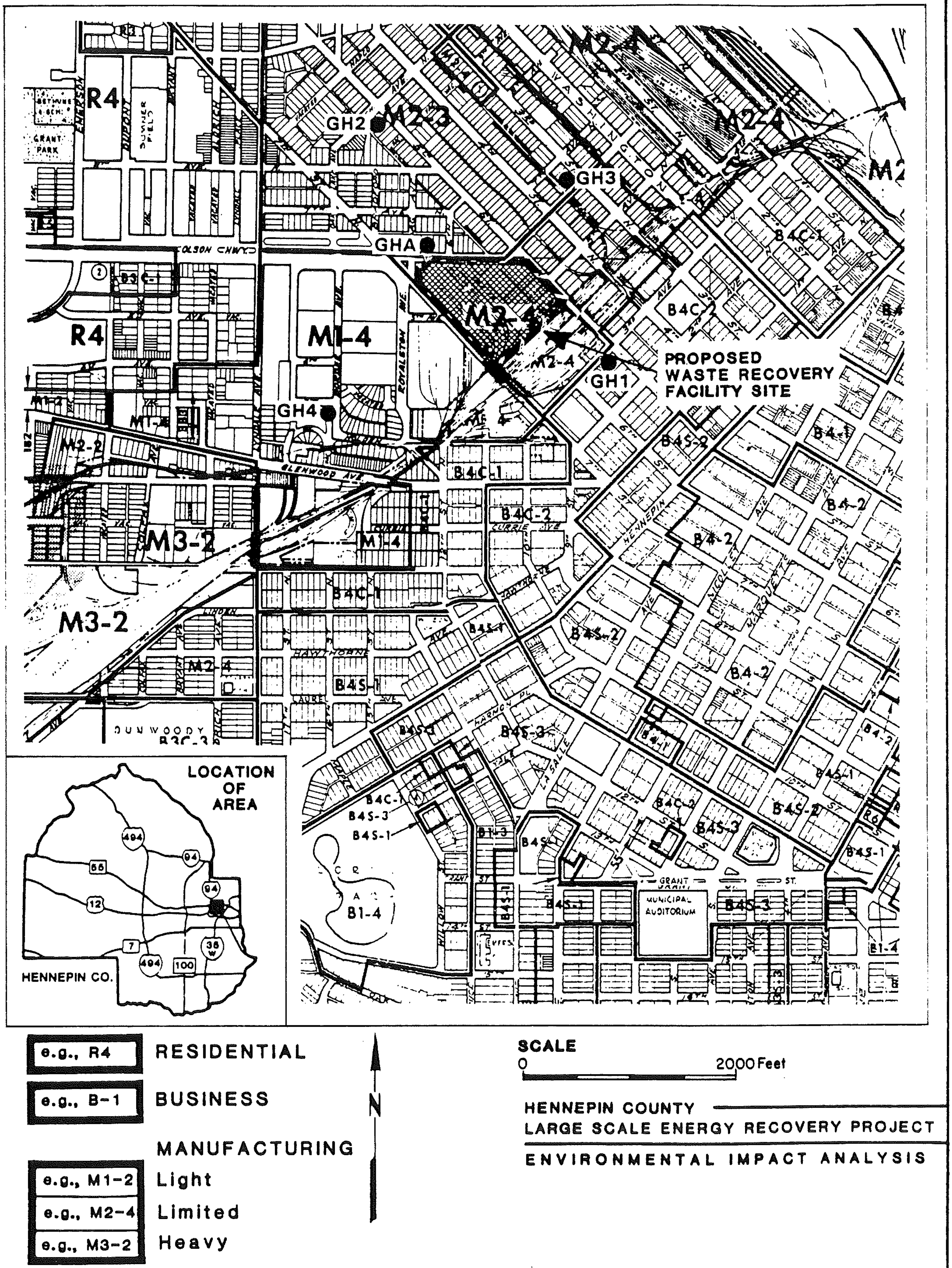

Figure 3.7-1 Noise Measurement Locations and Land Use/Zoning - Greyhound Site

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TABLE 3.7-8
MEASURED COMMUNITY NOISE LEVELS (dBA)[1]
GREYHOUND SITE RESOURCE RECOVERY FACILITY

Location[2]	Date[3]	Day	Start Hour[4]	Time[5]	Level Statistics L_{90}	L_{50}	L_{10}	L_{eq}	Noise Sources[6]
GH1	9/16	Mon	1045	D	59	62	67	66	Trucks on 5th St N, vehicles on 7th St N
GH1	9/16	Mon	1355	D	58	64	69	67	Local traffic on 7th St N
GH1	9/16	Mon	2200	N	54	57	61	61	Traffic, car in parking lot, jet aircraft
GH2	9/16	Mon	1105	D	59	61	65	64	I-94 traffic, local traffic, insects, birds.
GH2	9/16	Mon	1435	D	59	62	67	65	I-94 traffic, local traffic, birds.
GH2	9/16	Mon	2240	N	56	57	61	60	Traffic, police siren.
GH3	9/16	Mon	1125	D	62	65	75	71	Local & Rt 52 traffic, trucks unloading (100 ft).
GH3	9/16	Mon	1415	D	60	62	69	68	Local traffic, trucks unloading (100 ft).
GH3	9/16	Mon	2220	N	54	57	63	61	Traffic, transformer.
GH4	9/16	Mon	1150	D	59	61	65	63	Local & I 94 traffic, birds, sirens.
GH4	9/16	Mon	1455	D	59	61	66	65	Local & I 94 traffic.
GH4	9/16	Mon	2300	N	44	46	49	50	Insects & traffic.
GHA	6/18	Tue	0946	D	-	60	65	62	7
GHA	6/19	Wed	1153	D	-	59	64	63	7
GHA	6/19	Wed	1415	D	-	59	63	62	7
GHA	6/30	Sun	0727	D	-	50	58	54	7
GHA	6/30	Sun	1046	D	-	50	57	53	7
GHA	6/30	Sun	1415	D	-	50	56	53	7

1. Sources: Environmental Research & Technology, Inc. field data survey, September, 1985 (locations GH1 through GH4) and Northern Sound, July 5, 1985, Background Noise Monitoring--Hennepin County Recovery Project (draft), Minneapolis: HDR Techserv, Inc.

2. Locations are described in Table 3.7-7 and shown in Figure 3.7-1.

3. All dates refer to calendar year 1985.

4. Sampling durations for locations GH1 through GH4 are all 15 minutes. For location GHA, 1 hour samples were employed.

5. D and N refer to MPCA defined day (0700-2200 hours) and night (2200-0700 hours), respectively.

6. Principal noise sources observed during noise measurement times, as noted by instrument operator at locations GH1 through GH4.

7. Noise sources were traffic and aircraft. Traffic noise consisted of cars entering and leaving the parking lot and typical traffic levels on State Highway 55.

Location GH3 is in a commercial/manufacturing area along 6th Avenue North which could be classified as NAC-3. The daytime and nighttime standards in an NAC-3 area are 75 and 80 dBA for L_{50} and L_{10}, respectively. The highest monitored values were 65 and 75 dBA for L_{50} and L_{10}, well within standards.

Location GH4 is in a commercial/manufacturing area located southwest of the site. The highest monitored L_{50} and L_{10} values were 61 and 66 dBA, well within standards for a NAC-3 area.

Location GHA is at the MTC bus garage. This area would likely be classified as NAC-2. The standard for L_{50} and L_{10} are 65 and 70 dBA, respectively. The highest monitored values were 60 and 65 dBA for L_{50} and L_{10}. These values are within standards.

Table 3.7-8 shows that noise levels in the project area are relatively high. They are consistent with noise levels observed in highly developed urban areas. Noise standards are currently being exceeded at the residential receptor GH2. The most likely reason for this is the proximity of the receptor to heavy industrial and manufacturing activities. The result is a considerable amount of noise in the project area from many industrial, commercial, and institutional sources.

3.7.2 Bloomington East Transfer Station

3.7.2.1 Sensitive Receptors

The Bloomington East transfer station site is located north of West 96th Street, east of James Avenue South, and west of the frontage road that parallels I-35W. The closest sensitive receptors are the Donaldson Company test track just west of the proposed site (where new vehicle mufflers are tested) and residences on the west side of Penn Avenue. There are also two houses on the corner of 94th Street and James Avenue that are owned by Donaldson Company, and there is a Holiday Inn within view to the east-northeast (at approximately 800 feet from the center of the site). The Donaldson Company test track is partially separated from the proposed site by a lightly wooded, elevated buffer area. The residences on the west side of Penn Avenue are nearly two blocks from the site and are separated from it by commercial facilities and vacant land.

3.7.2.2 Noise Measurements

Noise measurements were conducted at the locations described in Table 3.7-9 and shown in Figure 3.7-2. Noise sources noted during the field survey include of car and truck traffic on city streets and I-35W, industrial plants on 96th Street; and some air traffic. There is a railroad track near the eastern edge of the proposed site. Only one instance of railroad activity was noted during the surveys.

Table 3.7-10 presents the measured A weighted noise levels and observed sources of noise during each measurement sample. Measured daytime L_{10} noise levels were generally in the range of 60 to 65 dBA or greater. These are consistent with the traffic and industrial sources of noise in the site vicinity. Nighttime noise levels were approximately 10 dBA lower than daytime values.

TABLE 3.7-9

NOISE MEASUREMENT SITE DESCRIPTIONS

BLOOMINGTON EAST TRANSFER STATION

Key	Approximate Distance and Direction from Project Facililty (feet)	(direction)	Description
BE1	1000	NW	At James Ave. and W. 94th St. (20 m from 94th St., 3 m from James Ave.)
BE2	800	NE	S. of Holiday Inn; between Bloomington Freeway & I-35W
BE3	600	SW	SW corner of 96th St. & Humboldt Ave., South
BE4	3100	W	NW corner of W. 96th St. and Penn Ave. South
BEA	3100	W	SW corner of N. 96th St. and Penn Ave. So. (similar to BE4)
BEB	600	W	N. side of W. 96th St., 300 ft west of site boundary and E. of Donaldson Co. test track.

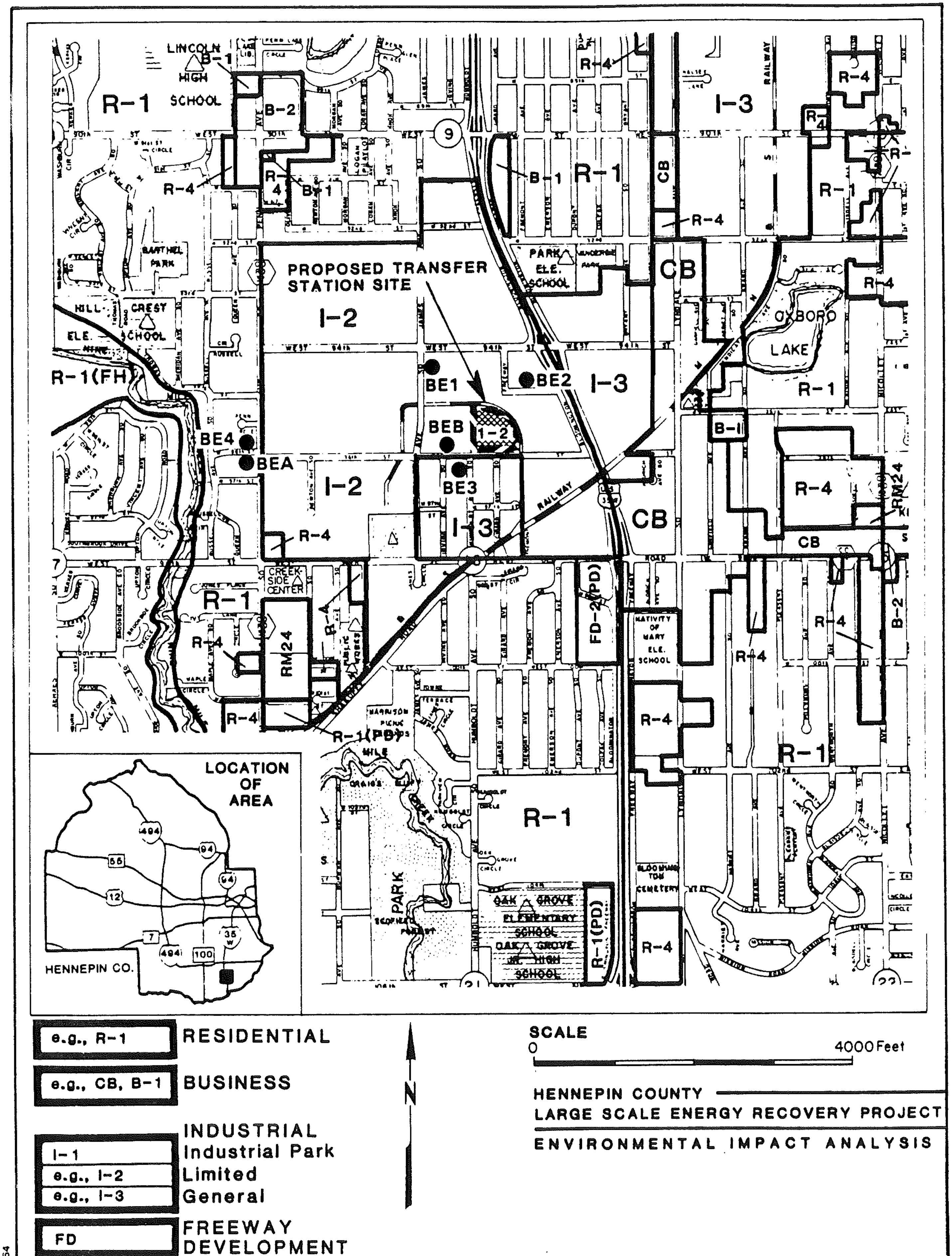

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Figure 3.7-2 Noise Measurement Locations and Land Use/Zoning - Bloomington East Site

TABLE 3.7-10

MEASURED COMMUNITY NOISE LEVELS (dBA)[1]

BLOOMINGTON EAST TRANSFER STATION

Location[2]	Date[3]	Day	Start Hour[4]	Time[5]	Level Statistics L_{90}	L_{50}	L_{10}	L_{eq}	Noise Sources[6]
BE1	9/17	Tue	0950	D	53	57	67	64	Chem. plant fans, heavy I-35W traffic.
BE1	9/17	Tue	1350	D	52	57	66	63	Chem. plant fans, heavy I-35W traffic.
BE1	9/17	Tue	0000	N	51	53	55	55	Chem. plant fans, insects, some traffic.
BE2	9/17	Tue	1020	D	57	60	67	67	Plastics factory, traffic on freeway & I-35W, fans on Holiday Inn
BE2	9/17	Tue	1325	D	56	58	65	64	Plastics factory, traffic on freeway & I-35W, fans on Holiday Inn
BE2	9/17	Tue	0020	N	58	58	59	59	Fans on Holiday Inn, tankcar loading, I35W traffic
BE3	9/17	Tue	1045	D	52	54	64	60	Traffic on Humboldt, fans, aircraft.
BE3	9/17	Tue	1415	D	53	56	63	61	Traffic on Humboldt, fans, aircraft, trains.
BE3	9/17	Tue	0045	N	49	50	51	51	Fans, local & I-35W traffic
BE4	9/17	Tue	1110	D	54	63	69	67	Traffic, aircraft, leaves rustling.
BE4	9/17	Tue	1440	D	53	64	70	68	Traffic, aircraft, leaves rustling.
BE4	9/17	Tue	0110	N	46	47	51	52	Home air conditioner, traffic, insects
BEA	6/10	Mon	1138	D	-	65	71	68	7
BEA	6/10	Mon	1439	D	-	65	72	68	7
BEA	6/08	Sat	0616	N	-	48	62	58	7
BEA	6/08	Sat	0722	N	-	53	65	60	7
BEB	6/24	Mon	1029	D	-	61	63	61	7
BEB	6/24	Mon	1257	D	-	62	64	62	7
BEB	7/13	Sat	0819	D	-	60	61	60	7
BEB	7/13	Sat	0604	N	-	60	61	60	7

1. Sources: Environmental Research & Technology, Inc. field data survey, September, 1985 (locations BE1 through BE4) and Northern Sound, July 5, 1985, Background Noise Monitoring--Hennepin County Recovery Project (draft), Minneapolis: HDR Techserv, Inc.

2. Locations are described in Table 3.7-9 and shown in Figure 3.7-2.

3. All dates refer to calendar year 1985.

4. Sampling durations for locations BE1 through BE4 are all 15 minutes. For location BEA and BEB, 1 hour samples were employed.

5. D and N refer to MPCA defined day (0700-2200 hours) and night (2200-0700 hours), respectively.

6. Principal noise sources observed during noise measurement times, as noted by instrument operator at locations BE1 through BE4.

7. Noise sources were primarily traffic and industrial.

Sensitive receptor BE1 is at the site of two residential units owned by Donaldson Company. This area is consistent with an NAC-1 classification. During daylight hours the L_{10} standard is exceeded at this receptor (67 dBA versus a standard of 65 dBA). The monitored values of 53 and 55 dBA for the nighttime L_{50} and L_{10} equal or exceed the standard of 50 and 55 dBA, respectively. This receptor is exposed to high, steady state noise levels.

Receptor BE-2 is at the Holiday Inn just west of I-35W. This land use would result in a classification of NAC-1. The daytime and nighttime standards are equalled or exceeded for both L_{50} and L_{10}. This receptor is in an area typical of noisy urban locations.

Location BE-3 is on Humboldt Avenue in an area with residential land uses (NAC-1). The nighttime noise levels of 50 and 51 dBA for L_{50} and L_{10}, respectively, are in compliance with noise standards. Similarly, the daytime monitored levels are below standards. This location is generally quieter than locations BE-1 and BE-2 due to its distance from major noise sources.

Location BE-4 is in a residential area (NAC-1) off Penn Avenue South. The daytime levels of 64 and 70 dBA for the L_{50} and L_{10} values exceed standards while the nighttime values are well below standards. This could be due to daytime traffic on Penn Avenue South.

Location BEA is close to BE-4. NAC-1 noise standards are exceeded during the daytime During the evening, the L_{10} standard of 55 dBA is exceeded (65 dBA monitored value), as is the nighttime standard of 50 dBA for L_{50} (53 dBA monitored).

Location BEB is at the Donaldson Company (NAC-2 area). Monitored values are below the standards of 65 and 70 dBA for L_{50} and L_{10}, respectively.

3.7.3 Brooklyn Park East Transfer Station

3.7.3.1 Sensitive Receptors

The Brooklyn Park East transfer station site is located north of I-94, west of U.S. Highway 169, and east of Shingle Creek Park. The access route is Winnetka Avenue by way of 73rd Avenue North off 68th Avenue North. The closest noise sensitive receptors are a home north of the site, and a home and two churches across Winnetka Avenue. There is also an office complex under construction west of the site across Shingle Creek.

The site and the new office complex are separated by a large expanse (about 1000 feet) of lightly wooded, grassy floodplain. The area between the site and the home to the north is lightly wooded. The site and the home and churches across Winnetka Avenue are at about the same elevation.

3.7.3.2 Noise Levels

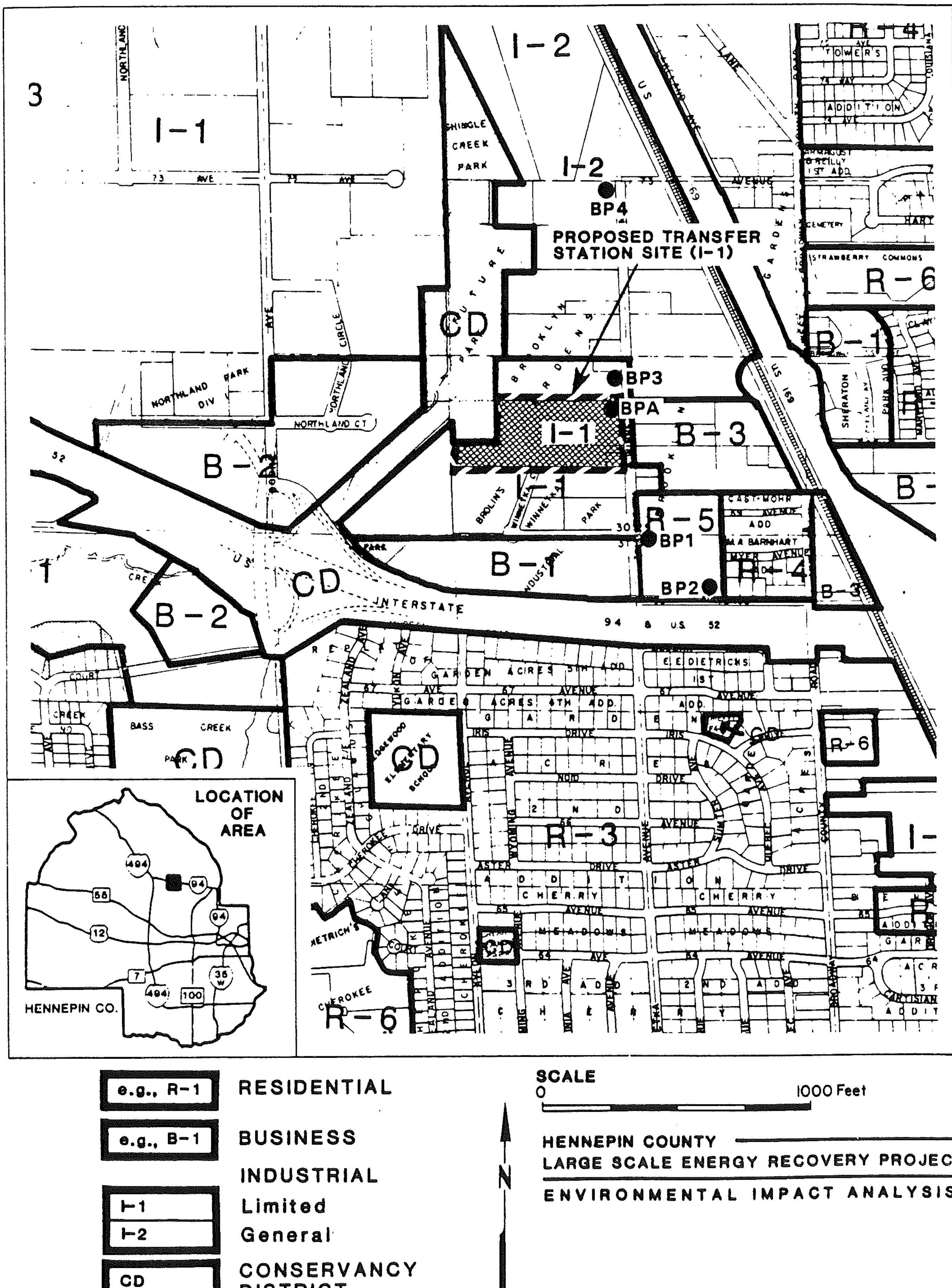
Noise measurements were conducted at the locations described in Table 3.7-11 and illustrated in Figure 3.7-3. Noise sources in the vicinity of the site include car and truck traffic on I-94 (and U.S. 169) and local streets, and small and medium size aircraft traffic from Crystal Airport. Single engine aircraft traffic was heavy on weekdays (10 to 20 per hour) and weekends (10 to 40 per hour). Some construction noise was noted during the field survey at the lumberyard to the east, and at the food warehouse to the northeast.

TABLE 3.7-11

NOISE MEASUREMENT SITE DESCRIPTIONS

BROOKLYN PARK EAST TRANSFER STATION

Key	Approximate Distance and Direction from Project Facililty (feet)	(direction)	Description
BP1	1000	SE	On Winnetka Ave., W of 68th Ave., near Grace Lutheran Church.
BP2	1600	SE	On 68th Ave., at Broadway, in residential area.
BP3	600	NE	On Winnetka Ave., N. of site; at residence.
BP4	1800	N	On Winnetka Ave. at 73rd Ave. at residence.
BPA	500	NE	On Winnetka Ave.; on the NE corner of site, approximately 60 feet from W. side of Winnetka Ave.



HENNEPIN COUNTY
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Figure 3.7-3 Noise Measurement Locations and Land Use/Zoning - Brooklyn Park East Site

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Table 3.7-12 presents a comprehensive list of measured A weighted noise levels and observed sources of noise during each measurement sample. The highest L_{10} daytime noise levels were obtained at locations BP2 (66 dBA) and are due to the closeness of this site to traffic on I-94 and U.S. 169. Levels at the other measurement locations ranged from 58 dBA to 63 dBA. Noise levels at night and on Saturday were somewhat lower (by approximately 5 decibels). The measured noise levels are consistent with the relationship of the site to major transportation (highway and air) routes.

Location BP1 is near a church on Winnetka Avenue. This area could be classified NAC-1 because of its sensitive nature. Daytime noise levels of 60 dBA (L_{50}) and 63 dBA (L_{10}) are within standards. The nighttime noise levels of 55 dBA (L_{50}) and 59 dBA (L_{10}) exceed the standards of 50 and 55 dBA, respectively.

Receptor BP2 is in a residential area along 68th Avenue (NAC-1 area). The daytime L_{10} standard of 65 dBA is exceeded. In addition, the nighttime monitored levels of 59 dBA (L_{50}) and 62 dBA (L_{10}) exceed the standards. Noise levels are consistent with noisy urban locations.

Receptor BP3 was located at a residence north of the site (NAC-1). Daytime monitored values of 58 dBA (L_{50}) and 61 dBA (L_{10}) are within standards. The nighttime values of 51 dBA (L_{50}) and 56 dBA (L_{10}) exceed the standards of 50 and 55 dBA, respectively.

Location BP-4 is a residence on Winnetka Ave (NAC-1). Daytime monitored levels of 58 dBA and 62 dBA (L_{10}) are within standards. The nighttime values of 52 dBA (L_{50}) and 54 dBA (L_{10}) exceed or are essentially equal to standards. These values reflect a noise urban environment near major transportation networks.

Location BPA is on the site (NAC-3). The monitored values of 56 dBA (L_{50}) and 58 dBA (L_{10}) are well within the standards of 75 and 80 dBA.

3.7.4 Hopkins DOT Transfer Station

3.7.4.1 Sensitive Receptors

The Hopkins DOT site is in the northwest corner of a 41-acre parcel currently used by the Hennepin County Department of Transportation (DOT) for storage and maintenance. The parcel is located on Third Street South, west of County Road 18, south of County Road 3, and east of Sixth Avenue South. The closest noise sensitive receptors are the residences and park south of Fifth Street South (about 700 feet from the site), and apartment buildings north of County Road 3 (the closest being 800 feet from the site).

The site is separated from the residences on the north side of County Road 3 by vacant land, a railroad track, Third Street South, and County Road 3 itself; and from the residences and park south of Fifth Street South by DOT property.

3.7.4.2 Noise Levels

Noise measurements were conducted at the locations described in Table 3.7-13 and illustrated in Figure 3.7-4. The major noise sources are car and truck traffic on County Roads 3 and 18 and on nearby city

TABLE 3.7-12

MEASURED COMMUNITY NOISE LEVELS (dBA)[1]

BROOKLYN EAST TRANSFER STATION

Location[2]	Date[3]	Day	Start Hour[4]	Time[5]	Level Statistics L_{90}	L_{50}	L_{10}	L_{eq}	Noise Sources[6]
BP1	9/18	Wed	1000	D	57	60	63	62	Traffic on I-94, local traffic.
BP1	9/18	Wed	1410	D	56	59	62	60	Local & I-94 traffic, insects.
BP1	9/18	Wed	2220	N	52	55	59	57	Local & I-94 traffic, insects, aircraft.
BP2	9/18	Wed	0915	D	61	63	66	65	Traffic on I-94, local traffic, insects.
BP2	9/18	Wed	1345	D	60	63	66	65	Local & I-94 traffic, insects.
BP2	9/18	Wed	2200	N	56	59	62	61	Local & I-94 traffic, insects.
BP3	9/18	Wed	0940	D	54	56	60	58	Traffic on I-94, local traffic, insects, birds.
BP3	9/18	Wed	1450	D	56	58	61	59	Local & I-94 traffic, aircraft.
BP3	9/18	Wed	2300	N	48	51	56	54	I-94 traffic, insects.
BP4	9/18	Wed	1050	D	56	58	62	61	Local & Rt 169 traffic, aircraft, construction @ 1000 ft.
BP4	9/18	Wed	1430	D	54	56	59	61	Rt 169, local & I-94 traffic, aircraft, construction, insects.
BP4	9/18	Wed	2240	N	50	52	54	57	Rt 169, local & I-94 traffic in
BPA	5/13	Mon	1308	D	–	53	55	54	
BPA	5/13	Mon	1535	D	–	54	56	55	
BPA	5/17	Fri	1334	D	–	56	58	56	
BPA	5/17	Fri	1558	D	–	54	58	55	
BPA	5/18	Sat	0744	D	–	48	54	53	
BPA	5/18	Sat	1010	D	–	50	56	53	
BPA	5/18	Sat	1529	D	–	48	53	51	

1. Sources: Environmental Research & Technology, Inc. field data survey, September, 1985 (locations BP1 through BP4) and Northern Sound, July 5, 1985, Background Noise Monitoring--Hennepin County Recovery Project (draft), Minneapolis: HDR Techserv, Inc.

2. Locations are described in Table 3.7-11 and shown in Figure 3.7-3.

3. All dates refer to calendar year 1985.

4. Sampling durations for locations BP1 through BP4 are all 15 minutes. For location BPA, 1 hour samples were employed.

5. D and N refer to MPCA defined day (0700-2200 hours) and night (2200-0700 hours) respectively.

6. Principal noise sources observed during noise measurement times, as noted by instrument operator at locations BP1 through BP4.

TABLE 3.7-13

NOISE MEASUREMENT SITE DESCRIPTIONS

HOPKINS DOT TRANSFER STATION

Key	Approximate Distance and Direction from Project Facililty (feet)	(direction)	Description
HD1	1000	N	N. side of County Rd. 3, E of 5th Ave. South, in front of Town Terrace Apts.
HD2	1400	E	NE corner of Belmore Lane & Washington Ave.
HD3	700	SE	At Buffer Park, 10 m from 5th St. South, on top of hill at E end of park.
HD4	700	S	SE corner of 6th Ave. South and 5th St. South (approx. 4 m from roads)
HDA	700	SE	Same as HD3, but at west end of park.
HDB	1000	N	Same as HD1.
HDC	800	S	At SW corner of 5th Ave. South and 5th St. South.

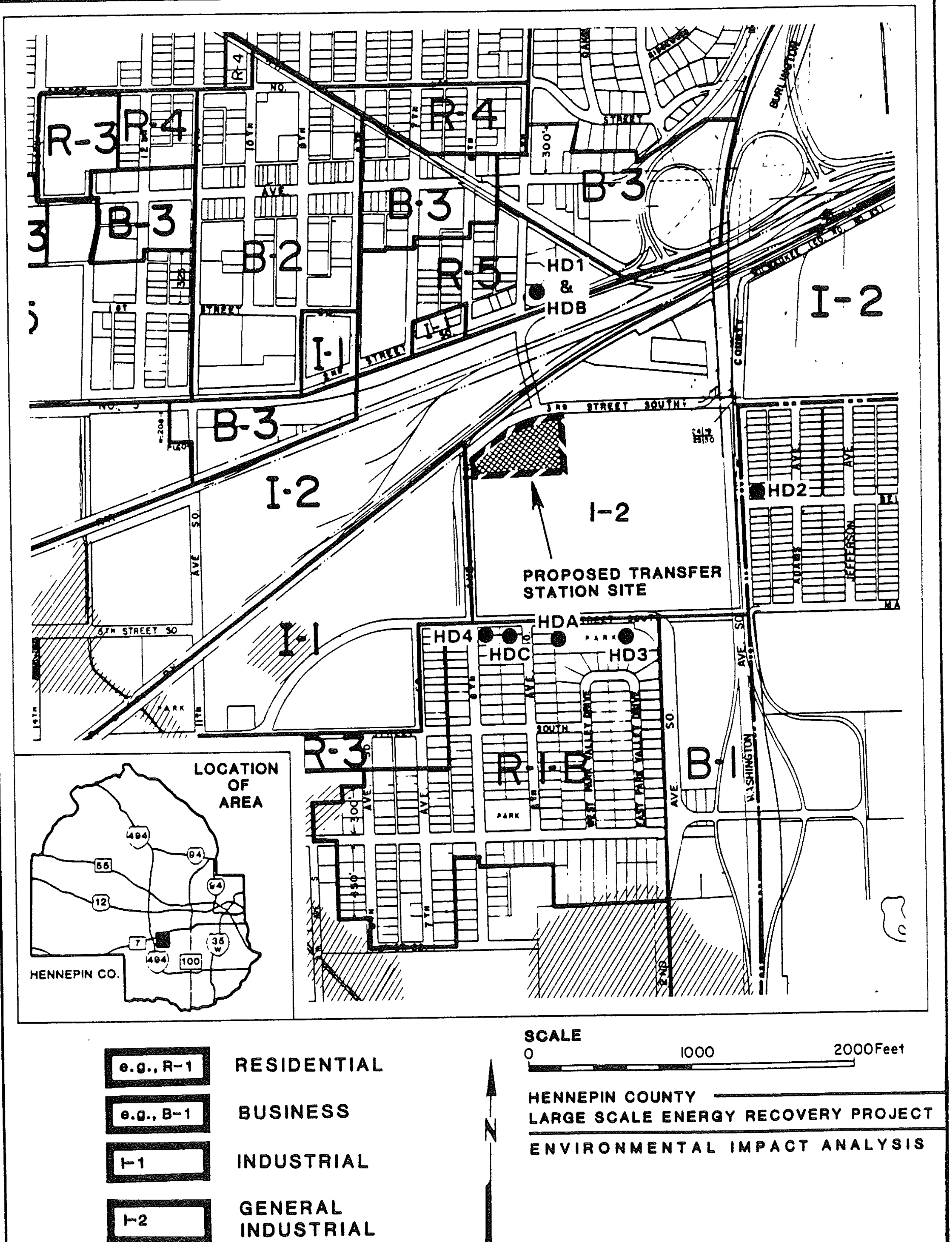

Figure 3.7-4 Noise Measurement Locations and Land Use/Zoning - Hopkins DOT Site

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streets. The truck traffic is heavy, partially because of the many food and building material warehouses in the area. Rail traffic also serves these facilities, and there is some air traffic over the area.

Table 3.7-14 presents the list of measured A weighted noise levels and observed sources of noise during each measurement sample. L_{10} daytime noise levels for locations south of the proposed transfer station site (HD-4, C, A, and 3) were in the range of 61 to 66 dBA, depending on proximity to streets and traffic. North of the site, at locations HD1 and HDB, the noise levels were in the range of 70 to 73 dBA, due to the close proximity to Rt. 3 traffic. Nighttime and Saturday daytime levels were lower by from 5 to 10 decibels.

Receptor HD1 is at an apartment complex north of County Road 3 (NAC-1 classification). Daytime monitored noise levels were 67 and 73 dBA for the L_{50} and L_{10} statistics. Nighttime noise levels were observed to be 61 and 67 dBA for the L_{50} and L_{10} statistics. In all instances, the monitored values were in excess of MPCA standards for both day and nighttime activity. L_{eq} values would also exceed the proposed MPCA standards.

Residential location HD2 (NAC-1) is off Washington Avenue southeast of County Road 18. Noise levels at this source are dominated by traffic on County Road 18. Daytime monitored levels were 64 and 69 dBA and exceed the standard of 60 and 65 dBA for the L_{50} and L_{10} statistics, respectively. Nighttime monitored noise levels were 59 and 64 dBA and exceed the standard of 50 and 55 dBA for L_{50} and L_{10}, respectively. The proposed L_{eq} standards would also be exceeded.

Residential receptor HD3 (NAC-1) is at a ball field south of Fifth Street South. Daytime monitored noise levels were 62 and 66 dBA and exceed the standard of 60 and 65 dBA for L_{50} and L_{10}, respectively. Nighttime monitored noise levels were 53 and 58 dBA and exceed the standard of 50 and 55 dBA for L_{50} and L_{10}, respectively. The proposed L_{eq} standard would be exceeded.

Residential receptor HD4 is at the corner of 6th Avenue and Fifth Street South. Daytime monitored noise levels were 61 and 71 dBA and exceed the standard of 60 and 65 dBA for the L_{50} and L_{10} statistics. Nighttime monitored noise levels were 54 and 64 dBA and also exceed the standard of 50 and 55 dBA for the L_{50} and L_{10} statistics. The proposed L_{eq} standard would be exceeded.

Noise levels were monitored by HDR at receptors HDA, HDB, and HDC which correspond to ERT receptors HD3, HD1, and HD4, respectively. The results of that monitoring program are consistent with the more recent measurements made by ERT.

In general, noise levels at all receptors in the area exceed the MPCA standards. The monitored values are representative of a very noisy urban environment. The primary sources of noise are County Road 18 and an abundance of industrial activities in the area. At receptor HD4 the dominant source of noise was from a food processing facility located across Fifth Street South.

3.7.5 Minneapolis South Transfer Station

3.7.5.1 Sensitive Receptors

The Minneapolis South transfer station site is located southwest of Hiawatha Avenue, east of Cedar Avenue South, and north of Lake

TABLE 3.7-14

MEASURED COMMUNITY NOISE LEVELS (dBA)[1]

HOPKINS DOT TRANSFER STATION

Location[2]	Date[3]	Day	Start Hour[4]	Time[5]	Level Statistics L_{90}	L_{50}	L_{10}	L_{eq}	Noise Sources[6]
HD1	9/17	Tue	1005	D	62	67	72	70	Traffic on Rt 3 and 3rd and 5th Sts, bus stop across st. wind ch
HD1	9/17	Tue	1350	D	62	67	73	70	Traffic on Rt 3 and 3rd and 5th Sts, bus stop across st. wind ch
HD1	9/17	Tue	2200	N	54	61	67	65	Traffic on Rt 3, insects, cars racing, truck.
HD2	9/17	Tue	1035	D	60	63	68	67	Traffic on Rt 18 and on Washington and Belmore Avenues.
HD2	9/17	Tue	1413	D	61	64	69	67	Traffic on Rt 18 and on Washington and Belmore Avenues.
HD2	9/17	Tue	2230	N	55	59	64	63	Insects, traffic (constant noise)
HD3	9/17	Tue	1100	D	59	62	66	64	Local & Rt 18 traffic, front end loader @ 150 feet.
HD3	9/17	Tue	1435	D	57	60	65	64	Local & Rt 18 traffic.
HD3	9/17	Tue	2255	N	51	53	58	58	Local & Rt 18 traffic, insects, aircraft, motorcycle.
HD4	9/17	Tue	1125	D	54	61	71	70	Local traffic, forklift at 100 ft (DOT yd.), birds, loudspeaker.
HD4	9/17	Tue	1455	D	54	59	68	66	Local traffic, train, birds.
HD4	9/17	Tue	2320	N	51	54	64	63	Local & Rt 18 traffic, fans, aircraft.
HDA	5/21	Tue	1355	D	-	48	61	59	
HDA	6/01	Sat	0711	D	-	48	57	55	
HDB	6/04	Tue	1119	D	-	64	70	69	
HDB	6/06	Thu	0944	D	-	63	70	67	
HDB	6/15	Sat	1534	D	-	66	72	70	
HDB	6/15	Sat	0613	N	-	54	63	62	
HDC	7/10	Wed	0849	D	-	51	64	61	
HDC	7/10	Wed	1213	D	-	53	66	63	

1. Sources: Environmental Research & Technology, Inc. field data survey, September, 1985 (locations HD1 through HD4) and Northern Sound, July 5, 1985, Background Noise Monitoring--Hennepin County Recovery Project (draft), Minneapolis: HDR Techserv, Inc.

2. Locations are described in Table 3.7-13 and shown in Figure 3.7-4.

3. All dates refer to calendar year 1985.

4. Sampling durations for locations HD1 through HD4 are all 15 minutes. For location HDA, HDB and HDC, 1 hour samples were employed.

5. D and N refer to MPCA defined day (0700-2200 hours) and night (2200-0700 hours), respectively.

6. Principal noise sources observed during noise measurement times, as noted by instrument operator at locations HD1 through HD4.

7. Refer to text.

Street on 20th Avenue South between East 28th and East 29th Streets. The site currently includes an operating transfer station (200 to 300 tons per day).

The closest noise sensitive receptors are the residences located one block east of the site on 21st Avenue South and the Pioneers and Soldiers Cemetery south and west of the site. The site is at the same elevation as the homes on 21st Avenue South and is separated from them by industrial buildings and some trees. The cemetery is separated from the site only by a fence.

3.7.5.2 Noise Levels

Noise measurements were taken at the locations described in Table 3.7-15 and illustrated in Figure 3.7-5. Major noise sources include car and truck traffic on area streets, some air traffic, and rail traffic one block north of the site.

Table 3.7-16 lists the measured A weighted noise levels and observed sources of noise during each measurement sample. At locations MS1 and MSA south of the facility, daytime L_{10} noise levels ranged from 65 to 72 dBA. This range in values possibly reflects variations in facility operating schedules. At the two remaining measurement locations, levels ranged between 64 and 72 dBA due to local traffic noise conditions.

Receptor MS1 is at the boundary of the Pioneers and Soldiers Memorial Cemetery on 29th Street, at the entrance to the existing transfer facility. Daytime noise levels were 62 and 68 dBA which exceed the NAC-1 residential standards of 60 and 65 dBA for the L_{50} and L_{10} statistics. Nighttime noise levels were 49 and 50 dBA which are in compliance with the standards of 50 and 55 dBA for the L_{50} and L_{10} values.

Residential receptor MS2 (NAC-1) is on 21st Avenue south. Daytime noise levels were 60 and 64 dBA which essentially are equal to the L_{50} and L_{10} standards. Nighttime noise levels were 51 and 58 dBA which exceed the standards of 50 and 55 dBA for L_{50} and L_{10}, respectively.

Residential receptor MS3 (NAC-1) is on Cedar Avenue South. Daytime noise levels were 66 and 72 dBA which exceed standards for L_{50} and L_{10}, respectively. Nighttime noise levels were 58 and 68 dBA which exceed the nighttime standards of 50 and 55 dBA for L_{50} and L_{10}, respectively.

Receptor MSA corresponds to receptor MS1 and the measurements are consistent with the noise levels observed at MS1.

For all receptors described above, monitored L_{eq} noise levels exceed or equal the proposed MPCA standards of 63 and 53 dBA for daytime and nighttime, respectively. The noise levels are representative of very noisy urban conditions. The primary sources of noise are traffic and industrial activity in the area.

TABLE 3.7-15
NOISE MEASUREMENT SITE DESCRIPTIONS
MINNEAPOLIS SOUTH TRANSFER STATION

Key	Approximate Distance and Direction from Project Facililty (feet)	(direction)	Description
MS1	250	S	At 20th Ave. S. & 29th St., in Pioneers and Soldiers Memorial Cemetery, at a point 50 feet from exit of existing transfer facility.
MS2	600	NE	W. side of 21st Ave. S., S. of 28th St. East and rail track; near residences.
MS3	1000	W	At 29th St. and Cedar Ave. South, in residential area (on sidewalk).
MSA	250	S	Similar to MS1

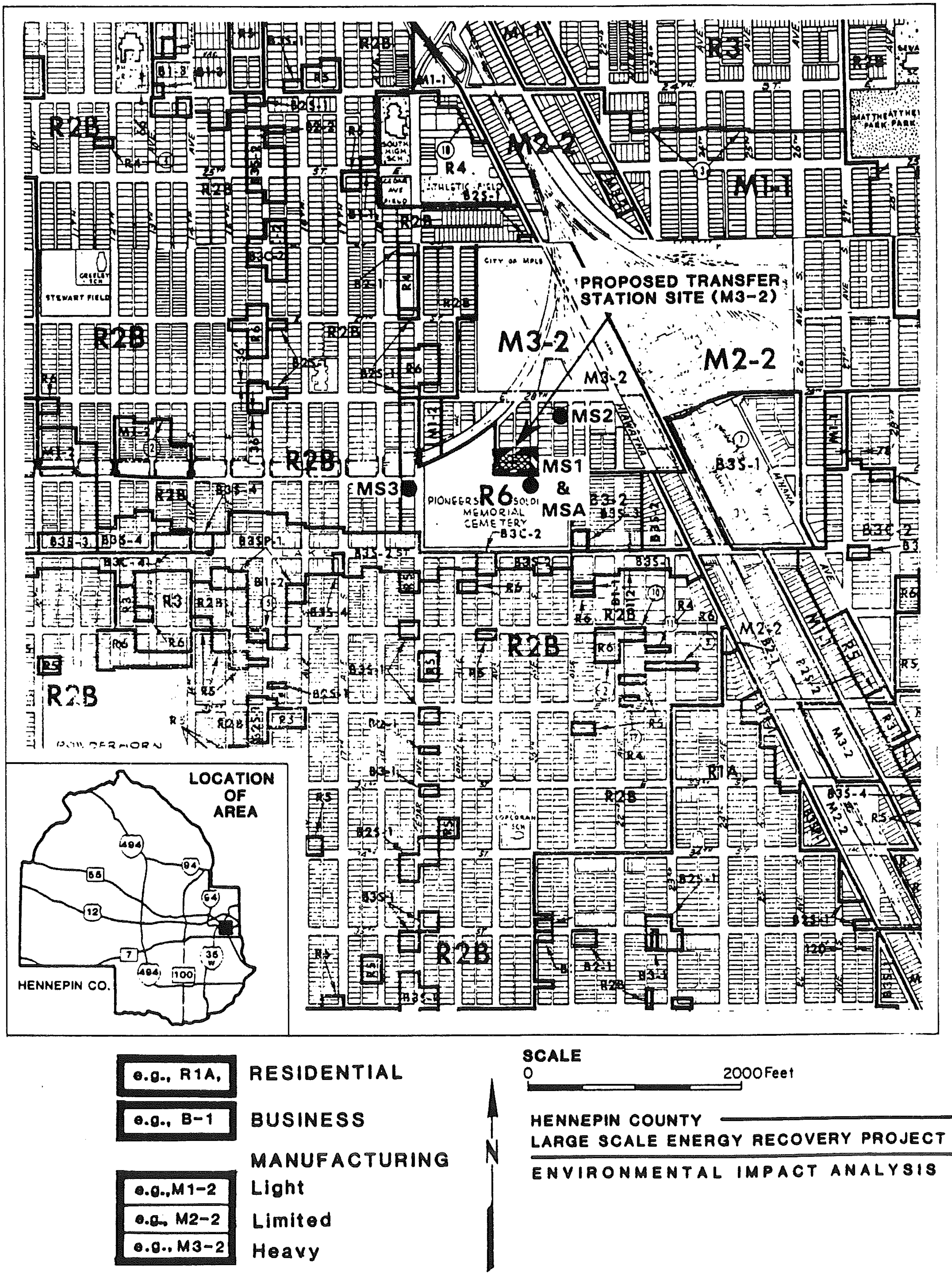

Figure 3.7-5 Noise Measurement Locations and Land Use/Zoning - Minneapolis South Site

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TABLE 3.7-16

MEASURED COMMUNITY NOISE LEVELS (dBA)[1]

MINNEAPOLIS SOUTH TRANSFER STATION

Location[2]	Date[3]	Day	Start Hour[4]	Time[5]	Level Statistics L_{90}	L_{50}	L_{10}	L_{eq}	Noise Sources[6]
MS1	9/16	Mon	1020	D	58	60	65	63	Local traffic, transfer station.
MS1	9/16	Mon	0930	D	59	62	68	65	Trucks and front end loader @ transfer station.
MS1	9/16	Mon	2345	N	48	49	51	50	Dog barking, insects, traffic.
MS2	9/16	Mon	1045	D	57	60	64	64	Insects, traffic, adjacent machine shop, train engine.
MS2	9/16	Mon	0005	N	48	51	58	56	Traffic, insects, jet plane.
MS3	9/16	Mon	1105	D	57	66	72	70	Traffic, insects, backup alarm tone from transfer station.
MS3	9/16	Mon	0025	N	51	58	68	64	Traffic, insects.
MSA	6/12	Wed	0815	D	-	62	72	68	
MSA	6/12	Wed	1029	D	-	65	72	69	
MSA	6/13	Thur	0820	D	-	61	71	67	
MSA	6/13	Thur	1033	D	-	62	69	66	
MSA	6/13	Thur	1401	D	-	58	70	67	
MSA	6/29	Sat	1012	D	-	50	58	58	
MSA	6/29	Sat	1225	D	-	50	58	55	
MSA	7/14	Sun	0836	D	-	45	52	49	

1. Sources: Environmental Research & Technology, Inc. field data survey, September, 1985 (locations MS1 through MS3) and Northern Sound, July 5, 1985, Background Noise Monitoring--Hennepin County Recovery Project Recovery Project (draft), Minneapolis: HDR Techserv, Inc.

2. Locations are described in Table 3.7-15 and shown in Figure 3.7-5.

3. All dates refer to calendar year 1985.

4. Sampling durations for locations MS1 through MS3 are all 15 minutes. For location MSA, 1 hour samples were employed.

5. D and N refer to MPCA defined day (0700-2200 hours) and night (2200-0700 hours) respectively.

6. Principal noise sources observed during noise measurement times, as noted by instrument operator at locations MS1 through MS3.

3.8. Utilities

3.8.1 Resource Recovery Facility

The City of Minneapolis supplies water to private citizens, businesses and industries within the City, as well as to the seven surrounding suburban communities. The supply source is the Mississippi River. The water is treated and partially softened before it is introduced to the municipal system. The quality is suitable for boiler makeup, plant use, and domestic use. In 1983, the average daily withdrawal from the Mississippi River was 59,708,306 gallons. The maximum amount of water delivered to the distribution system during any one day is 130,490,000. The capacity of the system is adequate to meet current demand. As the metro region grows and water demands increase, the municipality may look to ground water sources to augment surface waters (Minneapolis Plan for the 1980s).

Near the site, there is 12-inch municipal water main that is buried along Sixth Avenue North and an 8-inch main is located on Fifth Street North. An 8-inch water line enters the existing Greyhound building. The static pressure is 82-psi and the residual pressure is 54-psi at 1,267 gpm measured at the corner of Seventh Avenue North and Fifth Street North (HDR, 1985).

Fire protection is provided by seven fire hydrants that are on three sides of the site. There are no fire hydrants to the southeast of the site along the railroad tracks. There are two hydrants along the northeast side of the site near the intersection of Fifth Avenue North; two to the north along Sixth Avenue North, one at Hoag and Sixth Avenue South; and two to the southwest along Seventh Street North (HDR, 1985)

Sewage treatment for the City is provided by the Metropolitan Waste Treatment Plant which is located at Pig's Eye Lake adjacent to the Mississippi River and immediately downstream of downtown St. Paul. The treatment plant provides primary and secondary biological treatment. It's current capacity is 270 mgd. The average daily flow is 230 mgd. Originally, the city's sewer system was built to carry both storm water runoff and sewage; now, more than 50 percent of the city has separated sewers. A 15-inch sanitary sewer is located on Sixth Avenue North and a 90-inch sanitary sewer is located on Fifth Avenue North. A 36-inch concrete storm drain bisects the site.

The electric utility serving the site area, Northern States Power Company (NSP), has an existing 13.8 kV, 3-phase overhead line on Sixth Avenue North. The line is on the south side of the street from Seventh to Sixth street and on the north side of the street from Sixth to Fifth street. There is customer service to one building on the site (HDR, 1985). There are gas lines buried on Sixth Avenue North and Seventh Avenue North bordering the site. The site is not served by the Minneapolis Energy Center District heating system. The closest steam line to this site is located in Sixth Street South between Hennepin Avenue and Nicollet Mall. The telephone utility, Northwestern Bell, has a buried customer service line entering the site from Sixth Avenue North.

3.8.2 Bloomington East Transfer Station

The City of Bloomington uses high quality groundwater as the primary source of its municipal water supply. Water is softened in the municipal water treatment plant before distribution. The City's physical plant has a hydraulic capacity of 6 mgd, although the wells can produce much more. Water is drawn from the Prairie du Chien-Jordan aquifer which is characterized by high water yields. In addition, water is purchased from the City of Minneapolis during periods of peak demand. Minneapolis has contracted with Bloomington to furnish a maximum of 30 mgd. The average daily water use in Bloomington from January to September 1985 was 11.59 mgd.

An 8-inch cast iron water main is located on West 96th Street. There is also a 6-inch water line at the property line of the proposed site at the intersection of Girard Avenue South and West 96th Street. The static pressure is 65-psi and the residual pressure is 41-psi at a flow of 7,090 gpm, measured at West 94th Street and Pennsylvania Avenue South (HDR, 1985).

A 24-inch ductile main serves existing fire hydrants along West 96th between Girard Avenue South and the west frontage road. The fire hydrant at Freemont Avenue South, north of West 96th Street, is connected to this line. Other fire hydrants are located at Irving Avenue South, Humboldt Avenue South, and Girard Avenue South.

The City of Bloomington owns and maintains a collection system that transports sanitary wastes to the Seneca Waste Treatment Plant, owned by the Metropolitan Waste Control Commission. The Senaca Plant provides primary and secondary treatment, and serves Bloomington, two other towns in their entirety, and small fractions of two other towns. The capacity of the plant is 24 mgd: the current average daily flow is 19 mgd.

A 48-inch reinforced concrete sanitary sewer is located 30 feet south of the north right-of-way for West 96th Street. There is also a 6-inch sewer service stubbed to the property line of the proposed site at Humboldt Avenue North and West 96th Street. Manholes are located at the corners of Humboldt Avenue South, Girard Avenue South, and Freemont Avenue South. The invert elevation of the 48-inch sewer is approximately 799 feet at the Humboldt Avenue South manhole (HDR, 1985).

Bloomington's storm and sanitary sewers are separated. Bloomington's stormwater drainage system consists of ponding or holding areas and manmade and natural drainage ways (Bloomington Comprehensive Plan, 1980). An existing 18-inch reinforced concrete storm sewer is located on West 96th Street. The storm sewer flows to the east and ties into a manhole in the west frontage road of I-35 W.

Electrical service in Bloomington is provided by Northern States Power through an integrated network that includes generation and transmission facilities, electrical substations, and local distribution lines. NSP maintains a grounded mid-point delta transformer bank on the property, with a 50/100 kVA pole-mounted cluster. A 13.9 kV overhead line is adjacent to the property on West 96th Street.

Northwestern Bell maintains a buried underground cable at the northwest corner of West 96th Street and Humboldt Avenue South, adjacent to the site with a service line into the site proper. A 2-inch, 60-psi natural gas line is also buried on West 96th Street.

3.8.3 Brooklyn Park East Transfer Station

The City of Brooklyn Park's water supply is provided by a series of drift and rock wells throughout the City. Currently, the average daily demand is 4 mgd; the peak is 16 to 17 mgd. The current capacity with all wells producing is 19 mgd. The city owns and operates both underground and above ground storage facilities.

An 8-inch ductile iron municipal water main is buried in the right-of-way of Winnetka Avenue North, and a 12-inch water main is located in a 20-foot easement immediately south of the proposed site. The static pressure at 7300 Winnetka Avenue North is 75 psi, and the residual pressure is 45-psi with a flow of 2,106 gpm (HDR, 1985).

The two closest fire hydrants to the site are located at the southern property line and Winnetka Circle, 120 feet from Winnetka Avenue North, and 150 feet north of the southern site boundary at Winnetka Avenue North (HDR, 1985).

The sanitary sewer system of Brooklyn Park is based on a system of interceptors owned and operated by the Metropolitan Waste Control Commission, and city trunk and sub-trunk lines. Brooklyn Park's sanitary sewage is discharged into the Metropolitan Wastewater Treatment Plant, south of downtown St. Paul.

An existing 8-inch sanitary sewer is located in Winnetka Avenue North, 10 feet east of the 8-inch water line. A 10-inch sanitary sewer is located in the same 20-foot easement as the 12-inch water main. The 8-inch sewer ties into the 10-inch sewer at a manhole 2 feet west of the center line of the Winnetka Avenue North right-of-way (HDR, 1985).

A system of storm sewer laterals, sub-trunks, and trunk lines serves this portion of Brooklyn Park. An 18-inch storm sewer begins approximately 600 feet south of the southern site boundary and flows north towards the site. The line ties into a 48-inch storm sewer which in turn ties into a 78-inch storm sewer.

There are two gas mains in Winnetka Avenue North: a 12-inch, 175-psi line located 19 feet west of the east right-of-way, and a 2-inch, 60-psi line located 13 feet east of the 12-inch line (HDR, 1985).

NSP maintains a 13.8-kV, 3-phase overhead line on the west side of Winnetka Avenue North adjacent to the east side of the site, but there are no customer service lines into the property. Northwestern Bell has a partial overhead cable system on the west side of Winnetka Avenue North, changing to an underground system adjacent to the east side of the project site, however, there is no customer phone service on the site property (HDR, 1985).

3.8.4 Hopkins Transfer Station

Water supply in Hopkins is derived from 5 municipal wells which pump water from the Jordan Sandstone Aquifer. Average water demand has been approximately 1.7 to 2 mgd; peak demand is approximately 7 mgd. The water supply system has the capacity to pump 11-12 mgd.

A 16-inch ductile water main is located north of the site in Third Street South, and a 6-inch cast iron water main is buried in Sixth Avenue South West of the site. There is one fire hydrant along Sixth Avenue South, approximately 140 feet north of the southern site boundary. The static pressure is 70-psi, and the residual pressure is 69-psi at a flow of 4,475 gpm measured at a fire hydrant at the northeast corner of the site. At the southwest corner of the site, the static pressure is 75-psi and the residual pressure is 70-psi, at a flow of 2,306 gpm. (HDR, 1985).

The City owns and operates a sanitary sewer collection system including laterals, trunks and light lift stations. Sanitary sewage is discharged into the Metropolitan Waste Treatment Plant on the Mississippi River, south of downtown Minneapolis. Storm and sanitary sewers in Hopkins are separated. Storm sewers discharge into Minnehaha Creek and Nine Mile Creek. A sanitary sewer manhole, connected to an 8-inch sanitary sewer line, is located approximately 25 feet south of the southern boundary of the Hopkins DOT site.

There is an existing NSP 13.8-kV, 3-phase overhead line on the north side of Third Street South from Fifth Avenue and a tapped single-phase line south on the east side of Sixth Avenue. These lines are adjacent, but not within, the property bounds. There is a 13.8-kV, 3-phase overhead service, into the property, to a pole-mounted cluster transformer bank adjacent to an existing building on the site (HDR, 1985).

3.8.5 Minneapolis South Site

The municipal water supply system and sewer system described in Section 3.8.1 also service this site, and presently serve the existing transfer station building.

Water is provided through a 6-inch line on 20th Avenue South. There are fire hydrants at the corner of 20th Avenue South and East 29th Street, and approximately 80 feet north of the northern property line on 20th Avenue South. The static pressure is 74-psi and the residual pressure is 65-psi at a flow of 2,270 gpm measured at Lake Street and 22nd Avenue. There is no fire protection system at the existing solid waste transfer facility (HDR, 1985).

A 12-inch clay sanitary sewer pipe serves the site from the corner of East 29th Avenue and 20th Avenue South. Storm water runoff from the site is collected by the catch basins in 20th Avenue South, approximately 180 feet to the north of the northern property line (HDR, 1985).

NSP has an existing overhead 3-phase, 13.8-kV primary line on the east side of 19th Avenue, adjacent to the site. There is customer service into the property in the northwest quadrant of the site. The 1-1/4 inch gas building service is tied into the 8-inch, 175-psi steel main in East 29th Street (HDR, 1985).

The telephone utility, Northwestern Bell, has a buried underground cable on the west side of 20th Avenue south which ties into the property at the southeast quadrant (HDR, 1985).

3.9 Socioeconomics

3.9.1 County Population Overview

Based on the 1980 U.S. population census and Metropolitan Council population forecasts (Metropolitan Council, June 5, 1984), Hennepin County and the cities in which the proposed facilities are located will show a steady population increase through the year 2000. Census and Council population data for 1980-2000 are summarized below. The Council's projections for 1990 and 2000 assume a continuation of the present growth rate.

	1980 Census	1980 Estimate	2000 Estimate
Hennepin County	941,411	997,000	1,024,000
Bloomington	81,831	88,000	85,000
Brooklyn Park	43,332	57,000	65,000
Hopkins	15,336	14,400	14,800
Minneapolis	370,951	349,000	336,000

Source: Metropolitan Council of the Twin Cities Area, June 5, 1985. Preliminary Forecasts by Community for 1990 and 2000 St. Paul, Minnesota.

3.9.2 Greyhound Site

Community Overview

Minneapolis is a growing metropolitan area with a vision to become the economic and cultural center of the midwest. (City of Minneapolis, 1982). Office space, retail area, and hotels continue to expand in support of Minneapolis as a regional center for finance and trade, and as the midwest center for the communications industry.

Population, Housing, and Employment

Population

Consistent with national trends of outward migration from the cities to the suburbs, the Minneapolis population declined by 14.6 percent between 1970 and 1980. In 1980, the city's population was 370,951. Within census tract 35 where the proposed facility is located the population was 319. Census tract 35 extends from the Greyhound Site east to the river, south one-quarter of a mile to 3rd Avenue (which is parallel and south of the railroad tracks which form the northern boundary of downtown Minneapolis), due west one-quarter of a mile to 7th Street North, and northwest one-half to one mile to I-94 and Plymouth Ave.

The median age within this census tract is 46.1. Thirty percent of the population is 65 or older. In contrast, the median age of the Minneapolis population is 29.8; 18 percent are 65 or older. South of census tract 35 is census tract 45 where 1320 persons reside. In this tract, the median age is also relatively high, 59.8, and almost one half of the population is 65 or older. In census tract 42, west of 7th Street North and I-94, the median age of the population of 1549 is 21.2; less than 7 percent are 65 or older. Thus, in this tract the population is considerably younger than elsewhere in the metropolitan area. (U.S. Department of Commerce, 1982).

Census tract 35 has fifty-two year round households. Almost two-thirds of the households are white, with the remaining third primarily black. In contrast, more than three-quarters of the households in census tract 42 are minority households. South of the proposed project site in census tract 45, approximately 95 percent of the population is white.

Housing

Given demographic trends of fewer numbers of persons per household, the Minneapolis Plan for the 80s notes that pressure on the Minneapolis housing market is expected. Between 1970 and 1980, the city's population declined 14.6 percent, but the housing stock increased 1.0 percent. The plan also notes that Minneapolis compares favorably to the remainder of the Metropolitan area in providing affordable housing opportunities. This is attributable in part to the relatively poor condition of the city's housing stock relative to the housing stock in the remainder of the metropolitan area.

Within census tract 35, there were 52 year round housing units in 1980. Twelve of these units were vacant, sixteen were owner occupied, and 24 were renter occupied. The overall vacancy rate was approximately 20 percent. For the entire city, approximately 48 percent of the city's 168,859 housing units were owner occupied in 1980. This is considerably less than the 60 percent owner-occupied housing units within the metropolitan area. The median value of owner occupied homes in the Hennepin County-Minneapolis metropolitan area is $63,600. The median value of homes in the city of Minneapolis is $52,600.

In census tract 45 south of the site, there are less than 50 housing units. To the west, in census tract 42, there are a larger number of units, the majority of which are not owner-occupied. The Minneapolis plan for the 1980's classifies census tract 42 as a redirection area, showing an extreme need for improvement of housing conditions.

Employment

The Minneapolis-St. Paul labor market area induces the eleven counties of Anoka, Carver, Chisago, Dakota, Hennepin, Isanti, Ramsey, Scott, Washington, and Wright in Minnesota, and St. Croix county in Wisconsin. During the first six months of 1985, unemployment in this region varied monthly from 4.3 to 3.6 percent. The distribution of industry employment is presented in Table 3.9-1. Because the Metropolitan area is considered one economic unit, further breakdown of this information by town and census tract is not possible.

TABLE 3.9-1

DISTRIBUTION OF INDUSTRY EMPLOYMENT IN THE
MINNEAPOLIS-ST. PAUL METROPOLITAN AREA

Industry	Employment-May 1985 (000)	Number Unemployed-May[2] 1985 (000)
Total Non-agricultural	1214.2	20.9*
Manufacturing	258.9	6.9
Durable Goods	165.1	5.5
Non-durable Goods	93.8	1.4
Non-Manufacturing	955.3	
Construction	47.3	5.4
Transportation, Public Utilities and Comm.	78.7	.9
Trade	299.7	3.5
Finance, Insurance, and Real Estate	81.8	.7
Service and Miscellaneous[1]	296.5	3.2
Government	161.3	.2

1 Includes lodging and recreation, personal services, business services, repair services, health services, legal services, private education, social services, and miscellaneous services such as engineering and accounting.

2 Refers to the number of unemployment insurance claimants.

* Does not add up to 20.9 due to rounding.

Source: Twin Cities Labor Market Information, Minnesota Dept. of Economic Security, June, 1985.

Employment trends in the metropolitan area can be summarized as follows:

- Manufacturing has dropped as a percentage of total employment and 13 out of 18 industry groups have registered cutbacks.
- Construction employment, while not yet as great as prior to the last recessionary period, is now moving towards a peak.
- Wholesale and retail trade is the largest sector of the economy.
- Services have become the most expansive sector.
- The share of employment in the finance/insurance/real estate sector has been increasing.
- The growth of the Minneapolis labor force has been above the national average.

1980 Census data shows an unemployment rate of 4.8 percent for the city of Minneapolis, and an unemployment rate of 3.1 percent for census tract 35. More than one-quarter of the city's population is employed in managerial and professional specialty occupations. In census tract 35, the comparable percentage is closer to one fifth. Further, while one third of the city's employed are in technical, sales, and administrative support, the comparable percentage for census tract 35 is one-fourth.

Property Values

The assessed market value of land parcels on the proposed resource recovery site and selected lands adjacent to the site are included in Table 3.9-2.

Assessed market value differs from real market value in that it is an estimate used by the County Assessor's office to establish the worth of a property for tax purposes. Real market value is the actual or estimated selling price of a property. This is important because real market values are based on such factors as location, size, improvements, market conditions, taxes, property condition, neighborhood condition, availability of financing, and interest rates. Changes in these or other factors could cause a change in property values. Also, because assessed market values are simply estimates, separate appraisals of the same property may result in differing valuations.

Taxing Authorities

The Greyhound site is subject to three property tax authorities: Hennepin county, the City of Minneapolis, and Special School District 1. The site is also subject to the Miscellaneous Levies Rate assessed by the Metropolitan Council (a consolidation of funds for mosquito control, council bonds and interest, Right-of-Way Loan Fund, and the Metropolitan Transit District).

Property taxes are assessed by each of the taxing authorities at an annual mill rate. The County collects all the revenues and distributes then to the individual authorities (in this case, the cities and the school District). The County also collects special

TABLE 3.9-2

PROPERTY VALUES AT GREYHOUND SITE AND ADJACENT LANDS[1]

Site	On-Site Parcels: No. of Parcels	On-Site Parcels: Assessed Market Values (ASM)	On-Site Parcels: Total ASM	Adjacent Parcels[2]: Assessed Market Values	Adjacent Parcels[2]: Land Uses
Greyhound	12	\$762,000; \$729,000; \$590,000; \$188,000; \$ 29,500; \$ 27,500; \$ 25,500. Remaining five are tax-exempt railroad parcels.[3]	\$2,351,500 (excluding tax-exempt parcels)	\$2,310,000; \$1,150,000; \$ 507,000	Industrial and commercial properties

[1]All information obtained from Hennepin County Property Tax Records

[2]Representative parcels; does not include all adjacent properties.

Source: HDR, 1985

assessments for specific properties as part of city levies. These special assessments--designed to pay for civic improvements (streets, utilities, or other public works projects) that will benefit the assessed properties--are included in the total taxes on a property. Unlike regular taxes, however, they are collected only until the levy is fully paid (the taxes are continual).

Community Services

The City of Minneapolis is responsible for police and fire services at the Greyhound site. Fire protection is provided on a permanent paid staff basis. Fire stations are located in the greatest number near the Central Business District, and there are three fire stations located within one mile of the site. Response time to the site is estimated at 4-6 minutes.

3.9.3 Bloomington

Community Overview

Bloomington is primarily a residential neighborhood. 45 percent of Bloomington's land area is currently dedicated to residential use. Most of the city's neighborhoods are stable residential neighborhoods. Along with residential development, industrial and public uses are also found. The city is also a major employment center.

Population, Housing, and Employment

Population

The 1980 population of Bloomington was 81,831, a slight decrease from the 1970 population of 81,970. 2.7 percent of the city's population resides within census tract 256.02, where the proposed resource recovery facility is located. The median age of the city's population is on the rise, as the number of elderly persons is increasing. In 1980, 6 percent of the Bloomington population was over 65. Within the study area census tract, the comparable percentage is 7 percent. This percentage is considerably less than the whole of the Hennepin County-Minneapolis Metropolitan Area where 10.8 percent of the population is over 65. The median age of the Hennepin County Metropolitan area is 30. The median age of Bloomington and the study area census tract is 29.9 and 30.8, respectively.

In 1980, 2.9 percent of the city's population was classified as a minority racial group: minorities were distributed relatively equally in all census tracts. The larger minority groups were blacks and asians and pacific islanders. In contrast, over 69 percent of the population of the Hennepin County Metropolitan Area is minority, with blacks representing the largest group.

In 1980, the median income of Bloomington's 28,533 households was $26,083, which is somewhat higher than the median income of the Hennepin County SMSA which is $20,077. The median income of the 20,760 owner-occupied households within Bloomington was $30,302. Within the study area census tract, there are 788 households with a median income of $26,296, which is lower than the median income of Bloomington as a whole.

In sum, the population of the census tract in which the proposed transfer facility would be located is, on average, slightly older than the remainder of Bloomington, but on average, younger than the population of the metropolitan area. The minority population within the proposed study area is small. Further, the median income of the population within the study area census tract is 13 percent less than the median income of Bloomington's population, but higher than the median income of the metropolitan area.

Housing

Between 1970 and 1980, the number of dwelling units within Bloomington increased from 22,300 to 29,500. Approximately 70 percent of Bloomington housing is detached single family units. Of the remaining units, a large number are found in buildings of 20 or more units.

Whereas the median value of owner-occupied homes within the Hennepin County Metropolitan area is $63,600, the median value of owner-occupied homes within all of Bloomington is $70,700, and within the study area census tract, $75,100. According to the City of Bloomington Comprehensive Plan, the Greater Minneapolis Area Board of Realtors Multiple Listing Service reported that during the period 1969-1979, the housing prices in the western portion of the city (in which the site is marginally located) increased 169 percent. Prices in the eastern portion increased 156 percent. By way of comparison, prices for all homes in Minneapolis and surrounding communities increased 141 percent.

Additional comparative housing characteristic are as follows:

- Whereas 20,889 homes, or 72 percent of all homes in Bloomington are owner occupied, 57.4 percent of the homes in the study area census tract are owner occupied;
- whereas 2 percent of the homes in Bloomington are occupied by minorities, 1.6 percent of homes in the project area census tract are minority occupied;
- whereas the vacancy rate in Bloomington is 3 percent, the vacancy rate in the study area census tract is 1.4 percent.

Employment

General characteristics of the Minneapolis-St. Paul labor market area are discussed in Section 3.9.2. This information is useful in that 1984 data on employment are not generally available on an individual town basis, but instead are provided for the Minneapolis-St. Paul Labor Market area as a whole, given that the entire metropolitan area forms a more meaningful economic unit.

The 1980 U.S. Census can be used to complement the Minneapolis-St. Paul labor market area data. This census data reveals that the 1980 total civilian labor force within the study area census tract was 1254 with 3 percent unemployed. Comparable figures for Bloomington as a whole are 48,648 and 2.6 percent, respectively.

The mix of occupations within the study area census tract is similar to the occupation mix of Bloomington as a whole. The largest proportion of persons within both units are employed in technical, sales and administrative support functions, with managerial and professional specialty occupations, and wholesale and retail trade being the second and third most common occupations. In decreasing order of importance for both the study area census tract and Bloomington are operators, fabricators, and laborers, and precision production, craft repair operations, and mining, forestry, and fishery occupations.

Property Values

The assessed market values of land parcels at the proposed transfer station site and selected lands adjacent to the site are included in Table 3.9-3.

Taxing Authorities

The Bloomington East site is subject to the following taxing authorities: Hennepin County, the City of Bloomington, Independent School District 271, and the Nine Mile Creek Watershed District. The site is also subject to the miscellaneous levies rate assessed by the Metropolitan Council. A discussion of property tax assessment applicable to the proposed site is found in Section 3.9.2 Taxing Authorities.

Community Services

The City of Bloomington is the police and fire authority for the Bloomington East property. Fire protection is provided by an all-volunteer department. There are six fire stations throughout the community. Fire station 1 at 600 East 95th Street is located within one mile of the site. This station has two pumpers, a 75-foot aerial platform, hose connection, and utility truck, and serves as headquarters and a training center for the fire department.

3.9.4 Brooklyn Park East

Community Overview

Brooklyn Park is a suburb northwest of Minneapolis, which has grown rapidly in the last two decades and which is still developing. The city does not contain large commercial or industrial areas, and much of the residential labor force works outside Brooklyn Park, elsewhere in the metropolitan area. The Brooklyn Park Comp Plan 80s notes that the city actively encourages location, expansion, and

TABLE 3.9-3

PROPERTY VALUES AT BLOOMINGTON EAST TRANSFER STATION

SITE AND ADJACENT LANDS[1]

	On-Site Parcels			Adjacent Parcels[2]	
Site	No. of Parcels	Assessed Market Values (ASM)	Total ASM	Assessed Market Values	Land Uses
Bloomington East	1	$648,000	$648,000	$522,800; $394,200; $165,100	Industrial and commercial properties

[1]All information obtained from Hennepin County Property Tax Records

[2]Representative parcels; does not include all adjacent properties

Source: HDR, 1985.

development opportunities for commerce and that it is the city's long range goal to become a labor importer. At the same time, the plan notes that different types of housing should be encouraged and that the integrity and value of existing residential neighborhoods should be preserved.

Population, Housing, and Employment

Population

From 1970 to 1980, Brooklyn Park's population increased from 26,230 to 43,222, marking a second decade of rapid growth. The population of the census tract in which the proposed transfer station is located, census tract 268.06, numbered 555 persons in 1980. Census tract 268.06 encompasses the area north and west of the site for over one mile, and extends to I-94, approximately 1/4 mile to the south, and to Rt. 52, one quarter of a mile to the east. Census tracts 268.09 and 268.08 are located south, and east, respectively, of 268.06. Within Brooklyn Park and these three census tracts, the median ages of the respective populations are similar, as indicated below;

Location	Median Age
Brooklyn Park	25.2
Census tract 268.06	24.5
Census tract 268.08	25.5
Census tract 269.09	22.9

Of the 43,332 persons within Brooklyn Park, 96 percent are white. Similarly, 97 percent of census tract 268.06, 96 percent of census tract 268.08, and 93% of census tract 268.09 are white.

The median incomes within Brooklyn Park and the census tract in which the proposed facility would be located are more than ten percent higher than in the Hennepin County metropolitan area. However, the mean income of Brooklyn Park, $23,087.00, and the mean income of census tract 268.06, $23,754, are slightly lower than the Hennepin County Metropolitan area mean of $23,924.

In sum, the census tract in which the proposed facility would be located is similar in racial composition, age structure, and income to the community of Brooklyn Park as a whole, as is the census tract east of the facility. However, the census tract 1/4 mile south of the facility, separated by I-94, is comprised of a slightly younger population, with a slightly larger minority constituent (79 percent).

Housing

Between 1970 and 1980, Brooklyn Park experienced a large housing boom, growing from 7846 units in 1970 to 15,803 units in 1980. The comparable growth rate in Hennepin County was 18.4 percent. According to the Brooklyn Park Comprehensive Plan's inventory of housing, 54 percent of the city's housing stock in 1980 was single family dwellings, an additional 36 percent was apartments, and the remainder two family units and townhouses. The city's plan also indicates that houses in substandard condition and in need of immediate repair are not concentrated within one community, but are scattered throughout the city.

The 1980 census data shows that within the city, the median value of owner occupied homes was $66,900. Approximately 57 percent of the city's housing stock was owner-occupied in 1980, and the city's vacancy rate was 3.3 percent. The median value of the 174 owner occupied homes within census tract 268.06 was $61,600, approximately 8 percent lower than the city average. The percentage of owner occupied units within the study area census tract was higher (71.3%) than the city as a whole, while the vacancy rate was comparable.

Employment Characteristics

In 1980, unemployment within Brooklyn Park was 4.0 percent. Of a civilian labor force of 24,597 persons, 975 were unemployed. Within census tract 268.06 (where the proposed transfer station would be located), 7.4 percent of the civilian labor force of 272 persons was unemployed, according to U.S. Census 1980 figures. In the more populated census tract east of the facility, 3.5 percent of the 7894 person labor force was unemployed in 1980; in census tract 268.9 south of the facility, 7.0 percent of the 2213 percent labor force was unemployed.

Within Brooklyn Park, and census tracts 268.06, 268.08, and 268.09, the largest percentage of people were employed in technical, sales, and administrative support occupations. Managerial and professional specialty occupations was the next largest occupational sector, followed by operators, fabricators, and laborers.

Property Values

The assessed market values of land parcels at the proposed transfer station site and selected lands adjacent to the site are inlcuded in Table 3.9-4.

Taxing Authorities

The Brooklyn Park East site is subject to three property tax authorities: Hennepin County, the City of Brooklyn Park and Independent School District 279. The site is also subject to the Miscellaneous Levies Rate assessed by the Metropolitan Council. A discussion of property tax assessment applicable to the proposed site is found in Section 3.9.2, Taxing Authorities.

Community Services

The City of Brooklyn Park is the police and fire authority for the Brooklyn Park East property. The closest fire station is approximately one mile away, at 8104 Brooklyn Boulevard.

TABLE 3.9-4

PROPERTY VALUES AT BROOKLYN PARK EAST TRANSFER STATION AND ADJACENT LANDS[1]

	On-Site Parcels			Adjacent Parcels[2]	
Site	No. of Parcels	Assessed Market Values (ASM)	Total ASM	Assessed Market Values	Land Uses
Brooklyn Park East	3	$175,500; $ 80,000; $ 48,000	$303,500	$848,500; $75,000; $ 64,100	Industrial and commercial properties; some residential

[1]All information obtained from Hennepin County Property Tax Records

[2]Representative parcels; does not include all adjacent properties

Source: HDR, 1985.

3.9.5 Hopkins

Community Overview

Hopkins is an older community, with a variety of dwelling types that makes it possible to appeal to a full range of ages and economic capabilities. The city is primarily developed. The city not only represents an established residential community, but it is also an employment center. The 1990 Comprehensive Plan of the City indicates that the actual daytime population is larger than the nighttime population. Employment shifts of major proportion are continuing to occur in Hopkins: major industries include Honeywell, Super Valu, and Red Owl.

Population, Housing, and Employment

Population

1980 census data for Hopkins indicates that within the last decade the city's population grew 14.2 percent. The census shows that of the 15,336 persons in Hopkins, approximately 98 percent were white. The largest racial minorities were Asian and Pacific Islander, followed by black. The median age within Hopkins was 29.9, similar to the median age of the Hennepin County Minneapolis-St. Paul Metropolitan Area. Approximately 15 percent of the city's population is 65 or older.

The city is divided into three census tracts. The proposed transfer station would be located within census tract 234. County Road 3 and Milwaukee St. Paul and Pacific railroad tracks form the northern boundary of census tract 234. Lands north of county road 3, and west of county road 18, are within census tract 233; lands north of county road 3 and east of county road 18 are within census tract 232. Within census tract 234 where the proposed facility would be located, there are residential lands within one half a mile of the facility.

Census tract 234 contains 32 percent of the City's population (about 5,000 people). Its median age is 28.7, comparable to the City's median age of 29.9. Ten percent of the census tract's population is 65 or older. Similar to the City of Hopkins as a whole, the population within census tract 234 is primarily white. Less than three percent of the census tract 234 population is a racial minority. Neighboring tracts are of similar racial composition.

The mean and median incomes of households within census tract 234 are $23,650 and $21,299, respectively. The city mean and median incomes are lower - $17,318 mean; $20,952 median.

Housing

The percent change in the city's housing stock between 1970 and 1980 was 49.3, more than twice the Hennepin County Minneapolis Metropolitan Area rate of increase. Total year round housing units in Hopkins in 1980 were 7245. The 1990 comprehensive plan for Hopkins states that the city has one of the most integrated housing inventories in the metropolitan area. The plan presents the following breakdown:

Unit Type	Percentage of City Stock
Single Family	52
Duplex	11
Multiple Family	35
Mobile Home	2

An increase in rental occupancy accompanied the increase in housing construction within the last decade. According to the 1980 census data, only 38.5 percent of Hopkins' year round housing was owner occupied, in contrast to 66 percent in the Hennepin County-Minneapolis Metropolitan area. In census tract 234, the owner occupancy percentage was 46.6. 1980 vacancy rates for the entire city and for census tract 234 were 2.5 percent, and 4.3, respectively. Whereas the median value of owner-occupied housing units within the Hennepin Metropolitan area was $63,600, the comparable figure for Hopkins was $61,100 and for census tract 234, $61,500.

Employment

In 1980 the unemployment rate within Hopkins was 2.8 percent, which was lower than the county rate of 3.7 percent. Within census tract 234, the 1980 census data indicates a 2.5 percent unemployment rate. Of a civilian labor force of 3106 persons, 78 were unemployed.

The 1990 Comprehensive Plan of Hopkins notes that the most characteristic factor in Hopkins' occupational structure is the distribution of major occupational groups, which is indicative of a broad base of income, educational, and age levels. 1980 census data shows that within census tract 234, the largest percentage of the labor force (44 percent) was in technical, sales and administrative support positions. 28 percent of the labor force was engaged in managerial and professional specialty occupations, and 11 percent in service occupations. The remaining 17 percent of the employed population were in precision, production, craft, and repair; operators, fabricators, and laborers; and farming, forestry, and fisheries. These percentages parallel the occupational distribution of the city's entire labor force.

Property Values

The assessed market value of selected lands adjacent to the site are included in Table 3.9-5. There are no records of assessed values for parcels within the Hopkins-DOT site because the site is on tax exempt lands.

Taxing Authority

A discussion of property tax assessment applicable to the proposed site is found in Section 3.9.2 Taxing Authorities.

TABLE 3.9-5
PROPERTY VALUES OF ADJACENT LANDS
TO THE HOPKINS-DOT SITE[2]

Site	Adjacent Parcels[2] Assessed Market Value	Land Uses
Hopkins-DOT	$1,779,400; $ 63,300; $54,900	Industrial, commercial, and residential properties

[1]All information obtained from Hennepin County Property Tax Records
[2]Representative parcels; does not include all adjacent parcels

Source: HDR, 1985.

Community Services

The City of Hopkins is the police and fire authority for the Hopkins-DOT property. The city operates a fire station facility at First Street and Eleventh Avenue, which is less than one mile from the site. The fire department has a volunteer staff.

3.9.6 Minneapolis South

Population, Housing, and Employment

Population

Between 1970 and 1980, the Minneapolis population declined by 14.6 percent. In 1980, the city's population was 370,951. Within census tract 73, where the transfer facility is located in the south central portion, there were 2458 persons. Census tract 73 is bordered on the south by census tract 86, and on the west by tract 79. Both these tracts contain residential neighborhoods within one-half mile of the transfer facility. Their respective populations were 2073 and 2468.

The median age within census tract 73 is 24.6: 264 people within the tract are 65 or older. The median age within the city of Minneapolis is 29.8. Of the 2458 persons in census tract 73, approximately 50 percent are white; 42% are American Indian, Eskimo, or Aleut; and the remaining population are black, Asian or Pacific Islanders, or other. Within census tracts 79 and 86 more than 75 percent of the population is white, with the next largest racial group being American Indian, Eskimo or Aleut.

In 1980, the median and mean income of Minneapolis' 162,171 households were $14,351 and $17,775, respectively. The 1980 median and mean incomes within census tract 73 were $9677, and $13,806, respectively.

In sum, the population within census tract 73 is generally a younger population than the city as a whole and contains a greater percentage of minority groups than does the city. Further, the tract is characterized as generally lower income than the city as an average. Neighboring census tracts to the west and south are more similar to the city in terms of racial, income, and age characteristics.

Housing

The Minneapolis Plan for 80s classifies housing within census tracts by three distinct groups:

- o Protection areas - census tracts having a low preparation of substandard units;
- o Reinforcement areas - census tracts having a significant proportion of substandard areas; and
- o Redirection areas - census tracts having a high proportion of substandard units.

Census tract 73 as well tract 79 to the west fall within the redirection area classification. According to the Plan and 1980 census data, these are tracts characterized by a low level of owner occupancy and high levels of substandard condition housing. The plan estimates that between 26-40 percent of the one and two family units are in substandard condition. The median values of owner occupied home, within census tracts 73 and 79 are $33,000 and $36,300, respectively. Owner occupancy rates are 25.6 percent and 34.7 percent, respectively.

Census tract 85 south of the site is classified as a reinforcement area in the plan for the 1980s. In this tract, the median value is $45,000 and 46.3 percent of the homes are owner occupied.

Employment

1980 U.S. Census data for tract 73 indicates an unemployment rate of 10.5 percent. Of a civilian labor force of 1061 persons, 112 were unemployed. Thus the 1980 unemployment rate within this census tract was more than twice as high as the city's. In the neighboring tracts, the unemployment rate in both was nine percent. Within census tract 73 the largest sector of employment (29%) was operators, fabricators, laborers; followed by service occupations (28%), technical, sales, and administrative support occupations (21%); managerial and professional specialty occupations (17%); and precision production, craft, and repair operations (3%). In neighboring census tracts, technical, sales and administrative support occupations comprised the largest component of the labor force.

Property Values

The assessed market value of selected lands adjacent to the site are included in Table 3.9-6. There are no records of assessed values for parcels within the Minneapolis South site because the site is on tax-exempt lands.

Taxing Authority

Taxing authorities applicable to the proposed Minneapolis transfer station are described in section 3.9.2.

Community Services

Police and fire protection within Minneapolis is described in Section 3.9.2 Community Services. Two fire stations are located within close proximity to the Minneapolis South Transfer Station. Response time to the transfer station is 4 minutes.

TABLE 3.9-6
PROPERTY VALUES OF ADJACENT LANDS
TO THE MINNEAPOLIS SOUTH TRANSFER STATION[1]

	Adjacent Parcels[2]	
Site	Assessed Market Value	Land Uses
Minneapolis South	$110,000; $ 20,000; $ 15,000	Industrial and commercial properties; some older residential

[1]Except where noted otherwise, all information obtained from the Hennepin County Property Tax Records.
[2]Representative parcels; does not include all adjacent properties.

Source: HDR, 1985.

3.10 Cultural Resources

3.10.1 Resource Recovery Facility

3.10.1.1 Historic Resources

The site for the proposed resource recovery facility is currently occupied by a bus garage, a commercial building, a railroad spur, a large parking area, and a small abandoned storage building. These structures do not possess unique historical value, as determined by the Minnesota Historical Society. The site and the structures on site are not included and have not been nominated for inclusion on the National Register of Historic Places.

Further, the site's structures have not been identified, catalogued, or recommended for historic preservation designation by the Minneapolis Heritage Preservation Commission. The Commission has been actively involved in historic preservation in the City, and has designated a number of historic sites nearby for historic preservation. The closest historic sites include the Butler Brothers Building, now Butler Square on 2nd Avenue North; and the National Biscuit Company, now Appliance Parts Company on Third Ave. North. The significance of these sites, and a number of others within the North Loop Warehouse Plant District, has resulted in this area being designated as one of the city's five historic districts (City of Minneapolis, 1982). The proposed site is not within the district (Thorvig, 1985).

The site is a previously disturbed industrial area. As such, the Minnesota Historical Commission has determined that the site does not contain properties of archaeological value.

3.10.1.2 Aesthetics

Views from around each of the proposed sites were reviewed to determine the most sensitive view of each site. Selections for representation consider the number of people which would see a particular view, sensitivity of receptors, the most unimpaired view, and land uses dissimilar to the character of the proposed facilities. If a particular view was not selected for illustration, it was considered to be of similar or lesser visual quality and impact potential to the views discussed here. Because the facility would have a similar appearance when viewed from different angles, the degree of aesthetic impact is primarily dependent on the sensitive receptor. The views from nearby land uses, of the site including the MTC facility, reveal a Greyhound bus terminal garage in various stages of repair. Much of the site consists of broken concrete and paved areas with grass, weeds and shrubs growing throughout the site. An abandoned storage shed is present on the west side of the site. A railroad repair track and double track main line can be seen at the southern boundary of the site. From Sixth Avenue North, the downtown business district, including many multi-story officer towers can be viewed. The site is out of character with more modern and rehabilitated buildings such as MTC and Butler Square Buildings, surrounding it.

3.10.2 Bloomington East Transfer Station

3.10.2.1 Historic Resources

The site for the proposed Bloomington East Transfer Station is a partially developed industrial parcel of land surrounded by light industrial and commercial uses. Structures on site house the operations of Hose, Inc. and Conveyors Inc. The Minnesota Historical Society has reviewed the site and determined that it does not contain properties of historical or archaeological value.

The City of Bloomington developed from a prairie, marsh, forest, farming community, to a city of approximately 85,000. This evolution has been documented by historical research and evaluation. The report, Bloomington: A Community Survey of Historic Sites, identifies five prehistoric mound group sites within the City. However, these existing mound groups have been confined to the Minnesota River Bluff area more than one mile south of the facility. The community survey also provides a list of 47 historic sites within the City that comprise the Bloomington Historical Register. This preliminary survey lists no sites within the vicinity of the proposed development (Comprehensive Plan, Bloomington, Minnesota, 1984).

3.10.2.2 Aesthetics

A photograph of the Bloomington East site was taken from the northeast (Figure 4.11-2). The view is from the Holiday Inn Hotel at 1201 West 94Th Street. It represents the visual impressions of hotel residents and represents a sensitive view of the site. Views from other angles are from nearby industrial uses and I-35W. The photo shows newer industrial and commercial buildings, mostly single-story structures with well-maintained concrete or metal exteriors, dominating the site and the surrounding properties. The site itself is occupied by a single building with a parking lot and vehicle storage areas. Large cylinders of industrial materials are stored in open areas near the building. The area has no special scenic qualities, and is typical of the industrial nature of the area.

Railroad tracks are to the east and north edges of the site. There are patches of scrub vegetation in vacant areas within the site boundaries which can be seen from nearby vantage points.

3.10.3 Brooklyn Park East Transfer Station

3.10.3.1 Historic Resources

There are no structures of historic, architectural, cultural, or engineering significance on site. One 20th century residence is located in the southeast corner of the site.

However, because of proximity to Shingle Creek, and the role of watercourses in prehistoric and historic times in providing food, shelter, fuel, and transportation, a reconnaissance archaeological shovel test was performed. The Minnesota Historical Society had made a preliminary assessment that the site had a greater than average chance of containing previously unreported archaeological resources. There was also documentation of numerous prehistoric buried grounds.

The reconnaissance test, however, produced negative results. These consisted of shovel excavations and exposed soil examinations. No historic or prehistoric cultural debris were located in any of the test units or areas examined through pedestrian surface transects. The survey did reveal, though, that some parts of the site had been previously disturbed by cultivation and possibly a former gravel-quarrying operation. Based on these results the Minnesota Historical Society has determined that the site does not possess archaeological significance (HDR, 1985).

3.10.3.2 Aesthetics

A photograph of the Brooklyn Park East site was taken from the northwest and is shown in Figure 4.11-3. The view from the Northland Meadows Office Park is represented in the illustration. Residents to the east of the site would also view the facility. As the photo depicts, the area within the site boundary can be seen to be undeveloped and vegetated with thick stands of trees and undergrowth. A steel-frame building under construction adjacent to the site has a limited view of the area proposed for development. There are other commercial and industrial activities adjacent to the site, as well as approximately six residences.

3.10.4 Hopkins Transfer Station

3.10.4.1 Historic Resources

The Hopkins-DOT transfer station site is in the northwest corner of a 41-acre parcel currently used by the Hennepin County Department of Transportation (DOT) for storage and maintenance of vehicles, equipment, and construction material. The entire site has been disturbed.

The Minnesota Historical Society has reviewed the site and determined that it does not contain properties of historical or archaeological value. Additionally, the Hopkins Historical Society has inventoried late 19th century and early 20th century buildings within the city, and has deemed that no structure on-site or in the immediate vicinity merits preservation as a historical landmark. Historical landmarks in the city as identified by the Hopkins Historical Society are limited to the Opera House at 814 Excelsior Blvd.

3.10.4.2 Aesthetics

A photograph of the Hopkins-DOT site was taken from a residential area southwest of the site and is presented in Figure 4.11-4. The view depicted shows the direct and unobstructed view of the homeowners to the southwest. Other visual receptors are residents further east on Fifth Street South, the apartment residents north of the site, nearby food warehouses, southbound traffic on County Road 3, traffic in front of the facility, and area residents driving by the facility. The future transfer station would be one of the first structures viewed upon entering Hopkins. The City of Hopkins has expressed concerns about visual impacts (Rapp, 1985). The view from the north is interrupted by a highway, a railroad track, and a lumber company. The facility would however be visible from this area. The southern view of the site is broken by the existing fencing and shrubbery on the DOT property boundary. Both the eastern and western views of the site are from industrial areas. The view presented shows maximum visibility of the facility from the most sensitive receptors. The dominant features of the site are several vertical and horizontal storage containers and several transmission lines and parked trucks. Trucks and storage containers are owned by the Hennepin County DOT and stored on the site to support the County's highway construction and maintenance activities. The site contains a building and considerable parking and exposed soil and piles (sand and salt). A perimeter chain-link fence with visual screening, shrubs, and vegetation surround the site providing some screening of existing site structures, storage piles, equipment and other activities. The present visual condition of the site holds no aesthetically pleasing features and has no special scenic qualities. Existing structures and land uses are described specifically in Section 3.6, land use. Much of the area consists of industrial buildings and commercial structures. There are residential units, including apartment structures and single story residences within 700 feet of the site.

3.10.5 Minneapolis South Transfer Station

3.10.5.1 Historic Resources

The proposed site is now occupied by a solid waste transfer station that has been modified from an old incinerator. The entire site has been disturbed. The Minnesota Historical Society has reviewed the site and has determined that it does not contain properties of historical or archaeological significance. Similarly, the Minneapolis Heritage Preservation Commission has not identified the site or its surrounding environs as possessing historical or architectural value.

3.10.5.2 Aesthetics

A photograph of the Minneapolis South site was taken from the northeast as shown in Figure 4.11-5. The site is presently used as a solid waste transfer station (converted from an incinerator). It is bounded on two sides by industrial and commercial buildings built mostly of concrete and masonry. The Pioneers and Soldiers Cemetery with large stands of mature trees borders the site on the south and west. The general area is industrial. The view of the site shows an existing incinerator structure. The southern part of the western view is well screened by the trees in the cemetery. Residences one block east of the site are separated from the facility by other commercial and industrial uses.

The dominant visual features of the site are the transfer station structures and a chimney (not now used) from the old incinerator. Ground-level development in the vicinity consists of mostly parking and storage facilities, city streets, and railroad tracks. Because of the substantial industrial development, the site has no special scenic qualities.

3.11 Ecological Resources

3.11.1 Resource Recovery Facility

The site proposed for development of the resource recovery facility is located on the northern edge of downtown Minneapolis in an area devoted primarily to industrial and commercial activities. The 14.6 acre site is bounded to the north, east and west by roads and highways and to the south by railroad tracks. Existing development on the site consists of a parking area, several buildings and a railroad spur. These facilities are concentrated in the eastern two-thirds of the site. The western portion is covered by broken concrete interspersed with patches of deciduous shrubs and saplings and herbaceous vegetation. These areas are very disturbed and support primarily weeds and early successional species. The proposed resource recovery facility site provides only low quality habitat for wildlife as a result of its isolation within an industrial area, the limited extent of vegetated area and the lack of community diversity. The only species expected to use on-site habitats are small mammals and birds that are tolerant of or benefit from human disturbance and activity.

3.11.2 Bloomington East Transfer Station

The 5-acre site proposed for the Bloomington East Transfer Station is located in an industrial area in the City of Bloomington. It is bounded to the south by 96th Street and to the north and east by railroad spurs. It is surrounded on three sides by industrial and commercial properties. There is a small park directly west of the transfer station site. The central portion of the park is open. Mowed grass and a small stand of mature mixed hardwoods and conifers persist in the southeastern corner. The ground beneath these trees is maintained as grass so that a natural understory has not developed. Approximately 40 percent of the proposed site is covered by impervious surface (HDR, 1985). Much of the remaining 60 percent is covered with gravel although sparse herbaceous vegetation is established on the open area in the northeastern portion of the site.

The proposed Bloomington East Site and the adjacent park provide only limited habitat for wildlife. Songbirds and small mammals may use the trees and grassy areas but the absence of a natural understory, the low diversity of community types and the proximity of the site to industrial activities restrict use of the site to those species tolerant of human disturbance.

3.11.3 Brooklyn Park East Transfer Station

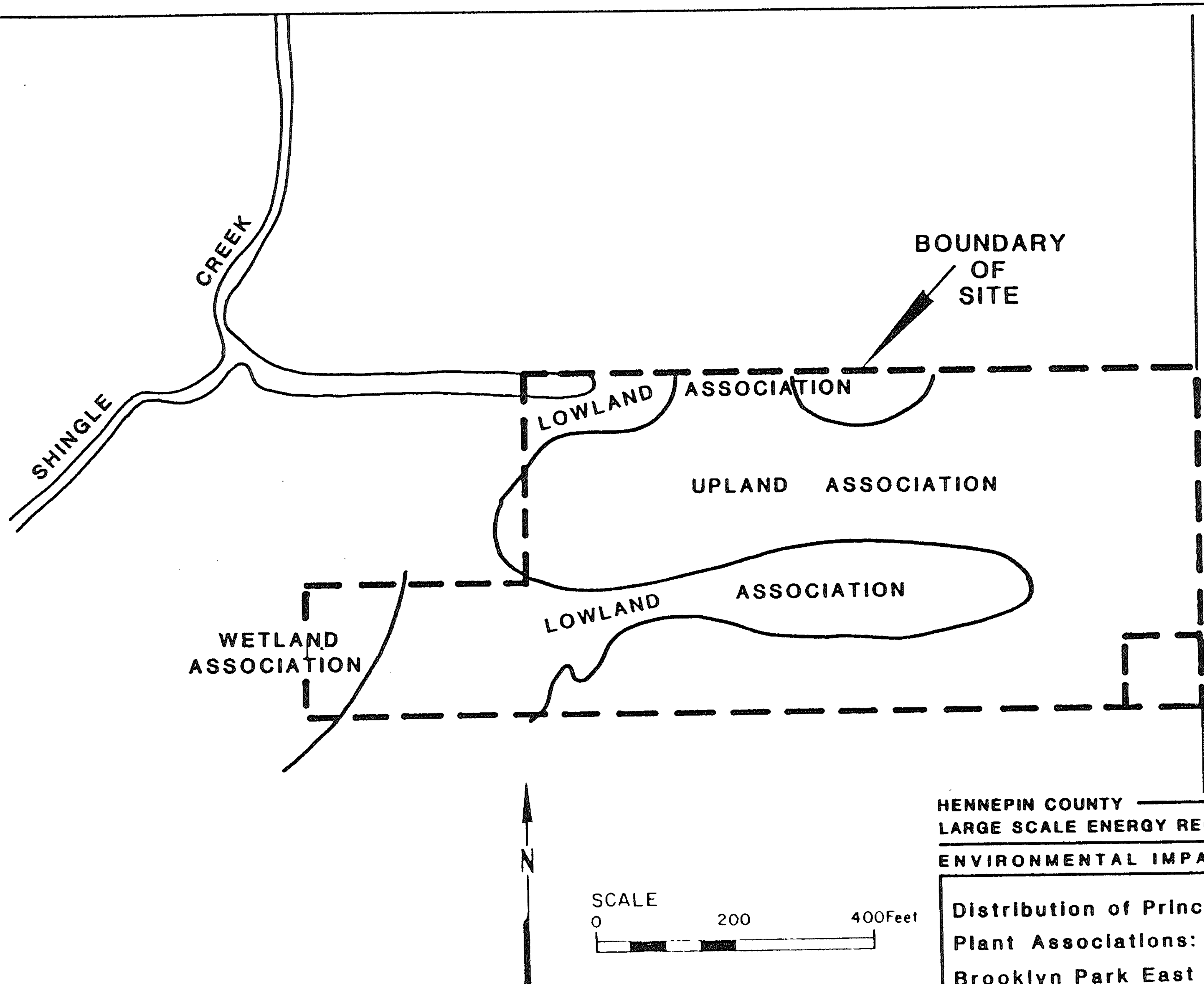
The 12 acre site proposed for construction of the Brooklyn Park East Transfer station is located on the western edge of Winnetka Avenue in the City of Brooklyn Park. A mixture of industry and open grasslands surround the site to the north and south. The Shingle Creek Parkway, an undeveloped conservancy district under the authority of the Brooklyn Park Parks Department borders the transfer station to the west. The park follows the floodway of Shingle Creek for approximately 2.25 miles from its headwaters in Eagle Lake to its outlet to the Mississippi River. The park encompasses the wetland area associated with Shingle Creek and has a maximum width of 600 feet. At the site of the proposed transfer station, the park is approximately 100 feet in width, but it does not include any of the wetland areas on the site. Construction of a hardsurface running and biking trail along the western side of Shingle Creek has been proposed although no date for this project has been announced (Berg 1985). The park is not managed for wildlife, but migrating waterfowl use the wetlands and open water during spring and fall migration. Small and medium-sized mammals, such as muskrats, marsh birds and reptiles would also be expected to use this area for breeding and foraging. Large game (deer) trails have not been observed in the park (Berg 1985). Shingle Creek provides habitat for small aquatic organisms. Since it freezes over during the winter, it does not support a permanent fish population (Berg 1985).

Except for one residence, the proposed transfer station site is undeveloped. An upland plant community predominates on most of the site where soils are sandy and well-drained (Figure 3.11-1). Since the area was at one time cleared and cultivated, most of the native woodland species that originally grew here have been replaced by weeds and alien species typical of disturbed habitats (Milske 1985). The existing vegetative cover is dominated by herbaceous grasses and herbs. A few ash (Fraxinus pennsylvanica) and cottonwood (Populus deltoides) are regenerating sporadically on the upland portions of the site (HDR 1985).

A shallow depression in the south-central part of the site and much of the southwestern corner support a lowland plant association (Figure 3.11-1). The extent of this community type is approximated by the limits of the Shingle Creek flood fringe (Figure 3.11-2). Soils in this area are sandy but less well-drained than upland soils (HDR 1985). The lowland habitat supports many of the herbaceous species found in the upland community, such as foxtail (Setaria sp.), Panicum spp., and goldenrod (Solidago sp.); but the community also includes an overstory layer of woody shrubs and trees, such as green ash, cottonwood, alder (Alnus sp.), boxelder (Acer negundo), American elm (Ulmus americana) and willow (Salix sp.) (HDR 1985). These species are typical components of floodplain communities.

The third plant community found on the proposed site is a shallow freshwater marsh located in the extreme southwestern and northwestern corners (Figure 2-2)(HDR 1985). This wetland, which is associated with Shingle Creek, has been designated as a Type-3 wetland by the Minnesota Department of Natural Resources (DNR)(DNR 1984). Vegetation in and bordering the wetland differs markedly from that associated with the adjacent lowland cover type. The marsh is dominated by cattail (Typha latifolia), canary reed grass (Phalaris sp.) and sedges (Carex spp.); small willows line its edge (HDR 1985). A small arm of Shingle Creek that extends onto the site along the northwestern boundary constitutes the only open water on the site. The wetland in the southwestern corner did not retain any standing water following a rainy period in August 1985 (Milske 1985).

The Brooklyn Park site provides good habitat for upland wildlife, particularly rodents, rabbits, shrews, grassland birds and raptors that hunt in open fields (HDR 1985). The wetland habitat on-site is limited in both its extent and its structural diversity so that alone its intrinsic value to wetland wildlife is relatively low. However,

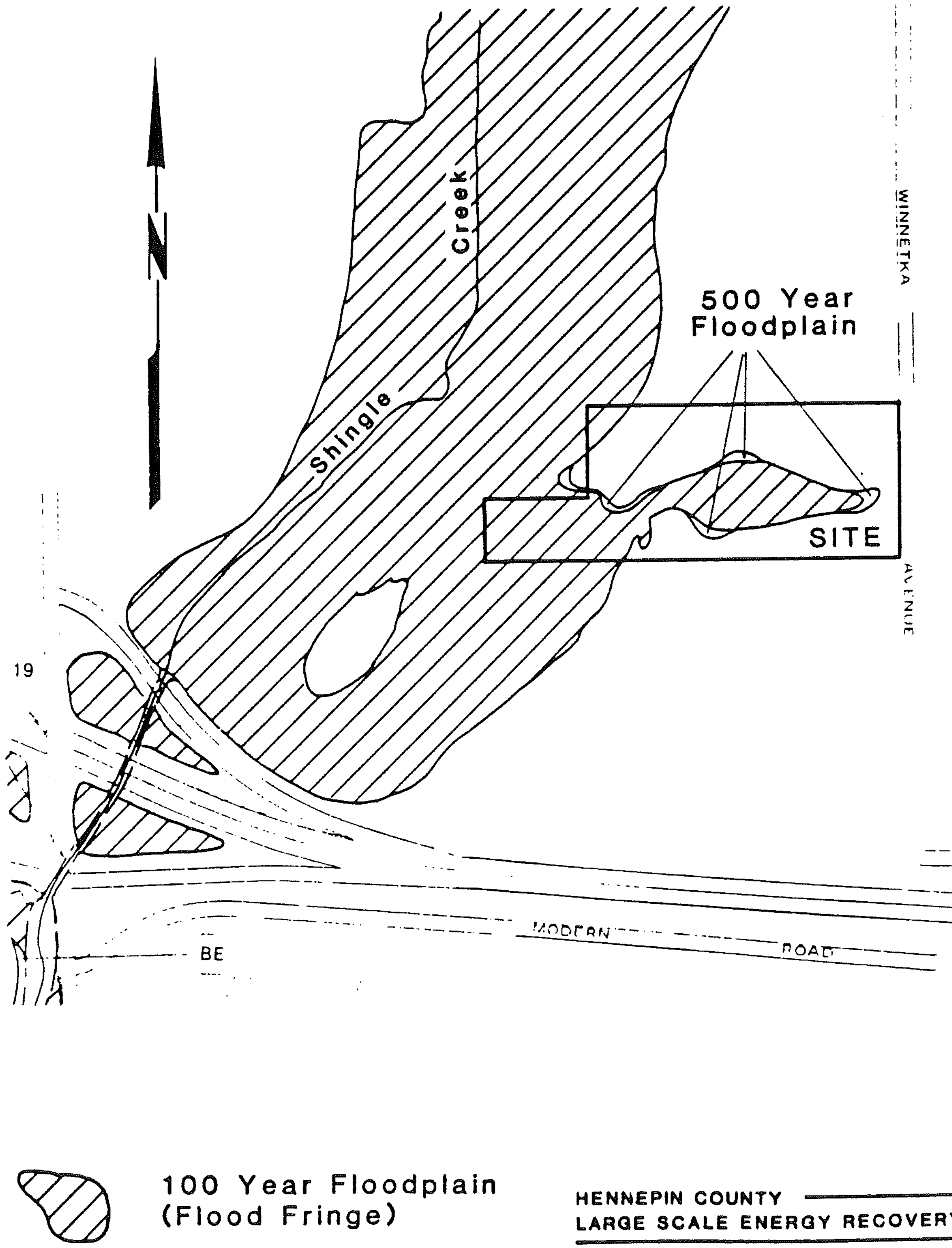


HENNEPIN COUNTY
LARGE SCALE ENERGY RECOVERY PROJECT

ENVIRONMENTAL IMPACT ANALYSIS

Distribution of Principal Plant Associations: Brooklyn Park East Site

Figure 3.11-1



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Floodplain Map:
Brooklyn Park East Site

Figure 3.11-2

SOURCE: City of Brooklyn Park, MN.

when evaluated in association with the more extensive Shingle Creek wetlands, open water areas and upland communities, it's value to wildlife, especially waterfowl and edge-preferring species is greatly increased. The presence of protected or rare species of plants or wildlife on or in the vicinity of the proposed site is not expected. A DNR/Natural Heritage program data search did not identify any records of threatened, endangered or unique species on the site (DNR 1985a). Although a field survey would be necessary to confirm the actual presence or absence, DNR has determined that such a survey is unnecessary because of the lack of appropriate habitat in the project area (DNR 1985b).

3.11.4 Hopkins Transfer Station

The proposed Hopkins Transfer Station site is located in the northwestern corner of an existing Hennepin County DOT storage site in the City of Hopkins. It is bordered by roadways to the north and west and by additional DOT land to the east and south. All vegetation has been removed from the site and replaced with artificial fill. Plant communities in the vicinity of the site are limited to a buffer strip of deciduous shrubs along Sixth Avenue to the west and to herbaceous vegetation surrounding a small runoff retention pond to the south (HDR 1985). The proposed site does not support any wildlife habitat. Amphibians, insects and small terrestrial wildlife species adapted to the urban environment may utilize the retention pond during portions of the year (HDR 1985).

3.11.5 Minneapolis South Transfer Station

The 1.2 acre site proposed for the Minneapolis South Transfer Station is located in the City of Minneapolis. Industrial facilities border the site to the north and east, and the Pioneers and Soldiers Memorial Cemetary Park borders it to the south and west. Vegetative cover in the cemetary is primarily mowed grass with a mixture of mature hardwoods scattered throughout the property. Stands of mature hardwoods are also located in the residential area to the east of the site. The site is currently used as a solid waste transfer station. All vegetation has been removed and replaced with impervious surface (HDR 1985), and therefore the site does not support any wildlife populations. Lack of an understory in the cemetary and the continual human presence limits the use of this area by many wildlife species. Grey squirrel and upland passerines may use the trees for shelter and foraging, especially during spring and fall migration. Insectivorous birds may also feed in the open areas.

4. ENVIRONMENTAL IMPACTS

This section of the environmental impact statement discusses the environmental, economic and sociological impacts of the proposed resource recovery project. Direct, indirect, adverse or beneficial impacts are identified.

4.1 County Solid Waste System

4.1.1 Compliance with State Laws and Regional Policies

The resource recovery project will further many state and regional solid waste policies and purposes. The recovery and utilization of resources from solid waste was first given preference in state law with passage of the 1976 Solid Waste Act. The 1980 state Waste Management Act (WMA) and the Metropolitan Council's Solid Waste Management Development Guide/Policy Plan give major emphasis to resource recovery over the landfilling of solid waste. A succession of amendments to the WMA have further clarified and strengthened this policy.

The Council's solid waste guide calls for a regional system of coordinated waste processing and recycling services with the seven metropolitan counties assuming the major responsibility for implementation. The termination of land disposal of mixed municipal solid waste is mandated by 1990. Only nonrecoverable residuals from waste processing should be landfilled after that date. The WMA was amended in 1985 to make this policy a requirement of state law for the Metropolitan Area.

The county resource recovery project will help implement the major policies in the Council's guide. It will reduce the region's dependence on landfilling and utilize resources from municipal solid waste. The county has established a 1989 target date to begin full-scale commercial operation of the recovery plant, which coincides well with the region's 1990 deadline. The Council's guide calls for the county to achieve by 1990 a 56 percent abatement level by refuse combustion. The resource recovery project helps meet this objective.

Coordination of solid waste management among local jurisdictions is a major element of the county-wide transfer station/resource recovery system. By designating all nonexempt and nonexcluded waste to be delivered to the resource recovery system, the county proposes to equalize waste management service costs as much as possible to waste generators in the county. The same tipping fee would be charged at all designated facilities, which means that waste generators should pay roughly the same, except for differences due largely to travel costs to the facilities (see discussion, 4.1.4 Impact of the Exclusion Projects). The county's resource recovery plant will be privately owned and operated, which is consistent with a long-standing policy in the state solid waste legislation.

4.1.2 Impact on Solid Waste Volumes and Composition

4.1.2.1 Waste Availability

The resource recovery facility will process on an annual average basis 1,000 tons of solid waste per day. The county on Aug. 6, 1985, entered into a processing agreement with the Hennepin Energy Resource Co., a limited partnership formed by the project vender, Blount Energy Resource Corp. The county agrees to deliver 365,000 tons of processible waste annually. In the event the county fails to deliver the annual amount, the county will be required to pay fees in lieu of the waste delivered (Hennepin County, 1985c).

A number of factors will affect the availability of waste supplies including: 1) seasonal adjustments to waste generation; 2) waste exempted or excluded from waste designation; and 3) other resource recovery activities. The resource recovery facility requires 36 percent and 34 percent of the solid waste amounts generated in 1990 (1,019,306 tons) and 2000 (1,074,932 tons), respectively. During seasonal low generation periods for 1990 (2,179 tons per day) and 2000 (2,297 tons per day), the recovery facility requires 46 percent and 44 percent of the waste amounts, respectively. During seasonal high generation periods for the same years (3,407 and 3,593 tons per day), the recovery facility requires 29 percent and 28 percent of the waste amounts, respectively.

The county's proposed waste reduction and recycling program calls for a 20 percent abatement level to be reached by 1990 (Hennepin County, 1985b). Waste materials recovered by these methods are automatically exempted from the county's waste flow designation. Added to the exempted waste materials are waste supplies that could potentially go to the three exclusion projects approved by the Metropolitan Council (see discussion, 3.1.6.2 Exclusion Projects). The exclusion projects are projected to be operating by September 1986. Assuming the exclusion facilities take about 694 tons per day of the county's waste, about 25 percent of the available supplies in 1990 would be committed to these facilities. (The 694 ton-per-day figure assumes the Richards facility draws its entire waste supplies for both the existing and planned combustion units from Hennepin County.)

The net effect of committing waste supplies, on both a contractual and planning basis, to the resource recovery facility, exclusion projects, and exempted reduction and recovery activities is significant. On an annual average basis for 1990, 80 percent of the available waste supplies would be committed. During seasonal low generation periods in the winter, as much as 95 percent of the available waste supplies would be committed. During seasonal high generation periods in the spring and fall, about 66 percent of the available waste supplies would be committed.

4.1.2.2 Acceptable and Unacceptable Wastes

Hennepin County has identified which waste types are acceptable and unacceptable at the resource recovery plant and transfer stations. The waste types are defined in the county's processing agreement and proposed waste flow designation ordinance (Hennepin County, 1985c; 1985a).

The recovery plant is required to take all acceptable waste delivered by the county, in accordance with the processing agreement's delivery schedule and guaranteed annual tonnage requirements. Acceptable waste is all solid waste, except unacceptable waste. Acceptable waste includes, without limitation: garbage, trash, rubbish, refuse, beds, mattresses, sofas, refrigerators, washing machines, bicycles, baby carriages, automobile or small vehicle tires (to the extent the air emission criteria applicable to the facility are not violated by their combustion), commercial and industrial solid waste, trees and lumber if not more than six feet long and one foot in diameter, branches, leaves, twigs, grass, plant cuttings, and baled or compacted garbage. The recovery plant is required to reject unacceptable waste that is delivered to it. Unacceptable wastes would include explosives, pathological and biological waste, radioactive materials, ashes, incinerator residue, foundry sand, sewage sludge, cesspool and other human waste, human and animal remains, motor vehicles, major vehicle parts such as transmissions, rear ends, springs and fenders, automobile and small vehicle tires to the extent the air emission criteria applicable to the facility are violated by their combustion, agricultural and farm machinery and equipment, marine vessels and major parts thereof, transformers, trees and lumber more than six feet long or one foot in diameter, liquid waste, nonburnable construction material, sludges from air or water pollution control facilities or water supply treatment facilities, demolition or other construction debris, hazardous waste, and any materials which if processed at the facility would cause the bottom ash produced at the facility to be classified as hazardous waste.

Transfer stations will only accept waste as defined by the designation ordinance (see Appendix C). Acceptable waste is garbage, refuse and other solid waste from residential, commercial, industrial and community activities that is generated and collected in aggregate, including, in limited quantities, nonburnable construction debris, tree and agricultural wastes and tires; excepting unacceptable waste. Unacceptable wastes at the transfer stations would include but are not limited to hazardous waste as defined in Minn. Stat., Sec. 116.06, subd. 13 (1984), as amended, and the Resource Conservation and Recovery Act, 42 U.S.C. 6903 (5); hazardous waste of any kind or nature, such as explosives, radioactive materials, cleaning fluids, crankcase oils, cutting oils, paints, acids, caustics, poisons, drugs or other material that would be likely to pose a threat to health or public safety, or cause injury to or adversely affect the operation of the transfer stations; pathological and biological wastes; ashes, foundry sand; sanitary sewage and other highly diluted water-carried materials or substances; sludges, including sewage sludge and septic and cesspool pumpouts; human and animal remains; auto hulks and other motor vehicles, including such major motor vehicle parts as transmissions, rear ends, springs and fenders; agricultural and farm machinery and equipment; liquid wastes; large quantities of nonburnable demolition debris; street sweepings; mining waste; construction debris, trees, agricultural waste and tires in excess of the quantities allowed as acceptable waste; and waste that was generated outside of the county.

The county's designation ordinance requires all refuse collection businesses engaged in the collection and transportation of designated waste to have a license issued by the county. The county will retain the right to inspect refuse vehicles to ensure that only acceptable waste is being delivered to the recovery facility and transfer stations. Persons delivering unacceptable waste will have the responsibility of removing it from the recovery facility or transfer stations. Licenses may be suspended temporarily or revoked for failure to comply with the ordinance (Hennepin County, 1985a).

Refuse vehicles will be visually inspected at the scales prior to entry to the tipping areas at the resource recovery facility and transfer stations. Identifiable unacceptable wastes will be denied entry to the tipping areas. Some unacceptable wastes, however, will undoubtedly be mixed with acceptable wastes and be received in the tipping areas. The crane operator at the recovery facility will have some ability to selectively remove identifiable unacceptable materials disposed of in the pit. Front-end loader operators at the transfer stations will also remove and segregate identifiable unacceptable materials.

No significant adverse impacts are expected to occur at the recovery plant or transfer stations as a result of handling unacceptable wastes. Refuse vehicles with loads of unacceptable wastes should be detected prior to entering the tipping areas. Persons delivering such wastes will have the responsibility of taking the materials to proper disposal facilities. Unacceptable wastes inadvertently mixed with acceptable solid wastes will be harder to detect. Some unacceptable waste will be transferred from the transfer stations to the recovery plant. Some of these materials will be fed into the furnaces with the refuse fuel, be subject to combustion and subsequently be disposed of with the ash residuals. Small quantities of unacceptable wastes that are segregated at the recovery facility and transfer stations can be temporarily stored.

4.1.2.3 Processible and Nonprocessible Wastes

Hennepin County's processing agreement calls for the delivery of processible waste to the recovery facility. Processible waste according to the agreement means that portion of acceptable waste that is not nonprocessible waste. The facility is designed to process waste with a higher heating value between 3,800 BTU/lb. and 5,200 BTU/lb. (HDR TechServ, 1985a). A report prepared by Henningson, Durham and Richardson for Hennepin County, Solid Waste Energy and Resource Recovery Study (1975), showed an average higher heating value of the solid waste to be about 4,500 BTU/lb. The county's 1985 comprehensive recycling study shows that about 82.9 percent of the solid waste is combustible.

Nonprocessible wastes are those that enter the receiving building of the resource recovery facility and are placed on the tipping floor, but which cannot be processed due to their physical characteristics. The processing agreement defines nonprocessible waste as acceptable waste that both 1) consists of refrigerators, washing machines, dryers, window air conditioners, hot water heaters, other major home appliances and any other noncombustible items weighing in excess of 25 pounds and 2) is segregated by the facility operator from the other acceptable waste prior to processing (Hennepin County, 1985c).

Some nonprocessible wastes may escape detection at the scale house and be deposited on the tipping floor or in the disposal pit. Such wastes should be identified by front-end loader operators at the transfer stations as nonprocessible, and should be removed or segregated. Crane operators situated over the storage pit at the recovery facility should also be able to sort out the large, noncombustible, oversized and bulky materials. Such materials can be segregated on the tipping floor or put in a storage bin for transfer to a recycling facility or landfill. Incoming wastes from the transfer stations should contain very little nonprocessible materials.

It is highly unlikely that such nonprocessible wastes, as defined above, could enter the charging hoppers to the furnaces. No significant adverse impacts should occur from the handling of nonprocessible wastes. No odor or short-term storage problems should occur. Because of their generally bulky characteristic nonprocessible wastes can be a storage problem if such materials accumulate. If the materials are stored outside, aesthetic impacts could increase.

4.1.2.4 Hazardous Wastes

Hazardous wastes are one type of unacceptable waste. Hazardous wastes include many of the materials and substances previously defined as unacceptable wastes. Ideally, hazardous wastes should not be delivered to the recovery facility and transfer stations. Industrial and commercial hazardous waste generators are licensed by the county and must comply with state and federal disposal regulations. However, household quantities will undoubtedly arrive mixed with legitimate waste (Metropolitan Council, 1985b). It is estimated that currently 1,700 to 6,700 tons of household hazardous wastes are generated annually in the county (Thornton, 1985). Household products that can become hazardous wastes include pesticides, automotive products, building and printing products, household cleaners, hobby and craft products, and personal care products.

As previously mentioned, Hennepin County will have the right to inspect all vehicles delivering waste to the recovery facility and transfer stations. The county may reject a delivery and require the waste hauler to dispose of the material at a proper facility. If a hauler dumps identified hazardous wastes onto the tipping floor of the recovery facility or transfer station, the hauler will be required to reload and remove it. Hazardous wastes not removed by the hauler, but separated by the facility operator, can be stored and disposed of in accordance with state and federal laws and regulations. It is important to note that waste haulers and waste generators can be subject to financial penalties imposed by the county, if hazardous wastes are intentionally brought to the transfer stations and recovery facility.

Employees of the transfer stations and recovery facility will have the primary responsibility for inspecting refuse vehicles. At the recovery facility, the crane operator will have inspection responsibilities for observing wastes in the pit. The operator can segregate identified hazardous wastes. The county's licensing requirement of the haulers can also be used as a mechanism to ensure compliance. Generally, such licensing requirements state that hazardous substances are prohibited to be delivered and that the disposer assumes liability for all such wastes, whether intentionally or inadvertently disposed. The county's processing agreement requires that all unacceptable wastes that are stored be in an enclosed area of the recovery facility (Hennepin County, 1985c).

Specific procedures regarding the segregation and removal of hazardous wastes at the transfer stations have not been developed by the county. The county's processing agreement does specify general procedures for the recovery facility (Hennepin County, 1985c).

Small quantities of household hazardous wastes if mixed with acceptable solid wastes will be hard to detect at both the transfer stations and recovery facility. Such materials will ultimately end up in the recovery facility furnaces. Combustion temperatures in the recovery facility are high enough to fully burn volatile organic wastes (Metropolitan Council, 1983).

4.1.2.5 Ash Residuals

The resource recovery facility combustion process will result in fly and bottom ash residuals. A spent lime reagent will also be generated by the dry scrubber system. The residuals are combined in the bottom ash quench tank. After removal of ferrous metals, the remaining residuals are transported to a landfill. It is estimated that for every 1,000 tons of municipal solid waste processed at the recovery facility, a furnace residue of 209 tons and scrubber/particulate residue of 69 tons will be generated (Blount, 1985). The total residuals on an annual basis would require approximately 93 acre-feet of landfilling space.

The recovery facility will be required to have an Air Emissions Facility permit from the MPCA. The permit addresses ash disposal by requiring compliance with specified Solid and Hazardous Waste Rules of the MPCA (6 MCAR 4.0004 and 4.0021, respectively). It is anticipated that the combined ash will be disposed of at an area landfill. Hennepin County has not identified a specific landfill for ash disposal, but is obligated to do so under the processing agreement.

Landfilling of the combined ash will require a "co-disposal" permit from the MPCA because the ash will be categorized as an industrial waste being co-disposed with municipal solid waste. The co-disposal permit requires testing according to EPA standards to determine toxicity. If the wastes are determined to be hazardous, state hazardous waste rules specify disclosure, as well as on-site treatment or storage and disposal requirements.

If the wastes are not identified as hazardous, their chemical composition must be determined, and additional leach testing may be required to determine landfill disposal requirements. A schedule for ongoing compliance testing will be negotiated during the permit process. The sanitary landfill that receives the waste must also meet permit standards regarding disposal of the ash material.

A comprehensive review of the impacts of incinerator fly ash and bottom ash disposal was completed in 1982 for Los Angeles, San Diego and San Francisco counties (Rigo, 1982). The report compared leachate characteristics of the ash with that of solid waste. Tests consistently showed that combined fly ash and bottom ash from refuse combustion could be classified as nonhazardous. Furthermore, the alkalinity of the combined ash appeared to stabilize metal content and reduce leachate metal concentrations when co-disposed with municipal solid waste.

The fly ash alone consistently produced extracts that tested as hazardous due to elevated levels of lead and cadmium. Column lysimeter tests also showed more metals and salts leached from resource recovery facility fly ash alone than from solid waste or bottom and fly ash combined. The leachate of salt and metals was higher per pound of solid waste than per pound of ash. Total dissolved solids leached from bottom ash and from combined ash were approximately 50 percent lower than from raw solid waste.

Comparison of leachates collected from sanitary landfills and ash only fills also showed that solid waste will produce higher salt and metal concentrations than equal weights of ash. The ash is more alkaline than solid waste, which helps to stabilize the metal content. Heavy metals have extremely low solubilities in an alkaline environment. The report suggests that co-disposal with solid waste may lower leachate metal concentrations. Some empirical support was found in studies comparing leachate from fills that contained a mixture of solid waste and ash from open burning dumps with leachate from an equally aged sanitary landfill from the same locale.

The MPCA has conducted water and acid leach tests on bottom and fly ash from the three incinerators that are permitted to burn municipal solid waste in Minnesota. The fly ash consistently tested as hazardous due to high levels of lead and cadmium. (It should be noted that the three incinerators are modular facilities and have different air quality control equipment from that being proposed for the Hennepin County facility.) The MPCA has not resolved a preferred means of addressing ash disposal. Although the alkalinity of the ash tends to stabilize the metals and reduce leaching, the volume of metals in the ash may be deemed too high to allow the mixing of ash with municipal solid waste. Disposal for combined fly and bottom ash may be restricted to segregated areas of sanitary landfills subject to permit standards that are nearly as strict as those for land disposing of municipal solid waste.

The ash disposal permit requirements appear to be comprehensive and adequately provide for the continued monitoring necessary to assure that disposal in landfills will not constitute a public health threat. The available experimental data suggests that adverse impacts from the land disposal of ash, even in combination with the associated effects of air emissions, will be less than from the disposal of raw municipal solid waste in landfills.

4.1.2.6 Recovered Materials

The resource recovery facility will process 365,000 tons of municipal solid waste per year with all but oversized, bulky waste and unacceptable waste fed into the incinerator. There will be a ferrous recovery system in the ash handling system to remove ferrous metals from the ash stream. Hennepin County's processing agreement requires the facility operator to use its best efforts to sell all ferrous metals recovered (Hennepin County, 1985c). The agreement also specifies a ferrous recovery efficiency of at least 75 percent of the ferrous metals in the processible waste. All ferrous not sold after a reasonable period must be deposited at a landfill.

It is estimated that for every 1,000 tons of waste processed at the recovery facility, 40 tons of ferrous metals would be recovered. Approximately two to three truckloads of ferrous will leave the facility each day.

The county also proposes to have drop-off containers for recyclables at the transfer stations, although specific information on this service and the types of recyclable materials and quantities that would be received has not been developed yet (HDR TechServ, 1985b). The containers would likely be available for public use during operating hours. The county would haul the recyclables to appropriate markets.

Impacts from ferrous handling and materials storage should be minimal. No odor problems would occur. The ferrous and recyclables would be stored in enclosed containers or an enclosed area. The material would be removed in enclosed vehicles. No long-term storage of materials will occur on a regular basis. Materials storage can be a nuisance problem, however, if not properly maintained. At the transfer stations, putrescible wastes can be disposed of with the recyclables in the drop-off containers. Materials can be inadvertently left outside of the containers, particularly if the containers have reached capacity.

4.1.2.7 Excess Waste and Alternate Facilities

The resource recovery facility is expected to operate at 82.5 percent on-line availability (Blount, 1985). Downtime allowance will be necessary for scheduled inspections, annual overhaul repair and cleaning, and during periodic maintenance and repair. Having two independent combustion units will ensure half-plant capacity for accepting waste during maintenance periods. During this time waste can be stockpiled in the pit, and it will not be necessary to divert the waste to a landfill. The pit has a storage capacity for 8,300 tons of solid waste (Blount, 1985). On an average daily basis the pit may contain about 1,500 tons of solid waste, leaving 6,800 tons or six to seven days' worth of excess capacity.

There may be periods, however, when the recovery facility is not able to process all of the waste delivered. During emergency shutdowns or if the volume of waste supplies exceeds the plant's capacity, wastes may have to be diverted to alternate refuse disposal facilities. The amount of excess waste will depend on the available operating capacity of the recovery facility and/or the amount of time the facility is nonoperable. During these periods, wastes may have to be removed from the storage pit and haulers may have to be diverted to other facilities. Wastes received at the transfer stations could be directed to alternate disposal facilities if the recovery facility is not operating.

It is not expected that operational problems at the transfer stations would cause a shutdown. The transfer stations require little maintenance and generally do not have mechanical problems. Some excess wastes can be prevented from arriving by phoning hauling firms if a particular transfer station is operating at capacity. The haulers could be diverted to alternate transfer stations, to the recovery facility or to landfills if necessary.

There is sufficient capacity at the transfer stations and recovery facility to handle additional wastes. Each transfer station has sufficient design capacity to handle the expected operating volumes of one other transfer station with the exception of wastes from the Hopkins facility. Because of its larger size, operating volumes from Hopkins would have to be diverted to at least two other transfer stations. If excess waste had to be diverted from one of the transfer stations, the following facilities could serve as alternates:

Transfer Station	Alternate Facilities
Brooklyn Park	Recovery Facility, Hopkins Transfer Station
Bloomington	Minneapolis South Transfer Station, Recovery Facility
Hopkins	Recovery Facility, Bloomington Transfer Station
Minneapolis South	Recovery Facility, Bloomington Transfer Station

Refuse vehicles that haul directly to the recovery facility could be diverted to one or more of the four transfer stations.

After 1990, landfill space will be limited. The Council's solid waste guide shows available landfill capacity being exhausted sometime between 1991 and 1993. The guide calls for additional capacity to be developed in Anoka, Hennepin and Washington Counties. It is difficult to predict which landfills could serve as alternate facilities. It appears that landfill capacity would be available in Anoka, Dakota and Hennepin Counties.

4.1.3 Net Abatement Potential and Effect on Needed Landfill Capacity

The resource recovery facility's net abatement potential is the amount of needed landfill capacity reduced, taking into account the amount of waste processed and residuals generated. Processing 365,000 tons of solid waste per year will abate 452 acre-feet of landfill capacity. The residuals produced from the facility will require about 93 acre-feet of capacity per year. The facility's net abatement would be a reduction of 359 acre-feet of needed landfill capacity annually. From 1990 through 2000, a total of 3,949 acre-feet of landfill capacity would not be needed. For this period, the county would abate its need for landfill capacity by about 28 percent. On a regional basis, landfill capacity needs would be reduced about 13 percent. This would save the equivalent of having to implement at least one, perhaps two, new landfill sites. The recovery facility's net abatement effect would extend the life of area landfills another two and one-half years, or until the mid-1990s.

From 1990 through 2000, 1,023 acre-feet of landfill capacity would be required to dispose of residuals. Existing landfills could take residuals until new landfill capacity is added to the regional system. The Council's solid waste guide requires the county to develop new landfill capacity of at least 3,232 acre-feet by 1991. Another 5,494 acre-feet must be developed by Anoka and Washington Counties. The county's processing agreement requires the county to make available landfill capacity to handle all process residue, bypass waste, unacceptable waste delivered to the recovery facility by the county, and all ferrous metals that are not recovered (Hennepin County, 1985c).

4.1.4 Impact of the Exclusion Projects

The three exclusion projects will process up to 694 tons per day of solid waste from Hennepin County. Based on estimates provided by proposers of the exclusion projects, approximately 81 tons of residuals would be produced daily. The projects would abate approximately 22 percent of Hennepin County's waste, or an equivalent of 277 acre-feet of landfill space would be saved annually. From 1990 through 2000, 3,047 acre-feet of landfill capacity would be saved, about the size of one new landfill site.

The exclusion projects will be privately owned and operated. The projects are proposed to operate independent of one another and the recovery facility. Both the exclusion projects and the resource recovery facility rely on being able to obtain a portion of the county's waste supplies to maintain their economic viability. The exclusion projects are free to contract for their waste supplies from anywhere in the county (see 3.1.6.2, Exclusion Projects). The remaining waste supplies, with the exception of certain exempted materials protected by state law, are subject to the county's designation ordinance. They must go to one of the transfer stations or directly to the recovery facility (see Appendix C).

Presumably, waste haulers will contract with particular exclusion projects that offer the most competitive tipping fees given the costs of transporting wastes to the facilities. Tipping fees may be lower at the exclusion projects to compete with the effect of the designation ordinance. Haulers, therefore, may not be going to the closest, most convenient disposal facility. Irregular service areas could develop, impacting the efficiency of county-wide waste management services. Although difficult to predict, such a system could result in greater service cost differentials to county waste generators and have adverse transportation effects as well.

The exclusion projects may impact enforcement of the county's waste flow designation ordinance. Vehicles with refuse subject to the designation should be clearly identified to ensure they do not go to the exclusion facilities. Cooperation with the exclusion facility operators will be necessary to turn away vehicles that must go to the designated facilities. County licensing requirements can specify enforcement conditions for the Reuter facility in Eden

Prairie. The county should seek cooperation from Ramsey and Scott Counties to ensure similar enforcement at the other two exclusion facilities. Notwithstanding, all nondesignated disposal facilities including area landfills should have responsibilities to comply with designation requirements.

Some questions have been raised about the ability of the exclusion projects to meet required timetables or implement viable facilities. As previously mentioned, the Metropolitan Council is monitoring closely the development of the exclusion projects. If the Council should revoke one or more of the exclusion approvals, additional waste supplies would be subject to the designation ordinance. The county would have to consider developing one or more additional recovery facilities, perhaps in conjunction with adjacent counties. The Greyhound facility is prevented by law from processing more than 1,000 tons per day on an annual average basis and, thus, could not be expanded in size. The transfer station system was originally sized to serve more than the Greyhound facility and could handle additional waste supplies.

4.1.5 System Impacts on the Transfer Stations and Resource Recovery Projects Outside of Hennepin County

As previously mentioned, Hennepin County initially intended to develop a larger resource recovery system than currently proposed. In December 1984, the county proposed to designate a minimum of 600,000 tons of solid waste per year to two or more large-scale resource recovery projects (see discussion, 3.1.6.2 Exclusion Projects). Not only was the Greyhound facility being proposed, but joint projects with Anoka and/or Dakota Counties as well. The county also proposed that the transfer stations serve the intercounty resource recovery system. The transfer stations were designed to handle on the average about 2,000 tons of solid waste per day.

With the Metropolitan Council's approval of the exclusion requests in April 1985, the county terminated its negotiations with the two counties because solid waste supplies could no longer be guaranteed to them. The county's proposed resource recovery system now only includes the Greyhound facility. The transfer station system, however, remains unchanged. A system of four facilities that would handle all of the county's nonexempt waste remains the same as before the decision on the exclusions. The four facilities have a total design capacity of 3,600 tons per day and a proposed operating capacity of between 1,900 and 2,000 tons per day. Questions seem to remain as to whether the exclusion projects will successfully develop and the waste supplies committed to them. Since one or more of these projects may not develop, the county is proceeding with transfer facilities that can manage nonexempt waste.

The county bases its use of the transfer stations on implementing waste flow designation. State law, however, provides that designation can only be imposed to serve resource recovery facilities. The transfer stations, thus, could not be used to send waste to other types of facilities such as landfills. The Greyhound facility's proposed operating capacity is about one-half the transfer stations' total operating capacity. This would suggest that the transfer facilities will be underutilized if the Greyhound facility is the only facility served by the transfer system. Moreover, as much as one-half of the waste going to the Greyhound facility may be from refuse vehicles directly hauling to the facility. On this basis, the transfer station system would be providing the other one-half of the needed waste, operating at about one-seventh and one-fourth of its design and operating capacities, respectively. Downsizing the transfer station system is an option that may eventually have to be examined.

The county has indicated that the transfer stations may supply waste to the exclusion projects, contingent on their construction and the negotiation of agreements to deliver waste by the county. Providing waste to all three exclusions would bring the total waste supply commitments close to a level (618,310 tons per year) the county had previously proposed. At this level, the transfer station system could operate at its originally proposed operating capacity. There are, however, no negotiations presently between the county and representatives of the exclusion projects.

Another option the county has to supply more waste to recovery facilities would be to resume its negotiations with Anoka and Dakota Counties. The two counties are proceeding with developing their own resource recovery projects (see discussion, 3.1.7 Solid Waste Projects Outside of Hennepin County). Building additional capacity into their proposals either on a permanent or contingency basis may be a possibility. The transfer stations could provide waste to the other counties during waste generation peaks and downtimes that may occur with the county's recovery facility and the exclusion projects.

The Council's most recent figures on wastes received at the region's landfills in 1985 suggest that previous generation forecasts may have been too low. More waste may be available to the transfer station system than originally thought. It will probably, however, take another year's worth of data to verify if this is true or not.

4.2 Air Quality

A comprehensive analysis has been conducted to assess the expected air quality impacts associated with construction activities and operation of the resource recovery facility and the four transfer stations. Air related impacts of the construction and operation of the proposed facility and transfer stations would originate from the following sources:

During Construction

- o fugitive dust from excavation and vehicular exhaust from employee traffic and heavy equipment

During Operation

- o incineration of municipal solid waste,
- o vehicular exhaust from employee cars and refuse delivery trucks and cars,
- o fugitive dust and odors from the refuse receiving area.

In addition to the above sources, the proposed dual cell mechanical draft cooling tower at the combustion site may cause or contribute to fogging and icing of nearby roadways.

The analysis considered the impacts of the facility alone and in combination with other sources of air pollution in the Minneapolis area. The analysis considered impacts of the criteria pollutants (SO_2, TSP, CO, NO_2, Pb) and certain other pollutants which are regulated under the PSD rules (40 CFR Part 52). The latter include asbestos, beryllium, mercury, vinyl chloride, fluorides, sulfuric acid mist, hydrogen sulfide, reduced sulfur and chlorides. Other pollutants that would most likely be emitted from the facility but which are not federally or state regulated are considered in Subsection 4.3, Human Health. The following subsections present the analysis methodologies used as well as results.

4.2.1 Construction Impacts

Operation of construction equipment, especially those involving earthmoving, would produce both mobile source air emissions and fugitive dust. Construction at the Greyhound and the four transfer station sites would involve two to three months of grading and earth moving activities. Total construction time at the transfer station sites is estimated to be nine to twelve months and at the Greyhound site is estimated to be about thirty-four months. (Blount, 1985) The majority of the mobile source and fugitive particulate emissions are expected to be associated with the two to three months of earth moving activities. Although impacts from earth moving and total construction activities would be short-term and localized, several measures will be employed to mitigate their effect. Implementation of these measures could result in no significant air quality impacts due to construction and operation of the Greyhound site and transfer stations.

4.2.2 GEP Stack Height Analysis

Section 123 of the 1977 Clean Air Act Amendments required EPA to promulgate regulations to assure that the control of any air pollutant under an applicable State Implementation Plan (SIP) was not affected by (1) stack heights that exceed GEP or (2) any other dispersion technique. GEP is defined with respect to stack height as "the height necessary to ensure that emissions from the stack do not result in excessive concentrations of any air pollutant in the immediate vicinity of the source as a result of atmospheric downwash, eddys, and wakes that may be created by the source itself, nearby structures, or nearby terrain obstacles" (EPA 1981a). These regulations were promulgated to discourage the practice of building excessively tall stacks to maintain ambient air quality, in lieu of installing air pollution control equipment.

On January 12, 1979, EPA published proposed regulations concerning GEP determination (44 FR 2608). EPA finalized the stack height regulations on February 8, 1982 (47 FR 5864) that incorporated changes to the originally proposed regulations. On October 11, 1983, the U.S. Court of Appeals issued a ruling on the final stack height regulations (Sierra Club and NRDC vs U.S. EPA et al.). EPA was remanded by the Court to review and revise certain sections of the regulations. On November 9, 1984, EPA published proposed revisions to the GEP regulations (49 FR 44878). EPA promulgated final GEP stack height regulations on July 8, 1985 (50 FR 27892). None of the changes affects the determination of the GEP stack height for the proposed facility.

The GEP definition is based on the observed phenomena of disturbed atmospheric flow in the immediate vicinity of a structure. It identifies the stack height at which significant adverse aerodynamics (downwash) are avoided. The maximum GEP stack height allowed under the 8 July 1985 regulation is calculated from:

$$H_G = H + 1.5L \qquad (4.2\text{-}1)$$

where: H_G is the maximum GEP stack height,
H is the height of the nearby structure, and
L is the lesser dimension (height or width) of the nearby structure, called the critical dimension.

Both the height and width of the structure are determined from the frontal area of the structure projected onto a plane perpendicular to the direction of the wind. The GEP stack height is calculated by substituting the plane projections of each nearby building into equation 4.2-1 and solving for H_G. For the purpose of determining the maximum GEP height, <u>nearby</u> is limited to five structure heights or widths, whichever is less, downwind from the trailing edge of the structure. The GEP maximum allowable height is defined as the maximum of all the calculated GEP heights. In the case where a stack is isolated from nearby structures, the maximum GEP stack height is defined as 65 meters.

The dominant building structure at the resource recovery facility is the Boiler House, located about 200 feet to the southeast of the proposed main stack. The height of this GEP controlling structure is 108 feet above the stack base elevation while the maximum perpendicular width is 95 feet. These dimensions correspond to a maximum GEP stack height of 250 feet above the reference base elevation. The proposed stack height for the facility is 212 ft which is within the maximum calculated GEP height. This means that credit can be taken for ambient dispersion of stack emissions because the proposed stack does not exceed the maximum calculated GEP height.

4.2.3 Source Data

4.2.3.1 Proposed Hennepin County Large-Scale Energy Recovery Facility

Measured data available for comparing unabated emissions from mass burn and RDF facilities are quite limited. Typically, mass burn produces lower levels of chlorine, sulfur, and trace elements than RDF which is a concentrated form of plastics and paper refuse. Thus, the emissions of sulfur, chlorine and certain trace elements are lower from mass burn than from RDF facilities (CARB, March 1980). The estimated emissions from the resource recovery facility of the criteria and PSD regulated pollutants are listed in Table 4.2-1. The air quality control technologies include a dry scrubber (spray dryer) with baghouse (fabric filter), primarily for the control of sulfur dioxide, acid gases (HCL and HF), and particulates. The air quality control equipment proposed at the Greyhound site would meet or exceed all EPA and MPCA requirements discussed in Subsection 3.2.

<u>Spray Dryers</u>

Acid flue gases leaving the economizer section of the boilers will be treated with hydrated lime ($Ca(OH)_2$) droplets in the atomizing spray dryers where sulfur dioxide (SO_2), hydrochloric acid (HCl) and hydrofluoric acid (HF) will be respectively neutralized to calcium sulfite ($CaSO_3$) or calcium sulfate ($CaSO_4$), calcium chloride ($CaCl_2$), and calcium fluoride (CaF_2). The hot flue gas will evaporate the water in the droplets, resulting in a dry powder residue which will flow into the particulate control device for removal. The design removal efficiencies for SO_2 and HCl are 90% and 95%, respectively.

<u>Baghouse Collector</u>

A baghouse will be employed to affect the required particulate removal from the flue gas prior to emission. Flue gases, partially neutralized in the spray dryer, will be further neutralized by the unreacted lime contained in the particulate layer on the bags of the baghouse collector.

TABLE 4.2-1
EMISSION ESTIMATES[1]
AND PSD SIGNIFICANCE THRESHOLDS[2]

Pollutant	Uncontrolled Emissions (TPY)	Expected Controlled Emissions (TPY)	PSD Significance Thresholds (TPY)
Carbon Monoxide	347	347	100
Nitrogen oxides	763	763	40
Particulates	7,300	37	25
Sulfur dioxide	587	176	40
Total hydrocarbons	22	22	40
Lead	50	3.4	0.6
Asbestos	negligible	negligible	0.007
Beryllium	0.009	$5x10^{-6}$	0.004
Mercury	1.2	1.2	0.1
Vinyl chloride	negligible	negligible	1.0
Fluorides	9.5	1.5	3.0
Sulfuric acid mist	5.3	0.37	7
Hydrogen sulfide	negligible	negligible	10
Reduced sulfur	negligible	negligible	10
Chlorides	930	93	N/A

[1]Based on annual throughput of 365,000 TPY.
[2]40 CFR 52.21 (b)(23)(i), 1984.

Source: Blount Energy Resources Corp.

The baghouses contain multiple modules for processing the gases. Normally, all modules are in operation; however, for maintenance purposes one can be taken out of service and the remaining modules can adequately accommodate the gas volume and maintain the desired emission control level.

Within the baghouse, the dust and particulate laden gas impacts the surface of the bags, which are of teflon coated fiberglass material.

The particulates will collect on the surface of the bags and be periodically blown off by a pulse jet of air inside the bag. The particulates will drop to the hopper at the bottom of the module for subsequent removal. After sequencing of the pulse jet action of all bags in the module, the module and its bags will once again receive and clean the dust laden gas. The air pulse action will automatically be sequenced from module to module within the baghouse.

The proposed Widmer+Ernst grate and furnace/boiler will minimize the introduction of particulates into the flue gas, and will assure the flue gas treatment system meeting a particulate limitation of 0.010 grains per dry standard cubic foot (gr/scf) of flue gas corrected to 12% CO_2 for any operating condition.

State-of-the-art boiler design and operation would be used to optimally reduce the concentrations of nitrogen oxides, carbon monoxide, and hydrocarbons.

The stack operating parameters listed in Table 4.2-2 are based upon typical operating conditions suggested in the proposals of vendors for the resource recovery facility (Dravo, April 1985; Blount Energy Resource Corporation, April 1985; Northern States Power Company, April 1985; American Ref-Fuel, April 1985; Ogden-Martin Systems, Inc., April 1985).

4.2.3.2 Major Background Sources

The MPCA has requested that dispersion modeling of Minneapolis-St. Paul metropolitan SO_2 emissions be performed to assess compliance with ambient standards. The current inventory includes numerous point and area sources of SO_2. Three sections of Minneapolis have been identified in previous modeling performed by the MPCA as potentially having high SO_2 impacts; these "hot spots" are located in south Minneapolis (Hot Spot A), in Fridley (Hot Spot B) and at the GAF facility (Hot Spot C). These are shown in Figure 4.2-1. The MPCA modeling indicated that the south Minneapolis "hot spot" is due primarily to SO_2 emissions from Northern States Power Company's (NSP) Riverside power plant and the Minneapolis Energy Center (MEC). Likewise, the modeling indicated that the Fridley hot spot is due primarily to SO_2 emissions from the FMC Northern Ordinance Plant (FMC) and the NSP Riverside plant. The GAF hot spot was predicted to occur as a result of point sources on the plant site. The stack and emission data for sources in these areas are given in Table 4.2-3.

4.2.4 Technical Approach to the Detailed Modeling Analysis

The operation of the proposed MSW boilers would result in emissions which will impact the ambient air quality in the

TABLE 4.2-2

RAM MODEL INPUT DATA: STACK PARAMETERS

Parameter	Value
Stack height	212 ft. (64.62 m)
Stack diameter	9 ft. (2.75 m)
Exit gas volume flow	230,000 acfm (108.5 m^3/s)
Exit gas velocity	60 fps (18.3 m/s)
Exit gas temperature	264° F (402° K)

Source: HDR, 1985.

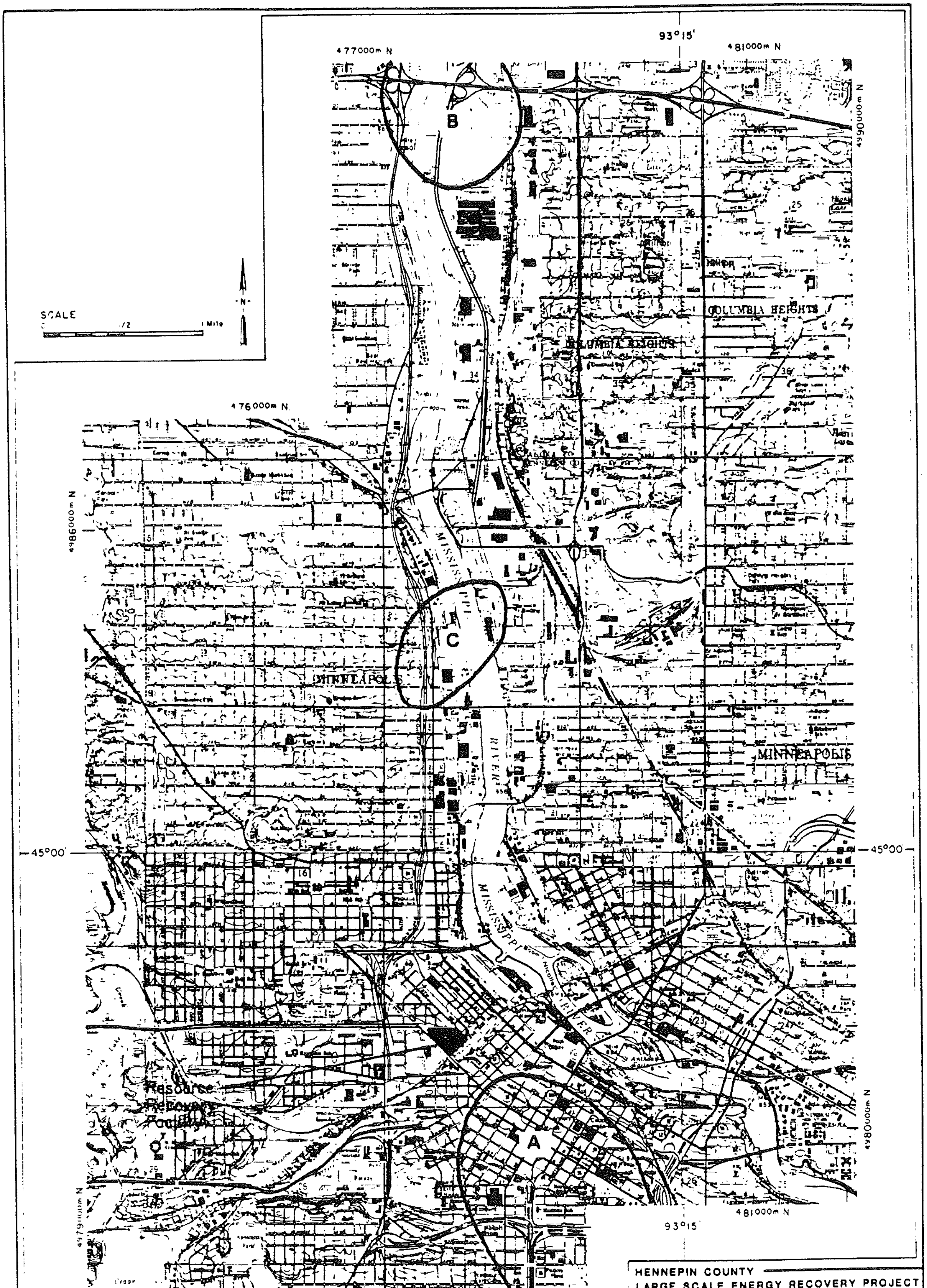

Figure 4.2-1 General Locations of Hotspots Identified in RAM modeling

TABLE 4.2-3

ADDITIONAL SO_2 SOURCES USED IN MODELING POTENTIALLY HIGH IMPACT AREAS

Source Name	UTM-X (km)	UTM-Y (km)	Stack Height (m)	Stack Diam. (m)	Stack Vel. (m/sec)	Stack Temp. (°k)	SO_2 Emission Rate (gm/sec)
GAF Corp	478.10	4984.276	18.29	0.40	5.27	489	2.55
	478.10	4984.322	5.49	0.31	2.73	644	0.71
	478.10	4984.345	12.19	0.76	2.85	700	1.41
	478.10	4984.360	18.29	1.22	0.83	677	1.10
FMC 1-7	478.20	4989.20	42.67	2.59	2.47	455	24.54
8-13			42.67	2.13	3.05	455	20.59
14-17			13.11	0.76	4.16	461	6.62
NSP 280	478.40	4985.20	83.82	3.66	14.50	436	97.50
			83.82	3.66	14.50	436	97.50
			144.80	4.88	23.20	422	718.20
Minnegasco	478.70	4980.00	48.77	1.50	20.60	444	46.97
Energy Center			48.77	1.50	20.60	444	46.97
			48.77	1.50	20.60	444	46.97
Metro Medical	479.60	4979.50	45.72	1.52	36.80	616	65.50

Source: HDR, 1985.

Minneapolis area. The technical approach followed to estimate the ambient point and area source impacts and the results of the analyses are summarized in the following sections. This preliminary analysis approach was reviewed and approved by MPCA. Air quality impacts associated with vehicular emissions are discussed in Subsection 4.2.7.

The air quality impacts resulting from operation of the facility were estimated using mathematical dispersion models. Air quality modeling is an analytical tool used to estimate ambient air concentrations of gaseous and particulate emissions. These emissions, such as SO_2 generated by the proposed MSW boiler, are emitted from a stack at certain rates or concentrations. The concentration is a measure of how much of a gas or particulate is contained in a unit volume (parcel) of flue gas which is discharged from the stack. The emitted flue gas becomes mixed with the ambient air flow and is carried downwind. The turbulent air motions will dilute the parcel of emissions with the surrounding "ambient" air such that the concentration at the ground is substantially less than initially. A dispersion model estimates ground-level concentrations at specific locations by mathematically simulating the dilution of the flue gas between the source and the specified locations (receptors). The rate of dilution is a function of meteorological factors, such as wind speed, wind direction, atmospheric stability, and the mixing height, and other physical factors, such as topography and building structures.

Dispersion modeling was performed to estimate ground level concentrations of emissions from the proposed resource recovery facility. Modeling was also performed to estimate the cumulative impact of SO_2 emitted from other significant background sources in the Minneapolis-St. Paul area. Other pollutants emitted by these background sources were not modeled. Rather, their impacts were assumed to be accounted for in monitored concentrations obtained from the MPCA monitors in Minneapolis. Compliance with the ambient standards for SO_2 was determined by adding the cumulative impacts of all modeled sources to an upwind background concentration that is not influenced by the urban sources of SO_2. Compliance with ambient standards for other pollutants was determined by adding the highest predicted impact from the proposed resource recovery stack to a conservative monitored background concentration.

4.2.4.1 Model Selection

EPA's RAM model was selected for use in this study after consultation with the MPCA, which presently uses the model to evaluate air quality impacts in the Minneapolis-St. Paul area. RAM is a steady-state Gaussian model which was developed for EPA to simulate dispersion from point and area sources for either rural or urban settings. A complete description of the RAM model algorithms and application methods is presented in Volume 1 of the User's Guide for RAM (Novak and Turner, November 1978). The EPA CALMPRO program was then applied to the concentration output files of the RAM model to eliminate the influence of reported calm meteorological conditions in the predicted concentrations (per MPCA direction).

4.2.4.2 Meteorology

Hourly pollutant concentrations were calculated using five years (1973-1977) of meteorological data from Minneapolis-St. Paul International Airport (surface data) and St. Cloud, Minnesota (upper air). The surface data used by the model are wind speed, wind direction, atmospheric stability, and temperature. The upper air data are the mixing heights derived from vertical temperature profiles measured twice daily by radiosonde ascents.

4.2.4.3 Receptor Locations for the Detailed Modeling Analysis

A radial receptor grid was used to determine the impact of the Hennepin County Energy Recovery Facility by itself. This receptor grid was based upon EPA's PTPLU model results and the procedures contained in the "Regional Workshops on Air Quality Modeling: A Summary Report" (EPA, 1981). The ten ring distances were set at 0.66, 0.86, 1.125, 1.525, 1.990, 2.58, 3.44, 4.50, 5.96 and 7.5 km.

A 13 x 13 receptor grid with 0.5 km spacing was used to determine locations of SO_2 hot spots within areas surrounding (1) the GAF facility, (2) the FMC facility, and (3) the Minneapolis central business district. The coordinates bounding these receptor grids are given in Table 4.2-4. A fine 11 x 11 grid with 0.1 km spacing centered on these high impact locations was used in calculating concentrations based upon the entire current Minneapolis-St. Paul SO_2 emissions inventory.

4.2.4.4 Detailed Modeling Analysis

Unit emissions were modeled for the facility with the urban version of RAM dispersion model using the five years of meteorological data and the radial receptor grid discussed above. Concentrations for each pollutant were scaled from the modeled hourly concentrations by the pollutant emission rate. The RAM model options used in this analysis are presented in Table 4.2-5. The calculated impacts due to the facility alone were evaluated to determine:

- o PSD increment consumption;
- o impacts for the nonattainment pollutants; and
- o concentrations for comparison with the de minimis concentrations for confirmation of a waiver of preconstruction ambient monitoring.

The short-term (averaging period of 24-hours or less) NAAQS and PSD increments can be exceeded at each receptor once per calendar year. That is, the highest predicted short-term concentration at each receptor is not used to determine if the proposed source is in compliance with the standards. Therefore, the highest of the second-highest short-term concentrations over all the receptors predicted for a calendar year is used to determine compliance. The predicted long-term (3-month and annual) concentrations must be below the standards/increments at all receptors for each year.

TABLE 4.2-4

COORDINATES OF MODELING AREAS

GAF Area:	
	475.0 - 481.0 UTM East
	4,981.0 - 4,987.0 UTM North
FMC Area:	
	475.0 - 481.0 UTM East
	4,987.0 - 4,993.0 UTM North
CBD Area:	
(Central Business	476.0 - 482.0 UTM East
District)	4,976.0 - 4,987.0 UTM North

Source: HDR, 1985.

TABLE 4.2-5
RAM MODELING OPTIONS
FOR DETAILED MODELING ANALYSES

Option Description	Value
Dispersion Parameters	Urban
Wind Profile Exponents	Default
Stack Tip Downwash	Not Used
Buoyancy Induced Dispersion	Not Used
Decay Coefficient	0.0
Gradual Plume Rise	Not Used

Source: HDR, 1985.

There are no other sources located in the Minneapolis-St. Paul area which will consume PSD increments, assuming that the area is redesignated as an attainment area for SO_2 (see Subsection 3.2.1.1). Therefore, the PSD increment consumption analysis was based solely on concentrations caused by the proposed source's SO_2 emissions. The highest, second-highest short-term SO_2 concentrations and highest annual SO_2 concentrations calculated from the five-year modeling analysis were then compared to the applicable PSD increments. All of the PSD increment was assumed available to the proposed facility because previous MPCA RAM modeling had indicated that total SO_2 concentrations in the area where the resource recovery facility has its maximum predicted impacts are less than the SO_2 concentration which would remain after subtracting the full PSD increment from the NAAQS.

Total criteria pollutant concentrations were determined by adding conservative background concentrations to modeled concentrations from the proposed facility calculated from the five-year modeling period. The total concentrations were then compared to the NAAQS and Minnesota ambient standards. To determine SO_2 compliance a more detailed analysis was performed. This analysis investigated SO_2 impacts at three "hot spot" areas. These model calculations were performed for the entire Minneapolis-St. Paul SO_2 emissions inventory. The maximum predicted concentrations were then added to a non-modeled background of 15 $\mu g/m^3$ for comparison to the appropriate standards. This value was chosen by the MPCA to represent background concentration (unaffected by urban source emissions) to be added to modeled concentrations from sources in the metropolitan area.

4.2.5 Background Air Quality

The predicted concentrations that are compared to the standards are composed of two components: modeled values plus background air quality. Background accounts for the total emissions from these sources (stack, area, vehicular) that contribute to ambient concentrations in the facility's impact area but whose individual emissions were not modeled separately. The background air quality concentrations developed for the point source impact analysis are presented in Table 4.2-6. They are conservatively estimated as the highest baseline values observed during the last three years as presented in Section 3.2

4.2.6 Results of the Modeling Analyses

The resource recovery facility is subject to PSD review for each attainment pollutant emitted in amounts greater than the significance threshold. From the expected facility emission rates given in Table 4.2-1, a PSD review is required only for nitrogen oxides, lead and mercury, as Minneapolis is currently a nonattainment area for SO_2, particulates, and CO. Since particulate emissions are less than the 100 ton per year major source designation, the facility will not be subject to nonattainment review. However, under the assumption that the redesignation of the SO_2 and CO nonattainment status to attainment may be approved by the EPA prior to the submission of permit applications, a PSD modeling analysis will also be performed for SO_2 and CO.

TABLE 4.2-6
MONITORED AMBIENT BACKGROUND CONCENTRATIONS
OF ATTAINMENT POLLUTANTS

Pollutant	Averaging Time	Background Concentration
SO_2	1-hour	0.203 ppm (532 $\mu g/m^3$)
	3-hour	0.170 ppm (445 $\mu g/m^3$)
	24-hour	0.120 ppm (314 $\mu g/m^3$)
	Annual	0.007 ppm (18 $\mu g/m^3$)
NO_2	Annual	0.017 ppm (34 $\mu g/m^3$)
Lead	Calendar quarter	0.36 $\mu g/m^3$

Source: Minnesota Pollution Control Agency, 1985.

4.2.6.1 Comparison of Predicted Concentrations with De Minimis Levels

An application for a PSD permit must contain an analysis of existing ambient air quality in the vicinity of the proposed source for each pollutant the source would have the potential to emit in amounts greater than the significance threshold. Monitoring data in the form of existing representative air quality data or a site-specific monitoring program are used to establish existing air quality for purposes of satisfying this requirement. Preconstruction monitoring by the applicant may be waived on a pollutant-by-pollutant basis by the reviewing authority (here the MPCA) if the emissions of pollutants subject to PSD review would cause minimal ambient impacts as defined by the de minimis monitoring concentrations established by EPA.

The maximum predicted air quality impacts of the resource recovery facility (based on the results of the RAM model) and the corresponding de minimis ambient concentration thresholds for the regulated pollutants are summarized in Table 4.2-7. Predicted concentrations for these pollutants as emitted from the facility are less than the de minimis threshold levels. Therefore, a preconstruction ambient monitoring program is not warranted.

4.2.6.2 PSD Increment Analysis

The MPCA has petitioned EPA to redesignate the entire metropolitan area to attaining the NAAQS for SO_2. When this occurs, PSD review will apply to SO_2. PSD review requires a demonstration of compliance with the PSD increments, that is, predicted ground level SO_2 concentrations associated with the proposed resource recovery facility must be below the PSD increments. The predicted highest annual average, and highest of the second highest 24-hour and 3-hour average SO_2 concentrations due to emissions from the proposed facility are given in Table 4.2-8 along with the corresponding allowable PSD increments. The highest annual average facility related SO_2 concentration is 0.5 $\mu g/m^3$ which is 2.5% of the allowable PSD increment. The highest, second highest 24-hour and 3-hour SO_2 concentrations are 5.2 $\mu g/m^3$ and 9.8 $\mu g/m^3$, respectively. These concentrations are 5.7% and 1.9% of the allowable PSD increment.

4.2.6.3 NAAQS and Minnesota Ambient Standards Analysis

Once compliance with PSD increments has been determined, compliance with the NAAQS and Minnesota state ambient air quality standards must be demonstrated. Total air quality levels are determined by combining the peak predicted concentrations with existing background levels. In comparing the facility impacts presented in Table 4.2-7 to the EPA's significant impact levels shown in Table 3.2-5, it can be seen that predicted concentrations are below significant levels for each of the pollutants except SO_2 and NO_2. In general, the EPA and MPCA do not intend to analyze the impact of a major new source beyond the point where its contributions fall below

TABLE 4.2-7

COMPARISON OF DE MINIMIS LEVELS

AND MAXIMUM PREDICTED POLLUTANT CONCENTRATIONS

FROM RESOURCE RECOVERY FACILITY

Pollutant	Averaging Time	Pollutant Emission Rate (g/sec)	Predicted Concentration[1] (μg/m³)	Location Distance (m)	Location Direction	De Minimis Threshold (μg/m³)[2]
Particulates	24 hours	1.3	1.1	660	WNW	10
	Annual	1.1	0.1	660	SE	-
Sulfur dioxide	3 hours	6.1	9.8	2,580	SE	-
	24 hours	6.1	5.2	660	WNW	13
	Annual	5.1	0.5	660	SE	-
Nitrogen dioxide	Annual	22	2.2	660	SE	14
Carbon monoxide	1 hour	12.1	27.0	860	N	-
	8 hours	12.1	15.0	2,580	ESE	575
Lead	3 months	0.12	0.011[3]	660	WNW	-
Mercury	24 hours	0.04	0.0359	660	WNW	0.25
Hydrogen fluoride	24 hours	0.05	0.045	660	WNW	0.25
Hydrogen chloride	24 hours	3.2	2.8	660	WNW	-
Beryllium	24 hours	$1.6x10^{-7}$	$8.9x10^{-6}$	660	WNW	.0005
VOCs	Annual	0.64	0.06	660	WNW	---[4]

[1]Results are highest second-high concentrations from RAM model run with five years of consecutive meteorological data. Modeled emission rates for annual averaging periods are based on 1000 tpd facility throughput. Modeled emission rates for averaging periods other than annual are based on 1212 tpd facility throughput. This is believed to represent a worst case scenario, although on average the facility will burn 1,000 TPD of MSW.

[2]40 CFR 52.21 (i)(8)(i), 1984.

[3]24-hour value is given as a conservative estimate of the 3-month average value.

[4]No de minimis air quality level is provided for ozone. However, any net increase of 100 tpy or more of volatile organic compounds subject to PSD would be required to perform an ambient impact analysis including the gathering of ambient air quality data. The resource recovery facility is predicted to produce only 91 tpy (total hydrocarbons).

NOTE: The Resource Recovery is constrained by law to burn no more than 365,000 TPY MSW (1000 TPD).

Source: Blount Energy Resources Corp.

TABLE 4.2-8

PSD CLASS II INCREMENT (FOR SULFUR DIOXIDE) CONSUMED BY THE RESOURCE RECOVERY FACILITY

Averaging Time	Facility Impact (ug/m^3)	Allowable PSD Class II Increment (ug/m^3)	Percent of PSD Increment Consumed
3 hour	21.3	512	4.2
24 hour	11.4	91	12.5
Annual	1.1	20	5.5

Source: HDR, 1985.

these significant levels. Therefore, a NAAQS compliance analysis was performed for three of the criteria pollutants, SO_2, NO_2 and lead (since significant impact levels for lead have not yet been established). Table 4.2-9 presents the highest of the second highest facility related impacts along with the highest observed background concentrations for comparison to the limiting ambient standard. As can be seen from the table, all concentrations are below the appropriate ambient standards. The highest, second highest predicted 1-hour and 3-hour SO_2 concentrations are 545.6 $\mu g/m^3$ and 454.8 $\mu g/m^3$, respectively. Both of these values are less than fifty percent of the limiting standard. The highest, second highest 24-hour average SO_2 concentration of 319.2 $\mu g/m^3$ is less than ninety-percent of the limiting standard. The highest predicted annual average impact of 18.5 $\mu g/m^3$ is 31% of the limiting standard. Total concentrations of NO_2 and lead are about thirty-six and thirty-one percent of the standards, respectively.

The MPCA request to the EPA for redesignation of the area for SO_2 is supported by the results of RAM modeling in the project area. However, the EPA guidelines recommend that input variables used in the RAM model by the MPCA--specifically, a decay rate (half-life) for SO_2 emissions, gradual plume rise, and stack downwash--not be considered. The modeling results that did take these variables into account approached and neared Minnesota's 1-hour SO_2 standard of 1,300 $\mu g/m^3$ in certain "hot spots." (A hot spot is an area where a pollutant standard is exceeded or where compliance is marginal.) Thus, in order to satisfy the EPA-modeling guidelines, it is expected that the MPCA will have to remodel the Minneapolis area using the revised modeling procedures. The MPCA is in the process of remodeling the metropolitan area using these same model inputs and options.

To assess the potential impacts of the proposed project on each of three identified hot spots (see Figure 4.2-1), the RAM model was run based on a procedure worked out in cooperation with the MPCA and consistent with EPA-recommended modeling guidelines and discussed in Section 4.2-4. Essentially, the RAM model was used to determine the cumulative impact on hot spot areas of emissions from the resource recovery facility and all sources in the Minneapolis-St. Paul emission inventory.

The SO_2 hot spot in south Minneapolis (Hot Spot A) is located near I-35W and Lake Street; the Fridley hot spot (Hot Spot B) is near the Mississippi River and I-694; the north Minneapolis hot spot (Hot Spot C) is north of Lowry Avenue and west of the Mississippi River. These hot spots occur as a result of the cumulative impacts of several point sources under certain meteorological conditions. The results of modeling at each of these hot spots indicate that the maximum cumulative SO_2 impacts will be below the controlling NAAQS or Minnesota state standards and that the Resource Recovery facility impact on these areas would not be significant (see Table 4.2-10).

4.2.6.4 Nonattainment Pollutant Impacts

The resource recovery facility point source impacts for the nonattainment pollutants are compared to the nonattainment significance thresholds in Table 4.2-11. A comparison of these values

TABLE 4.2-9
COMPARISON OF AIR QUALITY IMPACTS
OF RESOURCE RECOVERY FACILITY AND BACKGROUND CONCENTRATIONS
TO AMBIENT AIR STANDARDS

Pollutant	Averaging Time	Highest 2nd-High Facility Impact (μg/m^3)	Background Concentration (μg/m^3)	Total (μg/m^3)	Limiting Standard (μg/m^3)
SO_2	1 hour	13.6	532	545.6	1,300
	3 hour	9.8	445	454.8	1,300
	24 hour	5.2	314	319.2	365
	Annual	0.5	18	18.5	60
NO_2	Annual	2.2	34	36.2	100
Lead	Quarterly	0.11*	0.36	0.47	1.5

*Value listed is a 24-hour concentration; the quarterly average value would be less.

Source: HDR, 1985.

TABLE 4.2-10

COMPARISON OF AMBIENT STANDARDS

AND MAXIMUM CUMULATIVE IMPACT OF SO_2 EMISSIONS

FROM RESOURCE RECOVERY FACILITY AND

MINNEAPOLIS-ST. PAUL EMISSIONS INVENTORY

Location	Maximum Cumulative Impact ($\mu g/m^3$)[1]	Resource Recovery Impact ($\mu g/m^3$)[2]	Non-Modeled Background ($\mu g/m^3$)[3]	Total ($\mu g/m^3$)	NAAQS ($\mu g/m^3$)	Minnesota Standard ($\mu g/m^3$)
CBD:						
1 hour	912.5	0.044	15	927.6	N/A	1,300
3 hours	458.8	0.000	15	473.8	1,300	1,300
24 hours	321.4	0.000	15	336.4	365	365
GAF:						
1 hour	619.8	0.000	15	634.8	N/A	1,300
3 hours	467.2	0.000	15	482.2	1,300	1,300
24 hours	265.5	0.53	15	281.0	365	365
FMC:						
1 hour	879.2	0.016	15	894.2	N/A	1,300
3 hours	486.4	0.000	15	501.4	1,300	1,300
24 hou4s	294.8	0.001	15	309.8	365	365

[1] Total for resource recovery facility and all other sources in the MPCA emissions inventory for the Minneapolis-St. Paul area.

[2] The resource recovery facility's maximim impact does not occur at the same location at the maximum cumulative impact location.

[3] The MPCA suggests a background concentration of $15 \mu g/m^3$ be used to account for the non-modeled sources.

Source: Blount Energy Resources Corp.
HDR Techserv, Inc. Environmental Technical Report 7: Air Quality (Sept. 1985)

TABLE 4.2-11
NONATTAINMENT SIGNIFICANCE THRESHOLDS
AND RESOURCE RECOVERY FACILITY IMPACTS

Pollutant	Averaging Time	Facility[1] Impact ($\mu g/m^3$)	Nonattainment[2] Significance Thresholds ($\mu g/m^3$)
Carbon monoxide	1 hour	22.0	2,000
	8 hour	15.0	500
Sulfur dioxide	3 hour	9.8	25
	24 hour	5.2	5
	Annual	0.5	1
Particulates	24 hour	1.1	5
	Annual	0.1	1

[1]Blount Energy Resource Corp.
[2]40 CFR 51.18, Appendix S, 1984.

shows that the facility's stack would not contribute significant ambient concentrations of either carbon monoxide or particulates to the nonattainment area, but that it might contribute significant ambient concentrations of SO_2 over the 24 hour averaging period. The modeled 24-hour average facility related SO_2 concentration is 5.2 $\mu g/m^3$. The corresponding nonattainment significance threshold is 5 $\mu g/m^3$. The cumulative modeled impacts of the entire Twins Cities emissions inventory and the resource recovery facility along with a non-modeled background that show however, total SO_2 concentrations are within the standards, thus supporting MPCA's redesignation request to the EPA.

4.2.7 Indirect Source Analysis

Packer and transfer trucks, private vehicles and employee vehicles are sources of pollutant emissions that will result indirectly from Facility operation. For vehicular emissions the primary pollutant of concern, in terms of localized impacts, is CO. EPA has issued guidelines for evaluating the impact of vehicular indirect sources (EPA 1980). Using the EPA guidelines, an indirect source analysis was carried out to determine the maximum expected air quality levels of CO in the vicinity of the Greyhound site in the year 1989, the year of maximum site utilization. Maximum predicted truck and vehicular CO impacts associated with the operation of the Greyhound site in 1989 were added to a conservative background concentration to assess compliance with the 1- and 8-hour ambient standards for CO. An ambient standards compliance analysis was likewise performed for the area surrounding the Hopkins-DOT transfer station associated with operations at that site in the year 1989. Because the Hopkins-DOT site is expected to have the highest traffic volume of the four proposed transfer stations, it is believed to conservatively represent the level of impacts associated with the transfer stations. The analysis was very conservative in that it employed the use of background CO concentrations for downtown Minneapolis in the less urban areas where the transfer stations are located.

To calculate the impact of traffic associated with facility and transfer station operations in the year 1989, mathematical models were applied. EPA's Mobile 3 model was applied to quantify the CO emissions. EPA's preferred model, CALINE 3, was then used to calculate resulting CO concentrations at intersections and along roadways adjacent to the Greyhound site and Hopkins-DOT transfer station. Assumed meteorological conditions and vehicle mix are listed in Table 4.2-12. Daily and peak traffic volumes assumed in the modeling are listed in Table 4.2-13. A conservative background concentration to be added to modeled concentrations was derived from MPCA's Portland Ave. South Site (No. 949) for each averaging period. CO concentrations measured at this site were determined to best represent ambient concentrations at the Greyhound and transfer station sites. The 7th and Hennepin CO monitoring site, the only other site in the Minneapolis Area (MPCA Site No. 936), is not representative of the Greyhound or transfer station sites because traffic volumes are higher at 7th and Hennepin than at the proposed sites. Using the latest 3 years of monitoring data (1982-1984), the highest of the second-highest 1- and 8-hour CO concentrations (see Table 3.2-8) were

TABLE 4.2-12
MODEL INPUT PARAMETERS USED IN
THE INDIRECT SOURCE ANALYSIS

Meteorological Conditions	
Ambient temperature	= 20°F
Atmospheric Stability	= D (neutral)
Wind Speed	= 2 mph
Wind Direction	Maximizing Wind Angle at each receptor
Persistence Factor to scale 1-hour concentrations to 8-hour values	= 0.7
Vehicle Data	
Age & Mix	National Averages

Source: HDR, 1985.

TABLE 4.2-13

VEHICLE TRIP ESTIMATES USED IN THE INDIRECT SOURCE MODELING

Passenter Car Equivalents:

Packer Tk.	=	1.50
Transfer Tk.	=	2.00

Vehicle Capacity:

Packer Tk.	=	5 ton
Transfer Tk.	=	18 ton
Private Veh.	=	350 lbs

Site	Year (est. tpd)	Element	Daily Trips	AM Peak Hour			PM Peak Hour		
				In	Out	Total	In	Out	Total
Greyhound	1989	Packer Tk.	193	19	19	39	12	12	23
	(1000)	Private Veh.	193	12	12	23	19	19	39
		Employee Veh.	50	17	17	33	17	17	33
		Transfer Tks	29	1	1	2	1	1	2
		Total	465	49	49	98	49	49	98
		Routed PCEs		57	57	114	53	53	107
		Total PCEs		60	60	119	56	56	112
Hopkins-DOT	1989	Packer Tks.	232	23	23	46	14	14	28
	(1200)	Private Veh.	232	14	14	28	23	23	46
		Employee Veh.	20	20	0	20	0	20	20
		Transfer Tks.	67	8	8	17	8	8	17
		Total	551	65	45	111	45	65	111
		Routed PCEs		69	49	117	44	64	108
		Total PCEs		85	65	151	61	81	141

Source: HDR, 1985

selected as background values to be added to modeled concentrations for the ambient standards compliance assessment.

Modeling results are presented in Table 4.2-14. Facility-related traffic impacts are expected to be near or below EPA defined significance levels. The highest predicted CO concentrations associated with the Greyhound site were predicted at the signalized intersection of 7th Street and 6th Avenue North. Total concentrations of 16.6 ppm and 7.3 ppm were predicted at this location for the 1-hour and 8-hour averaging periods, respectively. Corresponding ambient standards are 30 ppm and 9 ppm. The highest CO concentrations near the Hopkins-DOT transfer station were predicted at the intersection of County Road 3 and 5th Avenue South. Total concentration of 16.3 ppm and 7.0 ppm were predicted at this location for the 1-hour and 8-hour avaraging periods As can be seen, compliance with 1- and 8-hour ambient standards is predicted at the Greyhound and Hopkins-DOT sites. Predicted ambient standards compliance at the Hopkins-DOT site suggests compliance at the remaining transfer stations as well. The analysis employed the use of the Minneapolis downtown CO background concentration at the Hopkins DOT site, a less urbanized area. Therefore, the results of the Hopkins analysis are believed to be very conservative and representative of an upper bound for all of the transfer stations.

The City of Minneapolis is currently designated as non-attaining the NAAQS for CO. The MPCA is currently petitioning EPA to redesignate the city to attaining based on newly implemented traffic control strategies and on the basis of 3 consecutive years of monitored compliance with the NAAQS (see Table 3.2-8) at both CO monitors. The project, while in an official non-attainment area, is not expected to have an impact on the former hot spot at 7th and Hennepin Ave. (a hotspot is a location where violations of ambient standards have been monitored) at 7th and Hennepin Ave. and is not expected to affect any current strategies that are being implemented by the MPCA. The CO modeling analysis shows that no hot spot will be created as a result of the truck and car traffic associated with facility operations and that predicted CO concentrations will be below Minnesota and federal ambient standards. The analysis of traffic from the transfer stations to the site (see subsection 4.7) further indicates that the project would not create any hotspots.

4.2.8 Cooling Tower Impact Analysis

The proposed Hennepin County Resource Recovery Facility will be equipped with a two-cell mechanical draft cooling tower. The cooling tower will be located approximately 45 meters south of 6th Avenue North and 90 meters northeast of 7th Street North. The cooling tower and site are shown in Figure 4.2-2.

4.2.8.1 Technical Approach

The potential extent of visibility impairment (fogging) and roadway icing resulting from operation of the cooling tower in a wet mode was evaluated. Results of the evaluation are summarized in this Subsection. Icing on road surfaces can result from two conditions:

TABLE 4.2-14
PROJECTED YEAR 1989 CO CONCENTRATIONS (PPM)
IN THE IMMEDIATE VICINITY OF THE PROPOSED SITES

Location	Background	Facility Traffic	Projected Air Quality	Most Stringent Ambient Standard***
Greyhound Site				
1-hour	15.7	0.9*	16.6	30
8-hour	6.6	0.7	7.3	9
Transfer Stations (Hopkins-DOT)				
1-hour	15.7**	0.6*	16.3	30
8-hour	6.6**	0.4*	7.0	9

*These values represent insignificant impacts because they are lower than the EPA significance levels of 1.75 ppm (2000 $\mu g/m^3$) and 0.44 ppm (500 $\mu g/m^3$) for 1- and 8-hour averages, respectively.

**Modeling assumed the use of downtown Minneapolis background CO concentrations for the transfer stations. This is extremely conservative since the transfer stations are located in less urbanized areas and are less prone to elevated CO levels than downtown Minneapolis.

***Promulgated standard believed to adequately protect the public health and welfare.

8511077

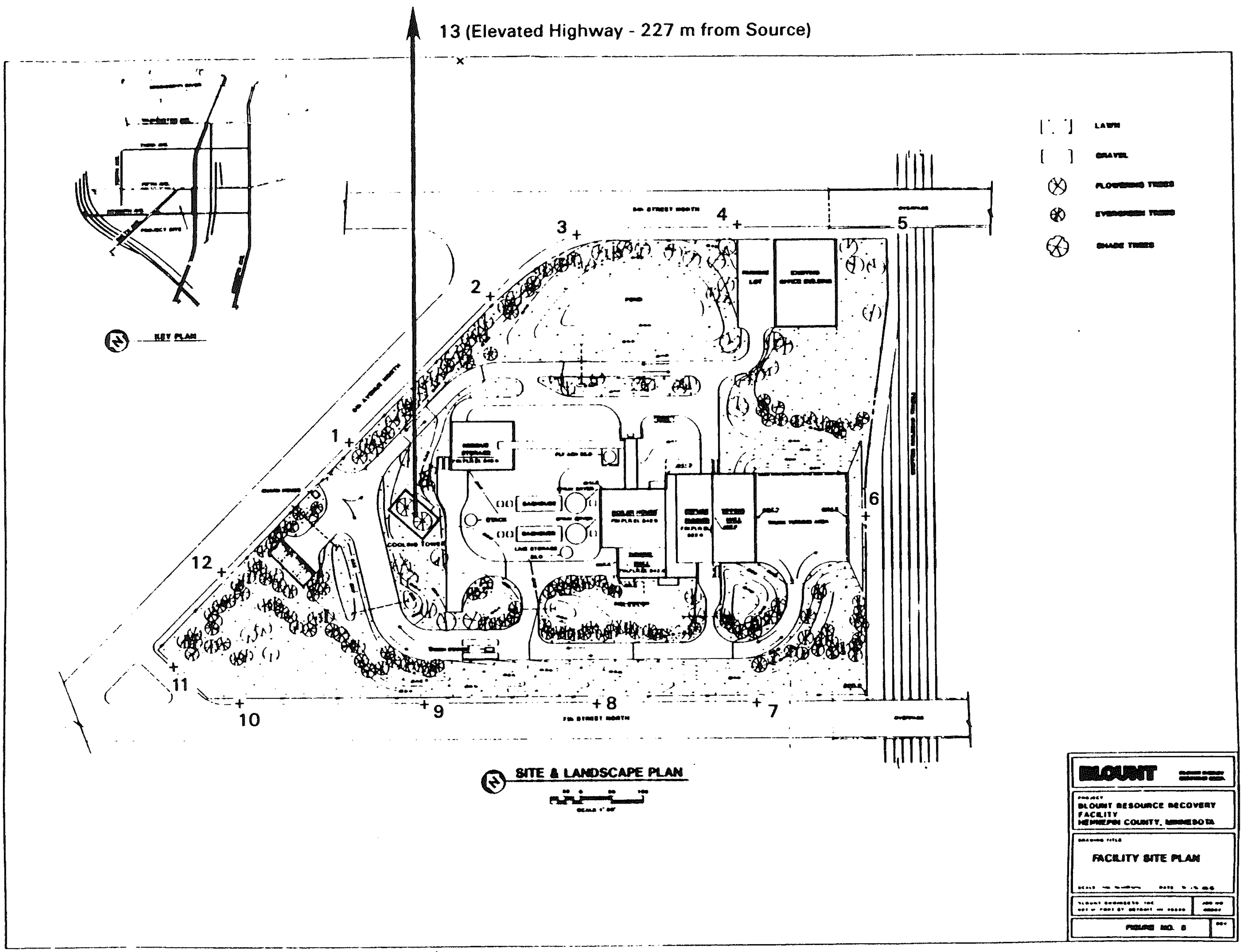

Figure 4.2-2 Receptor Locations for Cooling Tower Plume Modeling, Assuming that the Cooling Tower Building is the Controlling Building

deposition of the small water droplets (drift) that escape the cooling tower, and impaction of the visible plume on the road surfaces. The vapor plume emitted by the cooling tower will become visible (condense) when the water vapor in the plume and the ambient water vapor combine to cause saturation of the air in the plume. As the ambient temperature decreases, the amount of additional water vapor the atmosphere can hold before saturation and condensation occur also decreases. Therefore, the maximum occurrence of visible plume would be expected to occur during periods when the background (ambient) moisture content is high and the temperatures are low.

Two models were used to estimate the potential extent of surface icing and visibility impairment caused by operation of the proposed cooling tower. A drift deposition model was used to calculate the amount of water-droplet drift that is deposited on the ground as a function of various wind speed categories. The model assumes conservatively that the droplets do not evaporate after they leave the plume.

A cooling tower plume model was used to calculate the moisture content of the plume and the ambient air, and to then determine if the plume is visible at specified locations. Icing is assumed to occur if the plume is visible when the ambient temperature is at or below 32°F. Calculations were performed for every hour of a 1-year period. Meteorological year 1977 was chosen because wintertime temperatures were the coldest of the 5 year (1973-1977) meteorological data base used in the dispersion modeling studies described in Subsection 4.2.4. The model simulates building-downwash of the cooling tower plume. Inclusion of this condition in the model is essential because it is the primary means by which a visible plume can reach the ground.

Cooling tower operational data used in the impact modeling is presented in Table 4.2-15. The tower is designed to prevent 99.992 percent of the recirculating water from escaping the cooling tower in the form of drift.

4.2.8.2 Potential for Ground-Level Icing from Drift Deposition

Drift deposition rates were calculated for locations on 6th Ave. North, the closest roadway to the cooling tower. The potential for drift deposition would be greatest at locations within 100 m downwind of the cooling tower. Computations were made for six wind speed classes for winds from the southeast direction. The southeast sector (124°-146°) was chosen because it had the greatest frequency of occurrence during 1977 of the wind directions which would impact 6th Ave. North (see Figure 4.2-2). The results of the drift deposition analysis for 1977 are summarized in Table 4.2-16. Results are presented for the three wind speed categories modeled which were associated with the highest frequency of potential icing. The number of consecutive hours of potential icing for each wind speed category is listed as well. For example, as shown in the Table, there were 6 different 2-hour periods during 1977 in which there was potential for ice buildup on 6th Avenue North when winds were blowing at speeds of 3.4-5.5 m/sec. The single worst episode which occurred in 1977 was 14 consecutive hours of winds within the 124°-146° sector combined with

TABLE 4.2-15

COOLING TOWER OPERATING DATA

Parameter	Design Value
Type	Mechanical Draft
Dimensions (ft)	
Length	108
Width	54
Height	43
Diameter per Cell	38
Number of Cells	2
Recirculation Rate (gpm)	27,500
Design Hot Water Temperature (°F)	101
Design Cold Water Temperature (°F)	81
Drift Loss (gpm)	2.2

Modeling Conditions	Winter	Summer
Ambient Temperature (°F)		
Wet Bulb	8	74
Dry Bulb	10	85
Plume Temperature (°F)		
Wet Bulb/Dry Bulb*	70	93
Plume Exit Velocity (fpm)	1405	1405
Evaporative Water Loss (gpm)	337	509

*Plume is saturated at tower outlet.

Source: Blount Energy Resource Corp.

TABLE 4.2-16

RESULTS OF DRIFT DEPOSITION ANALYSIS

Road	Maximum Drift Deposition on Road for 1977 ($g/m^2/sec.$)	Wind Direction	Wind Speed (m/sec.)	Frequency (1977) When Temperature <32°	Resulting Ice Build-up (inches)
6th Avenue North	1.807×10^{-3}	SE	1.8-3.4	40	.00028/1 hr
				7	.00056/2 hrs
6th Avenue North	1.61×10^{-3}	SE	3.4-5.5	71	.00025/1 hr
				6	.00050/2 hrs
				7	.00075/3 hrs
				3	.00100/4 hrs
				1	.00150/6 hrs
6th Avenue North	1.149×10^{-3}	SE	5.5-8.6	33	.00018/1 hr
				3	.00035/2 hrs
				2	.00053/3 hrs
				1	.00071/4 hrs
				1	.0014/8 hrs
6th Avenue North	1.34×10^{-3}	SE	3.4-8.6	1	.0029/14 hrs

Source: ERT, 1985.

freezing temperatures, that is, 14 consecutive hours of potential icing conditions. During this 14 hour period the total deposition from droplet drift was computed to be .0029 inches of ice. During the entire year, the model predicted a total of 132 hours during which ice could potentially build up on 6th Ave. North when winds are from the 124° - 146° southeast sector.

Two different agencies were contacted regarding standards or guidelines covering a maneuvering vehicle's stability as a function of ice build-up: Federal Highway Administration (FHWA, 1985), and the Minnesota Office of Highway Maintenance. Neither of the agencies contacted provided a standard or guideline.

This conservative analysis of ice build-up resulting from deposition of drift droplets emitted by the proposed cooling tower did not consider the countering effect of friction caused by traffic on the roads nor did it consider potential evaporation of drift in the cooling tower plume or on the roadway surface. The results of this conservative analysis, however, indicate that there is potential for ice build-up on nearby roadways due to droplet drift deposition whenever ambient temperatures are at or below freezing. The greatest potential for ice build up is on 6th Ave. North and on other roadways immediately bordering this site. The maximum ice build up due to drift was modeled to be 0.0029 inches over a 14-hour period. This is equivalent to a very light dusting of snow and does not include the effects of road traffic. Friction from road traffic would tend to reduce ice build up.

4.2.8.3 Potential for Ground-Level Icing and Fogging From Visible Plumes

The potential for visible-plume-induced icing and fogging was estimated for Sixth Avenue North, Seventh Street North, Fifth Street North, U.S. Route 52, and the railroad track adjacent to the site to the southeast using the cooling tower plume model. Plume-induced means those hours when fogging or icing would not have occurred naturally. The analysis was performed for two seasons, summer (May through mid-October) and winter (mid-October through April). Cooling tower model runs were made for two different buildings which have the potential to cause aerodynamic downwash of the cooling tower plume, the boiler house, located 88 m to the southeast of the cooling tower, and the cooling tower building itself. The wind directions for which the boiler house was considered the controlling or influencing building were from 119°-152° (SE Winds). These wind directions would transport the cooling tower plume across a 70 m section of 6th Avenue North. This sector of wind directions was determined by computing the angle subtended by the width of the boiler house as seen from the source plus one fourth of the building height added to either side to account for boiler house building edge effects influencing wind flow (Briggs 1973). The cooling tower building was considered to influence the plume during all other wind directions (see Figure 4.2-3 for receptor locations).

Of the hours during which the plume was influenced by the cooling tower building only, plume induced fog was predicted to occur only twice during 1977, at locations on 7th Street North and U.S. Route 52. No plume-induced ice was predicted to occur anywhere when the cooling tower plume is influenced by the cooling tower building.

8511078

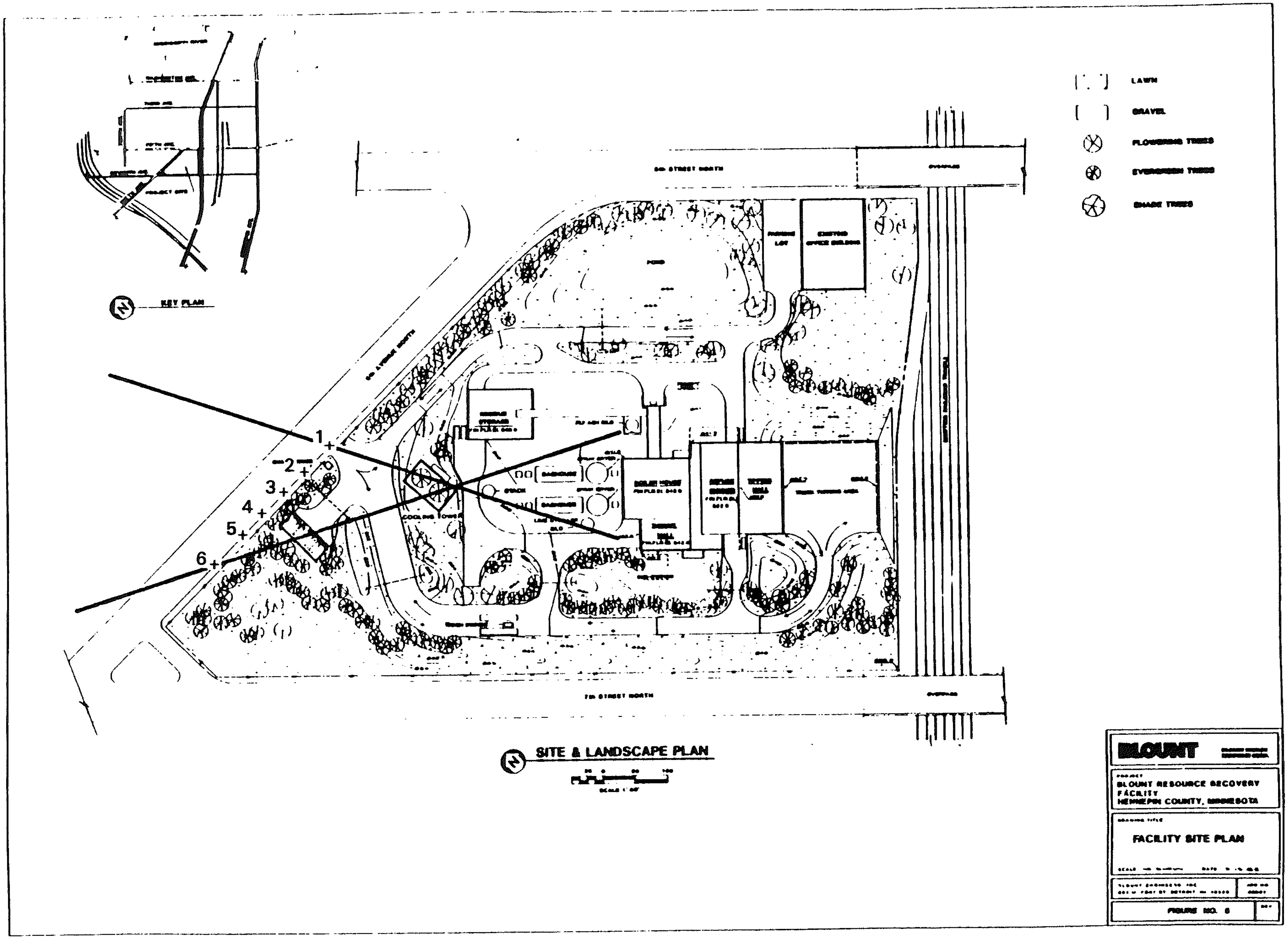

Figure 4.2-3 Receptor Locations for Cooling Tower Plumes Assumed to be Influenced by the Boiler House

Of the hours when winds were from the SE sector (119°-152°) and the plume was being transported across a 70m section of the Sixth Avenue North under the influence of the boiler house, plume induced ice or fog was predicted to occur for about 10% of the hours in the year (866 hours). For the winter model run, fog was predicted to occur 289 hours, and ice 184 hours. For the summer model run, ice was predicted to occur only twice and fog a total of 391 hours.

Clearly, modeling shows that there is potential for ground level impact from the cooling tower plume when the wind is blowing from the direction of the boilerhouse. It should be remembered that these impacts are predicted to occur along a 70 m stretch of Sixth Avenue North. Friction from automobiles on the roadway would reduce ice build-up, however. All other roadways surrounding the site should not be significantly impacted.

4.2.8.4 Potential for Ground-Level Icing and Fogging From Resource Recovery Stack Emissions

Cooling tower model runs were repeated for meteorological year 1977 to estimate the potential for ground-level icing and fogging in association with water vapor released in the flue gas from the 212' stack at the proposed facility. The cooling tower model can simulate dispersion of water vapor and subsequent condensation or icing from a stack as well as from a cooling tower. Stack parameters listed in Table 4.2-2 were input to the model. The water vapor emissions from the top of the stack were calculated to be 76,241 pounds per hour. The 76,241 pounds consists of 7,884 pounds of water evaporated in the dry scrubbing process and 68,357 pounds of water created in the combustion process. All water is in the vapor state as it exits the stack at a temperature of 264°F.

The potential for ground-level fogging or icing was calculated over the same 360 receptor grid used in the 5-year dispersion modeling study. Model results indicated that water vapor emitted from the stack does not cause or contribute to fogging or icing at any location at any time during the simulated year.

<u>Conclusions</u>

Modeling results indicate that ice could accumulate on a 70 m section of Sixth Avenue North due to drift deposition and due to impaction of the cooling tower plume. The boilerhouse disturbs the air flowing past it and causes aerodynamic downwash of the cooling tower plume on the road surface. The potential for icing at all other locations was predicted to be considerably less from the cooling tower and nonexistent from the stack.

4.2.9 Odor Analysis

The MPCA regulates odors in Minnesota (Minn. Rules, 1978, Chapter 7005.0900). The MPCA rules define an odor concentration unit as follows:

Odor Concentration unit shall mean the number of standard cubic feet of odor-free air needed to dilute each cubic foot of contaminated air so that at least 50 percent of the odor concentration test panel does not detect any odor in the diluted mixture.

The test panel referred to in the definition consists of individuals who undergo a sensitivity test to odor thresholds. These tests are based on what is known as the dilution methodology. This method is based on the fact that the panelist can report the presence or absence of an odor with more certainty than objectively can be determined. During the test, a sample of the odor is diluted with odor-free air until a dilution is achieved in which the odor is barely detectable by half of the odor panel.

4.2.9.1 Odors Associated with Resource Recovery Plants

A properly designed (negative pressure) and operated (no long-term refuse storage) resource recovery facility should produce no perceptible odors beyond the facility boundaries. Many mass burn facilities in Europe and the United States have had a long history of operation without any odor problems. One of the more serious odor problems occurred at the Hempstead, New York resource recovery facility, which utilized a wet-pulping RDF process, not mass burn technology. Because of inadequate operating practices odors were emitted. There were additional problems with the materials handling facilities and with housekeeping practices.

Two other resource recovery facilities that have experienced odor problems are located in Madison, Wisconsin and Glen Cove, New York. The Madison plant is a shredder-only facility. Municipal solid waste is shredded to produce RDF, which is transported off-site for incineration. The Glen Cove facility combines resource recovery and sewage treatment. Odors at this facility may be due in part to the sewage treatment activities (City of New York, September 1984).

Objectionable odors may occur inside any receiving, storage, or processing area, but the odors should be minimal outside the facilities. Odors do not form in most existing facilities that combust Municipal Solid Waste (MSW) daily, because the MSW is combusted soon after it is received and before it decomposes significantly.

Stale MSW delivered and deposited in the pit of a resource recovery facility may be odorous. Also, excessively wet MSW that remains unprocessed for some period (in excess of one day) may generate odors caused by anaerobic decomposition. Odors that are generated inside the resource recovery facility will be controlled by drawing air from inside the facility through the boilers to create a slight negative pressure. The odors will be destroyed as the air passes through the combustion zone before exiting from the stack.

The resource recovery facility should not be a source of odor to the neighborhood. All refuse handling, particularly tipping and storage, would occur in enclosed structures, not in the open. The refuse storage pit would prevent additional moisture from reaching the waste and will limit the rapid decomposition that could produce odors. Additionally, the refuse storage pit and tipping floor will be maintained at a negative pressure so that odors associated with fresh garbage would be drawn into the furnace. Furnace controls will keep the combustion gases in the vicinity of 1,850°F, well above the 1,400°F required to destroy organic compound odor (based on industry experience). The air within the facility will be exchanged approximately eight times per hour at plant capacity.

Underfire air for the furnaces will be drawn from the refuse storage pit and tipping area, so that not only garbage odors but also truck exhaust fumes will be drawn into the furnace. Overfire air will be drawn from other equipment areas in the plant, thereby assuring that no stale air would remain anywhere in the facility.

Even if not all the furnaces are firing and there is refuse in the pit, ventilation of the refuse pit and tipping area will be maintained by the induced draft fans. Under these conditions, odorous gases would be directed into the stacks and released at an elevation that favors better dispersion. In case of complete plant shutdown in an emergency, refuse will be sent directly to landfill.

4.2.9.2 Odors Associated with Transfer Facilities

Odors that do become a problem at transfer station facilities can generally be traced to design or operational problems. The proposed Hennepin County transfer stations would be designed to contain odors within site buildings and to minimize packer truck queuing. Should there be a shutdown of the resource recovery facility, the proposed plan calls for daily removal of waste to nearby landfills (on an emergency basis). Thus, the facilities should not be a source of odor to surrounding neighborhoods.

In the immediate vicinity of the transfer stations, however, there may be some odor from waste in packer trucks if vehicles are in line waiting to unload. However, this impact would probably be minor, because the Hennepin County transfer stations are designed to process all waste on a daily basis.

In general, municipal collection vehicles would not pose an odor problem, because MSW will remain in the vehicles only as long as it takes to travel from the collection area to the transfer stations and removal, or directly to the resource recovery facility. Odors at the transfer station fall into two major categories: hydrogen sulfide (rotten egg odor) and organic. These odors would only occur if refuse was stored on-site for long periods (in excess of a day). The operation of the transfer stations will not allow refuse to collect for more than a day. Odor from transfer stations can range from insignificant to noticeable depending on the proposed operation. It has been assumed that the County would operate the transfer stations in a responsible manner. This includes removal of all waste daily and cleanup of the facilities. No odor complaints have been received as a result of the existing Minneapolis South transfer station operation (City of Minneapolis, August 1985).

4.2.9.3 Landfill Odors

Odors related to the direct landfilling of MSW are largely due to anaerobic microbial decomposition, a process in which the carbon and sulfur in MSW are chemically reduced to produce odorous gases. The odors fall into two major categories: hydrogen sulfide and organics (particularly methane). Pure methane has no odor itself, but it is released from landfills along with larger, reduced organic molecules that produce noxious odors.

In the combustion of MSW or RDF, available carbon and sulfur are oxidized to produce carbon dioxide, water, and sulfur dioxide--all odorless compounds. In contrast, MSW placed directly in a landfill can decompose and become a significant odor source. Bottom and fly ash from the resource recovery facility would be disposed of at permitted landfills, but these nonputrescible materials will undergo no significant decomposition after placement in the landfill. Thus they would not contribute to odors at the landfill.

Note: This portion on Human Health was replaced by other text in the Final EIS

4.3 Human Health

4.3.1 Methodology for Non-Criteria Pollutants

4.3.1.1 Overview

This section addresses non-criteria pollutant emissions from the proposed Hennepin County waste-to-energy facility. The study included a comprehensive review of existing flue gas emission data for both mass feed and refuse derived fuel units. A "target" compound listing of potential flue gas contaminants for mass burn facilities was selected for use in establishing emission factors for the proposed facility. This approach, which made use of data contained in the published literature, was necessitated by the absence of state-of-the-art emissions data pertinent to the actual Blount Engineering design selected for the proposed resource recovery facility.

The aforementioned data base was reviewed and a subset of this was chosen for the emissions inventory using a number of key selection criteria. The emissions inventory included in this report includes data on facilities operated in North America, of mass-feed design, with controlled emissions (ESPs) and for which test data were verifiable and scientifically defensible. These data, provided in concentration units (ng/m^3), were used in conjunction with pertinent operating parameters proposed for the Blount project design to develop emission factors for each of the chemical categories (g/ton, etc.).

The dry scrubber-baghouse technology for the proposed facility is designed to result in lower emissions. The Blount facility is designed to operate at a temperature of 1,800° F., two seconds downstream of secondary air injection. These combustion conditions should result in more complete combustion (that is, less emissions) than the facilities used in this analysis which had lower combustion temperatures than the proposed facility. No credit was taken in this analysis for the higher combustion temperatures proposed; therefore, the EIS provides risk assessment estimates which represent conservative upper bound limits.

The emissions data were combined with appropriate dispersion modeling in order to provide predicted ground level concentrations for each of the chemicals or chemical categories. The data in turn provided the basis for the risk assessment and health effects information contained in the latter portion of this section. Each of the critical components in this process, including the development of emission factors, dispersion modeling, and health effects data are described in more detail in the sections that follow.

4.3.1.2 Literature Review

A comprehensive review of available literature on the subject of toxic emissions from municipal refuse incinerators was conducted in an effort to develop a data base of those chemicals and chemical categories most frequently found in flue gas emissions from municipal waste incinerators. This typically includes data contained in the open literature such as professional journals and published reports. A bibliography of all the pertinent citations contained in the literature review is provided. These data are believed to represent the most up-to-date data set pertinent to flue gas emissions from these facilities worldwide. Data available from existing solid waste resource recovery facilities has been compiled. It should be noted that this data base does not contain emissions monitoring data collected earlier this year at two other municipal incinerators in Westchester, NY and Pittsfield, MA. The final data on these units will not be publicly available until early next year.

A summary listing of the chemical categories and individual components is provided in Table 4.3-1. This listing is comprised of those constituents which have appeared most frequently in the open literature as components of flue gas emissions from municipal refuse incineration systems. The section to follow will focus on the selection of data from this data base for incorporation into the project emissions inventory for use in this analysis.

4.3.1.3 Emissions Data Selection Criteria

The data base of existing emissions from municipal waste incineration systems was reviewed in an effort to select data most representative of potential emissions from the proposed facility. The data base initially analyzed consisted of emissions from a wide variety of facilities located both in North America and abroad. This included operating facilities in the United States, Canada, Italy, Japan, Sweden, Netherlands and Germany. Despite the fact that a great deal of information presently exists on measured emissions from municipal incinerators, it would not be appropriate to consider all of this data in the development of an emissions inventory for the project. Therefore only certain data were selected for use in the emissions inventory. Only facilities operated in North America, of mass-burn operation were included in the emissions inventory. The data found was not from identical facilities; it was data that was available.

Accordingly, all of the data points identified in the literature survey were evaluated using a series of selection criteria in order to determine the emissions data to be included in the inventory for this project. These selection criteria (placed in order of importance) with a brief description and justification for each of them are provided below:

Flue Gas Emissions Measurements

Only data representing actual flue gas emissions were considered in the evaluation process. Only flue gas samples collected downstream of the particulate control device can be said to represent actual emissions to the atmosphere.

From an historical perspective, flue gas emissions have frequently in the past been estimated using data collected from bulk particulate samples taken from a particulate control device. While this data is more widespread and readily available and inherently less expensive to develop, it does not provide a representative picture of actual flue gas emissions. Rather, this data, typically in units of parts per billion (ppb) or parts per trillion (ppt) (weight to weight), represents potential emissions in the absence of a particulate control device. This information historically has been used in conjunction with a series of assumptions to provide an emissions estimate. There are several difficulties in the use of this type of data to estimate actual atmospheric emissions. ERT therefore for the following reasons elected to use only actual samples collected downstream of particulate control devices.

TABLE 4.3-1

"TARGET" COMPOUND INVENTORY - NON-CRITERIA POLLUTANT EMISSIONS IDENTIFIED IN THE OPEN LITERATURE AS BEING CONTAINED IN FLUE GAS EMISSIONS FROM THE INCINERATION OF MUNICIPAL REFUSE

(SEE BIBLIOGRAPHY FOR LITERATURE CITED)

Chlorinated Phenols
- Dichlorophenols
- Trichlorophenols
- Tetrachlorophenols
- Pentachlorophenol (PCP)

Chlorinated Benzenes
- Pentachlorobenzene
- Hexachlorobenzene
- Dichlorobenzenes
- Trichlorobenzenes
- Tetrachlorobenzenes

Polychlorinated Biphenyls (PCBs)
- Monochlorobiphenyls
- Dichlorobiphenyls
- Trichlorobiphenyls
- Tetrachlorobiphenyls
- Pentachlorobiphenyls
- Hexachlorobiphenyls
- Heptachlorobiphenyls
- Octachlorobiphenyls
- Nonachlorbiphenyls
- Decachlorobiphenyl

Polynuclear Aromatic Hydrocarbons (PAHs)
- Chrysene
- Benzo(a)pyrene
- Benzo(2)pyrene
- Benzo(a)anthracene
- Coronene
- Fluoranthene
- Fluorene
- Anthracene
- Pyrene
- Methylnaphthalene(s)
- Biphenyl
- Naphthalene
- Acenaphthylene
- Acenapthene
- Phenanthrene
- Benzo(k)fluoranthene
- Dibenz(a,h)anthracene
- Benzo(g,h,i)perylene

Chlorinated Dibenzodioxins (PCDDs)
- Monochlorodibenzodioxins
- Dichlorodibenzodioxins
- Trichlorodibenzodioxins

TABLE 4.3-1 (Continued)

Chlorinated Dibenzodioxins (Cont.)	Metals
Tetrachlordibenzodioxins (TCDDs)	Antimony (Sb)
Pentachlorodibenzodioxins	Beryllium (Be)
Hexachlorodibenzodioxins	Lead (Pb)
Heptachlorodibenzodioxins	Mercury (Hg)
Octachlorodibenzodioxin	Vanadium (V)
	Manganese (Mn)
Chlorinated Dibenzofurans (PCDF)	Molybdenum (Mo)
Monochlorodibenzofurans	Tin (Sn)
Dichlorodibenzofurans	Cadmium (Cd)
Trichlorodibenzofurans	Chromium (Cr)
Tetrachlorodibenzofurans (TCDF)	Copper (Cu)
Pentachlorodibenzofurans	Nickel (Ni)
Hexachlorodibenzofurans	Zinc (Zn)
Heptachlorodibenzofurans	Arsenic (As)
Octachlorodibenzofuran	Selenium (Se)

a) Samples taken directly from particulate control devices have traditionally been grab type samples and as such are not representative of the contents of the control device itself.

b) Data contained in the open literature appears to indicate that much of the toxic organic emissions from the incineration of municipal wastes are contained in gaseous emissions and are not associated with particulates in the flue gas stream, at least not at the time of release from the stack.

c) Semivolatile organics such as PCDDS, and PCDFS are not uniformly distributed (weight to weight) throughout all of the sizes of particulate typically contained in flue gas emissions from combustion systems.

d) Analytical measurements resulting from the analyses of bulk particulate samples do not always provide a true picture of the semivolatile organic matrix condensed on that particulate matter. In many instances data provided for particulate control device catches underestimate the amount of organics actually associated with that particulate matter.

Emissions Data Must Represent Total Vapor Phase Plus Particulate Phase Concentrations

For the reasons noted previously, only those data that accurately represent both the associated particulate and gaseous emissions were considered.

Comparable Pollution Control Technology

Only data collected downstream of the particulate control devices was considered. It was preferred that the control technology be similar to the design features of the proposed Blount Engineering technology. Unfortunately, none of the data sets examined conformed to the control technology proposed for the project. (Dry scrubber in combination with bag filter). Rather, the majority of the data sets examined made use of electrostatic precipitators (ESP) as the control device.

The dry scrubber-baghouse technology for the proposed facility is designed to result in lower emissions. The Blount facility is designed to operate at a temperature of 1,800° F., two seconds downstream of secondary air injection. These combustion conditions should result in more complete combustion (that is, less emissions) than the facilities used in this analysis which had lower combustion temperatures than the proposed facility. No credit was taken in this analysis for the higher combustion temperatures proposed; therefore, the EIS provides risk assessment estimates which represent conservative upper bound limits.

Data Quality Must be Verifiable

Each data set was examined in light of a number of quality control/quality assurance criteria in an effort to establish reliability. If a particular data set is not of verifiable quality, it does not mean that it is of poor quality. It simply means that the data cannot be verified and cannot be included in the data base. These data quality criteria in general conform with those adopted by the United States Environmental Protection Agency for use with state-of-the-art flue gas monitoring (Harris, 1983; EPA 1985). Typically, these include, but are not limited to, the following types of quality control data: field blanks, method blanks, spiked samples, replicate analyses and the use of isotopically labeled surrogates and other measures peculiar to analyses performed using state-of-the-art mass spectrometry.

Waste Feed Composition

The chemical composition of the flue gas is strongly influenced by the chemical composition of the waste feed itself. Accordingly, only test data collected with wastes similar in composition to that projected for the facility were incorporated into the emissions data base. In accordance with much of the open literature on this issue (U.S. DOE, 1984, Niessen, 1970, Niessen, 1972, Mikiya, 1975 Thomas and Holmes, 1975), the position has been taken that refuse composition in North America (United States and Canada) is not comparable to that found in Europe and Japan. As a consequence, only North American data sets meeting all of the aforementioned criteria were selected for use in developing the emissions inventory.

In summary, only data for North American, mass-burn facilities where emissions were collected downstream of the devices and for which the data are verifiable were included in this analysis. Blount (Widmer-Ernst) does not have an operating facility in North America. The section to follow will list all of the data sets examined, as well as those selected for incorporation into the emissions inventory.

4.3.1.4 Data Base Development

A summary of all of the data sets evaluated in preparation of the emissions inventory is provided in the reference section.

o Organic Emissions

Based on the results of the data selection process only certain data sets were selected for use in development of the organic emissions data base. These data sets, listed in Table 4.3-2, were used to generate emissions estimates for the following chemical categories listed previously in Table 4.3-1:

- o chlorinated phenols
- o chlorinated benzenes
- o polychlorinated biphenyls (PCBs)
- o polynuclear aromatic hydrocarbons (PAHs)
- o chlorinated dibenzodioxins (PCDDs)
- o chlorinated dibenzofurans (PCDFs)

TABLE 4.3-2

SUMMARY LISTING OF DATA SETS SELECTED FOR ORGANIC EMISSIONS INVENTORY --

HENNEPIN COUNTY WASTE-TO-ENERGY FACILITY

Facility	Location	Sponsor/ Author	Ref.	Date Tested	Process Description: Control/ Technology	Process Description: Size (Tons/day)	Process Description: Technology Type	Process Description: Installation Date/Age	Process Description: Other	Compliance With Evaluation Criteria: Flue Gas Data	Compliance With Evaluation Criteria: Vapor Plus Particulate Represented	Compliance With Evaluation Criteria: Pollution Control - ESP or Greater	Compliance With Evaluation Criteria: Verifiable Data Quality	Compliance With Evaluation Criteria: Unit Design Comparable to Blount	Compliance With Evaluation Criteria: Waste Feed Composition Comparable to Typical U.S. Municipal Refuse
Chicago NW Incinerator No. 2	Chicago, Illinois	EPA/Haile (MRI)	EPA 1983	1980	ESP (Inlet Temp 260°C) ESP Efficiency >97%	400/Four Units (Rated) 125/ unit (estimated)	Mass-feed	N/A	Furnace Temp. 1500-2000°F (Rated) -------------- During Test of 1100-1300°F (Actual)	x	x	x	x		x
Hampton	Hampton, Virginia	EPA/Haile (MRI)	Haile 1984	1983	ESP	125/Unit (Rated) Two Units	Mass-feed	N/A	Firebox Temp = 2300°F; Furnace Wall Temp 1450- (Actual) 1550°F; Furnace Temp 1200-1700°F (Actual)	x	x	x	x		x
Hampton	Hampton, Virginia	EPA/ Tiernan and Taylor	Taylor 1983 Tiernan, 1983	1982	ESP	177/Unit Two Units (Actual)	Mass-feed	N/A	Front Furnace 1250-1350 Rear Temp. 750°F* (Actual)	x	x	x	x		x
Des Carrieres	Montreal, Canada	Environ-mental/ Boisjoly	Boisjoly, 1984	1982	ESP	271/Unit Four Units (Rated) 24.66 tons/hr During Tests (2 units) 296 tons/day/ unit	Mass-Feed	1970	1270°F (693°C) Avg. Furnace Temp. No. 3 unit. Range During Tests 1258-1303°F ---------------------- 1305°F (707°C) Avg. Furnace Temp. No. 4 Unit. Range during tests 1249-1346°F	x	x	x	x		x
Des Carrieres	Montreal, Canada	Environment Canada/ Boisjoly	Boisjoly, 1984	1983	ESP	271/Unit Four Units (Rated). 13.71 tons/hr actual durint tests (329 tons/ day)	Mass-Feed	1970	1452°F (789°C) Avg. Furnace Temp. No. 1 unit. Range During Tests 1414-1513°F.	x	x	x	x		x

5313D 897-910

*Operating at lower combustion temperature; will need to be verified.

Emission concentration data in units of ng/m^3 or $\mu g/m^3$ from individual test runs within each test series selected were compiled into a comprehensive data base. Each of these data bases contains data points from all of the test series which satisfied the aforementioned evaluation criteria. Included in each data base are all of the individual data entries with associated statistical analyses ($\bar{X}$, range, etc). The average values for each chemical category and/or chemical isomer class were used in conjunction with the design features of the proposed unit to develop the necessary emission factors. Further discussion on the development of these factors as well as a summary of the organic emission factors themselves are provided in Section 4.1.3.5.

Trace Metal Emissions

In a manner similar to the selection process prescribed for the organic emissions, several sets of metals data were selected from the open literature for incorporation into the emissions inventory. Further discussion is provided in Section 4.1.3.5.

4.3.1.5 Development of Emission Factors

Organic Emission Factors

Emission projections for each of the aforementioned organic chemical categories were calculated using the mass burn technology data inventory. The emissions inventory data are for North American, mass-burn units. The average flue gas concentration calculated for each chemical or isomer class in units of $\mu g/m^3$ was used in combination with standard flue gas flow rates (DSCM) of 168,370 SCFM or 4771.4 m^3/min. proposed for the proposed facility. The product of these two data points ($\mu g/m^3$ x m^3/min) results in an emission rate provided in units of μg/min. Emission rate data are in turn converted to emissions factors (lb/min, lb/hr, lb/ton) employing a series of conversion factors. A generic presentation of this process is shown in the following equations.

$$\mu g/m^3 \times 4771.4 \ m^3/min = \quad \mu g/min \qquad (1)$$

$$\mu g/min \times \frac{1 \ lb}{453.6g} \times \frac{1g}{1 \times 10^6 ug} \times \frac{60 \ min}{hr} = lbs/hr \qquad (2)$$

$$lbs/hr \div \underset{(100 \ tons \ day)}{41.67 \ tons/hr} = lbs/ton \qquad (3)$$

A summary of emission factors for each of the chlorinated organics listed in Table 4.3-1 is provided in Table 4.3-3. Emission factors for the polycyclic aromatics (PAHs) are provided separately in Table 4.3-4. Results are provided for each of six chemical classes categorized in the following manner:

TABLE 4.3-3

Hennepin County Resource Recovery Project
Emissions Summary

Basis:
1000 TPD (41.67 TPH)
230000 ACFM @ 264 F
168370 SCFM
4771.4 M*3/min

Compound & Class	Number of Data Sets	Minimum Emission Rate (ug/M*3)	Maximum Emission Rate (ug/M*3)	Average Emission Rate (ug/M*3)	Flue Gas Rate (M*3/min)	Incinerator Emission Rate (ug/min)	(g/sec)	(lb/min)	(lb/hr)	(lb/ton)
1. Chlorinated Benzenes										
- Dichloro	3	0.0032	4.41	1.689	4771.4	8058.895	1.34E-04	1.78E-05	1.07E-03	2.56E-05
- Trichloro	6	0.3610	19.06	3.778	4771.4	18026.349	3.00E-04	3.97E-05	2.38E-03	5.72E-05
- Tetrachloro	5	0.6300	28.66	6.714	4771.4	32035.180	5.34E-04	7.06E-05	4.24E-03	1.02E-04
- Pentachloro	3	4.7450	39.41	16.552	4771.4	78976.213	1.32E-03	1.74E-04	1.04E-02	2.51E-04
- Hexachloro	6	0.0480	11.33	2.534	4771.4	12090.728	2.02E-04	2.67E-05	1.60E-03	3.84E-05
Total	6	1.1350	102.87	21.027	4771.4	100328.228	1.67E-03	2.21E-04	1.33E-02	3.18E-04
2. Chlorinated Phenols										
- Dichloro	3	0.240	0.63	0.383	4771.4	1827.446	3.05E-05	4.03E-06	2.42E-04	5.80E-06
- Trichloro	6	1.200	129.30	36.883	4771.4	175983.546	2.93E-03	3.88E-04	2.33E-02	5.59E-04
- Tetrachloro	6	1.100	64.50	17.417	4771.4	83103.474	1.39E-03	1.83E-04	1.10E-02	2.64E-04
- Pentachloro	6	0.160	40.60	8.913	4771.4	42527.488	7.09E-04	9.38E-05	5.63E-03	1.35E-04
Total	6	2.740	234.40	63.405	4771.4	302530.617	5.04E-03	6.67E-04	4.00E-02	9.60E-04
3. Polychlorinated Biphenyls (PCB's)										
- Monochloro	5	< 0.001	0.230	0.140	4771.4	667.996	1.11E-05	1.47E-06	8.84E-05	2.12E-06
- Dichloro	11	0.002	0.700	0.168	4771.4	801.595	1.34E-05	1.77E-06	1.06E-04	2.54E-06
- Trichloro	11	< 0.001	0.830	0.138	4771.4	658.453	1.10E-05	1.45E-06	8.71E-05	2.09E-06
- Tetrachloro	11	< 0.001	0.431	0.058	4771.4	276.741	4.61E-06	6.10E-07	3.66E-05	8.78E-07
- Pentachloro	11	< 0.001	0.082	0.018	4771.4	85.885	1.43E-06	1.89E-07	1.14E-05	2.73E-07
- Hexachloro	8	0.001	0.048	0.013	4771.4	62.028	1.03E-06	1.37E-07	8.20E-06	1.97E-07
Total	11	0.010	1.284	0.455	4771.4	2170.987	3.62E-05	4.79E-06	2.87E-04	6.89E-06
4. Polychlorinated Dibenzo Dioxins (PCDD's)										
- Monochloro	5	< 0.001	0.013	0.008	4771.4	38.171	6.36E-07	8.42E-08	5.05E-06	1.21E-07
- Dichloro	5	< 0.001	0.130	0.039	4771.4	186.085	3.10E-06	4.10E-07	2.46E-05	5.91E-07
- Trichloro	8	< 0.001	0.140	0.034	4771.4	162.228	2.70E-06	3.58E-07	2.15E-05	5.15E-07
- Tetrachloro	23	<1.00E-06	0.770	0.108	4771.4	515.311	8.59E-06	1.14E-06	6.82E-05	1.64E-06
- 2,3,7,8, TCDD	3	0.004	0.005	0.004	4771.4	19.086	3.18E-07	4.21E-08	2.52E-06	6.06E-08
- Pentachloro	23	<1.00E-06	2.800	0.342	4771.4	1631.819	2.72E-05	3.60E-06	2.16E-04	5.18E-06
- Hexachloro	23	<1.00E-06	1.710	0.231	4771.4	1102.193	1.84E-05	2.43E-06	1.46E-04	3.50E-06
- Heptachloro	23	<1.00E-06	2.050	0.173	4771.4	825.452	1.38E-05	1.82E-06	1.09E-04	2.62E-06
- Octachoro	23	<1.00E-06	0.490	0.045	4771.4	214.713	3.58E-06	4.73E-07	2.84E-05	6.82E-07
Total	23	<5.00E-06	4.570	0.921	4771.4	4394.459	7.32E-05	9.69E-06	5.81E-04	1.39E-05
5. Polychlorinated Dibenzofurans (PCDF's)										
- Monochloro	5	0.3000	0.420	0.362	4771.4	1727.247	2.88E-05	3.81E-06	2.28E-04	5.48E-06
- Dichloro	5	0.4000	0.700	0.506	4771.4	2414.328	4.02E-05	5.32E-06	3.19E-04	7.66E-06
- Trichloro	8	0.2700	3.300	1.350	4771.4	6441.390	1.07E-04	1.42E-05	8.52E-04	2.04E-05
- Tetrachloro	23	<1.00E-06	3.590	0.539	4771.4	2572.262	4.29E-05	5.67E-06	3.40E-04	8.17E-06
- Pentachloro	20	<1.00E-06	15.000	1.715	4771.4	8181.042	1.36E-04	1.80E-05	1.08E-03	2.60E-05
- Hexachloro	23	<1.00E-06	1.800	0.317	4771.4	1511.580	2.52E-05	3.33E-06	2.00E-04	4.80E-06
- Heptachloro	23	<1.00E-06	2.210	0.186	4771.4	888.912	1.48E-05	1.96E-06	1.18E-04	2.82E-06
- Octachloro	23	<1.00E-06	0.240	0.022	4771.4	106.879	1.78E-06	2.36E-07	1.41E-05	3.39E-07
Total	23	<7.00E-06	22.320	3.214	4771.4	15335.280	2.56E-04	3.38E-05	2.03E-03	4.87E-05

TABLE 4.3-4

Summary of PAH Emissions Projected for the Hennepin County Municipal Waste to Energy Facility

Compound & Class	Average Emission Rate (ug/M*3)	Flue Gas Rate (M*3/min)	---- Incinerator Emission Rate ---- (ug/min)	(lb/min)	(lb/hr)	(lb/ton)
1. Phenanthrene	188.83	4771.4	900983.46	1.99E-03	1.19E-01	[illegible]
2. Fluoranthene	76.01	4771.4	362674.11	8.00E-04	4.80E-02	[illegible]
3. Pyrene	91.78	4771.4	437919.09	9.65E-04	5.79E-02	[illegible]
4. Napthalene	620.00	4771.4	2958268.00	6.52E-03	3.91E-01	[illegible]
5. Acenaphthylene	220.00	4771.4	1049708.00	2.31E-03	1.39E-01	[illegible]
6. Acenaphthene	2.60	4771.4	12405.64	2.73E-05	1.64E-03	[illegible]
7. Fluorene	15.00	4771.4	71571.00	1.58E-04	9.47E-03	[illegible]
8. Chrysene	14.00	4771.4	66799.60	1.47E-04	8.84E-03	[illegible]
9. Benzo(k)fluoranthene	3.50	4771.4	16699.90	3.68E-05	2.21E-03	[illegible]
10. Benzo(a)pyrene	12.00	4771.4	57256.80	1.26E-04	7.57E-03	[illegible]
11. Dibenz(a,h)anthracene	0.03	4771.4	128.83	2.84E-07	1.70E-05	[illegible]
12. Benzo(g,h,i) perylene	6.100	4771.4	29105.54	6.42E-05	3.85E-03	[illegible]

Source: ERT, 1985.

- o minimum flue gas concentration (μg/m^3)
- o maximum flue gas concentration (μg/m^3)
- o average flue gas concentration (μg/m^3)
- o average emission rate (μg/min)
- o average emission rate (lbs/min)
- o average emission rate (lbs/hr)
- o average emission rate (lbs/ton)

It should be noted that no provisions are contained in these emission factors to account for the enhanced collection efficiency of the proposed Blount Engineering design. As discussed previously the design for the facility includes both a dry scrubber and a bag filter for the removal of flue gas particulates. This configuration can be expected to provide a greater collection efficiency than electrostatic precipitator (ESP) control devices which are more commonly used for particulate control in other MSW facilities. In fact, the majority of the facilities identified in the literature survey were configured with ESP units. None of the facilities used are presently in operation with a bag filter for particulate control. It was decided to employ the flue gas emissions data base comprised of ESP control and lower combustion temperatures without provisions for the enhanced efficiency of the proposed bag filter and higher combustion temperatures for the following reasons:

- o The organic flue gas emissions data base identified in the survey indicated that atmospheric emissions of the chemical categories identified in Table 4.3-1 are primarily contained in the gas phase. As a consequence increased particulate control efficiency should not markedly reduce actual emissions.
- o No actual flue gas data are presently available for an operating unit configured with a dry scrubber and a bag filter system.
- o While it is true that emissions estimates could be calculated so as to account for the enhanced removal efficiency of the bag filter, this would warrant some assumptions about the distribution of these organics amongst the particle size ranges present. This extrapolation could compromise the validity of the existing data base without achieving a significant reduction in the projected emissions values.

<u>Metals Emission Factors</u>

A review of the literature for metal emissions revealed little published data on the emissions of trace metals from mass-fired municipal solid waste incinerators. Several reports, including those by the EPA (EPA, 1980), Arthur D. Little, Inc., (ADL, 1981) and the California Air Resources Board (CARB, 1984), published ranges of emission rates for the majority of the metals under consideration in this study. However the original data on which these trace emission rates were based could not be obtained. Furthermore, it was uncertain whether all of the facilities used to establish these metal emission rates meet the criteria previously established in this study for use of a data set, i.e., a mass-fired unit, controlled by an electrostatic precipitator or fabric filter, etc. Consequently these data sets were not used.

However, one data set was found that does meet these criteria and is the most recent verifiable data available. Metal emissions from the SWRC resource recovery facility in Washington D.C. have been published in the open literature (Greenberg, 1978). These data report an average value and a standard deviation for each metal concentration. These data form the basis for the metal emission estimates for the proposed facility. In order to provide an estimate of maximum metal emissions and not solely average emission rates, a peak controlled emission rate was calculated by multiplying the standard deviation of the SWRC data by two and adding it to the average. For molybdenum and vanadium, where SWRC data were not available, the highest reported value of the CARB report was used.

The emission factors for the metals are summarized in Table 4.3-5.

4.3.2 Risk Assessment

This section addresses the potential impact on human health of operation of the proposed mass burn facility. A quantitative human health risk assessment was done utilizing methodology consistent with that described in the Federal Register (FR 49 46294-46331, November 23, 1984; FR 50 1170-1176, January 9, 1985).

A health risk assessment is a multi-step process. The first step is to identify the type and quantity of emissions expected from combustion at the facility and to profile the toxicity of each of these compounds. This first step is called <u>hazard identification</u>. Those contaminants considered to have potential for toxicity then undergo health risk analysis. The types of contaminants expected to be emitted from the proposed facility were identified and quantified in Subsection 4.3.1. The toxicity profile of each compound is presented below in Subsection 4.3.2.1.

The second step of the risk assessment is <u>dose-response assessment</u>. In this step, amounts of contaminants expected to produce little or no harm to human health are determined. The dose-response assessment is discussed in Subsection 4.3.2.

The third step of the risk assessment is called <u>exposure assessment</u>. In this step, projected emissions from the facility are subjected to dispersion modeling to determine ambient air concentrations for compounds of concern at locations where the potential for human exposure exists. The magnitude of human exposure to emitted contaminants is calculated via two exposure routes: inhalation and ingestion. The exposure assessment step is discussed in Subsection 4.3.2.3.

The fourth step of risk assessment is the <u>hazard characterization</u> in which expected doses are compared to safe doses. This characterization is discussed in subsection 4.3.2.4.

The final step of the risk assessment is to review the above information, place the calculated risks in context with risks experienced in every day life, and draw conclusions concerning the potential hazards posed by the facility's projected emissions. This final step is discussed in Subsection 4.3.2.5.

TABLE 4.3-5

SUMMARY OF TRACE METAL EMISSIONS PROJECTED FOR
THE HENNEPIN COUNTY MUNICIPAL WASTE TO ENERGY FACILITY

Metal	Emission Factor* (lb/T)
Arsenic	6.3×10^{-5}
Beryllium	4.26×10^{-6}
Cadmium	3.85×10^{-4}
Chromium	1.70×10^{-4}
Copper	3.04×10^{-4}
Lead	1.58×10^{-2}
Manganese	8.3×10^{-5}
Mercury	1.42×10^{-2}
Nickel	3.4×10^{-5}
Selenium	8.0×10^{-6}
Tin	2.19×10^{-3}
Vanadium	8.0×10^{-6}
Zinc	2.84×10^{-2}

*All emission factors exept for beryllium and mercury were derived from published data for the SWRC Facility in Washington, D.C. (Greenberg, 1978). The beryllium and mercury data were obtained from Signal/Resco

4.3.2.1 Hazard Identification

The following are brief profiles on the toxicity of compounds which might be emitted from the facility (see Table 4.3-1). They are intended to identify which emissions should be subjected to detailed risk analysis.

- Arsenic: Arsenic is an irritant of the skin, mucous membranes, and GI tract. Acute toxicity for ingestion results in vomiting, diarrhea, and cardiovascular effects. Acute exposure to airborne arsenic, adsorbed on particles, causes conjunctivitis and pharyngitis. Chronic inhalation of arsenic has been associated with pulmonary cancer in producers of arsenical pesticides and smelter workers. Some studies have associated increased cancer risk with high levels of arsenic in drinking water. Arsenic exists in more than one oxidation state, and it appears that trivalent arsenic is more toxic than pentavalent arsenic, while metallic arsenic is only minimally toxic. Total arsenic is generally considered in risk assessments because analytical methods for speciation are difficult and the species associated with carcinogenesis has not been determined (USEPA, 1984a). Therefore, arsenic will be subjected to a detailed risk analysis.

- Beryllium: Beryllium produces toxic effects through all routes of exposure, however the major health hazard is through inhalation. Occupational exposure to beryllium produces lesions of the lungs, a chronic disease known as berylliosis. Inhalation of elemental beryllium and certain beryllium-containing compounds have been reported to cause cancer in animals. Carcinogenicity has not been demonstrated in man or animals exposed to beryllium by ingestion. Cancer risk analysis of beryllium will only address the inhalation route of exposure.

- Cadmium: Cadmium is associated with both acute and chronic toxicity. Acute doses by ingestion produce severe gastrointestinal signs including nausea, vomiting, salivation and diarrhea. By the inhalation route, acute exposure is associated with pulmonary edema while longer-term exposures are associated with flu-like symptoms, and emphysema with fibrotic changes of lung tissue. By any route cadmium affects the kidneys, blood, and possibly the cardiovascular, reproductive, and skeletal systems. Cadmium workers have been reported to be at risk of prostate and lung cancer. Because of these reports, the risk assessment for cadmium will be based on carcinogenic potency. No carcinogenic response to this compound has been observed with ingested doses (EPA, 1984), so inhalation exposure alone will be analyzed.

- Chlorinated benzenes: The chlorination of benzene can yield 12 different compounds. It has been found that toxicity differs at least in potency, and perhaps qualitatively, among individual members of this chemical class. Most chlorinated benzenes appear to have effects on the reticuloendothelial and hematopoetic systems, liver and kidneys. Only hexachlorobenzene has been associated with carcinogenesis. EPA documents are inconsistent in their opinion on whether sufficient data exists to analyze risk from long term exposure to chlorinated benzenes, except for hexachlorobenzene. In the cases where analysis has been performed (EPA, 1980), acceptable daily intakes (ADI) were calculated at hundreds of ug/kg/day. Only hexachlorobenzene was subjected to further analysis.

- Chlorinated phenols: Toxicologic data is sufficient for detailed risk analysis of 2,4,6-trichlorophenol and pentachlorophenol only. No other chlorinated phenols will be subjected to a detailed risk analysis. The trichlorophenol is an animal carcinogen, and pentachlorophenol is suggested to be a teratogen and fetotoxic agent.

- Chromium: Chromium dusts and chromic acid are extremely irritating and have produced conjunctivitis, bronchitis, and dermatitis in humans occupationally exposed. Kidney damage has been observed in experimental animals exposed to chromium salts. Chromium exists in three oxidation states (Cr^{+2}, Cr^{+3}, and Cr^{+6}), as elemental chromium metal, or alloyed with other metals. Trivalent and hexavalent chromium are predominant. It is believed that hexavalent chromium compounds are substantially more toxic than trivalent compounds. There is a good epidemiologic evidence that inhalation of certain Cr^{+6} salts causes pulmonary cancer. The issue is complicated, however, in that only relatively insoluble salts of Cr^{+6} are carcinogenic. Carcinogenicity has not been demonstrated in man or animals exposed to chromium by routes other than inhalation. Thus, cancer risk analysis of chromium will only address the inhalation route of exposure (USEPA, 1984).

- Copper: Copper is of relatively low toxic potency. Inhalation of copper fume is associated with pulmonary effects, but the concentrations required are beyond those that would realistically be associated with the facility. Thus, further risk analysis was not performed.

- Lead: Lead has toxic effects on the blood, gastrointestinal tract, central nervous system and, after prolonged exposure, the kidneys. Peripheral nerves are also affected by lead poisoning. Lead chromate is a suspect carcinogen, but the data are inadequate to make a positive determination. Lead may be absorbed via various routes so that total lead exposure must be considered in the risk assessment.

- Manganese: Inhalation of manganese fume is associated with pulmonary and neurological effects, but the concentrations required are beyond those that would realistically be associated with the facility. Chronic inhalation exposure to low levels of manganese increase the prevalence of pneumonia and bronchitis without effect on the nervous system (EPA, 1983). Ingestion exposure, except at high levels, is not associated with untoward effect, probably because the element is poorly absorbed by the gastrointestinal tract. Detailed risk analysis will focus only on inhalation exposure to manganese.

- Mercury: Exposure to mercury in most forms is associated with a high degree of toxicity. Acute exposures produce irritation of the respiratory and gastrointestinal tracts. Elemental metallic mercury causes behavioral effects and other nervous system damage. Inorganic mercury salts do not cross the blood/brain barrier but will produce kidney damage. Divalent mercury is substantially more toxic in this regard than the monovalent form. Organic mercury compounds reach the central nervous system easily, producing behavioral and motor changes. Organic mercury can cross the placental barrier and cause devastating and irreversible neurologic damage to the fetus. Therefore, mercury will be subjected to a detailed risk analyses.

- Nickel: Nickel toxicity is dependent on the form of nickel and its route of exposure. Contact with nickel produces dermatitis. Additionally, a small proportion of the population exhibits nickel allergy which is presumably like other allergic reactions in not being dose dependent. The toxicity of nickel by the oral route is low, partly because intestinal absorption of nickel is low. The main effect in oral ingestion appears to be gastric irritation. Inhalation but not ingestion of certain nickel compounds is associated with cancer of the respiratory tract. Common practice is to consider only inhalation exposures in analysis of cancer risk. The inhalation pathway will be considered in this analysis as well.

- Polychlorinated biphenyls: Polychlorinated biphenyls possess essentially the same toxic properties as the polychlorinated dibenzodioxins and dibenzofurans, detailed below. The potency of PCBs is substantially less than that of the dibenzodioxins and dibenzofurans. Polychlorinated biphenyls will be subjected to a detailed risk analysis.

- Polychlorinated dibenzodioxins and dibenzofurans: Chlorinated dibenzodioxins and dibenzofurans are considered together because they have identical toxic properties. The potency of toxic effect is highly variant among the members of the group, however. Mono through trichloro substitutions of dioxins and furans will not be considered in the risk assessment because their toxicity is minimal relative to higher chlorinated isomers in the class (EPA, 1985). The remaining dioxin and furan isomers will be subjected to detailed risk analysis. Acute human response to accidental dibenzodioxin exposure results in mucous membrane and dermal irritation if the exposure is via inhalation. Regardless of exposure route, the acute toxic signs are followed (within days to weeks) by chloracne skin eruptions, hyperpigmentation of the skin, psychopathological changes and other disorders. Equivalent signs are seen with lower-level subacute to chronic exposure. Most experimental toxicologic study has centered on 2,3,7,8-tetrachloro-p-dibenzodioxin (2,3,7,8 TCDD), which has been demonstrated to be among the most potent animal toxins known. Animal data on 2,3,7,8 TCDD and other specific isomers of polychlorinated dibenzodioxins and dibenzofurans yield results comparable to human observations, with the exception of chloracne. Other animal studies indicate that the compounds are potent teratogens, embryotoxins, and carcinogens, but these effects have not been unequivocally observed in man.

o Polynuclear Aromatic Hydrocarbons (PAH): This is a large group of compounds grouped on the basis of chemical character (multiple aromatic rings). The toxic actions of the members of this class are not equivalent in either a qualitative or quantitative sense. PAH tend to have very low acute toxicity (IARC, 1983). The health effect of major concern for PAH is cancer following long-term exposure via any route, but this is a toxic property of only a portion of the chemical class. Cancer risk analysis is further complicated by variance in carcinogenic potency among individual PAH compounds. Only carcinogenic PAH will be subjected to risk analysis. These are noted in Table 4.3-1.

o Selenium: Selenium dust is an irritant to mucous membranes and the lungs. Long term exposure by ingestion or inhalation in humans has been associated with lassitude, dermatitis, halitosis, poor teeth and nails, hair loss, and chronic gastrointestinal disease (Beliles, 1978). There is no compelling evidence that selenium is carcinogenic. As the doses producing toxic effect are well in excess of that realistically expected from the facility, and because selenium at low levels is an essential nutrient, further risk analysis will not be performed.

o Tin: Tin is of relatively low toxic potency. Although long term inhalation exposure to the metal is associated with pulmonary effects, the toxic concentrations are well beyond those that would realistically be associated with the facility (Stokinger, 1978). Thus, further risk analysis will not be performed.

- o Vanadium: The toxicity of vanadium is limited to pulmonary dysfunction upon inhalation of vanadium pentoxide in concentrations well in excess of those which might be emitted at the facility (Stokinger, 1978). The metal will not be subjected to detailed risk assessment.

- o Zinc: With the exception of some irritant salts ($ZnCl_2$), the metal is without toxicity unless inhaled in high doses as a fume. Because of its limited toxicity, and the fact that zinc is an essential nutrient at low levels, this element will not be subjected to detailed risk analysis.

In summary, ten compounds or compound groups have been selected for risk analysis based on carcinogenicity. They are: arsenic, beryllium, cadmium, chromium, hexachlorobenzene, nickel, polychlorinated biphenyls, polychlorinated dibenzodioxins and dibenzofurans, carcinogenic polynuclear aromatic hydrocarbons, and trichlorophenols. Four other compounds were determined to be of concern due to other toxic effects. They are: pentachlorophenol, lead, manganese, and mercury. Copper, tin, selenium, vanadium, and zinc have been eliminated as emissions of concern, as have certain members of the compound classes chlorinated benzenes, chlorinated phenols, and polynuclear aromatic hydrocarbons.

4.3.2.2 Dose Response Assessment

An assessment of potential chronic effects from the emissions at the facility was undertaken. Review of the dispersion data and emission types for this facility indicated that acceptable levels forminimizing long term effects would be substantially below concentrations at which acute health effects might be expected. Thus, no detailed dose-response assessment for short term health effects was developed. Long term effects of potential emissions are placed in one of two groups: cancer risk or other chronic effects.

<u>Carcinogen Dose Response</u>

The U.S. EPA Cancer Assessment Group (CAG) has estimated the upper bound (95% confidence by a Chi square goodness of fit method) slope of a specialized dose response model for approximately 50 carcinogens. Implicit in the models is the assumption that there is no threshold for carcinogenic response. Only the magnitude of risk can be calculated from the so-called "potency slopes,". There is no absolutely safe dose which can be compared to exposure levels.

CAG potency slopes were used to calculate risk. Cancer risk is the product of the potency slope times the calculated lifetime daily dose. Because of the small number of potency slopes available, certain allowances were made to estimate cancer risk for all potential emissions at the proposed facility:

a) Total trichlorophenols were used with a potency slope generated specifically for 2,4,6-trichlorophenol.
b) Total PCBs were used with a potency slope generated for a specific PCB mixture, Aroclor 1254.

c) Of the 12 PAH judged to have potential for emission from the facility, only 4 are known or suspected carcinogens (ERT, 1984). Non-carcinogenic PAH were eliminated from assessment and the total of carcinogenic PAH was used with a potency slope generated for benzo(a)pyrene.

d) Assumptions outlined by the Chlorinated Dioxins Work Group (1985) were used to calculate 2,3,7,8 TCDD "equivalents" from doses of other polychlorinated dibenzodioxins and dibenzofurans. A further assumption was that all positional isomers of polychlorinated compounds have equal likelihood of forming. Thus, the proportion of the total chlorinated dibenzodioxin or dibenzofuran class which is chlorinated at positions 2,3,7 and 8 can be calculated. This is a necessity because the potency of 2,3,7,8 substituted compounds is much higher than other members of each class. The Work Group equivalence factors (potency factors) and proportions of 2,3,7,8 substitution are shown in Table 4.3-6; 2,3,7,8 TCDD equivalent doses were calculated for each receptor and are shown in Table 4.3-7.

Other Long Term Effects

Acceptable daily intakes (ADI) were calculated for pentachlorophenol, lead, manganese, and mercury. The ADI is the concentration below which no adverse health effect would be expected.

ADIs for the four non-carcinogenic compounds which were determined are as follows:

a) Pentachlorophenol: The U.S. EPA (1980) has reviewed animal studies indicating that ingestion of pentachlorophenol may be fetotoxic. The EPA calculated that limitation of pentachlorophenol exposure to 0.03 mg/kg/day would protect humans from this potential toxicity. This value will be used as an ADI in the present risk assessment:

Pentachlorophenol ADI = 0.03 mg/kg day.

b) Lead: The acceptable daily intake for lead is difficult to calculate because it must be set to prevent further effects rather than prevent toxicity. The average blood lead level of an urban dweller in the U.S. is near 17 ug/dl (EPA, 1984). This blood level has been associated with subtle effects on enzymes and nervous system function. Thus, while overt clinical signs of lead poisoning are not prevalent in the population at large, little room has been left for safety. For the purpose of this risk assessment, it is proposed that a lead dose which produces no more than a 1% increase in blood lead be set as the ADI. Extensive study has been made of the relation of lead intake to increase in blood lead levels. The EPA has calculated that 1 ug/m^3 increase in air lead concentration produces a 1.7 ug/dl increase in blood lead. Similar comparisons have been made

TABLE 4.3-6

2,3,7,8-TCDD EQUIVALENCE FACTORS

Compound	2,3,7,8 Isomer Proportion	2,3,7,8 Isomer Potency Factor	Other Positional Isomers Proportion	Other Positional Isomers Potency Factor
TCDD	0	1	1	0.01
2,3,7,8-TCDD	1	1	0	0
PCDD	0.071	0.2	0.929	0.002
HxCDD	0.30	0.04	0.70	0.0004
HpCDD	0.50	0.001	0.50	0.00001
TCDF	0.026	0.1	0.974	0.001
PCDF	0.072	0.1	0.928	0.001
HxCDF	0.252	0.01	0.748	0.0001
HpCDF	0.50	0.001	0.50	0.00001

Source: ERT, 1985.

TABLE 4.3-7

CALCULATION OF 2,3,7,8-TCDD EQUIVALENT DOSES

Compound	Ambient Air Concentrations (μg/m^3)	Total 2,3,7,8-TCDD Equivalence (μg/m^3)
TCDD	3.04 E-7	3.04 E-9
2,3,7,8-TCDD	1.10 E-8	1.10 E-8
PCDD	9.60 E-7	1.58 E-8
HxCDD	6.50 E-7	7.98 E-9
HpCDD	4.87 E-7	2.45 E-9
TCDF	1.51 E-6	5.39 E-9
PCDF	4.80 E-6	3.91 E-8
HxCDF	8.90 E-7	2.31 E-9
HpCDF	5.22 E-7	2.64 E-10
Total 2,3,7,8 - TCDD equivalences		8.73 E-8

Source: ERT, 1985.

for ingestion exposures and the increases have been found to have a shallower slope. To be conservative, this risk analysis will use the air calculations. Presuming the relation is linear, one would expect a 0.17 ug/dl increase in blood lead from 0.1 ug lead/m^3. This would represent an increase of 1% over the average human blood lead level. Applying standard breathing volume and weight assumptions to this concentration:

Lead ADI = 0.1 ug/m^3 x 20 m^3/day x 1/70 kg body weight
= 2.8 E-2 ug/kg day = 2.8 E-5 mg/kg day.

c) Manganese: Several reports indicate that chronic low-level inhalation exposure to manganese is associated with chronic bronchitis, increased sensitivity to infection, and other subtle pulmonary effects (see review in U.S. EPA, 1983). These appear to be the effects which occur at the lowest dose. On the basis of animal dose response experiments where the same toxic effect was observed, the U.S. EPA (1983) calculated adjusted human equivalent exposure levels (HEELs) of 5-37 ug/m^3. These values will be used for the calculation of acceptable daily intake.

ADI = 37 ug/m^3 x 20 m^3/day x 1/70 kg x 1/1000
= 1.05 E-2 mg/kg/day.

d) Mercury: Because mercury types (organic, inorganic, elemental) are known to intraconvert as the result of chemical and biological actions in air and soil, a conservative approach in determining dose-response is to choose the most toxic species of the element. Methylmercury appears to be that species (U.S. EPA, 1984). Extensive study has been made of the toxic effects of this compound in humans. The effect occurring at the lowest dose seems to be paresthesia. This toxic effect is noticed in approximately 8% of people receiving 3 ug methylmercury/kg body weight day. For a dose of approximately 0.7 ug/kg/day, the response drops to 0.3% of the population. This is for practical purposes the threshold dose. For this risk assessment, a value ten-fold lower than the practical threshold will be used as an acceptable daily intake:

Mercury ADI = 0.7 ug/kg day x 1/10 = 0.07 ug/kg day
= 7.0×10^{-4} mg/kg day.

4.3.2.3 Exposure Assessment

The purpose of exposure assessment is to determine a dose of pollutant, usually calculated as an average lifetime daily dose, which might reasonably be attained by an individual residing near the facility. This value may then be compared to an acceptable long-term daily intake for a non-carcinogenic pollutant or used in the calculation of cancer risk for a carcinogenic pollutant. The average lifetime daily dose is a function of the air and soil/dust concentration of pollutant which is, in turn, dependent on climate and distance factors (estimated by the dispersion model) and the length of time of the exposure.

Selection of Receptors of Concern

Projected emissions for the facility were subjected to dispersion modeling using EPA's RAM model, as previously described in subsection 3.2. Three receptor sites in the dispersion model were chosen for exposure assessment. Annual average ambient air concentrations of pollutants were noted at the closest areas of permanent residence:

a) The Stevens Square area located 2.0-2.4 km south of the Greyhound site.
b) The housing project located 0.6 to 0.7 km west of the Greyhound site. The housing project is located immediately west of Interstate 94 along Olson Memorial Highway.
c) A neighborhood located 2.0 to 2.4 km north northwest of the Greyhound site. This neighborhood is located immediately northwest of the intersection of W. Broadway and Interstate 94.

Ambient pollutant concentrations in these three neighborhoods from facility related emissions were modelled to be of similar magnitude even though the neighborhoods are in different directions and at different distances from the Greyhound site.

For example, ambient pollutant concentrations in the Stevens Square area to the south were predicted to be just slightly higher than in the housing project to the west. Stevens Square is farther from the site than the housing project and one might expect lower concentrations at the former because of additional dispersion with distance. However, Stevens Square is located in a prevailing downwind direction whereas the housing project is not. Predicted pollutant concentrations at the two locations are similar because distance and prevailing wind directions compensate for one another.

For purposes of quantifying the expected health risks, the impacts of the facility will be essentially identical at any of the three receptors. The numbers are slightly higher for the neighborhood located 2.0 to 2.4 km north northwest of the Greyhound site. The analysis was therefore based on the higher values predicted for that receptor. The public housing project to the west of the facility is closer to the proposed project, however, and the risks provided in this report are believed to be representative of anticipated risks at that receptor.

The annual average ambient air concentrations were used to calculate exposures using the methods described below. Predicted annual average concentrations of all pollutants of concern are listed in Table 4.3-8 for each of the three receptors.

TABLE 4.3-8

AMBIENT AIR CONCENTRATIONS

Compound	Emission Rate (g/sec)	Average Annual Concentrations ($\mu g/m^3$) Maximum
Dichlorobenzene	1.343 E-4	4.74 E-6
Trichlorobenzene	3.004 E-4	1.06 E-5
Tetrachlorobenzene	5.339 E-4	1.88 E-5
Pentachlorobenzene	1.316 E-3	4.65 E-5
Hexachlorobenzene	2.015 E-4	7.11 E-6
Trichlorophenol	2.933 E-3	1.04 E-4
Pentachlorophenol	7.088 E-4	2.50 E-5
Total PCB's	3.618 E-5	1.28 E-6
Tetrachlorodibenzodioxin	8.59 E-6	3.04 E-7
2,3,7,8-TCDD	3.18 E-7	1.10 E-8
Pentachlorodibenzodioxin	2.72 E-5	9.60 E-7
Hexachlorodibenzodioxin	1.84 E-5	6.50 E-7
Heptachlorodibenzodioxin	1.38 E-5	4.87 E-7
Tetrachlorodibenzofuran	4.29 E-5	1.51 E-6
Pentachlorodibenzofuran	1.36 E-4	4.80 E-6
Hexachlorodibenzofuran	2.52 E-5	8.90 E-7
Heptachlorodibenzofuran	1.48 E-5	5.22 E-7
Total 2,3,7,8-TCDD equivalents:	-	8.73 E-8

TABLE 4.3-8 (Continued)

Compound	Average Annual Concentrations ($\mu g/m^3$) Emission Rate (g/sec)	Maximum
Arsenic	1.13 E-3	3.99 E-5
Beryllium	2.23 E-5	7.87 E-7
Cadmium	6.62 E-3	2.34 E-4
Chromium	4.02 E-3	1.42 E-4
Lead	3.88 E-2	1.37 E-3
Manganese	6.62 E-3	2.31 E-4
Mercury	7.46 E-2	2.63 E-3
Nickel	8.51 E-4	3.00 E-5
PAH		
Phenanthrene	9.45 E-3	3.34 E-4
Fluoranthene	6.05 E-3	2.14 E-4
Pyrene	7.30 E-3	2.58 E-4
Naphthalene	4.93 E-2	1.74 E-3
Acenaphthylene	1.75 E-2	6.18 E-4
Acenaphthene	2.07 E-4	7.31 E-6
Fluorene	1.19 E-3	4.20 E-5
*Chrysene	1.11 E-3	3.92 E-5
Benzo(k)fluoranthene	2.78 E-3	9.81 E-5
*Benzo(a)pyrene	9.54 E-4	3.37 E-5
*Dibenz[a,h]anthracene	2.15 E-6	7.60 E-8
*Benzo[g,h,i]perylene	4.85 E-4	1.71 E-5
Total Carcinogenic PAH	2.55 E-3	9.00 E-5

*Carcinogenic PAH
Source: ERT, 1985.

Determination of Exposure

Humans may be exposed to facility emissions via three routes: inhalation of pollutants in ambient air; ingestion of soils onto which pollutants have deposited; and dermal absorption of pollutants in air or soils. It has been shown that dermal absorption of pollutants from operations such as the proposed facility represent a minor exposure route relative to inhalation and ingestion (Fred C. Hart, 1984). Thus, only the latter two exposure routes were considered. Calculations indicate that the maximum average lifetime daily dose at any receptor would be attained by a person breathing air containing emissions from the entire operating life of the facility (assumed to be 30 years for purposes of this analysis) and ingesting small amounts of soil containing deposited pollutants for an entire human lifetime (assumed to be 70 years). It is highly unlikely, however, that anyone would be exposed to continuous emissions from the facility over 30 years. The following sections describe methods for determining inhalation and ingestion doses given this scenario.

Exposure by Inhalation

Inhalation exposures were estimated by noting the ambient air concentrations of pollutants (in $\mu g/m^3$) and assuming a 70 kg human, breathing 20 m^3 air/day was exposed. The daily air intake of pollutant in mg/kg/day was calculated from the following equation:

$$\underset{(\text{in } ug/m^3)}{\text{Ambient air concentration}} \times 20\ m^3/\text{day} \times 1/70\ \text{kg} \times 1/1000 = \underset{(\text{in mg/kg/day})}{\text{daily dose (air)}} \qquad (1)$$

The equation makes the conservative assumption that the entire dose is respirable. It must be noted that this is a daily dose not a lifetime daily dose, because the facility will likely operate for only 30 years out of a normal 70 year human lifespan. Individuals born during the operation of the facility would be exposed for even shorter periods.

The simple calculation of daily dose (Equation 1) was not altered for compounds being assessed for risk of non-carcinogenic chronic effects, because 30 years is a reasonable exposure period in which to expect long term effects. However, cancer risk assessment using the method of the EPA Carcinogen Assessment Group (CAG) requires input of a lifetime daily dose. An accurate assessment of cancer risk from exposures for a portion of a lifetime is further complicated by the observation that risk is not linearly related to either length of exposure or the period in an individual's life when the exposure takes place (Crump and Howe, 1984). Doses early in life are more important than those experienced later. Thus, the worst case situation for portion-of-lifetime exposure in the case of the facility would be inhalation exposure in the first 30 years of life (this is identical to the scenario which was chosen to maximize dose).

Using Crump and Howe's model for this situation, it can be calculated that exposure to a carcinogen at some concentration, C, for the first 30 years of life yields a cancer risk equivalent to a lifetime exposure at concentration 0.95C. (Contrast this to an expected risk equivalent to exposure to 30/70 C for a lifetime, if the relation were linear over time.) The cancer risk assessment therefore used a lifetime daily dose which was equal to 0.95 times the daily dose calculated by Equation 1.

The calculation of the health risk of cancer in this section is based on the greater potency of doses early in life. The annual risk assessed for any compound is the annual risk calculated for the first 30 years of life multiplied by the expected life span (70 years). The health risk assessment presented is quite conservative based on the calculations in the section.

Exposure by Ingestion

Humans may be exposed to emissions from the facility by ingestion of soil onto which pollutants are deposited. Determination of the magnitude of soil/dust ingestion by humans is highly uncertain. For the purpose of this assessment, the quantity of 50 mg soil/day will be used as has been previously accepted. No attempt will be made to apportion the exposure between house dusts and outdoor soils, nor will separate pollutant concentrations be calculated. The uncertainty involved in doing such a calculation makes its benefit questionable.

Potential emissions from the facility would be generally continuous so individuals would be exposed to progressively higher concentrations in soils and dusts as the result of deposition during the operating life of the facility. That time is followed by a period of exposure to soils with a constant concentration of pollutants. As previously stated, constant lifetime daily exposures are used for most risk estimations.

Making the conservative assumption that all of a pollutant is adsorbed to particles and using a deposition rate of 1.0 cm/sec (864 m/day, McMahon and Denison, 1979), pollutant accumulation may be calculated as:

deposition (864 m/day) x pollutant concentration in air (ug/m^3) =

pollutant accumulation (ug/m^2 day) (2)

Further assuming that all deposition is onto the top 1 cm of soil:

deposition x pollutant concentration x 1/depth of deposition (1.01 m) =

pollutant accumulation (ug/m^3 day) (3)

Finally, pollutant accumulation may be converted to units of mg pollutant/kg soil day, if a soil density is known. Soil density was assumed to be 1.6 g/cm^3. Integrating the function of a soil contaminant concentration increasing linearly at the rate calculated from Equation 3 for 30 years (Facility operating life) followed by constant soil concentration for 40 years (70 year human lifespan - Facility operating life), and dividing this value by 70 years, a "constant" soil concentration may calculated which would provide an equivalent cumulative dose as the actual situation. Average lifetime daily dose was calculated from the "constant" soil concentrations assuming an ingestion rate of 50 mg of soil/day. Because much of the actual exposure to pollutants in soil occurs later in life, this value is, if anything, conservative for use in cancer risk assessment (Crump and Howe, 1984).

Exposure Risk Assessment Results

The calculated average lifetime daily doses of all compounds at the receptor to the north northwest of the facility are given in columns 1 and 2 of Table 4.3-9. Doses via inhalation (air dose) and ingestion (soil dose) are given for each compound (with the exception of those for which ingestion exposure was determined to be irrelevant).

4.3.2.4 Hazard Characterization - Cancer Risk

Results

Table 4.3-9 presents cancer risk estimates for the receptor of concern. The highest predicted cancer risk from any of the compounds is from dioxins. Total increased cancer risk from dioxins is 9.27×10^{-6} (or .927 per 100,000 chances).

The table also provides comparisons of estimated doses to acceptable daily intakes for pentachlorophenol, lead, manganese, and mercury. The dose values are extremely small proportions of the ADIs, indicating virtually no health impact from these constituents. The MPCA has indicated that a health risk of 10-5 (approximately 1 chance per 100,000 is acceptable).

Certainty of the Estimates

The cancer estimates presented here should be viewed as maximum values, due to the conservatism of the exposure assessment and the "upper bound" value utilized with CAG estimation methodology. Risk would probably not be higher than the values noted here, and is likely to be much lower. The conservatism applied to estimates of ADI increases the certainty that the projected emissions from the facility will have little health impact. If data specific to a Blount designed facility were available the risk might be considerably lower.

Sources of Uncertainty

Estimations of soil intake by adults are uncertain and must be highlighted as a source of variability in estimation of true risk (Table 4.3-10). Inspection of the data reveals that the overwhelming contribution to total cancer risk is made by the presence of polychlorinated dibenzodioxins and dibenzofurans. The analysis presented represents an upper bound estimate of the likely cancer risk from the facility. It is expected that actual risks will be much less.

4.3.2-5 Comparison of Risks with Common Experience

The predicted carcinogenic lifetime risk of 0.9 per 100,000 can be put into perspective by considering other risks which are encountered in every day life. These risks, shown in Table 4.3-11 range from a common event such as a fatality from an auto accident (1,750 per 100,000) to very rare events, such as death from being struck by lightning (3.5 per 100,000) or death from being struck by a falling object (42 per 100,000). A comparison of the predicted carcinogenic risk of 0.9 per 100,000 with risks shown in Table 4.3-11

TABLE 4.3-9

RISK CALCULATIONS

Cancer Risk	Exposure Assessment Air Dose (mg/kg/day)	Exposure Assessment Soil Dose (mg/kg/day)	Dose Response Assessment Potency Slope	Hazard Characterization Risk
Hexachlorobenzene	1.93 E-9	3.00 E-9	1.67	8.23 E-9
Trichlorophenol	2.82 E-8	4.39 E-8	0.0199	1.44 E-9
Total PCB's	3.49 E-10	5.71 E-10	4.34	3.49 E-9
2,3,7,8-TCDD equivalents	2.37 E-11	3.57 E-11	156000	9.27 E-6
Arsenic	1.08 E-8	1.68 E-8	15	4.14 E-7
Beryllium	2.13 E-10	0	1.4	2.99 E-10
Cadmium	6.34 E-8	0	6.65	4.21 E-7
Chromium	3.86 E-8	0	41	1.58 E-6
Nickel	8.14 E-9	0	1.15	9.36 E-9
Carcinogenic PAH*	2.44 E-8	3.80 E-8	11.5	7.17 E-7

Other Chronic Effects	Air Dose	Soil Dose	ADI	% ADI
Pentachlorophenol	7.14 E-9	1.06 E-8	3.00 E-2	5.90 E-5
Lead	3.91 E-8	5.79 E-7	2.8 E-5	2.21
Manganese	6.69 E-8	0	1.05 E-2	6.37 E-4
Mercury	7.51 E-7	1.11 E-6	7.0 E-5	2.66

*Assumes all carcinogenic PAH is benzo(a)pyrene.

Source: ERT, 1985.

Receptor located at a neighborhood located 2.0 to 2.4 km north northwest of the facility. Receptor represents highest risk for permanent kind lifetime exposure.

TABLE 4.3-10

CONSTANT SOIL CONCENTRATIONS BASED ON 30 YEAR FACILITY OPERATION

(CONCENTRATIONS IN μg/kg)

Compound	
Dichlorobenzene	2.8
Trichlorobenzene	6.3
Tetrachlorobenzene	11.1
Pentachlorobenzene	27.5
Hexachlorobenzene	4.2
Trichlorophenol	61.5
Pentachlorophenol	14.8
Total PCB's	0.8
Total 2,3,7,8-TCDD Equivalents	.05
Arsenic	23.6
Beryllium	0.5
Cadmium	138.4
Chromium	84.0
Lead	810.1
Manganese	138.4
Mercury	1,555.1
Nickel	17.7
Carinogenic PAH	53.24

Source: ERT, 1985.

TABLE 4.3-11
COMPARISON OF RISKS WITH
COMMON EXPERIENCE

Examples of Risk of Fatality

Type of Risk	Life-Time Risk (chances per 100,000)
De Minimis Risks:	
Medical X-Rays (fatal cancer)	70-140
Air Travel	70
*Denver vs. East or South Coast (fatal cancer due to radiation difference)	70
Falling Objects	42
Hunting	70
*Lightning or Tornadoes	3.5
Other Risks	
Driving Car	1,750
Living below a dam	700
*Firearms, poisonous gases and liquids	140-280

*These risks may be classified as involuntary, or risks over which the person at risk has no substantial control.

Note: Life-time risk is calculated by multiplying the annual risk by 70 years.

References:

Standard, 1969, Insurance, October 25, 1969: Pochin, 1974.

indicates how small the carcinogenic risks from the facility are expected to be. For instance, a person is 4 times more likely to die as a result of being struck by lightning and 47 times more likely to die as a result of being struck by a falling object than from cancer caused by the projected lifetime exposure to emissions from the resource recovery facility. The MPCA has indicated that a risk, such as that of the facility, of less than one per 100,000 chances is considered insignificant and does not pose a human health concern.

Based on the results of this health risk assessment, it is clear that several pollutants with the potential to cause cancer will be emitted from the proposed facility. However, the amounts which will be emitted are so small that they represent only a minute increase in cancer risk to the surrounding community. The increased cancer risk from the facility is acceptable when compared to the MPCA guideline of 1 per 100,000.

4.4 Geology and Soils

4.4.1 Resource Recovery Facility - Greyhound Site

4.4.1.1 Surficial Geology

Construction of the proposed resource recovery facility would involve the demolition and removal of an existing bus garage and railroad spur. Some excavation, grading and filling of the surficial soils would occur in areas where structures and paved surfaces will be placed. The near-surface native soils have already been disturbed by previous development of the site, so the impact of construction of the new facility would be minimal. Soils excavated during construction would be re-used on site to the greatest extent practical. Demolition debris would require landfilling by the applicant at a permitted facility.

A soil sampling and analysis program has revealed evidence of potential widespread soil contamination on the site. The excavation and removal of the degraded soils may be necessary before construction of the proposed facility. Soil removal and replacement would have a positive impact on the soil and water quality in the site area.

4.4.1.2 Bedrock

The bedrock is encountered beneath the surficial deposits on the site at a depth of approximately 130 to 150 feet below the ground surface. The foundation will be supported by piles which will extend to 120 feet below grade. The placement of piles does not involve rock excavation, and so the impact on the bedrock would be minimal.

4.4.1.3 Ground Water

Because most of the Greyhound site is currently covered by buildings and pavement, construction of the new resource recovery facility is not expected to significantly alter surface runoff, rainfall infiltration and the ground-water table on the site (see Section 4.5.1). Dewatering may be necessary during construction due to shallow ground-water depths on the site. It is most likely that the water will be discharged to the sewer system. A permit would be required. This would locally depress the water table level on a temporary basis.

All solid waste and residue handling on the site will occur above ground. Waste water will be discharged to the municipal sanitary sewer system (see Section 4.9.2). Therefore, the potential for ground-water contamination resulting from the facility operation is considered to be minimal.

There is evidence of potential ground-water contamination on the site. Withdrawal and treatment of the contaminated water may be necessary, and would have a positive impact on ground-water quality in the site vicinity.

4.4.2 Bloomington East Site

4.4.2.1 Surficial Geology

The construction of the solid waste transfer facility will involve the excavation, compaction, grading, and filling of surficial soils. An existing building will be demolished. The near-surface native soils on the site have been disturbed by previous development, so the impact of the proposed construction would be minimal. Excavated soils would be re-used on site whenever possible. Demolition debris from the removal of the building from the site would require landfilling at a permitted facility.

4.4.2.2 Bedrock

Excavations during construction of the transfer facility are not expected to penetrate the bedrock. Consequently, bedrock disturbance would be non-existent.

4.4.2.3 Ground Water

Buildings, roads, and parking areas will be constructed on the Bloomington East Site, and will cover much of the ground surface. This would prevent surface water from infiltrating into the soil and recharging the surficial ground-water aquifers. The ground-water table on the Bloomington site would be minimally impacted, as buildings and pavement are currently present over much of the site.

Ground-water was encountered in two borings on the site at depths of 30 and 38 feet below current grade. It is not anticipated that excavations during construction of the transfer facility will encounter ground water. Therefore, dewatering should not be necessary.

Water usage and wastewater discharge associated with the facility will be minimal. All wastewater will be discharged to the municipal system (see Section 4.9.3). The potential for ground-water contamination during facility construction and operation is considered to be insignificant.

4.4.3 Brooklyn Park East Site

4.4.3.1 Surficial Geology

The construction of the Brooklyn Park East transfer facility will involve the excavation, grading, and filling of surficial soils. A house located in the southeast corner of the property will be removed. Native soils existing on the site would be permanently impacted in areas where structures and paved surfaces will be placed. Excavated soils would be re-used on site to the greatest extent practical. Demolition debris from the removal of the house would require landfilling at a permitted facility.

4.4.3.2 Bedrock

Bedrock is present at a depth of approximately 100 feet below grade at the proposed transfer station location. Excavations are not expected to penetrate the bedrock. Consequently, bedrock disturbance would be non-existent.

4.4.3.3 Ground Water

Buildings, roads and parking areas will be constructed on the transfer facility site and will cover much of the ground surface (about 60 percent). This will prevent surface water from infiltrating into the soil and recharging the surficial ground-water aquifers. Ground-water table elevations may be permanently altered. The overall impact would be to lower the water table, reduce the seasonal water table fluctuations, and increase surface water stream flow.

The water table was measured in soil borings drilled on the site at depths of 6 to 14.5 feet below the ground surface. If water is encountered during construction, dewatering may be necessary. This would locally affect ground-water table elevations on a temporary basis.

All solid waste and residue handling on the site would occur above ground. Wastewater will be discharged to the municipal sanitary sewer system (see Section 4.9.4). The potential for ground-water contamination during facility operation is considered to be minimal.

4.4.4 Hopkins DOT

4.4.4.1 Surficial Geology

Construction of the Hopkins DOT solid waste transfer facility will involve the excavation, grading and filling of surficial soils. Soils excavated will be re-used on site to the greatest extent practical. Portions of a bituminous batch plant facility still existing on the site will be removed. Demolition debris would require landfilling at a permitted facility.

4.4.4.2 Bedrock

Depth to bedrock beneath the site is approximately 100 feet. Excavations are not expected to penetrate the bedrock. Consequently, bedrock disturbance would be non-existent.

4.4.4.3 Ground Water

Because much of the Hopkins site is currently covered by buildings and pavement, construction of the Hopkins transfer facility is not expected to significantly alter surface runoff, rainfall infiltration and the ground-water table on the site.

Ground water was encountered at depths of 11.5 to 19 feet below grade along the western edge of the site, and at a depth of 34.5 feet in one boring at the center of the site. Excavations during construction of the facility are not expected to intersect the water table, and dewatering should not be necessary.

All solid waste and residue handling on the site will occur above ground. Waste water will be discharged to the municipal system (Section 4.9.5). Therefore, the potential for ground-water contamination during facility operation is considered to be minimal.

4.4.5 Minneapolis South

Construction of the Minneapolis South transfer facility will involve the removal of existing buildings and the excavation, grading, and filling of surficial soils. Demolition debris will require landfilling at a permitted facility. Native soils have been disturbed during previous development of the site and therefore would not be significantly impacted by the proposed project. Excavated soils will be re-used on site to the extent practical.

4.4.5.1 Bedrock

Bedrock lies approximately 60 feet below the land surface on the site. Excavations are not expected to penetrate the bedrock. Consequently, bedrock disturbance would be non-existent.

4.4.5.2 Ground Water

Most of the ground surface on the Minneapolis South site is currently covered by buildings and pavement. Construction of the proposed transfer facility is not expected to significantly alter surface runoff, rainfall infiltration and the ground-water table on the site.

Ground water was only encountered in one boring at a depth of 34.5 feet below existing grade. Excavations during construction are not expected to encounter ground water, therefore, dewatering should not be necessary.

All solid waste and residue handling on the sites will occur above ground. Wastewater will be discharged to the municipal system (Section 4.9.6). The potential for ground-water contamination during facility operation is considered to be minimal.

4.5 Surface Water

4.5.1 Resource Recovery Facility

Hydrology

Development of the proposed resource recovery facility is not anticipated to result in significant long-term impacts to hydrologic resources on or near the site. Upon development of the site, it is expected that the increased impervious surface (roof area and paved area) would increase slightly the existing runoff volume. It is estimated that the maximum runoff from the 14.6-acre site during a 2.4 inch, 25 year, 1-hour storm would increase from 11,008 gpm (25 cfs) for the existing condition to 12,580 gpm (28 cfs) for the post-development condition. This represents a 10 percent increase in flows, which is considered to be insignificant. This estimate assumes there would be an increase in the amount of building and paved area within the site. Discharge would be to a rerouted storm sewer. The storm sewer would likely be routed along the southeastern and 5th Street sides of the site.

Water Quality

The facility would be located in a previously developed industrial area with no lakes, streams, or other natural surface water bodies in the vicinity. All solid waste transfer and delivery during facility operations would take place in enclosed areas. The county has proposed that transfer vehicles be required to be covered, and appropriate measures taken to minimize and remove any wastes spilled from these trucks. These measures include daily washdown and sweeping of facilities. The combustion and storage facilities will be enclosed. This would eliminate any potential surface water impacts related to contact with stored waste materials. Wastewater generated by facility operations (approximately 117,000 gallons per day) will be discharged directly to the existing municipal sanitary sewer system. Stormwater runoff from paved portions of the site will be directed to the municipal storm sewer. Although the probability of oil or other types of contaminated liquid being spilled from trucks during facility operation is slight, this could occur. Methods to collect and trap these liquids will be incorporated into the on-site drainage plan. Oil-water separation may not be appropriate for the entire site. Tipping hall areas and the oil tank loading area are practical site areas for this practice.

There would be a potential for increased contaminants in site runoff generated during construction and operation of the proposed facility. Construction activities tend to increase the quantity and decrease the quality of runoff. This is primarily due to the removal of vegetation and the exposure of bare soil to precipitation. Soils that are exposed have a lower infiltration rate and yield higher runoff volumes than the same soils with sufficient vegetative ground cover. In general, exposed soils tend to erode more easily than protected soils causing a temporary decrease in runoff quality. The proposed development and excavation of surface and subsurface soils at the Greyhound site includes the removal of several thousand cubic yards of petroleum contaminated soils that have been encountered at various depths near the existing surface of the site. Removal of these soils would result in their exposure to precipitation and runoff. This could potentially result in the introduction of contaminants within the drainage area. Temporary detention basins if necessary would be constructed during site work to intercept and contain runoff in order to separate out contaminants that can be removed later. Other standard construction practices would be employed to minimize temporary changes in rates of erosion and runoff caused by disruption of compacted soils and vegetation. These practices include:

- o Periodic wetting and mulching of unvegetated and uncompacted areas to reduce blowing dust,soil erosion, and runoff.
- o Prompt revegetation of disturbed areas.
- o Staging development so that limited portions of the site are unvegetated at any one time.

Impacts during construction would be short term in nature, lasting generally for thirty months. Removal of contaminated soils from the site would reduce the potential for future contamination of water sources in the area, and would result in an improvement of existing conditions. Contaminated soils would have to be deposited in a permitted landfill.

Wetlands

There are no designated wetlands or surface water bodies (lakes, ponds, streams or other flowages) on or adjacent to the site. Consequently, there would be no adverse surface water impacts to these areas.

4.5.2 Bloomington East Transfer Station

Hydrology

Development of the site would result in an increase in sodded and landscaped areas in conjunction with a reduction in building roof area. This would offset the runoff impact of any increased paved impervious areas. As a result, the proposed site development would yield runoff volumes which are slightly lower than existing runoff volumes. The calculated runoff from a 2.4-inch, 25-year, 1-hour storm for the existing site is 7.56 cfs or 3393 gpm. After development, the site would generate 5.83 cfs or 2617 gpm of runoff from the same size storm.

Storm runoff from the site will be collected by a 10-inch storm drain and discharged into the municipal storm sewer on 96th Street West. Sanitary waste will be conveyed by a 4-inch sewer to discharge to a 48-inch municipal sanitary sewer on 96th Street.

Surface water impacts related to contact with stored waste materials would be unlikely since the tipping and storage areas would be fully enclosed. In addition, wastewater generated by the facility (approximately 100 GPD) would be contained on-site and discharged to the municipal sanitary sewer system to eventually be treated and discharged. Most of the site surface area will be either paved or sodded, thereby reducing the potential for erosion. Although the probability of oil or other types of contaminated liquid being spilled from trucks during facility operation is slight, this can occur. Appropriate methods to collect and trap these liquids should be incorporated into the on-site drainage plan. The utilization of an in-line baffled concrete drop box structure that serves to contain and collect suspended and separated contaminated liquids behind the weir and prevent petroleum injection into the storm sewer system is recommended.

Since there are no natural surface water bodies on or adjacent to the site, the major surface water concern during construction is the potential for increased contaminants in site runoff. The removal of buildings and vegetation from the site would expose bare soils to precipitation. These soils would erode more easily than covered soils and decrease the quality of the surface runoff. The impacts from construction would, however, be short term in nature, lasting only about 9 months.

Wetlands

There are no designated wetlands or surface water bodies on or adjacent to the site. Consequently, there would be no adverse surface water impacts to these areas.

4.5.3 Brooklyn Park East Transfer Station

Hydrology

Construction and operation of the proposed transfer station would permanently increase runoff volumes and alter drainage patterns on the site. Approximately 30 percent of previously undeveloped land would be occupied by impervious surfaces such as buildings and pavement. It is anticipated that the existing drainage toward the center of the site would be maintained but collected by catch basins and either diverted to the existing municipal storm sewer north of the site, or discharged directly to Shingle Creek. The existing runoff from a 2.4-inch, 25-year, 1-hour storm is estimated to be 2.02 cfs or 907 gpm. After development, the site would generate 12.5 cfs or 5623 gpm of runoff from the same size storm.

To minimize the potential to alter the nature and character of portions of the adjoining marshland, it will be necessary to avoid a drastic reduction of the natural drainage pattern toward the west side of the site. Maintaining an adequate supply of surface water flow to this area can be accomplished by grading unpaved portions of the site to allow localized drainage to flow overland to the west.

Wetlands

Approximately 25 percent of the land surface within the site planned for development is within the Shingle Creek 100-year floodplain. Some construction in the floodplain will occur. The area to be developed is subject to the floodplain regulations of the Brooklyn Park Zoning Ordinance (1974, Sec. 364.23) which requires construction areas to be filled to an elevation equal to or exceeding a height of 1-foot above the regulatory flood elevation, which is 1-foot above the actual floodplain elevation. Consequently, at least 2-feet of fill would be added to these areas. It would be necessary to obtain permits from the City of Brooklyn Park and the State of Minnesota DNR for this activity.

Water Quality

Excavating and refilling within the floodplain zone would result in the loss of vegetative ground cover and a temporary degradation of soils and runoff quality. During construction, temporary detention ponds would be required to intercept runoff from heavily disturbed portions of the site. Other standard construction practices will be necessary to minimize contaminated runoff entering Shingle Creek and accompanying marshlands. These include the periodic wetting and mulching of unvegetated and uncompacted areas to reduce blowing dust, soil erosion and runoff, and the prompt revegetation of disturbed earth.

Runoff from the developed portion of the site will be collected and diverted by a storm sewer that will discharge directly into Shingle Creek. A permanent holding/settling basin is necessary to purify storm-runoff prior to the eventual discharge to Shingle Creek. The utilization of an in-line baffled concrete drop box structure that serves to contain and collect suspended and separated contaminated liquids behind the weir and prevent petroleum injection into the storm sewer system is also recommended. Surface water impacts related to contact with stored waste materials would not occur because the tipping and storage areas will be fully enclosed. Wastewater generated by the facility (approximately 100 GPD) will be contained on-site and discharged to the municipal sanitary sewer for treatment.

By using standard techniques and practices during the construction phase, adverse surface runoff impacts to the adjoining Type 3 wetland and associated waterway would be reduced. Construction impacts would be short term, lasting only about nine months. With the incorporation of an on-site drainage system, including an in-line dropbox structure, impacts to Shingle Creek are not expected to be significant.

4.5.4 Hopkins Transfer Station

Hydrology

Construction at this site would occur in an already disturbed area. Replacement of the existing highly compacted, poorly drained gravel filled area with structures would result in only a slight increase in site runoff. The calculated runoff volume from a 2.4-inch, 24-year, 1-hour storm for the existing site is 6.0 cfs or 2693 gpm. After development, the site would generate 6.36 cfs or 2854 gpm for the same size storm. The increase in runoff would be insignificant. The existing holding/settling pond to the south of the proposed transfer station site has available storage of 1.7 acre-feet of runoff. The above referenced 1-hour storm would produce 1.52 acre-feet of runoff from the developed site, which is within the capacity of the existing pond. Storm runoff from the site will be collected by 10-inch and 12-inch storm sewers and conveyed south to the holding pond. Flow from the holding pond will continue to drain to the municipal storm sewer system which discharges at Nine Mile Creek. Sanitary waste generated from the facility (approximately 100 GPD) will be conveyed by a 4-inch gravity sewer to the municipal sewer on Sixth Avenue South.

Water Quality

During operation, surface runoff will be routed through the existing holding/settling pond and into the existing municipal storm sewer system. Surface water impacts from contact with stored waste materials are not expected to occur since the tipping and storage areas will be fully enclosed. Although the probability of oil and contaminated liquid spillage from trucks is slight, this can occur. The utilization of an in-line baffled concrete drop box structure that serves to contain and collect suspended and separated contaminated liquids behind the weir and prevent petroleum injection into the storm sewer system is recommended. Wastewater generated by the facility (approximately 100 GPD) would be discharged to the municipal sewer system. Because sodded and paved areas would occupy most of the developed site, the potential for erosion-related problems should be minimal.

There are no natural surface water bodies on or adjacent to the site. The major surface water concern is the potential for increased contaminants generated in site runoff during construction. Standard construction practices will be required to minimize the temporary changes in rates of erosion and runoff caused by disruption of the compacted soils on the site. The construction activity would be short term in nature however. Thus, long term adverse impacts are not expected.

Wetlands

There are no designated wetlands or surface water bodies on or adjacent to the site. Consequently, there would be no adverse surface water impacts to these areas.

4.5.5 Minneapolis South Transfer Station

Hydrology

The existing transfer station site is virtually 100 percent occupied by impervious surfaces such as buildings and pavement. Any landscaping for the proposed transfer station would result in a net reduction in site runoff. Drainage from the 1.5 acre developed site will continue to be collected by the catch basin north of the site on 20th Avenue South, and enter the municipal storm sewer system. The calculated runoff from a 2.4-inch, 24-year, 1-hour storm for the existing site is 3.06 cfs or 1373 gpm. With landscaping of about 5 percent of the site, runoff may be reduced to 2.93 cfs or 1314 gpm for the same size storm. Sanitary waste generated at the facility (approximately 100 GPD) will be conveyed by a 4-inch gravity line and discharged into the municipal sanitary sewer on 29th Street East, south of the site.

Water Quality

Surface water impacts from contact with stored waste materials should not occur since the tipping and storage areas will be fully enclosed. The probability of oil or contaminated liquid spillage from trucks during facility operation can occur. Appropriate methods to collect and trap these liquids should be incorporated into the on-site drainage plan. The utilization of an in-line baffled concrete drop box structure that serves to contain and collect suspended and separated contaminated liquids behind the weir and prevent petroleum injection into the storm sewer system is recommended. Wastewater generated by the facility will be contained on-site and discharged to the municipal sanitary sewer.

There are no natural surface water bodies on or adjacent to the site. The major surface water concern is the potential for increased contaminants generated from site runoff during construction. Standard construction practices should minimize the temporary changes in rates of erosion and runoff caused by the removal of buildings and disruption of soils on the site.

Wetlands

There are no designated wetlands or surface water bodies on or adjacent to the site. Consequently, there would be no adverse surface water impacts to these types of areas.

4.6 Land Use and Zoning

4.6.1 Introduction

One measure of a location's acceptability is the degree of consistency with local comprehensive plans and zoning ordinances, as well as compatability with existing and future land uses. The following subsections discuss the extent to which the proposed facilities would be consistent with community opinions, existing land uses, plans, and zoning ordinances.

4.6.2 Greyhound Facility

The proposed resource recovery facility would occupy a large part of the 14.6 acre Greyhound site. In addition to administrative use of the existing Insty-Print structure, there will be a process building for the waste handling and receiving equipment, combustion equipment, and an electric generator/turbine.

The existing industrial structures on site and the present land uses are not consistent with the more modern industrial properties in the area such as the MTC facility across the street. The proposed facility would be compatible with many of the surrounding industrial land uses in the vicinity. These nearby industrial uses include the railroad tracks and truck facilities to the south, and the heavy and light industrial properties to the west and north including warehouses, scrapyards, junkyards, and older industrial buildings.

The proposed structure is also located in an industrial neighborhood undergoing improvement. Concerns have been raised regarding the potential incompatibility of the proposed land use with other existing and proposed land uses. These concerns address the following issues:

1) Will the project detract from the general efforts to upgrade the 7th Street corridor? At the northern end of Seventh Street North, a new industrial park is being established. At the southern end, office restoration has occurred.
2) Will the project influence the potential utilization of the former Honeywell Plant Building which is now vacant? The proposed resource recovery facility may be perceived as affecting its marketability.

The proposed resource recovery facility would be a heavy industrial use. The characteristics of the proposed facility are similar to those enumerated in the the City's Comprehensive Plan for the 80's for general or heavy industrial use. They include the following characteristics:

- the facility requires a relatively large site;
- the facility requires close proximity to major transportation facilities; and
- the facility would generate traffic including heavy trucks.

The facility would not be consistent with the light industrial classification assigned to the site area in the City's Comprehensive

Plan. It is not small in size nor contained within a single structure; would require major transportation facilities; and would generate truck traffic.

The proposed facility, nevertheless, would be consistent with the more general goals and policies of the Comprehensive Plan. This policy plan supports efforts to use solid waste as a fuel to provide heat to large areas downtown via a hot water grid system. Facility generated proposed steam would be used to supplement the city's district heating system.

The facility is allowed under the city's zoning ordinance and as a conditional use it is permitted in the M-2 limited manufacturing district in which the site is located. Limited manufacturing districts permit production, processing, and storage of goods and products, as long as activities conform to performance standards set forth for the district for the emission or creation of noise, vibration, smoke, dust or particle matter, toxic or noxious materials, odors, fire, or explosive hazards, or glare or heat. These standards are summarized in Table 4.6-1. Certain public utility uses are also permitted. Conditional uses within the M-2 district include areas for dumping or disposal of refuse or trash. Thus, the facility's proposed activities are consistent with activities allowed as conditional uses within light industrial zoned districts (M-2).

4.6.3 Bloomington East

Major components of the proposed transfer station are an entrance/exit road, external scale facility with incoming and outgoing scales, a tipping area, an office, a parking area, and truck storage area. The proposed site is occupied by a low profile building which would have to be removed, displacing its two occupants, Hose Inc. and Conveyer Inc. The entire 5 acre site would be dedicated to the proposed transfer station and access roads. This would preclude development of other industrial and commercial properties on the site.

The existing nature of the site and adjacent lands is commercial and light manufacturing. The proposed transfer station has been perceived by the City of Bloomington and some selected industries (Sharlin, 1985) as having the potential to adversely affect abutting and nearby land uses. The City (City of Bloomington, May 1984) has indicated that a great deal of industrial land being held in reserve for corporate expansion would be negatively impacted by the proposed facility. Further, the Donaldson Company facility adjacent to the site, which functions as a research facility for acoustical testing of mufflers, air filters, and air intake devices has objected to the proposed facility on the grounds that expansion of company facilities would be hindered, and that an increase in ambient noise levels brought on by an increase in truck traffic could cause difficult problems (Jim Martin, Donaldson Company, May 1984).

With the exception of Donaldson Company's expansion on facility dedicated lands, these land use conflicts may be only perceived as problems. Increased truck volumes would not significantly impact roadways. Noise generated by facility operations would exceed ambient standards but the increases will be barely perceptible and not

TABLE 4.6-1

M-2 PERFORMANCE STANDARDS (Summarized)

o Noise - At no point on the boundary of a residence or business district shall the sound level of any operation or plant (other than background noises not directly under the control of a Manufacturer) exceed decibel limits established by the city in Section 542.480 of the Zoning Code.

o Vibration No industrial operation or activity shall cause ground transmitted vibrations in excess of limits set forth below:

Frequency (Cycles Per Second)	Maximum Permitted Displacement Along Residence District Boundaries (Inches)
0-10	.0008
10-20	.0005
20-30	.0002
30-40	.0002
40 and over	.0001

o Smoke and Particulate Matter - Smoke Emission shall not exceed that authorized in Chapter 47, Minneapolis Code of Ordinances.

o Toxic and Noxious Matter - Noxious matter emitted from any industrial operation or activity shall not exceed twenty-five percent of the maximum allowable concentrations of atmospheric contaminants listed in Minnesota Safety Regulation 447, and on file with the Minneapolis Air Pollution Control Engineer and the fire protection bureau. Measurement shall be made at any point on or beyond the lot line.

o Odorous Matter - No activity or operation shall cause discharge of odorous matter in such concentrations as to be detectable at any point along lot lines when diluted in the ratio of one volume of odorous air to four volumes of clean air.

o Fire and Explosive Hazards - Storage, utilization, or manufacturing of flammable materials shall be permitted if conforming to Minneapolis Code if Ordinances, Chapter 173 with safety factors applied (see Chapter 542.730 Zoning Code).

o Glare and Heat - Any operation producing intense glare or heat shall be performed within a completely enclosed building in such manner as not to create a public nuisance or hazard along lot lines. Exposed sources of light shall be shielded so as not to create a nuisance across lot lines.

significant. An analysis of facility generated noise and traffic indicates that there would be no significant increases in traffic or noise associated with the facility's operation other than on Donaldson Company property where increases would be barely perceptible. Further, landscaping could be employed to screen the facility.

Other existing land uses in the area would be buffered from the facility. John Deere, across the street, is centered on a large parcel of land and is set back from the proposed facility. Physical distance, about 600 feet, and other industrial uses including rail activity, would separate the facility from the Holiday Inn and residential properties. These land uses exist in an industrial area which is already representative of a noisy urban setting.

The Bloomington Comprehensive Plan indicates that continued industrial development in the area encompassing the proposed transfer station and surrounding lands will occur. The plan does not, however, distinguish between light and heavy industrial uses. The plan also includes public land use designations. There are no sites specifically designated in the plan for both industrial and public uses, although the transfer station (which would be publicly owned), possesses both these characteristics. Thus, a determination of whether the proposed facility is consistent with the City's Comprehensive Plan has not yet been made by the City of Bloomington (Sharlin, 1985).

The site of the proposed transfer station is zoned I-2. Permitted uses include compounding, processing, and packaging of products and materials, as well as public utility uses. Transfer station facilities are not expressly listed, but conditional uses have been granted by the City for similar uses (i.e., aluminum recycling business). The transfer station would be a public use as indicated in the zoning ordinance.

4.6.4 Brooklyn Park East

The major components of the proposed transfer station are an entrance/exit road, scale house with incoming and outgoing scales, a tipping area, an office, a parking area, and truck storage area. The site is at present largely undeveloped. The site's land use would be altered once the facility is constructed. Construction of the facility would also result in the displacement of one home on the southeast corner of the parcel.

There are several residences within the industrial and business zoned districts along Winnetka Avenue near the site, as well as a residence on industrially zoned land across from the site. The residences are not fully compatible with the industrial uses in the area. The facility would, however, be consistent with other industrial land uses in the vicinity. Residential lands to the southeast would be separated from the facility; however, increased traffic on nearby roadways would result.

New industrial and commercial expansion is occurring on undeveloped lands. These lands are slated for industrial growth in the city's Comprehensive Plan Update. The plan does not distinguish between light and heavy industrial uses. The proposed industrial land use would be consistent with the comprehensive plan, insofar as an industrial use is proposed.

The Northland Industrial Park is located one-half mile west of the site. This development will be separated from the site by the Shingle Creek Conservancy District. Nonetheless, some potential perceived land use conflicts have been identified by the owners of the industrial park (Stuebner, December 1983). Northland has contended that the location of the facility on any of the major access roads, adjacent to or in the proximity of the Park, would constitute a devaluation of valuable commercial land. Further, the transfer station facility would be visible from Northland. While it might be argued that the proposed facility may not be consistent with the image of this growing high technology and commercial park, the proposed facility would be more than one-half mile away. The Shingle Creek Conservancy District would provide a buffer between these two land uses. Proper traffic controls and proper facility design and operation should preclude emission of noxious odors or creation of excessive ambient noise levels. This would result in little or no land use impacts on the Industrial Park and associated commercial growth. Further, operation of the facility would not necessarily result in incompatibility with the Shingle Creek Conservancy District.

The proposed land use is not a permitted or conditional use under the City of Brooklyn Park's present zoning ordinance. This could possibly be a result of the fact that resource recovery is a new technology in this country and has not been incorporated into zoning ordinances. The site is located within a limited industrial-zoned district I-1. A resource recovery facility or transfer station would not be a permitted use, as indicated in Section 3.5.3. Moreover, conditional land uses within I-1 are limited and do not include facilities of the nature proposed. In contrast, conditional land uses allowed within the I-2 district are far more encompassing. They include uses with characteristics similar to a transfer station. Based on the City Planning Office's interpretation of the zoning ordinance, the proposed facility is more suitable in a heavy industrial zone than it is for the light industrial zone in which it is proposed to be located (Gary Berg, 1985).

A portion of the site is located within the floodway fringe of Shingle Creek. Floodway fringe is defined as that portion of the flood plain outside of the floodway. A solid waste transfer station and associated entrance and exit roads are not expressly permitted or conditional uses in a flood fringe.

4.6.5 Hopkins

Major components of the proposed transfer station are an entrance/exit off Fifth Avenue South, a scale house facility, a tipping area, an office, a parking area, and truck storage area. The total project area would encompass five acres in the northwest corner of a parcel currently used by Hennepin County DOT for storage, and maintenance of vehicles. The current DOT activities and other nearby industrial land uses create substantial truck traffic.

The immediate borders of the site are occupied by industrial and vacant lands comprising an industrial corridor running northeast-southwest through the center of Hopkins. The Country Club

Food Warehouse and Super Value Perishables Warehouses are within about 100 and 750 feet, respectively, west of the proposed facility. A proposed multi-housing development would be 750 feet southwest of the site. Single and multi-family residences are about 800 feet north of the proposed site. Although food warehouses are within close vicinity of the site, there is no current evidence of municipal waste from transfer stations effecting food handling at food warehouses. The proposed use, like the warehousing activities, would also generate considerable truck traffic. The community has expressed concern regarding the impact of the facility on these land uses including residences to the south of the site (Pepin, Dayton, Herman, Graham & Getts 1985).

Additional land use concerns expressed by the community are:

- o The proposed site is adjacent to the Hopkins Downtown Redevelopment area. The city contends redevelopment efforts in the area could be impacted.
- o The site is in close proximity to residential properties and violates the 1,000 foot separation from residential uses (MPCA guidelines).

There are intervening land uses between the redevelopment area and the proposed site. These include County Road 3 which is heavily trafficked and the railroad tracks. There is a physical separation of approximately 1000 feet between these potentially incompatible land uses. Further, the proposed transfer station would not encroach upon CBD lands. There are, however, plans to potentially expand the CBD development district across County Road 3 (Rapp, 1985). These factors suggest that due to separation distances of 1000 feet or more, the project would not impact adjacent land uses.

The transfer station site is about 800 feet from a high density residential area to the north, and within about 700 feet of a residential area to the south. There are additional plans to develop office and residential uses to the west and southwest (Rapp, 1985). Adverse land use impacts to these residential areas due to implementation of the transfer station may be more perceived than real. Both residential areas are separated from the proposed site by intervening land uses including the already developed County DOT site. The City of Hopkins has, however, indicated concern about future development potential of nearby property if a transfer station is located in Hopkins (Rapp, 1985). Further, although truck traffic associated with the facility would result in round trips daily of about 310 trucks, this would not significantly impact roadway capacity or operations as described in Section 4.7. Facility truck traffic would not result in significant decreases in levels of service, or increases in noise levels. Finally, there is no evidence of existing transfer facilities generating impacts due to odors, rodents, or litter on the nearby neighborhoods. These factors would mitigate against significant adverse impacts to residential nehghborhoods.

The site's I-2 industrial zoning classification provides for junk yards and public utility structures as conditional uses, but has no mention of transfer stations. The proposed transfer station has a public use purpose (will be owned and operated by a public entity, the County). As a public use the project appears to be consistent with other conditional uses. An interpretation of whether the site would be an allowed conditional use, however, has not yet been made by the City of Hopkins (Carrigan, 1985).

The proposed site would be a public industrial use and is slated for industrial development in the City's Comprehensive Plan. The designation does not distinguish between heavy and light industrial use. The proposed project is both a governmental (public use) and industrial use. One relevant industrial policy of the plan is that:

> "standards for new industrial development will be upgraded and existing industrial developments will be encouraged to upgrade the existing image through removal or screening of unsightly outside storage, improved building maintenance and screening or major parking lots from neighboring areas, etc.

The transfer station's compatability with the Hopkins land use plan is contingent upon buffering and screening from nearby residential areas. The transfer station activities would not include outside open air storage of refuse. The City of Hopkins will ultimately review the proposed transfer station and determine its consistency with the Comprehensive Plan and Zoning ordinance.

4.6.6 Minneapolis South

A 400 TPD (operating capacity) transfer station is proposed for the Minneapolis South site. The site is currently used as a 200-300 TPD solid waste transfer station by the city. The existing facility will have to be demolished and rebuilt. The proposed land use would be consistent with the existing usage of the site. Although greater traffic volumes would be associated with an expanded facility, these volumes would not create traffic problems which would significantly affect surrounding land uses.

A solid waste transfer station is consistent with the heavy industrial designation of the site in the Minneapolis Comprehensive Plan for the 80's. Similarly, a transfer station is consistent with the site's zoning classification of M-3, general manufacturing.

4.7 Transportation Impacts

4.7.1 Methodology

The objective of the traffic engineering analysis is to evaluate the impact of the resource recovery facility and transfer station generated traffic on site access roadways from the perspective of roadway operational capacity and safety. A worst case analysis was employed. All employee traffic was assumed to arrive during the commuter peak hour. All facility truck traffic was routed through the most heavily utilized intersections in order to estimate the greatest project impacts possible. Transfer trucks were assumed to travel directly to landfills from the transfer stations.

Evaluation criteria used to assess the Project's traffic related impacts include the following:

- Traffic level of service - will the added demand increment represented by the solid waste trucks and private vehicles affect the level of service and traffic flow characteristics of resource recovery facility and transfer station site access roadway facilities.
- Traffic operating safety - will the truck movement into and out of the resource recovery facility and transfer stations affect vehicle operating safety. Consideration is given to available sight distance, approach speeds, vehicle gap acceptance, and vehicle maneuverability given roadway geometrics.
- Site accessibility - this criteria is a measure of the directness of solid waste truck routing by direction to and from the resource recovery facility and transfer stations.
- Land use compatibility - will the additional truck traffic present a potential conflict with adjacent land use activity.

To evaluate the impacts that the proposed project will have on the roadway networks around each site, the 1985 existing traffic volumes were increased by a factor representing historical traffic growth in a given area to 1989 (Brown, MNDOT, 1985). Then facility generated traffic was added onto the roadway network to provide a cumulative traffic demand scenario. Traffic projections for 1989, the first year of operations, were computed by using the growth rates found in Table 4.7-1. Waste trip generation and distribution were identified for the resource recovery facility through the use of a Metro Council computer model, and for the transfer stations through existing landfill traffic patterns estimated by HDR and Metro Council Staff (Caswell, 1985). Capacity analyses were performed using procedures described in TRB circulars 212 and 281 to estimate project impacts on level of service.

4.7.2 Resource Recovery Facility (Greyhound Site)

4.7.2.1 Trip Generation and Distribution

The vehicular traffic demand generated by the proposed resource recovery facility (Greyhound Site) can be classified according to the following categories:

TABLE 4.7-1

BACKGROUND TRAFFIC GROWTH RATES (1985-1989)

Site	Percent Per Year	Factor
Greyhound	1.5	1.077
Bloomington East	2.0	1.104
Brooklyn Park East	2.5	1.131
Hopkins DOT	2.0	1.104
Minneapolis South	1.5	1.077

Source: ERT 1985
Brown, MNDOT, 1985

- o Facility employee travel
- o Solid waste delivery trucks to resource recovery facility
- o Transfer trailers
- o Private vehicles delivering solid waste to resource recovery facility.

Vehicle generation with the Greyhound site was based on a design capacity of 1,200 tons per day (tpd) to represent a worst case analysis. The anticipated operating capacity of the facility is 1,000 tpd. Refuse trucks will carry 5 tons per truck, transfer station trucks will carry 18 tons per truck, and private cars will carry 350 pounds per car.

The Greyhound site facility is expected to employ 45 persons on a 24-hour basis. Of this total, about 30 persons are expected to be employed on the primary daytime shift (generally 7:00 AM-3:00 PM), 10 on the second daytime shift, and 5 in the late evening shift. Assuming a vehicle occupancy of 1.0 persons per automobile, the morning shift change will contribute during the AM peak hour a total of 30 vehicles inbound (for the primary daytime shift) to the site, and 5 vehicles outbound (from the evening shift). During the afternoon shift change, PM peak hour employee travel is expected to be about 10 vehicles inbound (for the second shift) to the site and about 30 vehicles outbound (from the primary daytime shift). Refuse trucks' and private vehicles' arrival rates are expected to be 10 percent and 6 percent during the AM and PM peak hours. Transfer truck traffic was assumed to be zero, a worst-case assumption (implies 100 percent direct haul).

Solid waste truck activity has been calculated based on the quantity of municipal solid waste to be processed and truck usage data supplied by HDR for existing landfills. About 240 packer trucks (design capacity) are expected to use the resource recovery facility on a daily basis. During the AM commuter peak hour (7-8:00 AM), about 25 truck trips in and out will be made. During the PM peak hour (4:30-5:30 PM) 15 trips in and out will be made. About 240 private vehicles (design capacity) are expected to use the facility on a daily basis (HDR). Private vehicles will make about 25 trips in and out during the AM commuter peak hour and 15 trips in and out during the PM peak hour.

Directional distribution has been based on the origin of waste. For an average operating day, about 35 percent of the total traffic (trucks and private vehicles) generated by the facility is expected to arrive from or depart to the south, 35 percent from the west, 15 percent to the northwest, and 15 percent from the northeast (See Figure 4.7-1). The distributions were arrived at by using the Metro Council's computerized model and allocating waste to Transportation Analysis Zones (TAZs) and ultimately to roadways.

Table 4.7-2 lists the expected operating capacity and traffic volumes associated with operation of the facility at its expected operating capacity, at design capacity, and during construction.

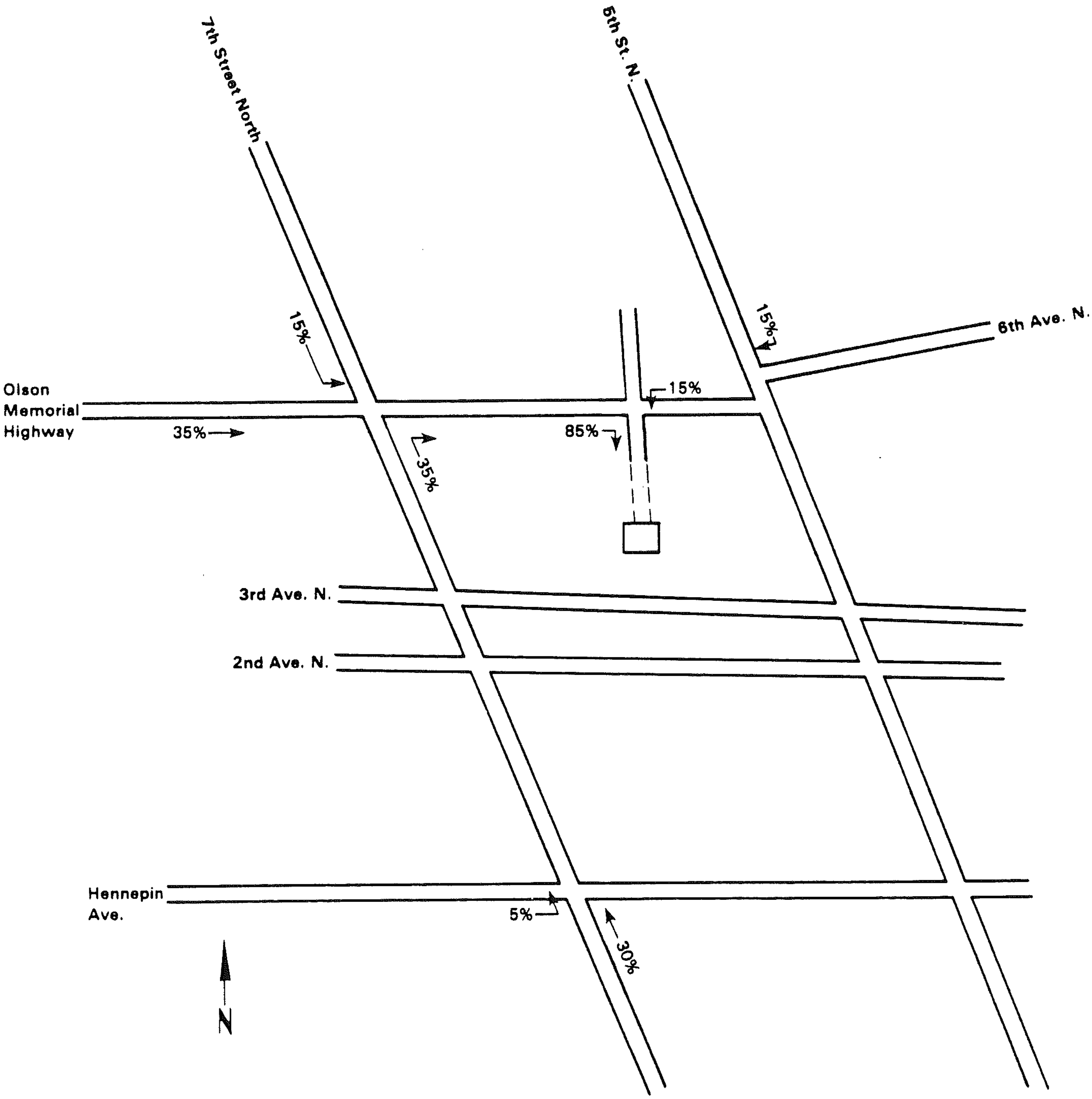

Figure 4.7-1 Trip Distribution, In-Bound Trips - Greyhound Site

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TABLE 4.7-2

TRAFFIC GENERATION CHARACTERISTICS OF PROPOSED RESOURCE RECOVERY

	Operation Capacity	Design Capacity	Construction
Waste Processed in tons per day (tpd)	1000	1200	---
Number of Refuse Trucks/Day	200	240	---
Number of Transfer Truck/Day	---	---	---
Number of Private Vehicles/Day	200	240	---
Work Force			
Peak	---	---	210
Average	45	45	130

Source: Metro Council 1985
ERT, 1985

4.7.2.2 Future Traffic Volumes

1989 Baseline Traffic Volumes

The existing 1985 traffic volumes around the Greyhound site were increased by 1.5 percent per year compounded growth, or by a factor of 1.077 to arrive at the 1989 baseline traffic demands. Figure 4.7-2 illustrates the 1989 baseline traffic demands for the AM peak hour, and FIgure 4.7-3 illustrates the 1989 PM peak hour demands.

1989 Cumulative Traffic Volumes (with Facility)

Operation of the proposed resource recovery facility at its design capacity is expected to result in an increase in vehicular traffic in 1989 on Olson Memorial Highway of approximately 135 vehicle trips in the AM peak hour (80 vehicles entering, 55 vehicles exiting) and 100 vehicle trips in the PM peak hour (40 entering, 60 exiting). Traffic increases on area roadways are illustrated on Figure 4.7-4 and 4.7-5. Figures 4.7-6 and 4.7-7 illustrate the 1989 Cumulative AM and PM Peak Hour Traffic Volumes with the facility functioning at its operating capacity, while Figures 4.7-8 and 4.7-9 illustrate the 1989 Cumulative AM and PM peak hour traffic volumes with the facility operating at its design capacity.

4.7.2.3 Capacity Analysis

1989 Baseline Level of Service

Intersection capacity analyses were performed using the methodology described in Section 3.6.1.2. Without development of the proposed resource recovery facility, 1989 future year baseline conditions have been estimated. Table 4.7-3 indicates better than a LOS "C" condition at all intersections proximate to the Greyhound Site. Olson Memorial Highway at Seventh Street North will operate at a LOS "B/C" condition in the AM peak hour and a LOS "B" condition in the PM peak hour. This equates to acceptable operating conditions with average delays to vehicular traffic in the AM peak hour, and very good operations with some short delays during the PM peak hour. The MTC Garage Access at Olson Memorial Highway will operate at a LOS "A/B" condition in the AM peak hour and LOS "B" condition in the PM peak hour. This relates to little delay or congestion in the AM peak hour and very good operations with some short delays in the PM peak hour. Sixth Avenue North and Fifth Street North will operate at a LOS "B" condition in the AM peak hour and at a LOS "B/C" condition in the PM peak hour. This corresponds to very good operations with some short delays in the AM peak hour and acceptable operating conditions with average delays in the PM peak hour. Finally, Hennepin Avenue at Seventh Street North will operate at a LOS "A/B" condition in the AM peak hour and a LOS "B" condition in the PM peak hour. This equates to little delay or congestion in the AM peak hour and very good operations with some short delays in the PM peak hour.

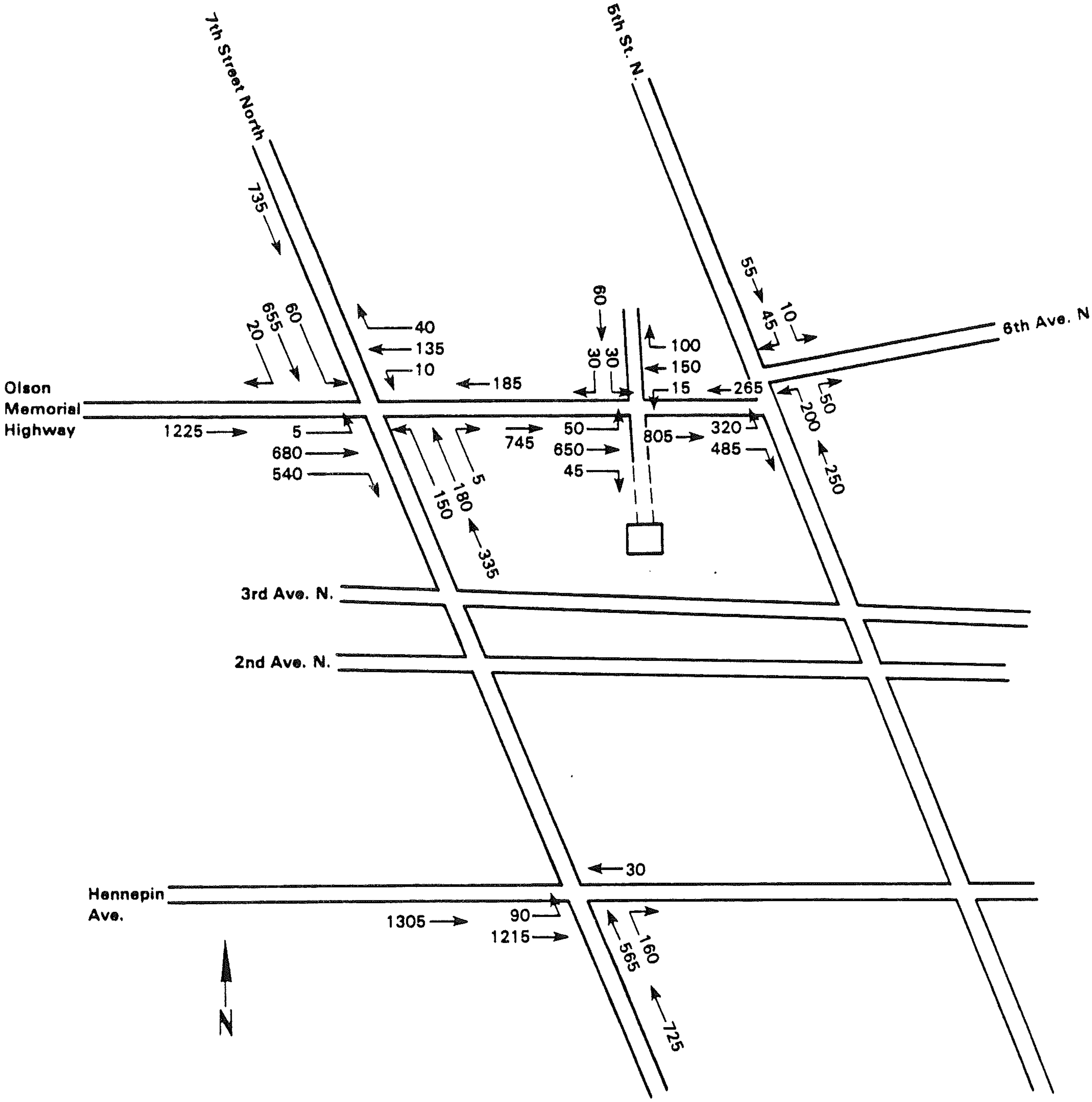

Figure 4.7-2 1989 Baseline A.M. Peak Hour Volumes - Greyhound Site

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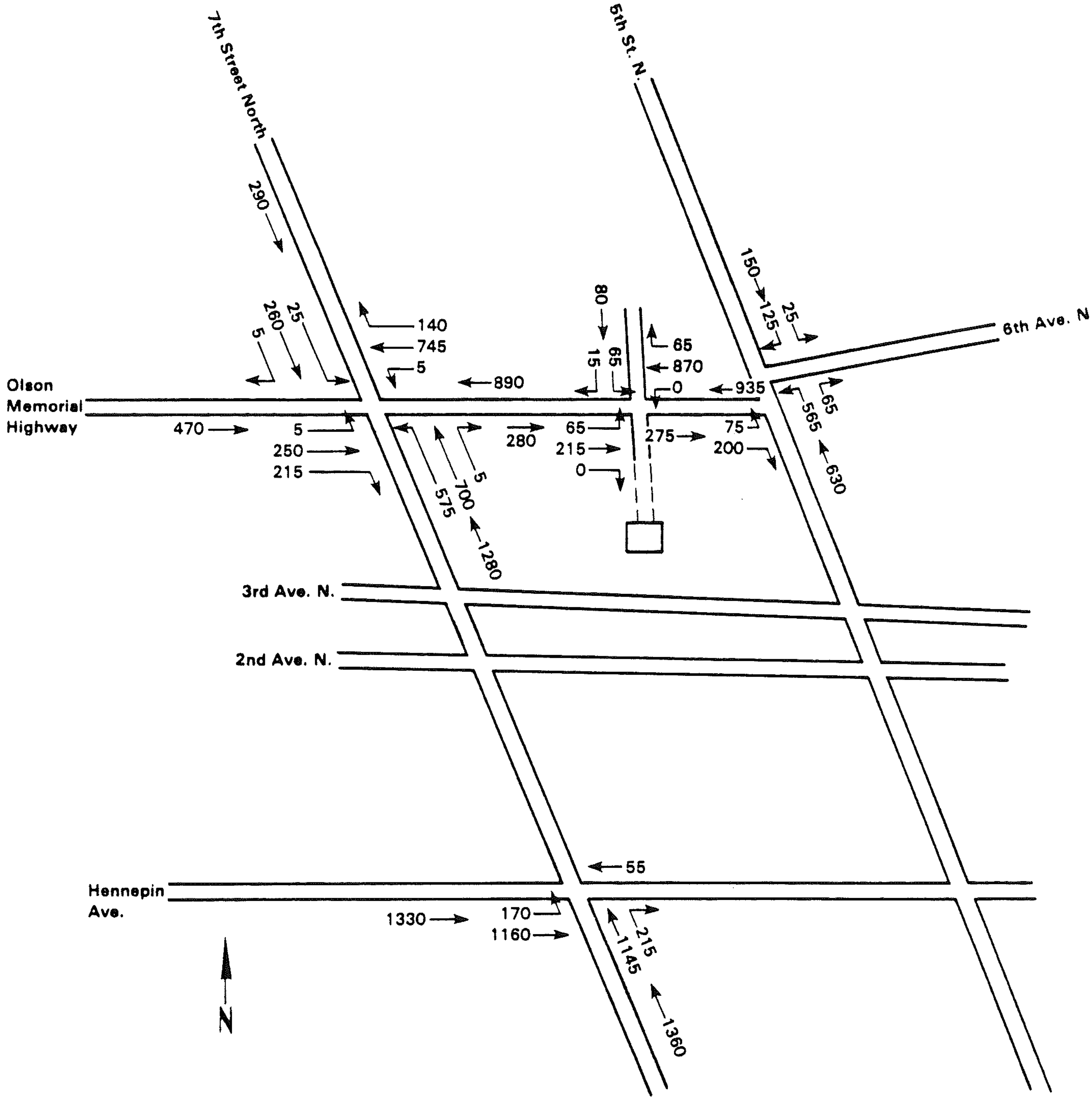

Figure 4.7-3 1989 Baseline P.M. Peak Hour Volumes - Greyhound Site

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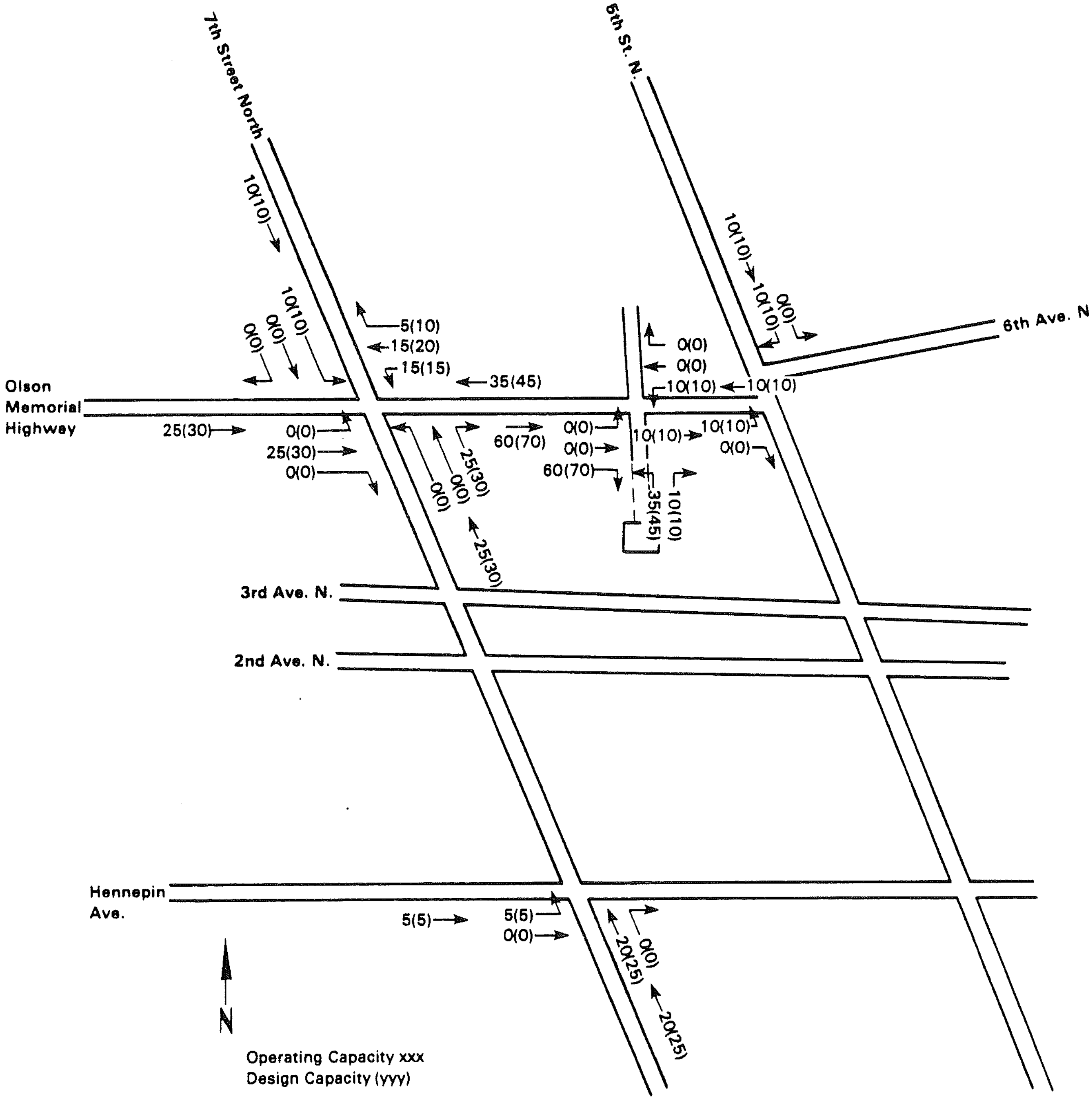

Figure 4.7-4 Project Traffic Only, 1989 A.M. Peak Hour - Greyhound Site

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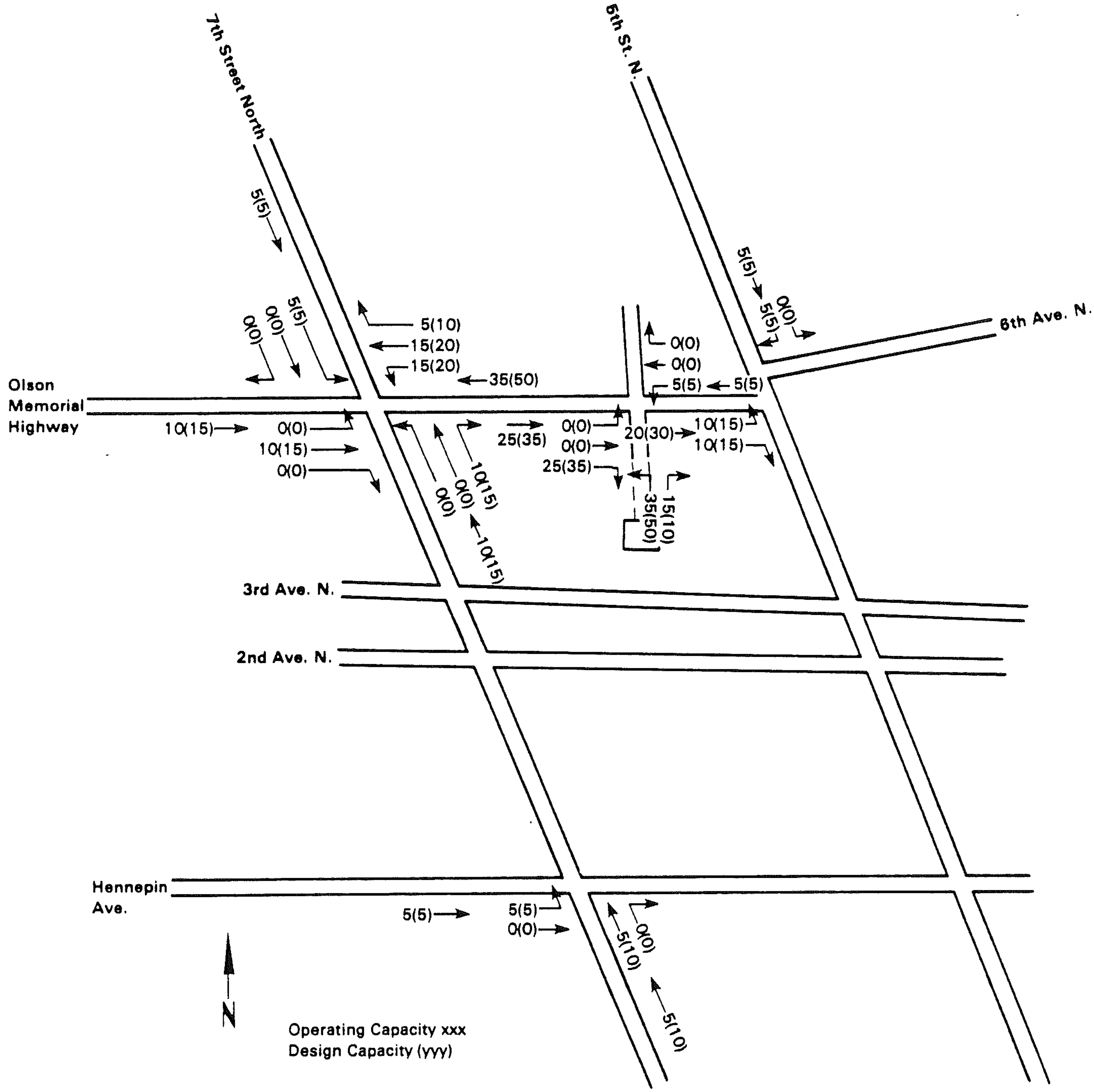

Figure 4.7-5 Project Traffic Only, 1989 P.M. Peak Hour - Greyhound Site

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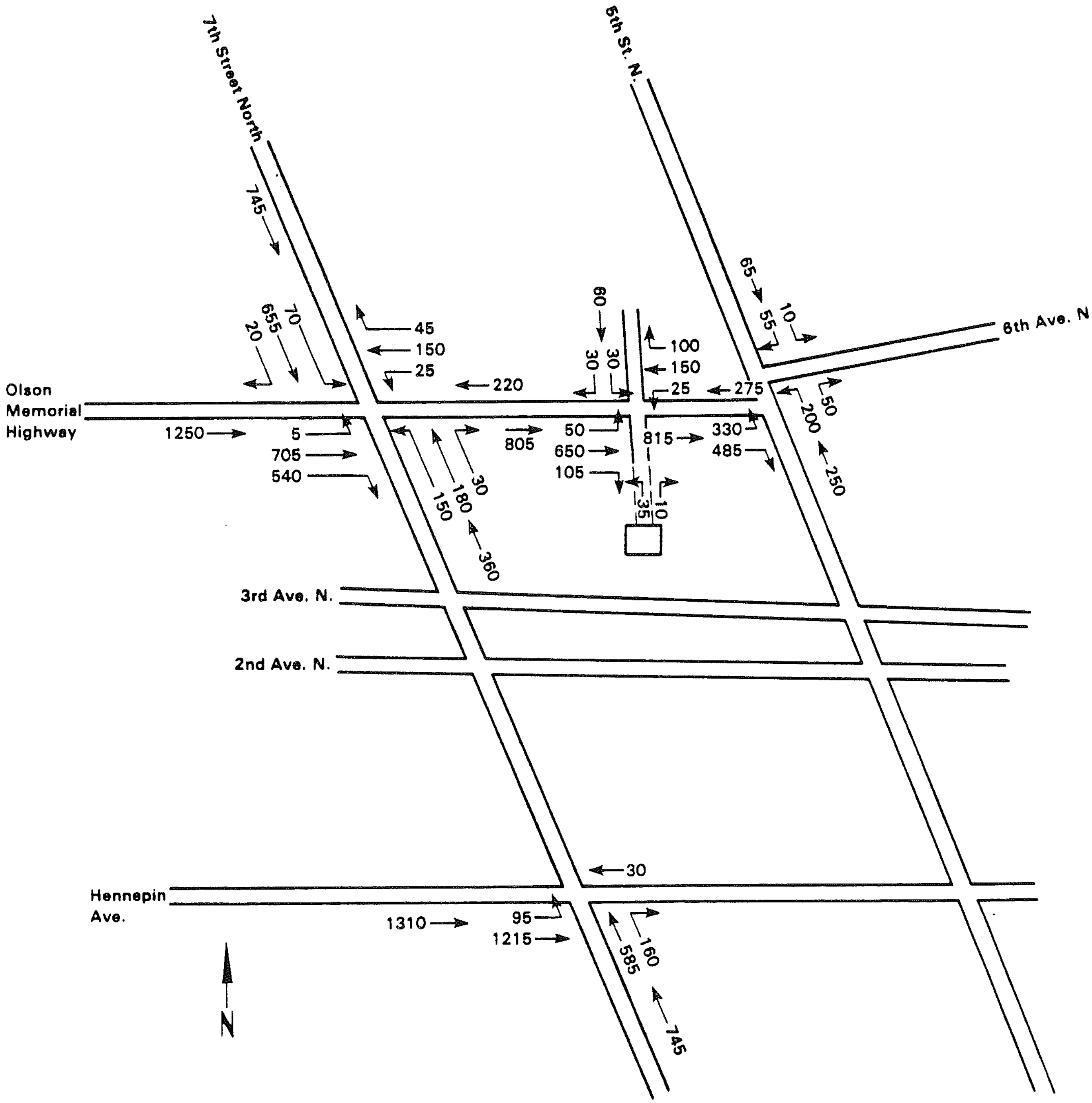

Figure 4.7-6 1989 Cumulative Traffic Volumes, A.M. Peak Hour - Greyhound Site (Operating Capacity)

8511027

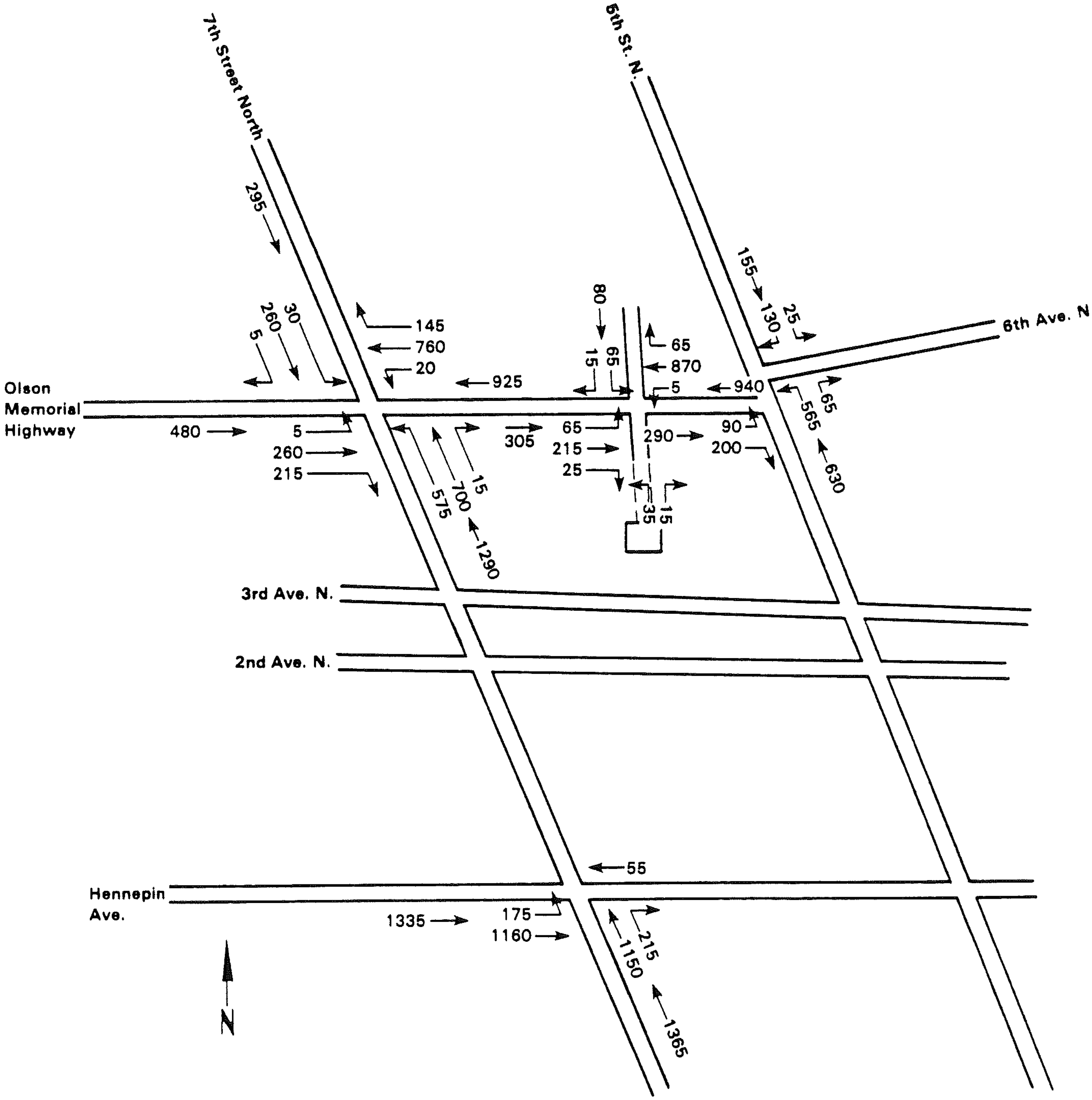

Figure 4.7-7 1989 Cumulative Traffic Volumes, P.M. Peak Hour - Greyhound Site (Operating Capacity)

8511028

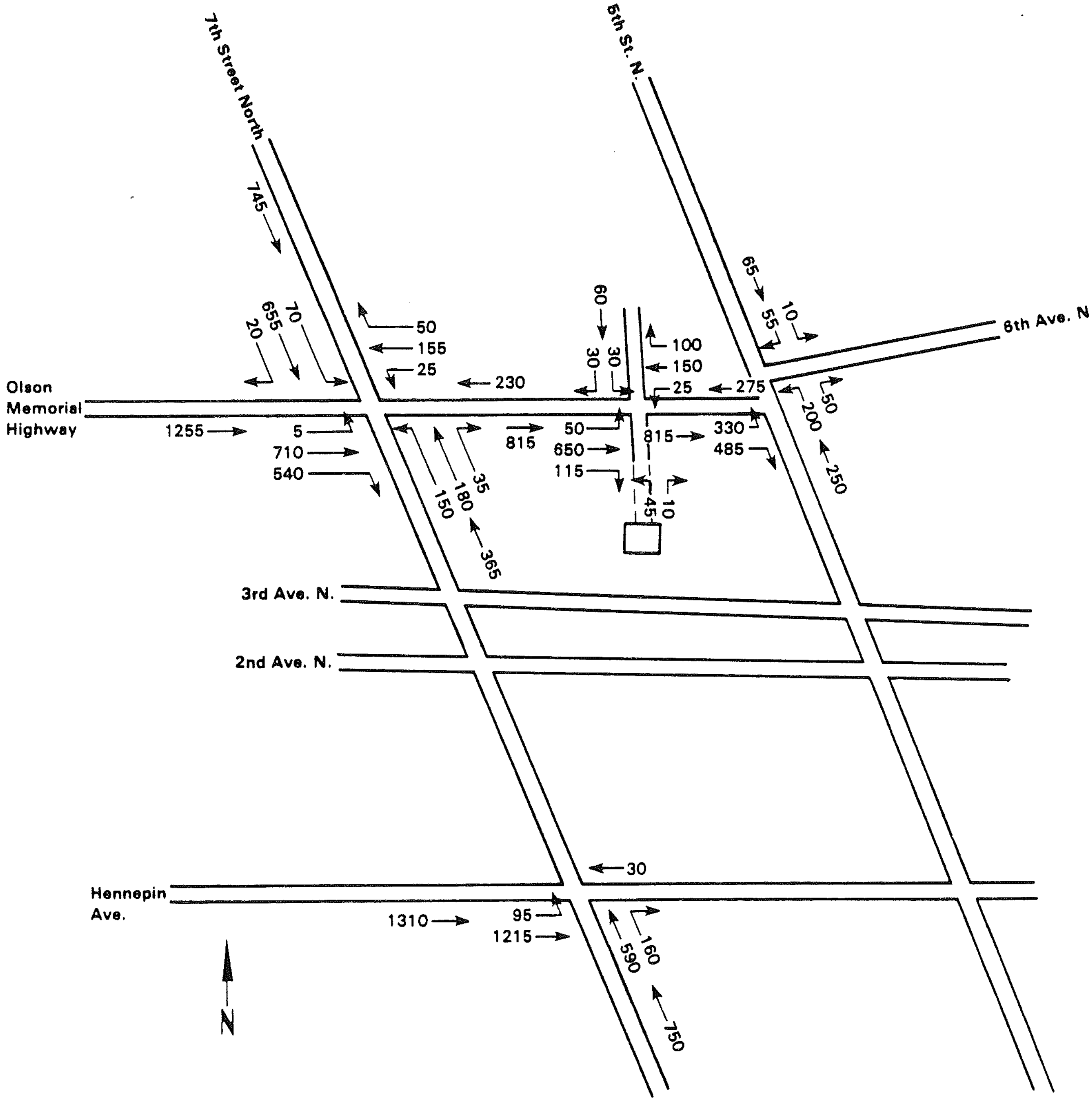

Figure 4.7-8 1989 Cumulative Traffic Volumes, A.M. Peak Hour - Greyhound Site (Design Capacity)

8511029

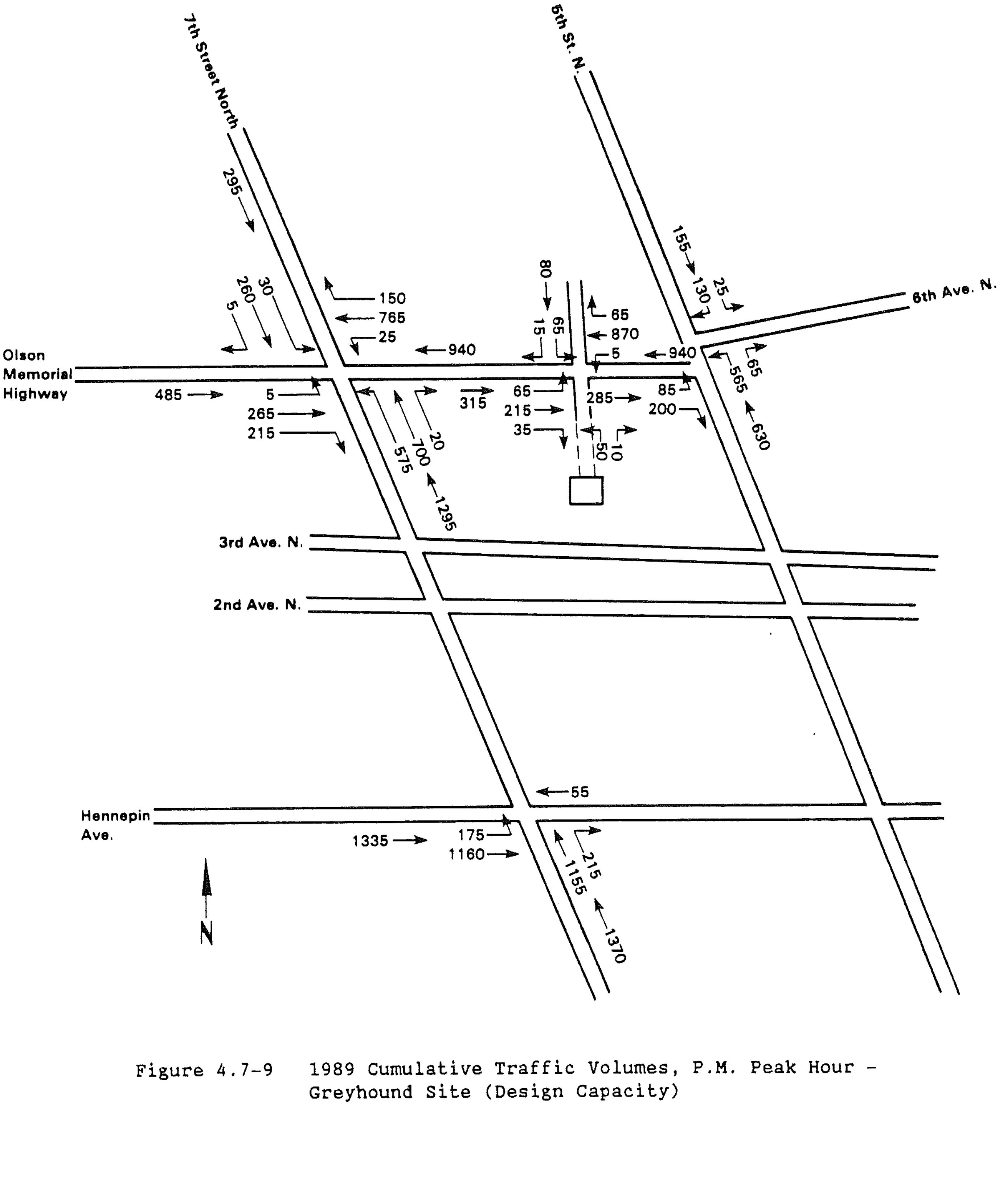

Figure 4.7-9 1989 Cumulative Traffic Volumes, P.M. Peak Hour - Greyhound Site (Design Capacity)

8511030

TABLE 4.7-3
1989 BASELINE LEVELS OF SERVICE
(GREYHOUND SITE)

Intersection	Level of Service AM	PM
Olson Memorial Highway at 7th Street North	B/C	B
MTC Garage Access at Olson Memorial Highway/6th Ave. North	A/B	B
6th Avenue North at 5th Street North	B	B/C
Hennepin Avenue at 7th Street	A/B	B

Source: ERT 1985

1989 Cumulative Level of Service

Roadway operations at adjacent intersections are expected to be better than a LOS "C" condition at all intersections proximate to the proposed facility. Olson Memorial Highway at Seventh Street North will operate at LOS "B/C" condition during the AM and PM peak hours. The AM peak hour LOS is unchanged from the 1989 baseline while the PM peak hour LOS represents a slight decrease at the intersection. However, this still corresponds to acceptable operating conditions with average delays to vehicular traffic. The other three intersections proximate to the site (MTC Garage Access at Olson Memorial Highway; Sixth Avenue North at Fifth Street North; and Hennepin Avenue at Seventh Street) will all remain unchanged from 1989 baseline (without project) conditions. Table 4.7-4 summarizes the results of the 1989 cumulative capacity analysis by intersection.

4.7.2.4 Safety Analysis

Safe operation of an intersection requires that several conditions be satisfied. Adequate sight distance on the major road must be available to provide time for an entering vehicle from a minor road to view approaching vehicles and decide whether or not to proceed with a merging maneuver. In addition, safe operation requires the existence of gaps in vehicle traffic on the major roadway so that a vehicle entering from a minor road can safely access. Also, an intersection should be controlled in the proper fashion, either signalized or unsignalized, in order to ensure safe operations.

Sight Distance

The safe operation of a roadway (such as the proposed site access road) requires that adequate sight distance on the major roadway exist. With the introduction of an access road at the proposed resource recovery facility, the potential for vehicular conflict will be increased as vehicles enter and exit the proposed facility. The sight distance on Olson Memorial Highway/Sixth Avenue North in both directions must be adequate for drivers on Olson Memorial Highway/Sixth Avenue North traveling at or near the posted speed (40 mph) to come to a stop before reaching a conflicting vehicle leaving the access road.

Stopping time is a function of both perception and reaction time. Minimum and desirable sight distances are provided in the Transportation and Traffic Engineering Handbook, Institute of Traffic Engineers, and are a function of roadway speed, perception time, and pavement.

Vehicles traveling on Olson Memorial Highway/Sixth Avenue North should have adequate time to view a vehicle exiting the access road for Olson Memorial Highway/Sixth Avenue North, and then come to a stop or slow down on Olson Memorial Highway/Sixth Avenue North. Likewise, vehicles exiting the access road should be able to see vehicles on Olson Memorial Highway/Sixth Avenue North at a distance great enough to ensure that the exiting vehicle can safely merge onto Sixth Avenue North. The required stopping sight distance per the Institute of Traffic Engineering Standards is approximately 400 feet, based upon a speed of 40 miles per hour.

TABLE 4.7-4
1989 CUMULATIVE LEVELS OF SERVICE
(GREYHOUND SITE)

Intersection	Level of Service AM	PM
Olsen Memorial Highway at 7th Street North	B/C	B/C
MTC Garage Access at Olson Memorial Highway/6th Ave. North	A/B	B
Sixth Avenue North at 5th Street North	B	B/C
Hennepin Avenue at 7th Street	A/B	B

Source: ERT 1985

The sight distance on Olson Memorial Highway/Sixth Avenue North, from the proposed site access road is about 600 feet to the east and west. As a result, vehicles on Olson Memorial Highway/Sixth Avenue North would have adequate time to react to vehicles exiting the access road. It can be concluded that adequate sight distance would exist at the proposed access road to allow for safe operations at its intersection with Olson Memorial Highway/Sixth Avenue North.

4.7.3 Bloomington East Transfer Station

4.7.3.1 Trip Generation and Distribution

The vehicular traffic demand generated by the proposed Bloomington East transfer station can be classified according to the following categories:

- Facility employee travel
- Solid waste delivery trucks to transfer station
- Transfer trucks
- Private vehicles delivering solid waste and/or recyclables to transfer station

Vehicle generation at the Bloomington East transfer station was based on a design capacity of 800 tpd. The anticipated operating capacity is 500 tpd. Refuse trucks will carry 5 tons per truck, transfer station trucks will carry 18 tons per truck, and private vehicles will carry 350 pounds per vehicle to the transfer station.

The Bloomington East transfer station is expected to employ 10 persons on a 11-hour basis. About 160 packer trucks (at design capacity) are expected to use the transfer station on a daily basis. During the AM commuter peak hour (7-8:00 AM) about 15 truck trips in and out will be made. During the PM peak hour (4:30-5:30 PM) 10 trips in and out will be made. About 45 transfer trucks (at design capacity) are expected to use the transfer station on a daily basis. During the AM and PM peak hours 5 truck trips will be made in and out of the transfer station. About 160 private vehicles (at design capacity) are expected to use the transfer station on a daily basis. Private vehicles (including employees) will make about 25 trips in and out of the transfer station during the AM peak hour and 20 trips in and out during the PM peak hour.

Directional distribution has been based on the origin of waste. For an average operating day, about 50 percent of the total traffic (trucks and private vehicles) generated by the transfer station is expected to arrive from and depart to the northeast, 20 percent from the southeast, 15 percent from the southwest, 10 percent from the south, and 5 percent from the northwest (Figure 4.7-10). The employee distribution was assumed to be the same as the delivery vehicles.

Table 4.7-5 lists the expected traffic volumes associated with operation of the facility at its expected operating capacity, at design capacity and during construction.

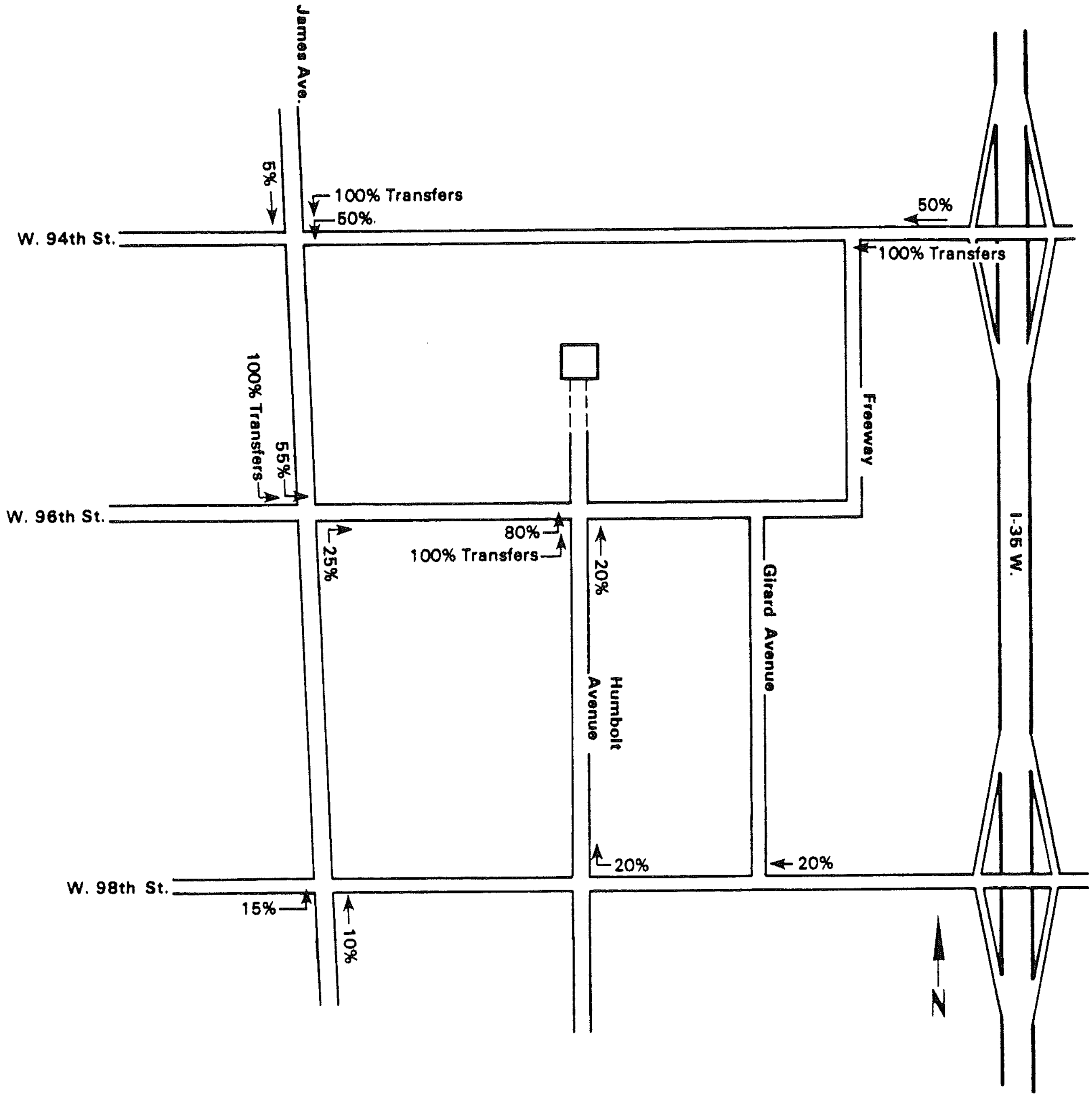

Figure 4.7-10 Trip Distribution, In-Bound Trips - Bloomington East Site

8511031

TABLE 4.7-5

TRAFFIC GENERATION CHARACTERISTICS OF PROPOSED BLOOMINGTON EAST TRANSFER STATION

	Operation Capacity	Design Capacity	Construction
Waste Processed in tons per day (tpd)	500	800	---
Number of Refuse Trucks/Day	100	160	---
Number of Transfer Trucks/Day	30	45	---
Number of Private Vehicles/Day	100	160	---
Number of Employees			
Peak	---	---	50
Average	10	10	35

Source: ERT, 1985

4.7.3.2 Future Traffic Volumes

1989 Baseline Traffic Volumes

The existing 1985 traffic volumes around the Bloomington East Site were increased by 2.0 percent per year compounded growth, or by a factor of 1.104 to arrive at the 1989 baseline traffic demands. Figure 4.7-11 illustrates the 1989 AM peak hour traffic demands, and Figure 4.7-12 the PM peak hour demands.

1989 Cumulative Traffic Volumes (With Facility)

Operation of the proposed transfer station is expected to result in an increase in vehicular traffic (at design capacity) in 1989 on West 96th Street of approximately 100 vehicle trips in the AM peak hour (45 vehicles entering, 55 vehicles exiting) and 75 vehicle trips in the PM peak hour (35 entering and 40 exiting). The transfer station is also expected to increase vehicular traffic in 1989 on James Avenue by 70 vehicle trips in the AM peak hour (35 entering and 35 exiting) and 60 vehicle trips in the PM peak hour (30 entering and 30 exiting). In addition, the proposed transfer station is expected to result in an increase in vehicular traffic on West 94th Street of approximately 100 vehicle trips in the AM peak hour (50 entering and 50 exiting) and 40 vehicle trips in the PM peak hour (20 entering and 20 exiting). Other minor traffic increases on area roadways are shown on Figures 4.7-13 and 4.7-14. Figures 4.7-15 and 4.7-16 illustrate the 1989 Cumulative AM and PM peak hour traffic volumes with the facility functioning at its operating capacity while Figures 4.7-17 and 4.7-18 illustrate AM and PM peak hour traffic volumes with the facility operating at design capacity.

4.7.3.3 Capacity Analysis

1989 Baseline Level of Service

Level of Service calculations were completed for the 1989 baseline AM and PM peak hours. Table 4.7-6 summarizes the results. Several intersections will perform below a LOS "C" condition. The intersection of West 98th Street and James Avenue will operate at a LOS "C/D" condition during the PM peak hour with long delays occurring on both James Avenue approaches to the intersection. The intersection of West 98th Street and Girard Avenue South will also operate at a LOS "C/D" condition during the PM peak hour. The major street traffic flow will not experience any delays, however the 45 vehicles on the Girard Avenue approach to the intersection will experience considerable delays due to the high volume of traffic on West 98th Street. Finally, the intersection of West 98th Street and Old Shakopee Road will operate at a LOS "C/D" condition during the PM peak hour. This LOS "C/D" condition will result from the large delays and long queues that will most likely occur on West 98th Street eastbound. By 1989 it is estimated that 795 vehicles will travel on West 98th Street eastbound during the PM peak hour. These vehicles will be under stop sign control, and the long delays and queues will

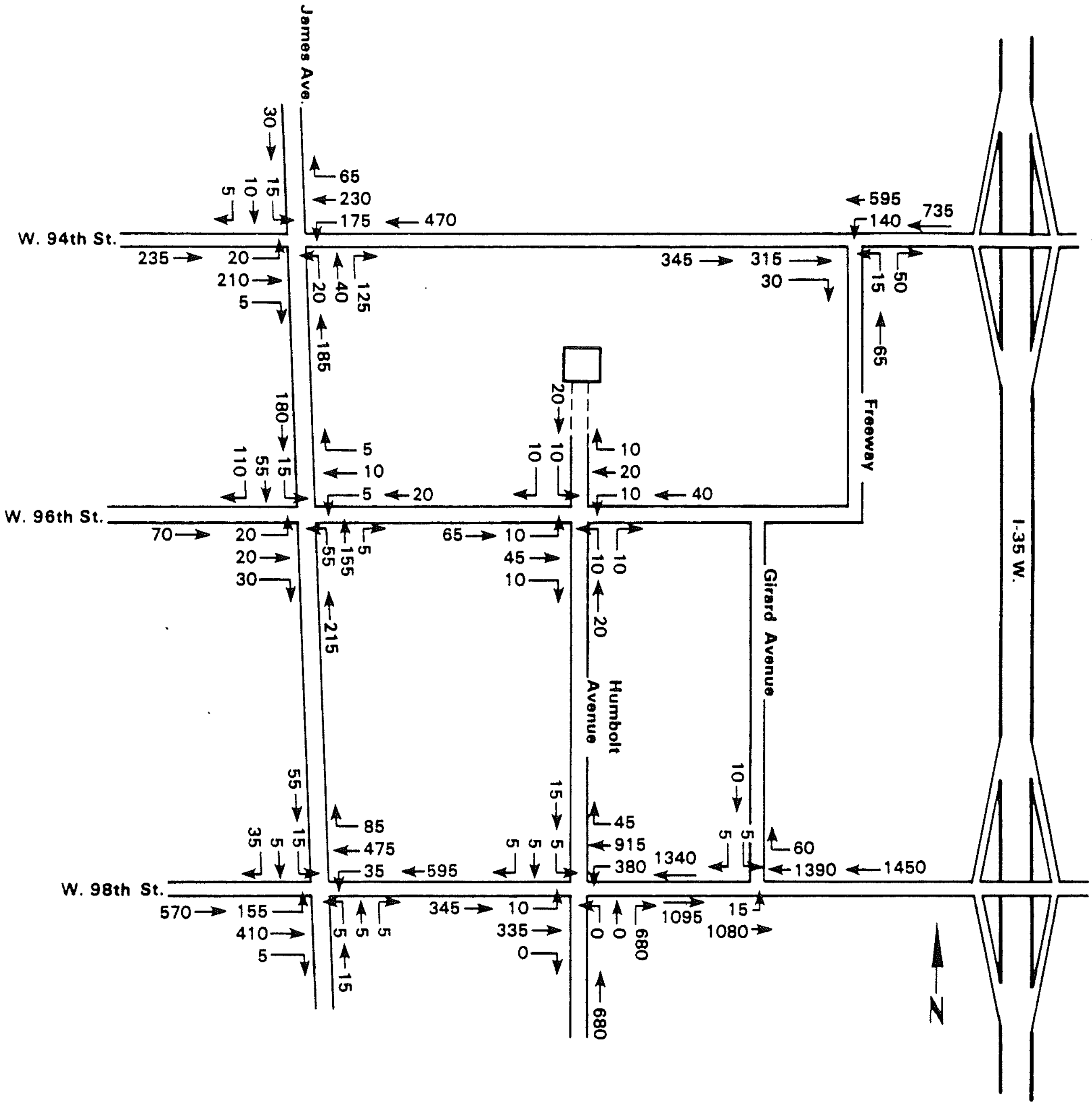

Figure 4.7-11 1989 Baseline A.M. Peak Hour Volumes - Bloomington East Site

8510055

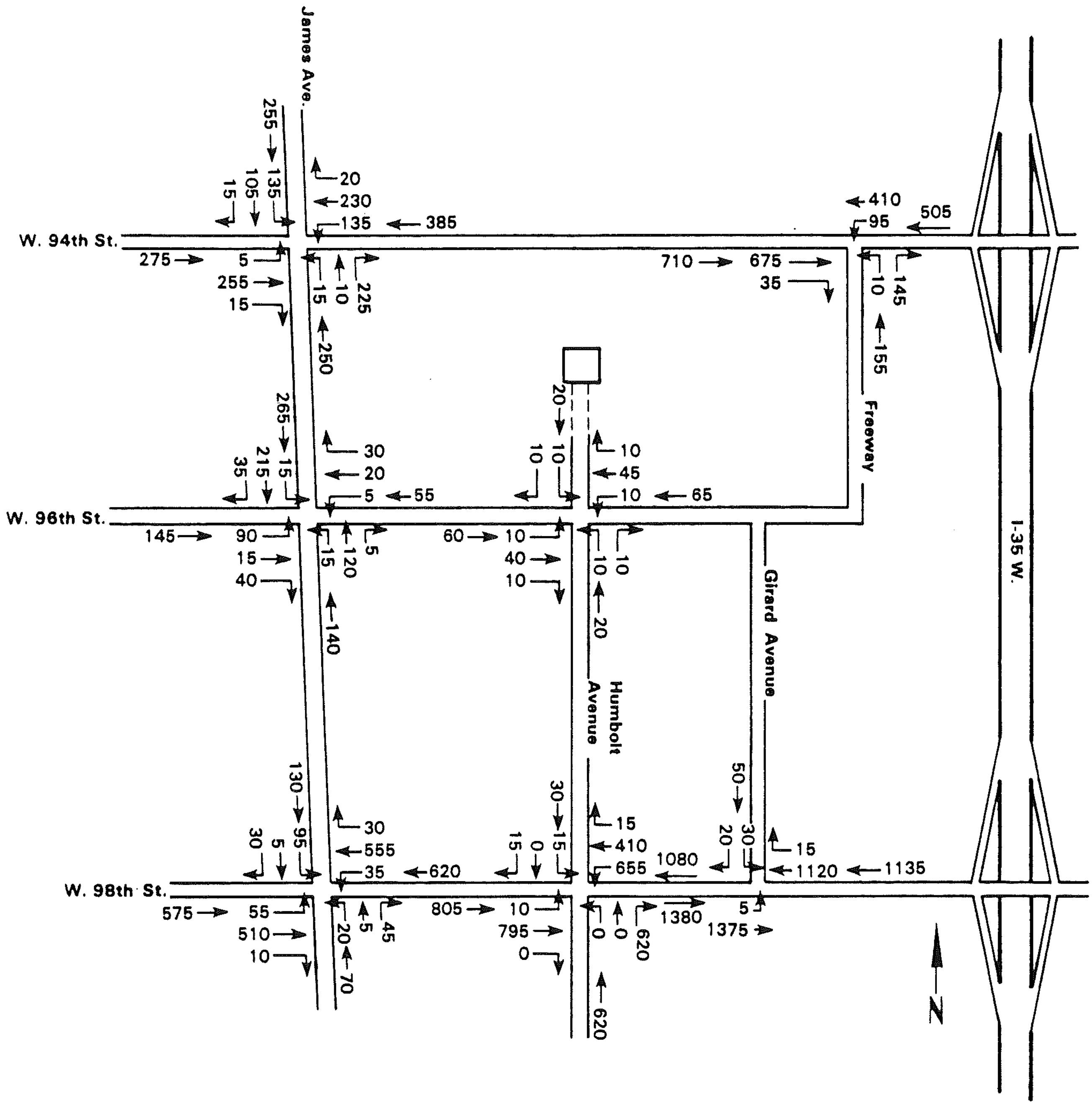

Figure 4.7-12 1989 Baseline P.M. Peak Hour Volumes - Bloomington East Site

8510056

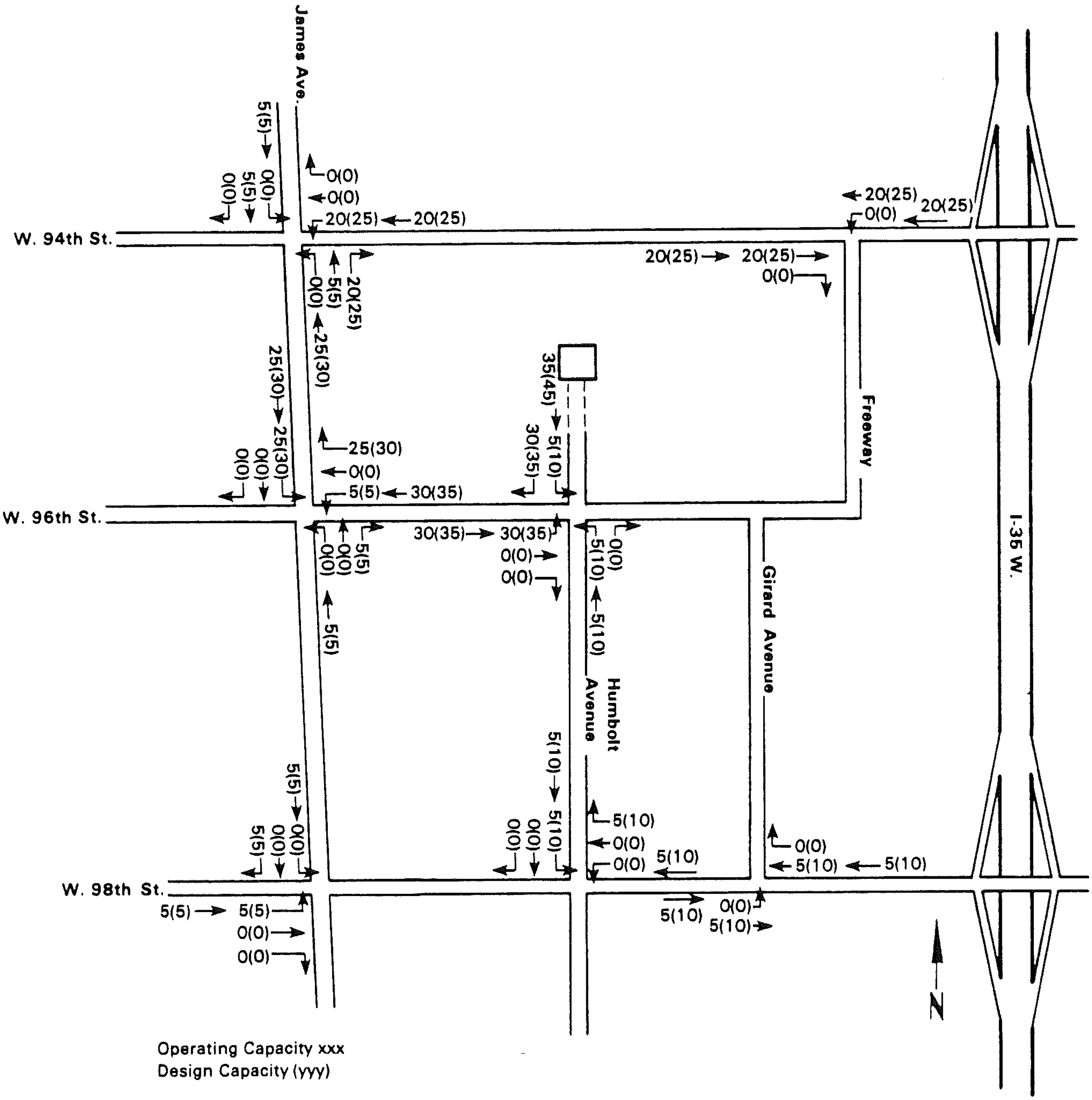

Figure 4.7-13 Project Traffic Only, 1989 A.M. Peak Hour - Bloomington East Site

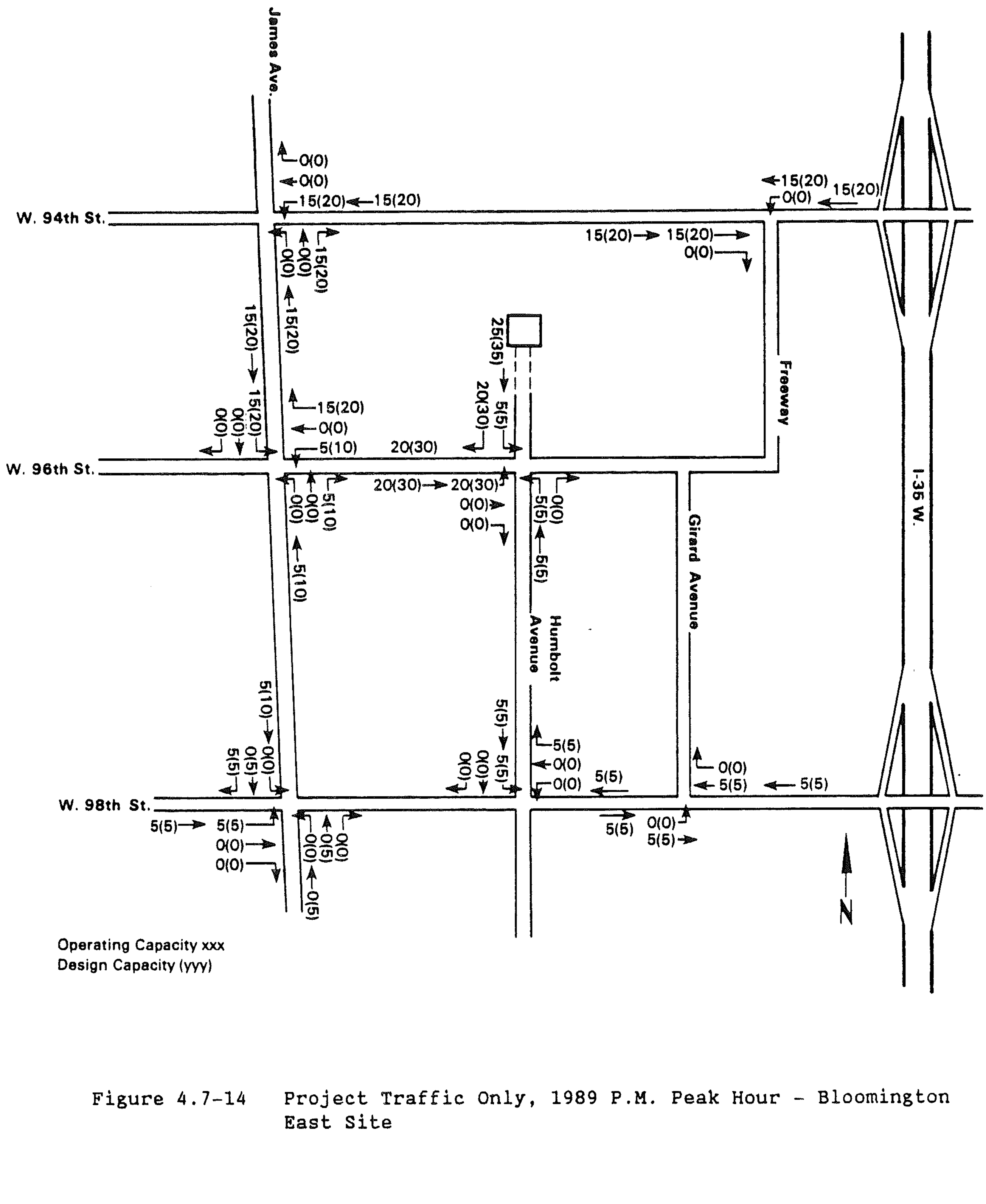

Figure 4.7-14 Project Traffic Only, 1989 P.M. Peak Hour - Bloomington East Site

8511033

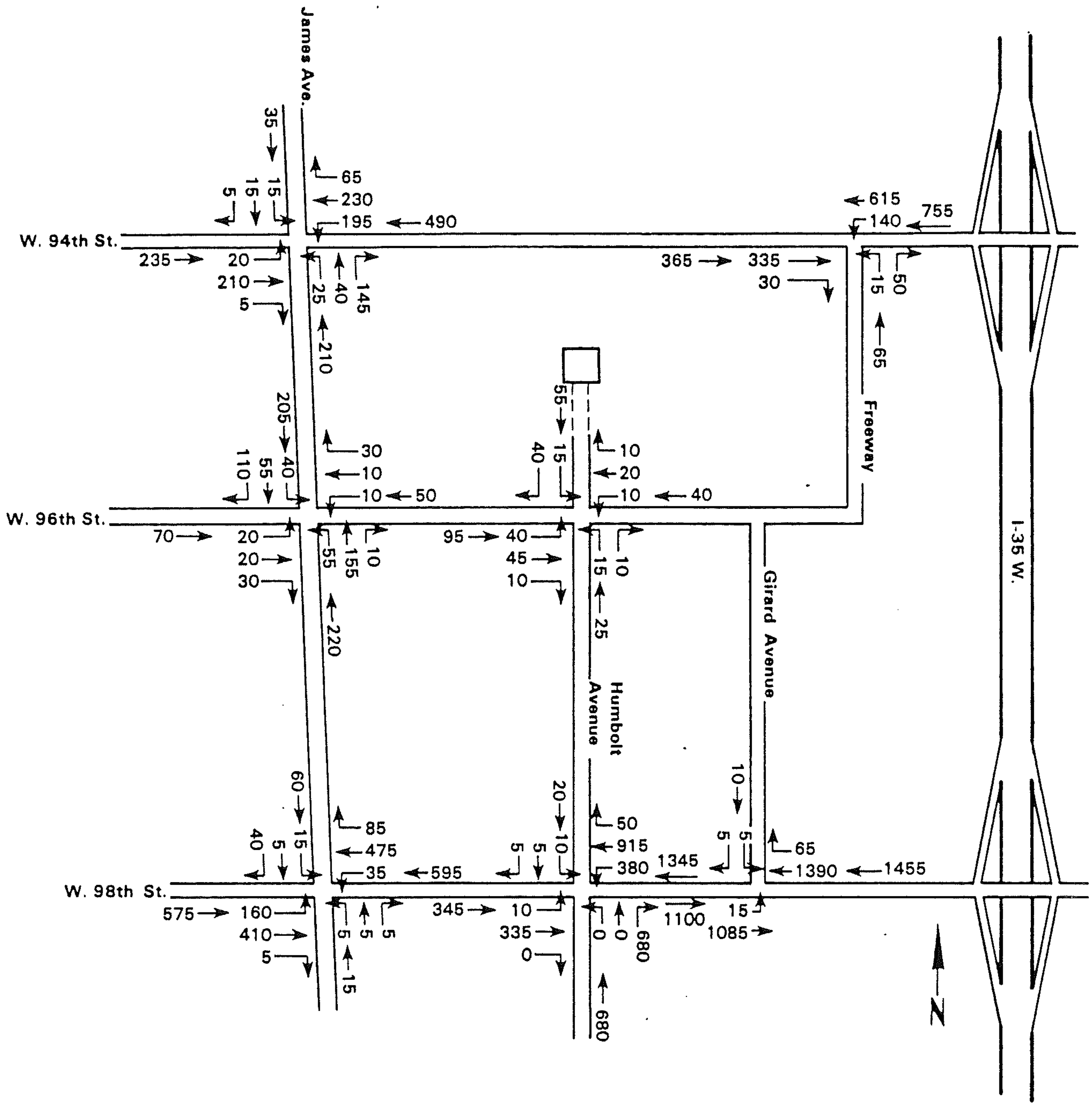

Figure 4.7-15 1989 Cumulative Traffic Volumes, A.M. Peak Hour - Bloomington East Site (Operating Capacity)

8511034

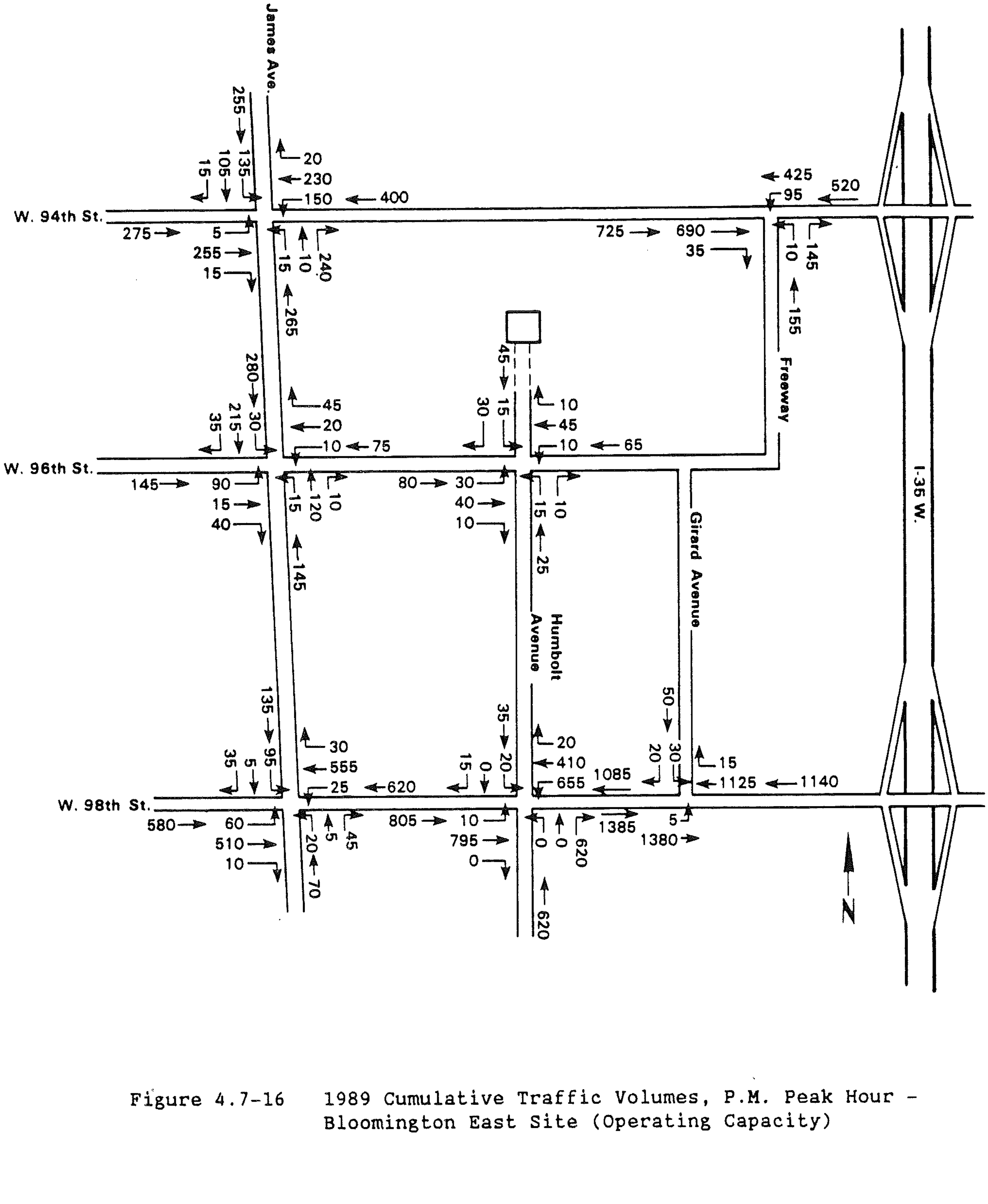

Figure 4.7-16 1989 Cumulative Traffic Volumes, P.M. Peak Hour - Bloomington East Site (Operating Capacity)

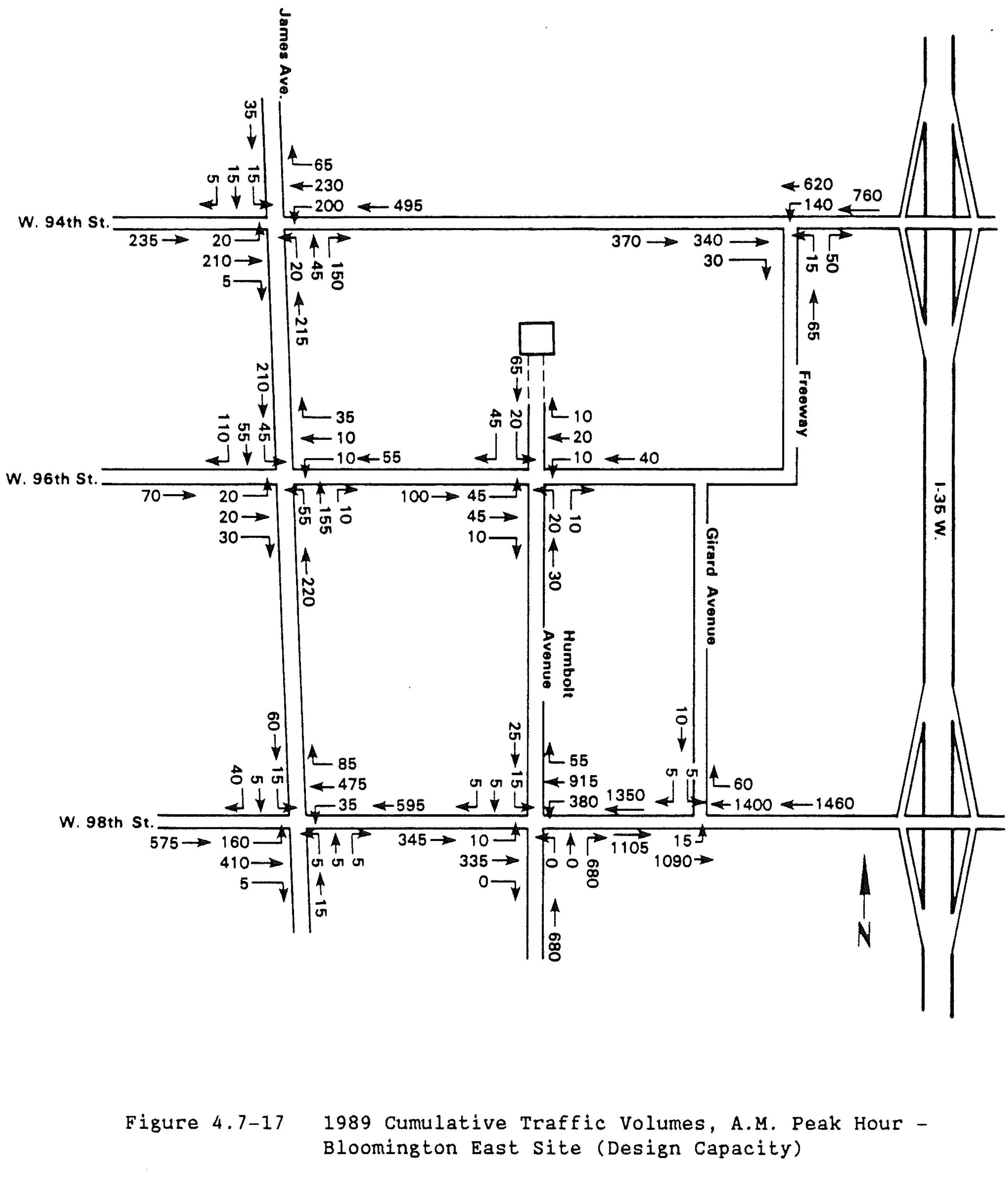

Figure 4.7-17   1989 Cumulative Traffic Volumes, A.M. Peak Hour - Bloomington East Site (Design Capacity)

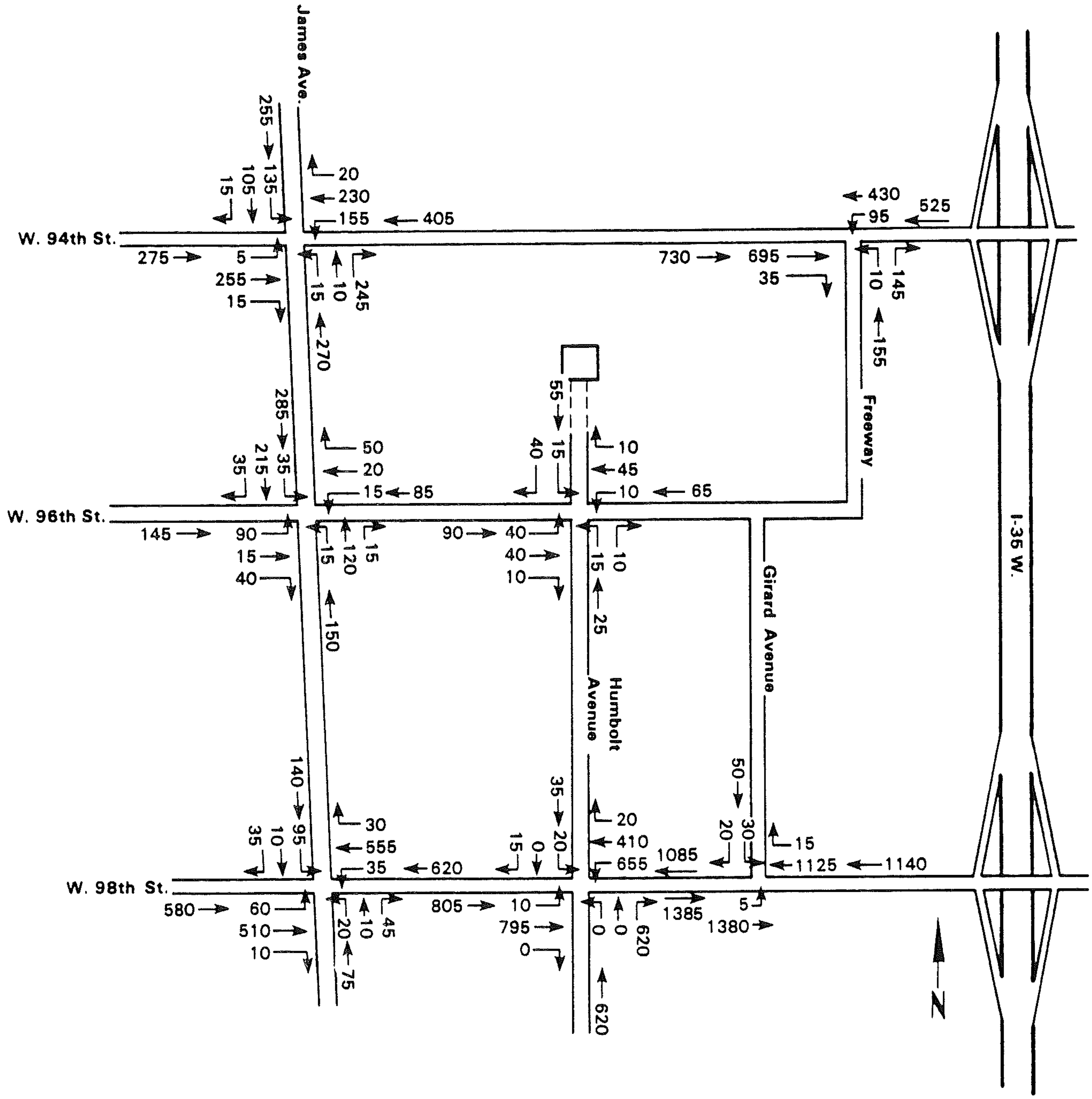

Figure 4.7-18 1989 Cumulative Traffic Volumes, P.M. Peak Hour - Bloomington East Site (Design Capacity)

8511037

TABLE 4.7-6

1989 BASELINE LEVELS OF SERVICE

(BLOOMINGTON EAST SITE)

Intersection	Level of Service AM	PM
West 94th Street and James Avenue	B	B
West 96th Street and James Avenue	A	A/B
West 98th Street and James Avenue	B	C/D
Freeway and West 94th Street	B	B
West 98th Street and Girard Avenue South	C	C/D
West 98th Street and Humboldt Avenue South	B	B
West 98th Street and Old Shakopee Road	C	C/D

Source: ERT 1985

develop as the vehicles approach the intersection. Consideration will have to be given to upgrading and/or signalizing those intersections that operate below a LOS "C" value during the 1989 baseline scenario. It has been indicated that West 98th at Old Shakopee Road may be signalized by 1987 (HDR, 1985). If this occurs, level of service at the above intersections will be improved.

1989 Cumulative Level of Service

Of the seven intersections proximate to the proposed transfer station, two intersections are expected to be unchanged from 1989 baseline condition of LOS "B" or better (West 94th Street and James Avenue; West 96th Street and James Avenue) during the AM and PM peak hours. West 98th Street and James Avenue will operate at LOS "B/C" condition in the AM peak hour. This represents a slight decrease in LOS from the 1989 baseline condition ("B") but still corresponds to acceptable operating conditions with average delays to vehicular traffic. The LOS in the PM peak hour will remain unchanged from the 1989 baseline condition of LOS "C/D". The Freeway and West 94th Street intersection will operate at LOS "B/C" conditions in the AM and PM peak hours. This represents a slight decrease in LOS from the 1989 baseline condition ("B"), but still corresponds to acceptable operating conditions with average delays to vehicular traffic. The West 98th Street and Girard Avenue South intersection will operate at a LOS "C/D" condition during the AM and PM peak hours. This represents a decrease in capacity from the 1989 baseline condition ("C") in the AM peak hour, while the PM peak hour LOS will be unchanged. The AM LOS condition at this intersection will result in some delays and merits consideration for upgrading the intersection as stated in the 1989 baseline scenario. The West 98th Street and Humboldt Avenue South intersection will operate at LOS "B/C" conditions in the AM and PM peak hours. This represents a slight decrease in capacity over the 1989 baseline condition ("B"), but still relates to acceptable operating conditions with average delays to vehicular traffic. Finally, the West 98th Street and Old Shakopee Road intersection will operate at a LOS "C/D" condition during the AM and PM peak hours. This represents a decrease in capacity from the 1989 baseline condition ("C") in the AM peak while the PM peak LOS will be unchanged. The AM LOS condition at this intersection will result in some long delays and also merits consideration for upgrading or signalization as discussed in the 1989 baseline scenario. Train operations in the area are not expected to impact level of service.

Table 4.7-7 summarizes the results of the intersection LOS calculations for the proposed transfer station.

4.7.3.4 Safety Analysis

Safe operation of an intersection requires that adequate sight distance be available on a major road to allow time for an entering vehicle from a minor road to view oncoming vehicles and decide to proceed with a merging maneuver or not. Another requirement for safe operation is the presence of gaps in vehicle traffic on the major roadway to provide safe access for a vehicle entering from a minor road. Lastly, proper control (signalized or unsignalized) should be present at an intersection to ensure safe operations.

TABLE 4.7-7
1989 CUMULATIVE LEVELS OF SERVICE
(BLOOMINGTON EAST SITE)

Intersection	Level of Service AM	PM
West 94th Street and James Avenue	B	B
West 96th Street and James Avenue	A	A/B
West 98th Street and James Avenue	B/C	C/D
Freeway and West 94th Street	B/C	B/C
West 98th Street and Girard Avenue South	C/D	C/D
West 98th Street and Humbolt Avenue South	B/C	B/C
West 98th Street and Old Shakopee Road	C/D	C/D

Source: ERT 1985

Sight Distance

The safe operation of a roadway (such as the proposed site access road) requires that adequate sight distance on the major roadway exist. With the introduction of an access road at the proposed transfer station, the potential for vehicular conflict will be increased as vehicles enter and exist the proposed facility. The sight distance on West 96th Street in both directions must be adequate for drivers on West 96th Street traveling at or near the posted speed (35 mph) to come to a stop before reaching a conflicting vehicle leaving the access road.

Stopping time is a function of perception and reaction time. Minimum and desirable sight distances are provided in the Transportation and Traffic Engineering Handbook, Institute of Traffic Engineers, and are a function of roadway speed, perception time, and pavement.

Vehicles traveling on West 96th Street should have adequate time to view a vehicle exiting the access road for West 96th Street and then come to a stop or slow down on West 96th Street. Similarly, vehicles exiting the access road should be able to see vehicles on West 96th Street at a distance great enough to ensure that the exiting vehicle can safely merge onto West 96th Street. The required stopping sight distance per the Institute of Traffic Engineering Standards is approximately 350 feet based upon a speed of 35 miles per hour.

The sight distance on West 96th Street from the proposed site access road is about 500 feet to the east and west. As a result, vehicles on West 96th Street would have adequate time to react to vehicles exiting the access road. It can be concluded that adequate sight distance would exist at the proposed access road to allow for safe operations at its intersection with West 96th Street.

4.7.4 Brooklyn Park East Transfer Station

4.7.4.1 Trip Generation and Distribution

The vehicular traffic demand generated by the proposed Brooklyn Park East transfer station can be classified into the following categories:

- o Facility employee travel
- o Solid waste delivery trucks to transfer station
- o Transfer trucks
- o Private vehicles delivering solid waste to transfer station

Vehicle generation at the Brooklyn Park East transfer station was based on a design capacity of 800 tpd. The anticipated operating capacity is 400 tpd. Refuse trucks will carry 5 tons per truck, transfer station trucks will carry 18 tons per truck, and private vehicles will carry 350 pounds per vehicle to the transfer station.

The Brooklyn Park East transfer station is expected to employ 10 persons on a 11-hour basis. About 160 packer trucks (at design capacity) are expected to use the transfer station on a daily basis. During the AM commuter peak hour (7-8:00 AM), about 15 truck trips in and out will be made. During the PM peak hour (4:30-5:30 PM) 10 packer truck trips will be made in and out. About 45 transfer trucks (at design capacity) are expected to use the transfer station on a daily basis. During the AM and PM peak hours 5 transfer truck trips will be made in and out of the transfer station. About 160 private vehicles (at design capacity) are expected to use the transfer station on a daily basis. Private vehicles (including employees) will make about 25 trips in and out of the transfer station during the AM peak hour and 20 trips in and out during the PM peak hour.

Directional distribution has been based on the origin of waste. For an average operating day, about 75 percent of the total traffic (trucks and private vehicles) generated by the transfer station is expected to arrive from and depart to the south, 20 percent from the north, and 5 percent from the east (Figure 4.7-19).

Table 4.7-8 lists the traffic volumes associated with operation of the facility at operating capacity, at design capacity, and during construction.

4.7.4.2 Future Traffic Volumes

1989 Baseline Traffic Volumes

The 1985 existing traffic volumes around the proposed transfer station site were increased by 2.5 percent per year compounded growth, or by a factor of 1.131 to arrive at the 1989 baseline traffic demand. This 2.5 percent per year growth was the highest growth rate reported to ERT at all of the five sites analyzed. The 1989 baseline traffic demands for the AM and PM peak hours are illustrated in Figures 4.7-20 and 4.7-21 respectively.

1989 Cumulative (With Facility) Traffic Volumes

Operation of the proposed Brooklyn Park East transfer station is expected to result in an increase in vehicular traffic (at design capacity) in 1989 on 68th Avenue and West Broadway Avenue of approximately 70 vehicle trips in the AM peak hour (35 vehicles entering and 35 vehicles exiting) and 60 vehicle trips in the PM peak hour (30 entering and 30 exiting). In addition, the proposed transfer station is expected to result in an increase in vehicular traffic on U.S. Route 169 of approximately 80 vehicle trips in the AM peak hour (40 entering and 40 exiting) and 60 vehicle trips in the PM peak hour (30 entering and 30 exiting). Traffic increases on area roadways generated by the transfer station are shown on Figures 4.7-22 and 4.7-23. Figures 4.7-24 and 4.7-25 illustrate the 1989 Cumulative AM and PM peak hour traffic volumes with the facility functioning at operating capacity while Figures 4.7-26 and 4.7-27 illustrate the 1989 Cumulative AM and PM peak hour traffic volumes with the facility operating at design capacity.

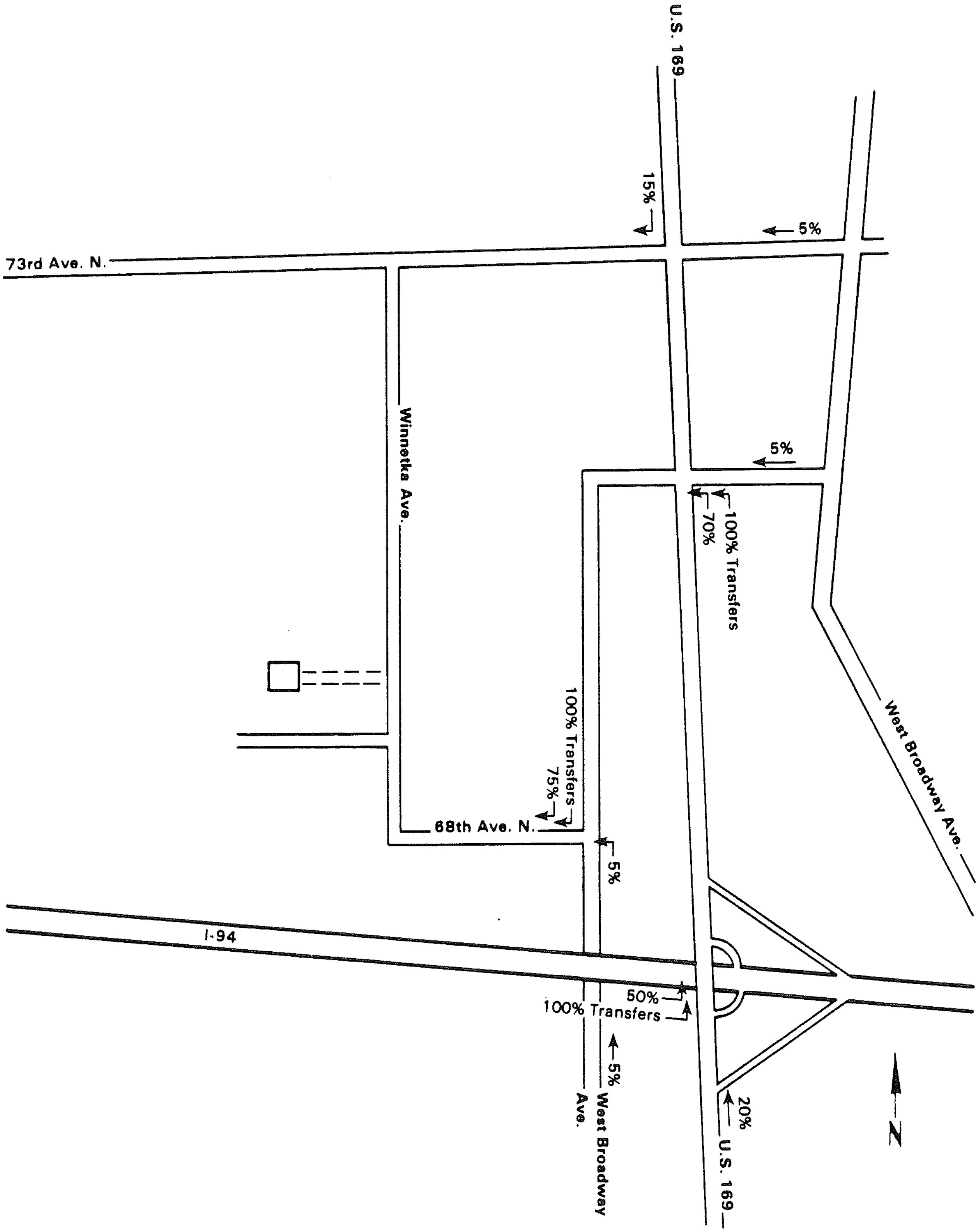

Figure 4.7-19 Trip Distribution, In-Bound Trips - Brooklyn Park East Site

8511038

TABLE 4.7-8

TRAFFIC GENERATION CHARACTERISTICS OF PROPOSED BROOKLYN PARK EAST TRANSFER STATION

	Operation Capacity	Design Capacity	Construction
Waste Processed in tons per day (tpd)	400	800	---
Number of Refuse Trucks/Day	80	160	---
Number of Transfer Trucks/Day	20	45	---
Number of Private Vehicles/Day	80	160	---
Number of Employees			
Peak	---	---	50
Average	10	10	35

Source: ERT, 1985

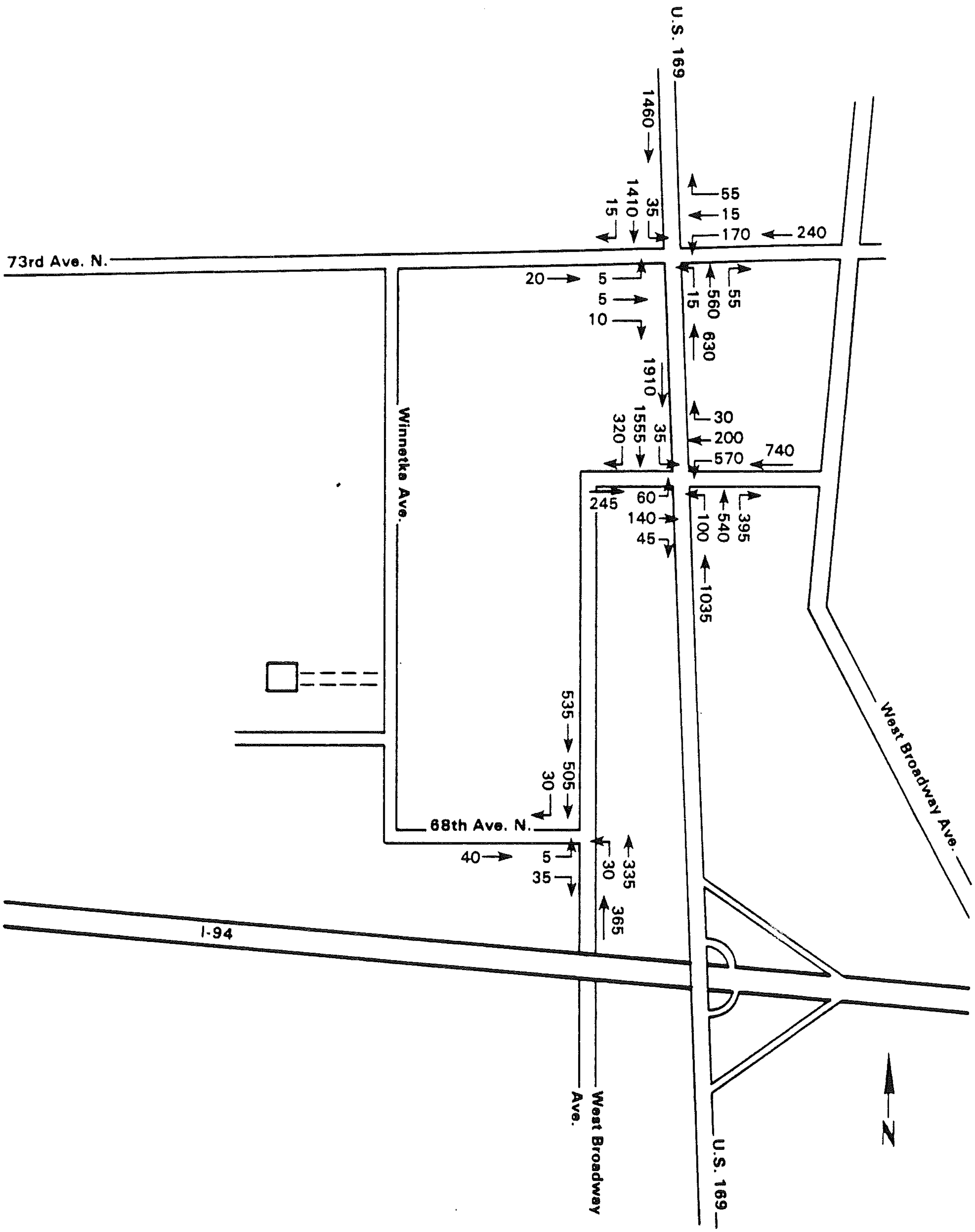

Figure 4.7-20 1989 Baseline A.M. Peak Hour Volumes - Brooklyn Park East Site

8510053

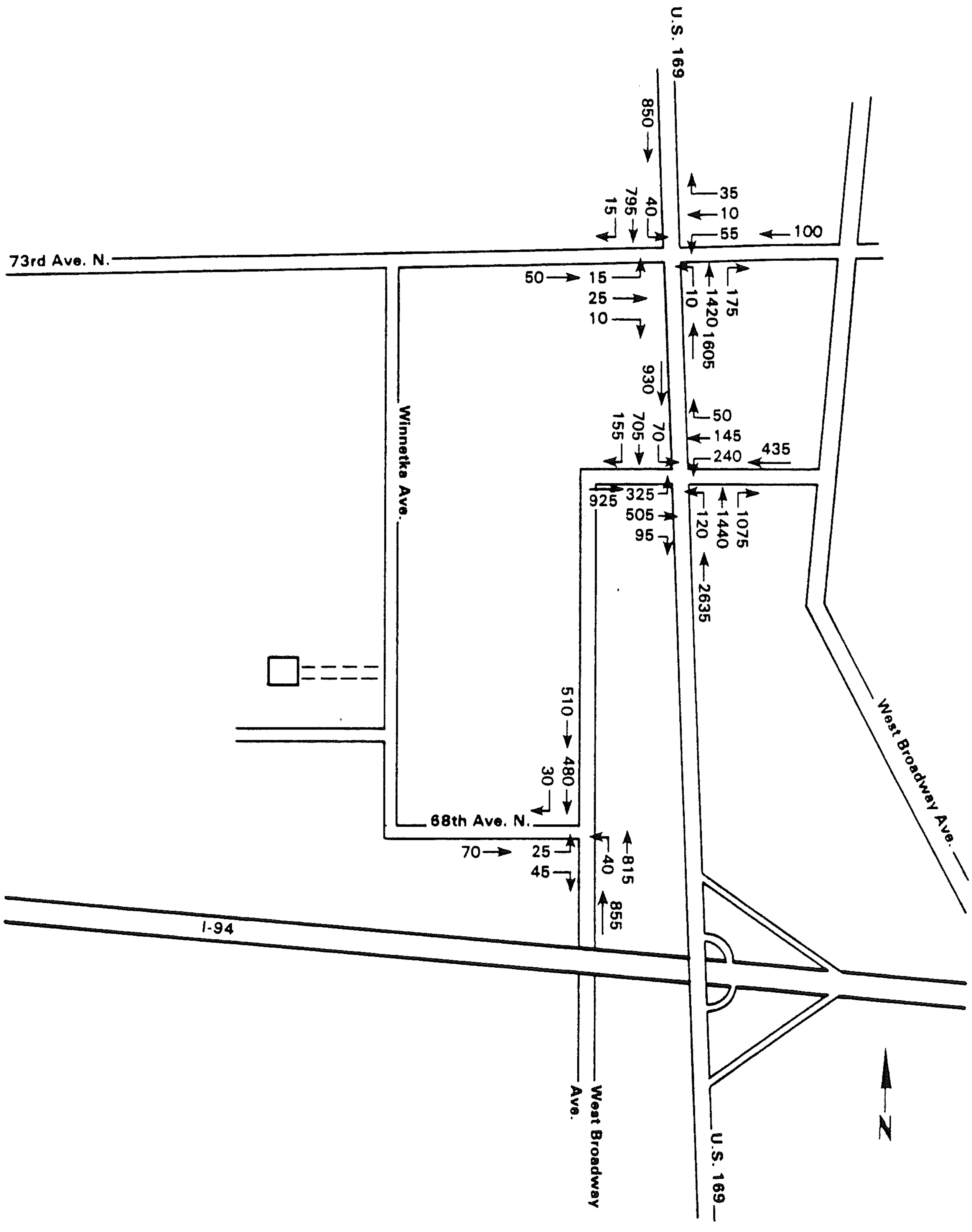

Figure 4.7-21 1989 Baseline P.M. Peak Hour Volumes - Brooklyn Park East Site

8510054

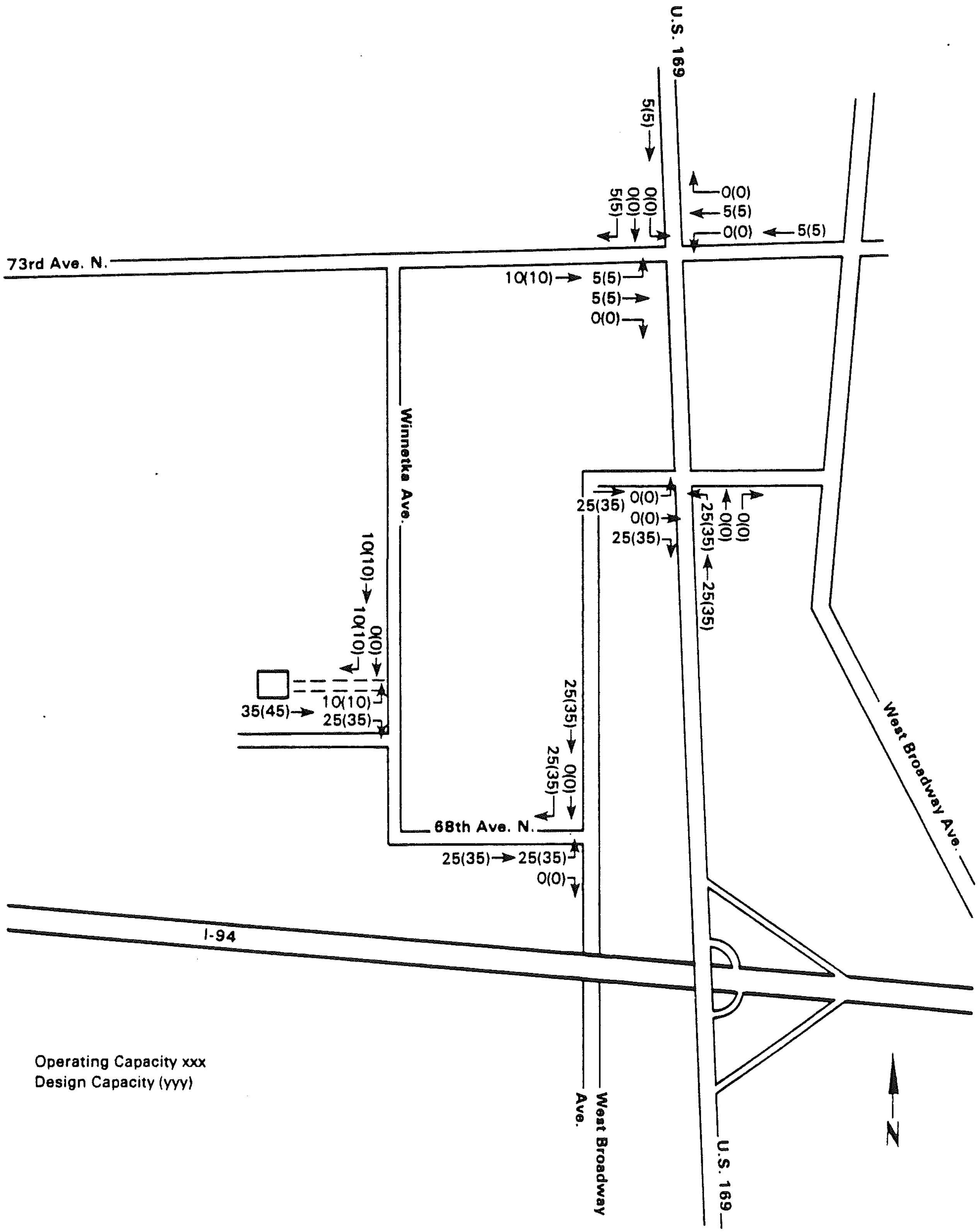

Figure 4.7-22 Project Traffic Only, 1989 A.M. Peak Hour - Brooklyn Park East Site

8511039

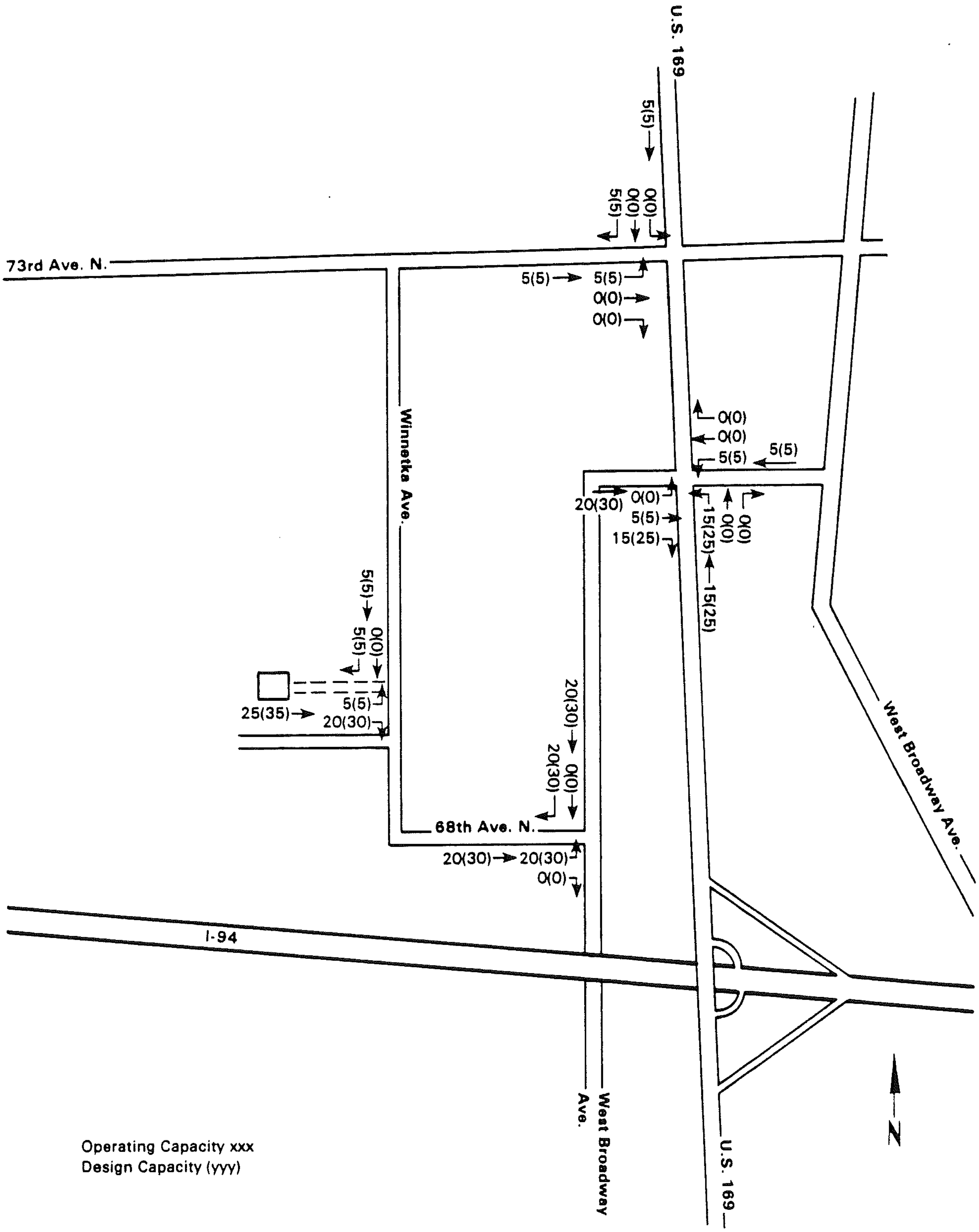

Figure 4.7-23 Project Traffic Only, 1989 P.M. Peak Hour - Brooklyn Park East Site

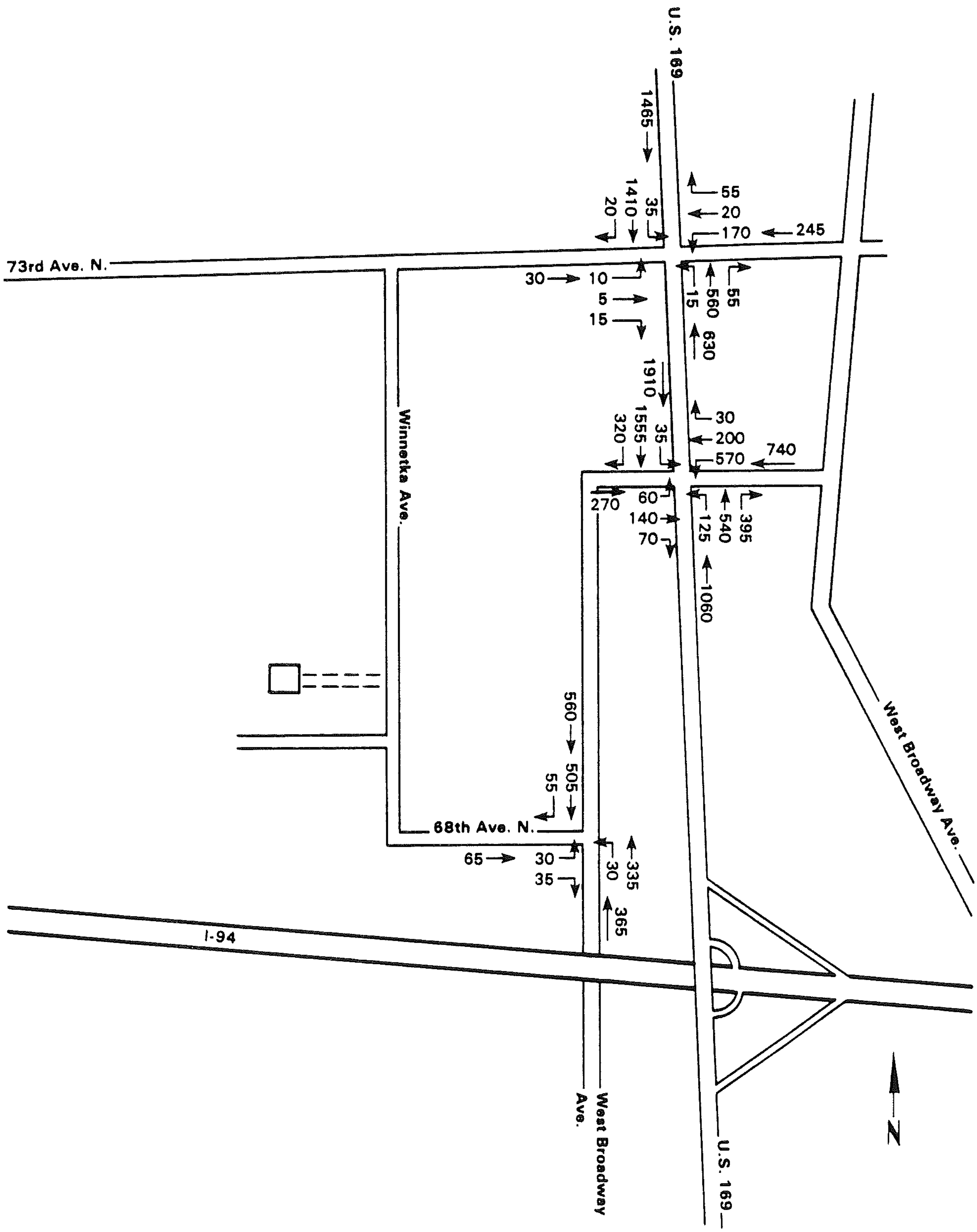

Figure 4.7-24 1989 Cumulative Traffic Volumes, A.M. Peak Hour - Brooklyn Park East Site (Operating Capacity)

8511041

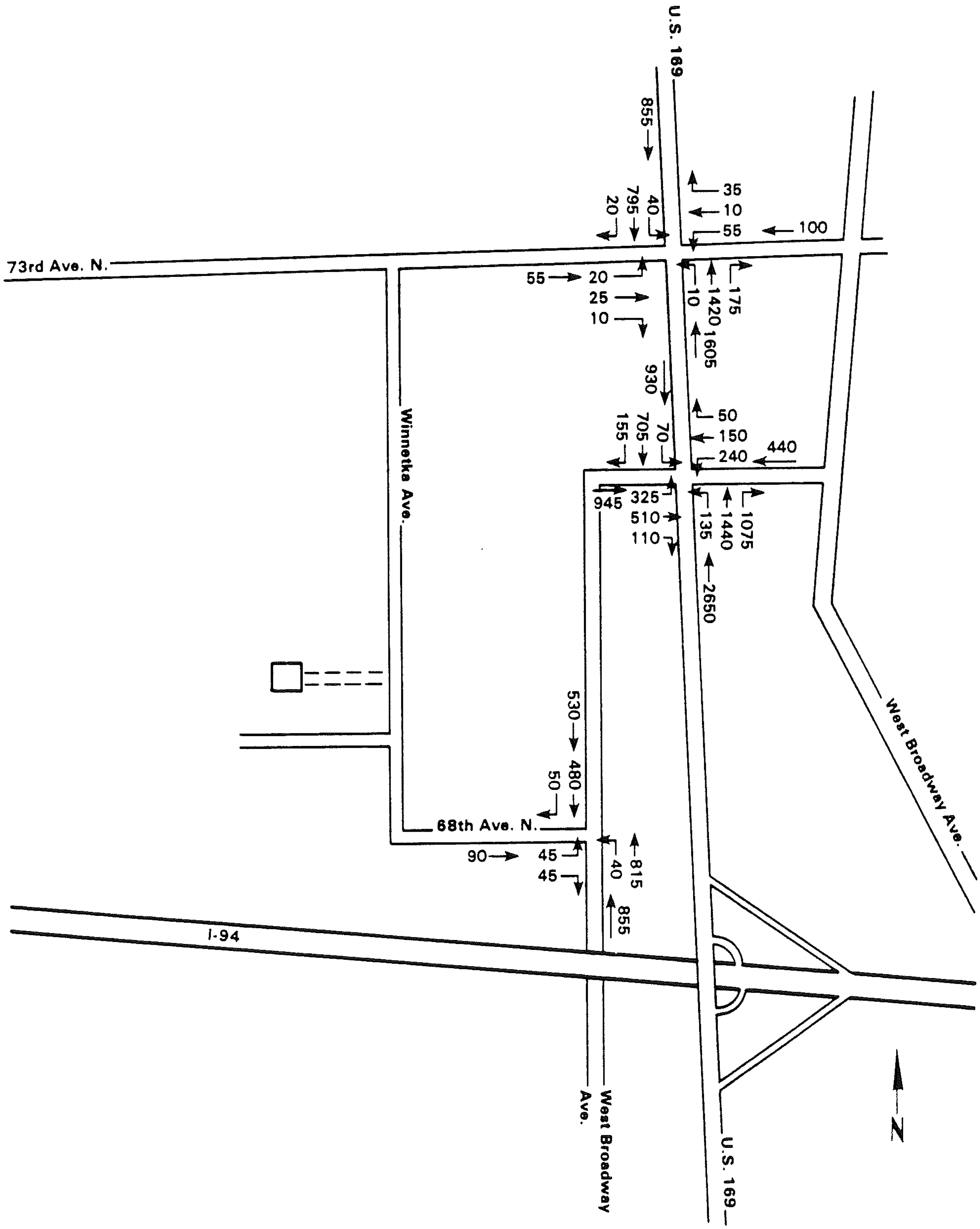

Figure 4.7-25 1989 Cumulative Traffic Volumes, P.M. Peak Hour - Brooklyn Park East Site (Operating Capacity)

8611042

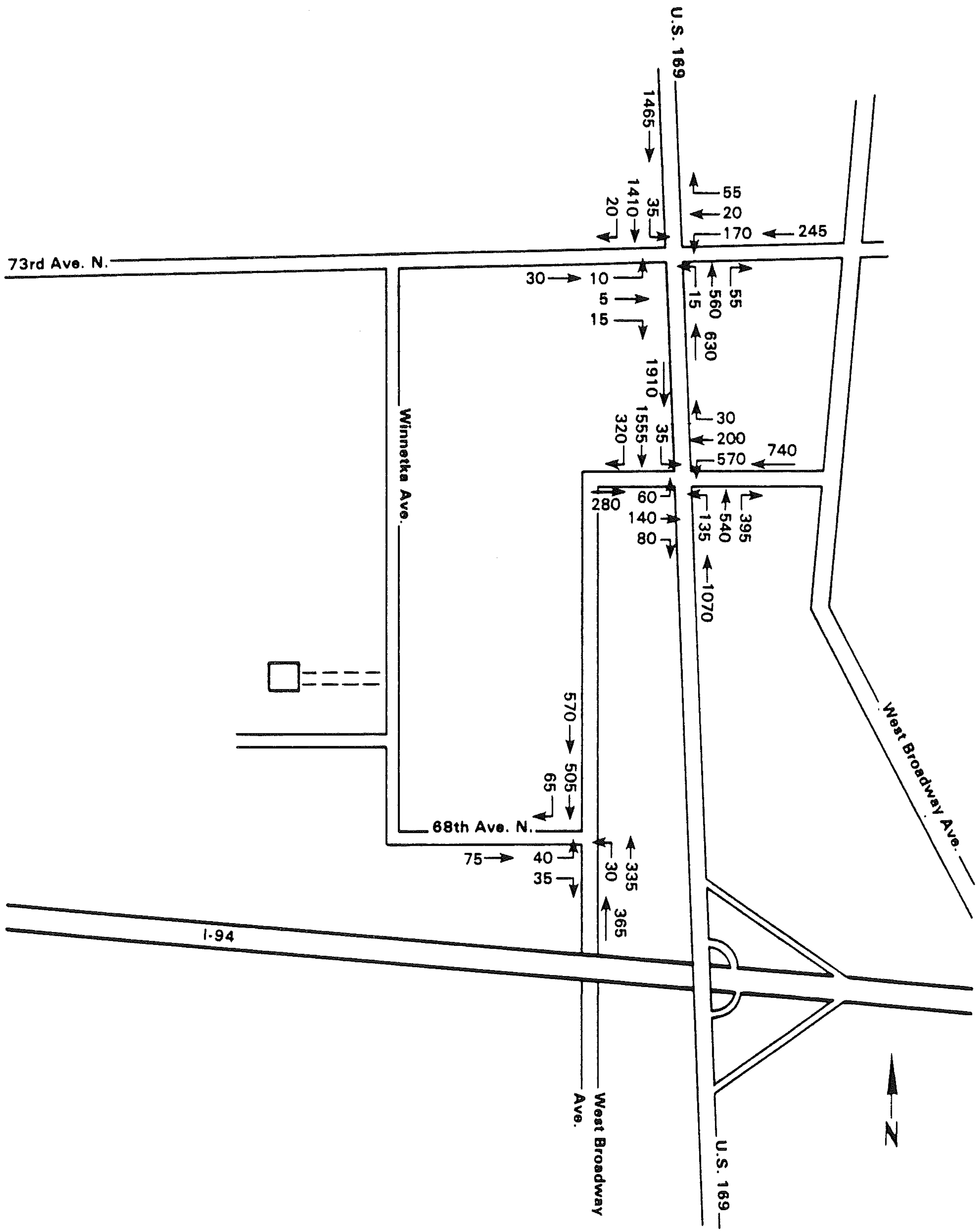

Figure 4.7-26 1989 Cumulative Traffic Volumes, A.M. Peak Hour - Brooklyn Park East Site (Design Capacity)

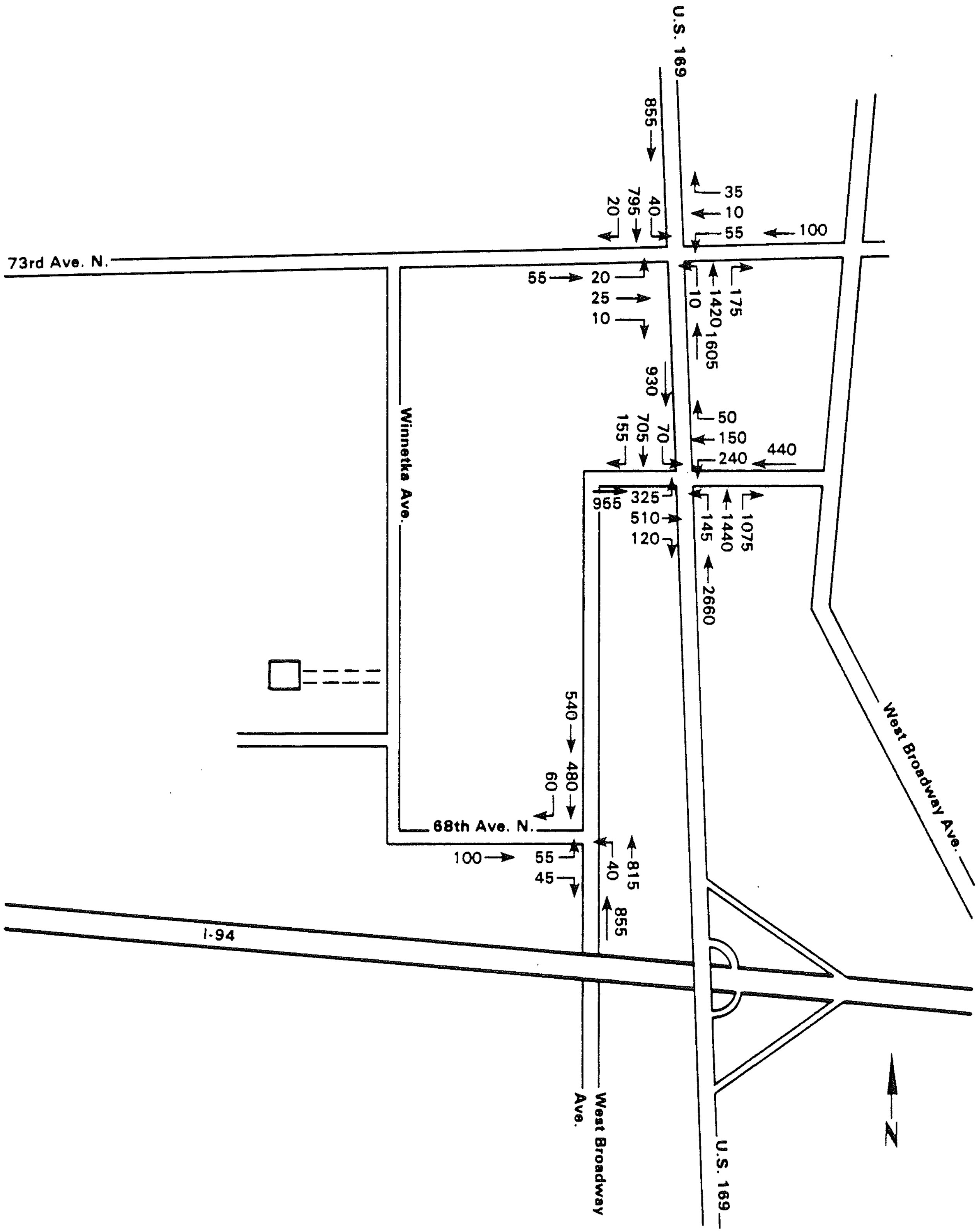

Figure 4.7-27 1989 Cumulative Traffic Volumes, P.M. Peak Hour - Brooklyn Park East Site (Design Capacity)

8611044

4.7.4.3 Capacity Analysis

1989 Baseline Level of Service

Two of the three intersections analyzed during the 1989 baseline scenario will operate below a LOS "C" condition. The intersection of U.S. Route 169 and 73rd Avenue North will operate a LOS "D" condition during both the AM and PM peak hours. This intersection is currently unsignalized and carries heavy traffic demand on U.S. Route 169. U.S. Route 169 has two through lanes of traffic with exclusive right-turn lanes at this intersection. The separation between these lanes provided by the grass median at the intersection of 73rd Avenue North allows vehicles to queue in the turn lane before proceeding onto either direction of U.S. Route 169. This increases the capacity of the 73rd Avenue North approaches but also increases the possibility of accidents. This intersection should be considered for signalization if it meets the manual on Uniform Traffic Control Devices warrants, to achieve LOS "C" or better operations.

The intersection of U.S. Route 169 and West Broadway will operate at a LOS "E" condition during both AM and PM peak hours in 1989. This degradation in the LOS is mostly due to high traffic demands exceeding the capacity. At the LOS "E" condition, many vehicles will have to wait through more than one signal cycle on both West Broadway and U.S. Route 169. Lanes may need to be added, as well as changing the signal cycles for this intersection to operate at or better than a LOS "C" condition. Table 4.7-9 summarizes the results.

1989 Cumulative Level of Service

Of the three intersections proximate to the proposed transfer station two will not change in LOS condition from the 1989 baseline condition. U.S. Route 169 and 73rd Avenue North will remain at a LOS "D" during AM and PM peak hours. Similarly West Broadway and U.S. Route 169 will remain at a LOS "E" during the AM and PM peak hours. Traffic improvements for these two intersections are discussed under the 1989 baseline condition and will not be impacted due to development of the facility. Finally, at West Broadway and 68th Avenue North the LOS condition "A/B" in the AM peak hour will remain unchanged from the 1989 baseline condition. The LOS for the PM peak hour, however, will decrease slightly from a LOS "B" to "B/C". This represents a slight decrease in LOS from the 1989 baseline condition, but still corresponds to acceptable operating conditions (LOS "C" or better) with average traffic delays. Table 4.7-10 summarizes the result of the capacity analyses conducted for the intersections proximate to the proposed transfer station.

4.7.4.4 Safety Analysis

Safe operation at an intersection requires the availability of adequate sight distance on the major road to allow sufficient time to decide whether to make a merging maneuver from a minor road. Gaps in vehicle traffic on the major roadway must also exist to ensure safe access for a vehicle entering from a minor road. Lastly, safe operation at an intersection is dependent upon proper control, either signalized or unsignalized.

TABLE 4.7-9
1989 BASELINE LEVELS OF SERVICE
(BROOKLYN PARK EAST SITE)

Intersection	Level of Service AM	PM
West Broadway and 68th Avenue North	A/B	B
U.S. Route 169 and 73rd Avenue North	D	D
West Broadway and U.S. Route 169	E	E

Source: ERT 1985

TABLE 4.7-10
1989 CUMULATIVE LEVELS OF SERVICE
(BROOKLYN PARK EAST SITE)

Intersection	Level of Service AM	PM
West Broadway and 68th Avenue North	A/B	B/C
U.S. Route 169 and 73rd Avenue North	D	D
West Broadway and U.S. Route 169	E	E

Source: ERT 1985

Sight Distance

The safe operation of a roadway (such as the proposed site access road) requires that adequate sight distance on the major roadway exist. With the introduction of an access road at the proposed transfer station, the potential for vehicular conflict will be increased as vehicles enter and exit the proposed facility. The sight distance on Winnetka Avenue in both directions must be adequate for drivers on Winnetka Avenue traveling at or near the posted speed (30 mph) to come to a stop before reaching a conflicting vehicle leaving the access road.

Stopping time is a function of perception and reaction time. Minimum and desirable sight distances are provided in the Transportation and Traffic Engineering Handbook, Institute of Traffic Engineers, and are a function of roadway speed, perception time, and pavement.

Vehicles traveling on Winnetka Avenue should have adequate time to view a vehicle exiting the access road for Winnetka Avenue and then come to a stop or slow down on Winnetka Avenue. Likewise, vehicles exiting the access road should be able to see vehicles on Winnetka Avenue at a distance great enough to ensure that the exiting vehicle can safely merge onto Winnetka Avenue. The required stopping sight distance per the Institute of Traffic Engineering Standards is approximately 300 feet based upon a speed of 30 miles per hour.

The sight distance on Winnetka Avenue from the proposed site access road is about 1,000 feet to the north and south. As a result, vehicles on Winnetka Avenue would have adequate time to react to vehicles exiting the access road. It can be concluded that adequate sight distance would exist at the proposed access road to allow for safe operations at its intersection with Winnetka Avenue.

4.7.5 Hopkins DOT Transfer Station

4.7.5.1 Trip Generation and Distribution

The vehicular demand generated by the proposed Hopkins DOT transfer station can be classified into the following categories:

- o Facility employee travel
- o Solid waste delivery trucks to transfer station
- o Transfer trucks
- o Private vehicles delivering solid waste to transfer station.

Vehicle generation at the Hopkins DOT transfer station was based on a design capacity of 1,200 tpd. The anticipated operating capacity is 600 tpd. Refuse trucks will carry 5 tons per truck, transfer station trucks will carry 18 tons per truck, and private vehicles will carry 350 pounds per vehicle to the transfer station.

The Hopkins DOT transfer station is expected to employ 10 persons on a 11-hour basis. About 240 packer trucks (design capacity) are expected to use the transfer station on a daily basis. During the AM commuter peak hour (7-8:00 AM), about 25 packer truck trips in and out of the transfer station will be made.

During the PM peak hour (4:30-5:30 PM) 15 packer truck trips will be made in and out. About 65 transfer trucks (design capacity) are expected to use the transfer station on a daily basis. During the AM and PM peak hours 5 transfer trucks trips will be made in and out of the transfer station. About 240 private vehicles (design capacity) are expected to use the transfer station on a daily bases. Private vehicles (including employees) will make about 35 trips in and out of the transfer station during the AM peak hour and 25 trips in and out during the PM peak hour.

Directional distribution has been based on the origin of waste. For an average operating day, about 70 percent of the total traffic (trucks and private vehicles) generated by the transfer station is expected to arrive from and depart to the northeast, 25 percent from the northwest, and 5 percent from the north (Figure 4.7-28). The employee distribution was assumed to be the same as the delivery vehicles.

Table 4.7-11 lists the traffic volumes associated with operation of the facility at operating capacity, at design capacity and during construction.

4.7.5.2 Future Traffic Volumes

1989 Baseline Traffic Volumes

The 1985 existing traffic volumes around the Hopkins DOT site were increased by 2.0 percent per year compounded growth, or by a factor of 1.104 to arrive at the 1989 baseline traffic demands. These 1989 baseline traffic demands for the AM and PM peak hours are illustrated in Figures 4.7-29 and 4.7-30, respectively.

1989 Cumulative (With Facility) Traffic Volumes

Operation of the proposed Hopkins DOT transfer station is expected to result in an increase in vehicular traffic (at design capacity) in 1989 on County Road 3 and Fifth Avenue of approximately 130 vehicle trips in the AM peak hour (65 vehicles entering and 65 vehicles exiting) and 90 vehicle trips in the PM peak hour (45 entering and 45 exiting). Figures 4.7-31 and 4.7-32 illustrate the project traffic expected in the AM and PM peak hours respectively for area roadways in the vicinity of the Hopkins DOT transfer station. Figures 4.7-33 and 4.7-34 illustrate the 1989 Cumulative AM and PM peak hour traffic volumes with the facility functioning at operating capacity, while Figures 4.7-35 and 4.7-36 illustrate the 1989 Cumulative AM and PM peak hour traffic volumes with the facility operating at design capacity.

4.7.5.3 Capacity Analysis

1989 Baseline Level of Service

Level of Service calculations were completed for the 1989 baseline AM and PM peak hours. Table 4.7-12 summarizes the results. All of the intersections analyzed operated at or better than a LOS "C" condition. This means that, in general, long delays or queues should

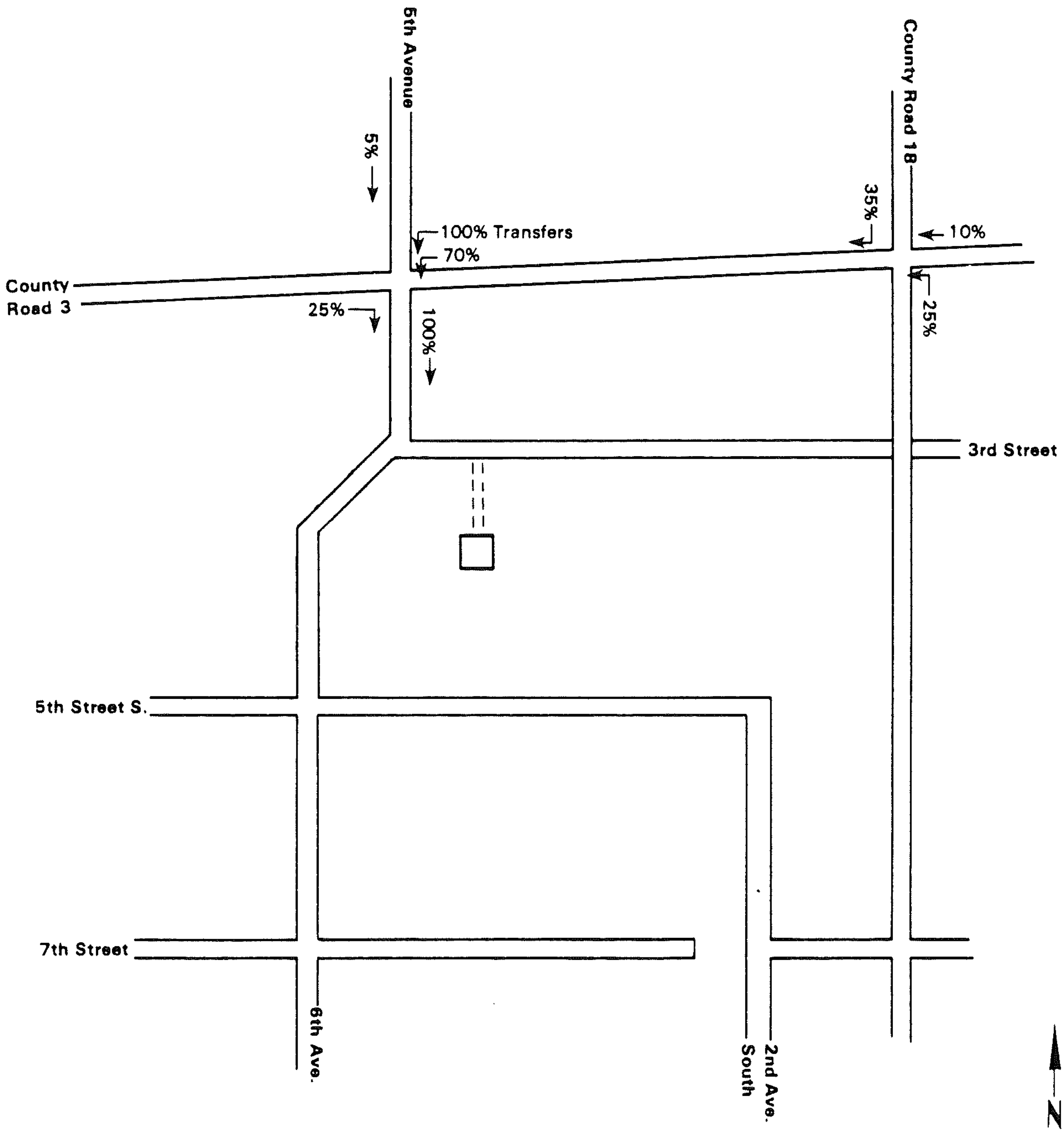

Figure 4.7-28 Trip Distribution, In-Bound Trips - Hopkins DOT Site

8511045

TABLE 4.7-11

TRAFFIC GENERATION CHARACTERISTICS OF PROPOSED HOPKINS DOT TRANSFER STATION

	Operation Capacity	Design Capacity	Construction
Waste Processed in tons per day (tpd)	600	1200	---
Number of Refuse Trucks/Day	120	240	---
Number of Transfer Trucks/Day	35	65	---
Number of Private Vehicles/Day	120	240	---
Number of Employees			
Peak	---	---	50
Average	10	10	35

Source: ERT, 1985

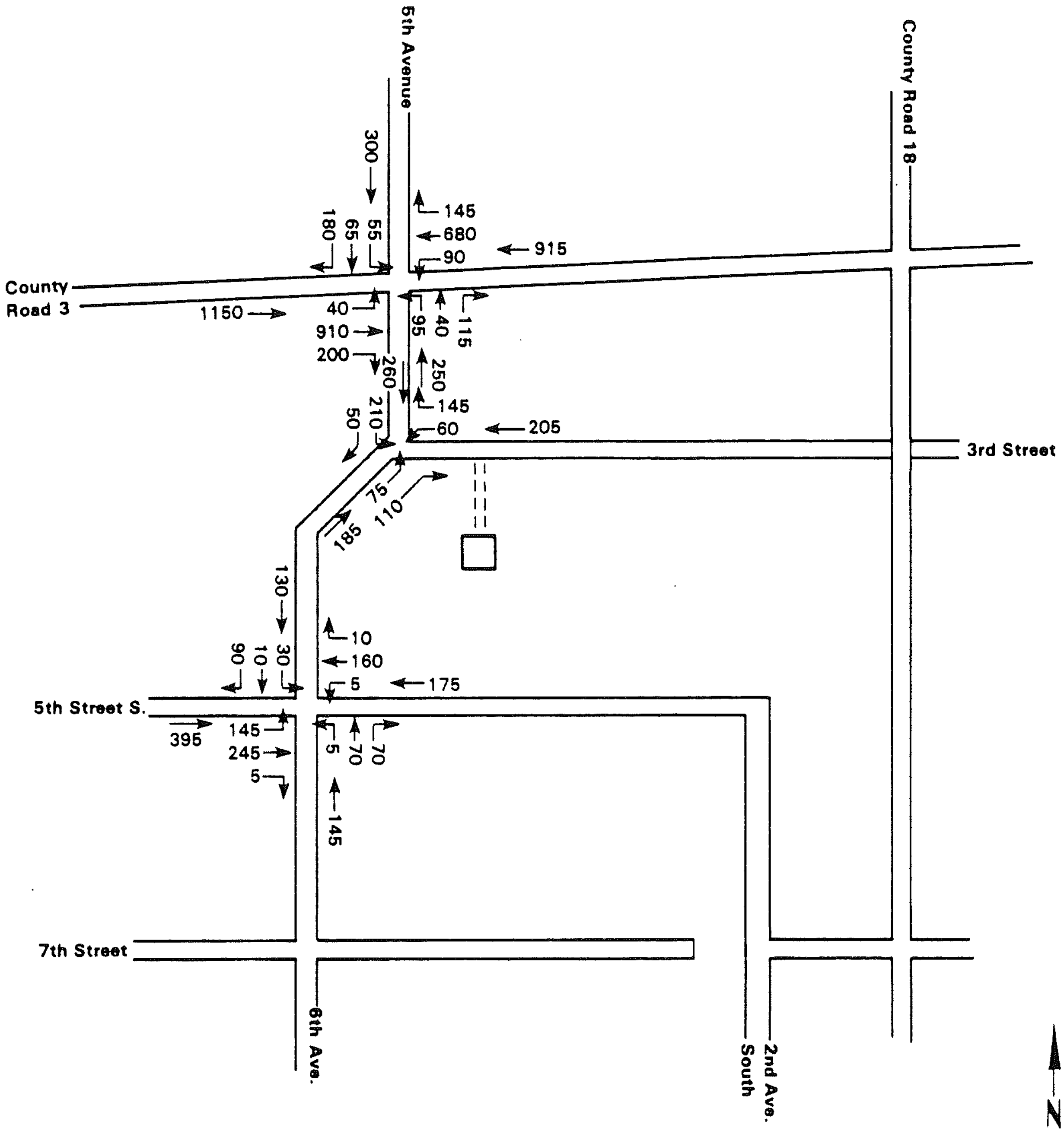

Figure 4.7-29 1989 Baseline A.M. Peak Hour Volumes - Hopkins DOT Site

8510047

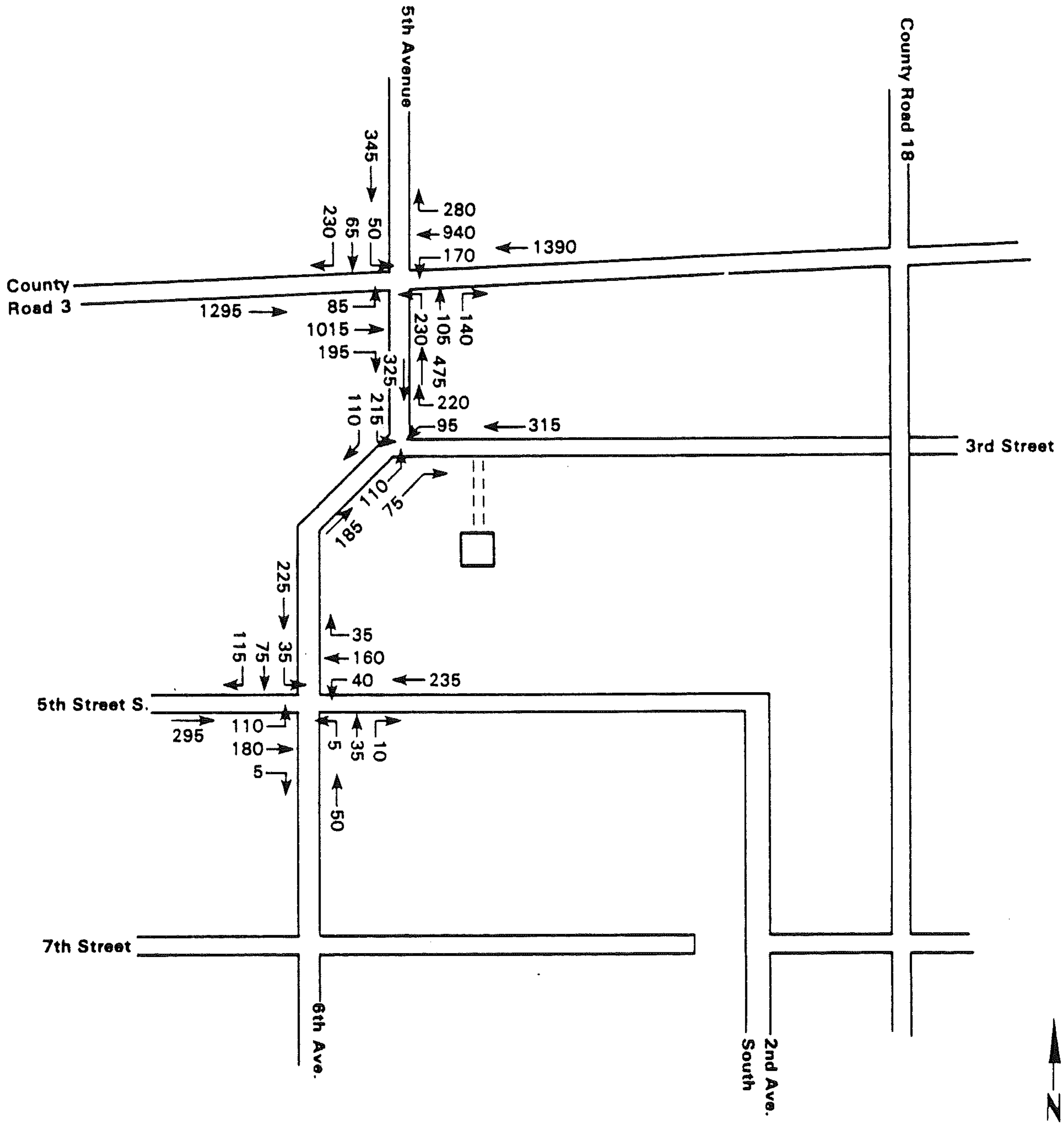

Figure 4.7-30 1989 Baseline P.M. Peak Hour Volumes - Hopkins DOT Site

8510048

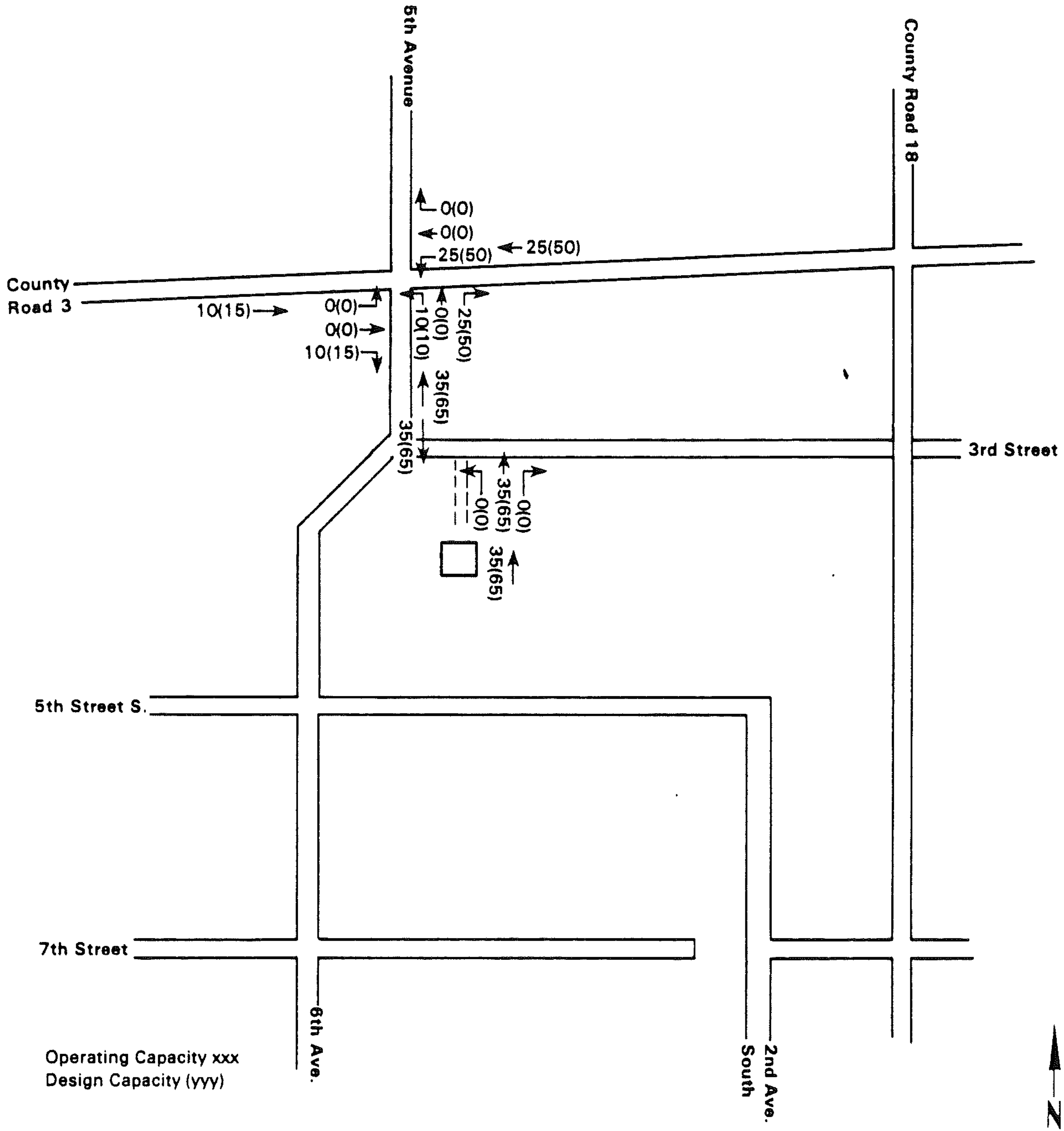

Figure 4.7-31 Project Traffic Only, 1989 A.M. Peak Hour - Hopkins DOT Site

8511046

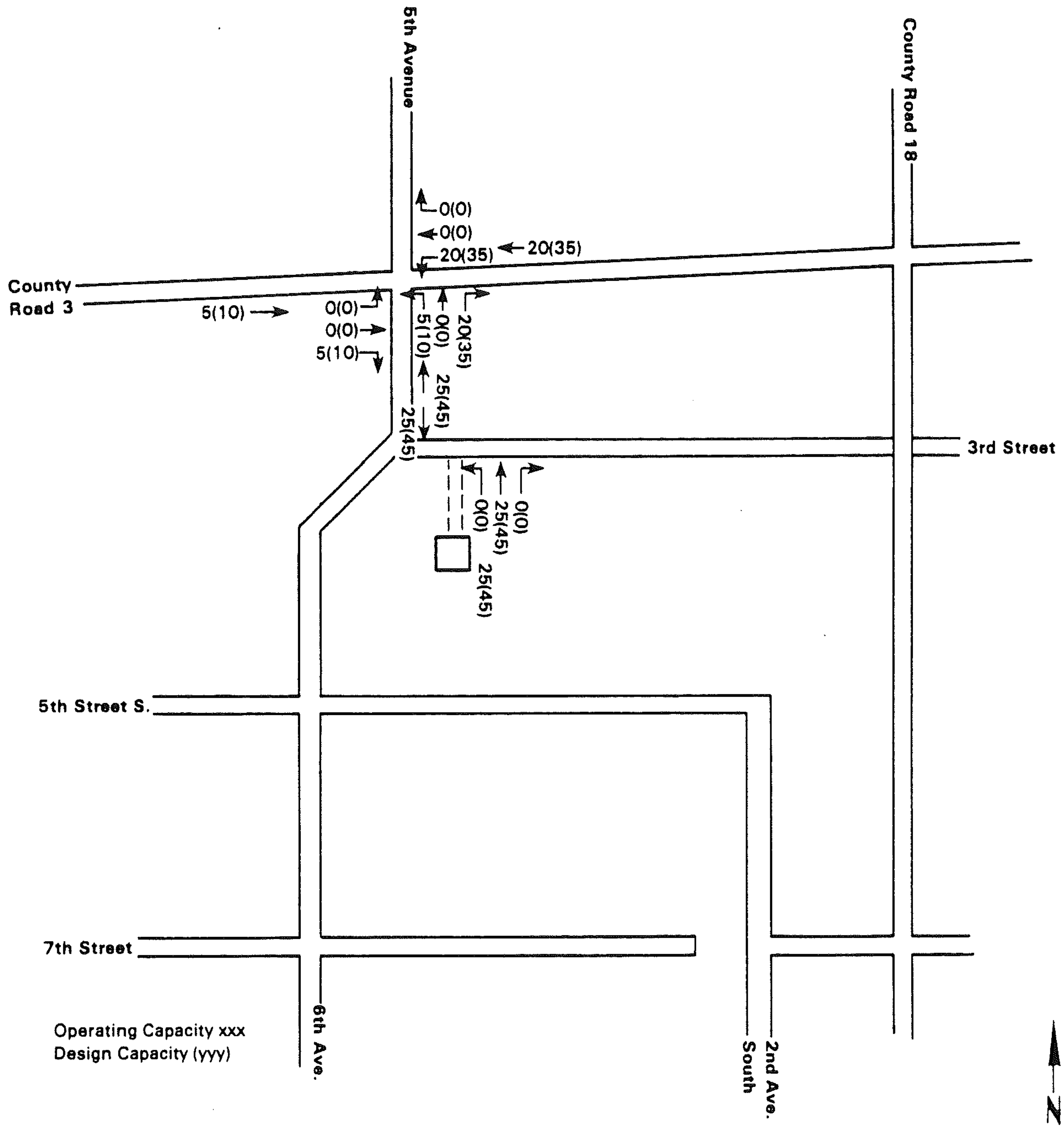

Figure 4.7-32 Project Traffic Only, 1989 P.M. Peak Hour - Hopkins DOT Site

8511047

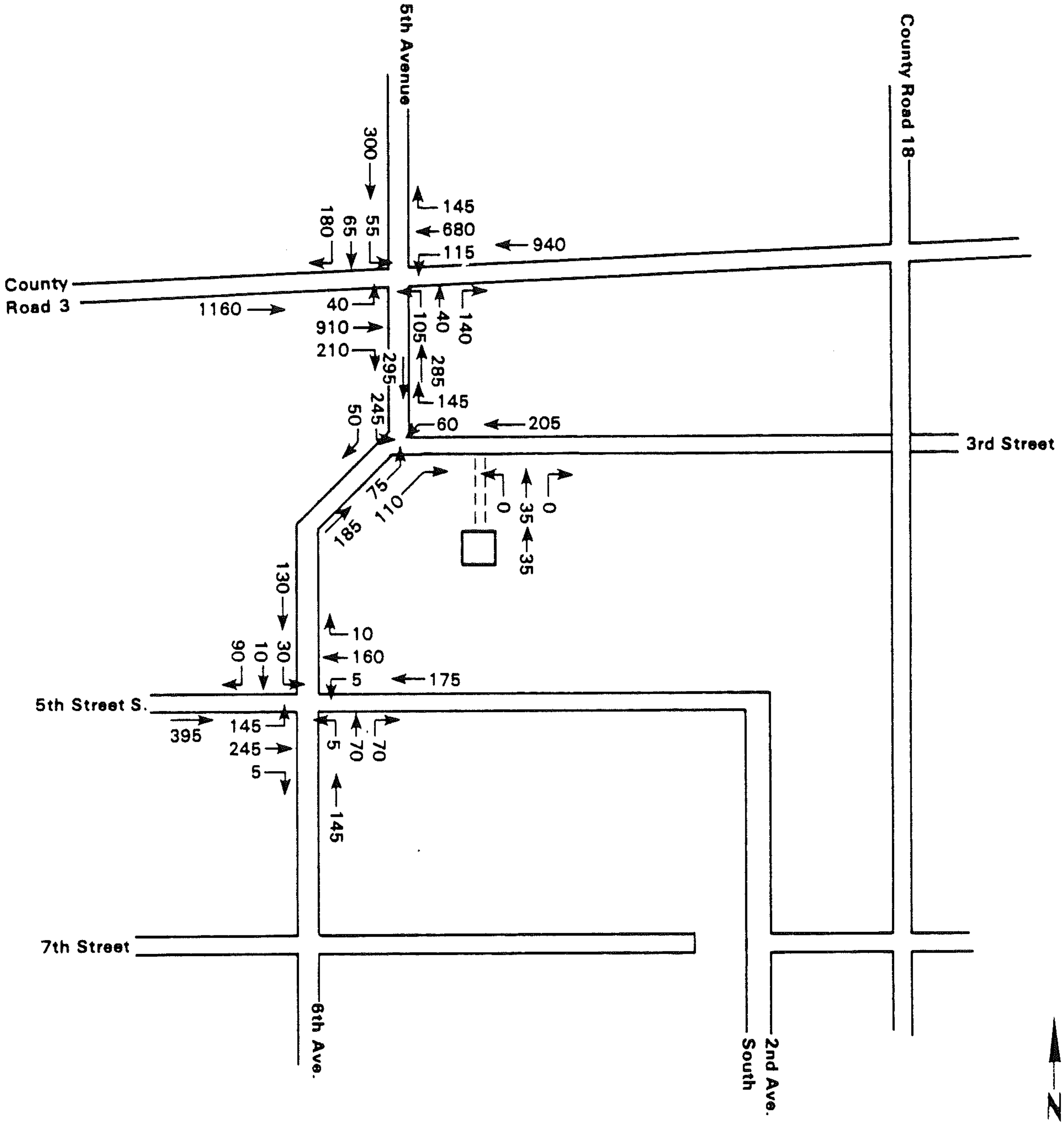

Figure 4.7-33 1989 Cumulative Traffic Volumes, A.M. Peak Hour - Hopkins DOT Site (Operating Capacity)

8511048

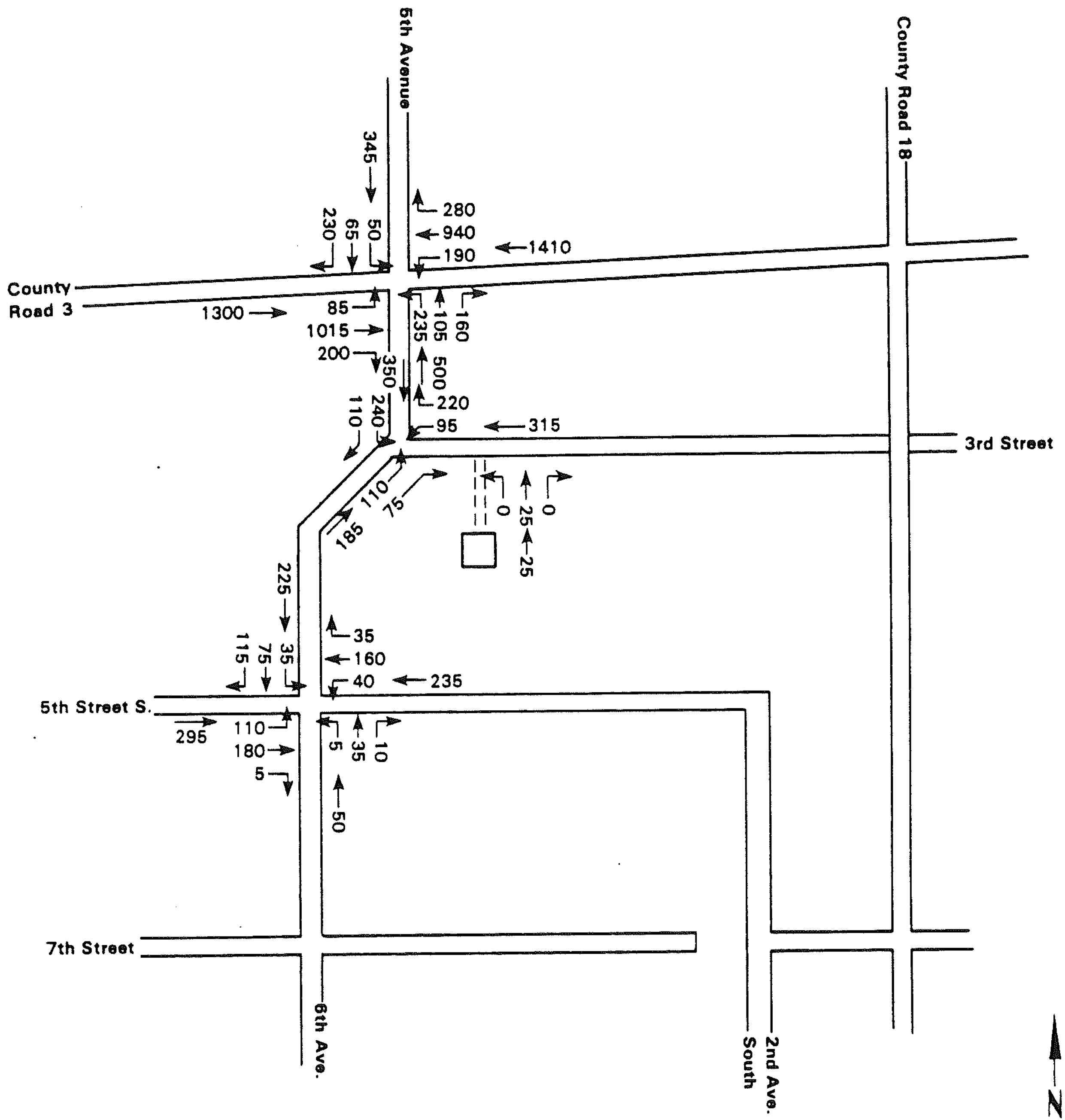

Figure 4.7-34 1989 Cumulative Traffic Volumes, P.M. Peak Hour - Hopkins DOT Site (Operating Capacity)

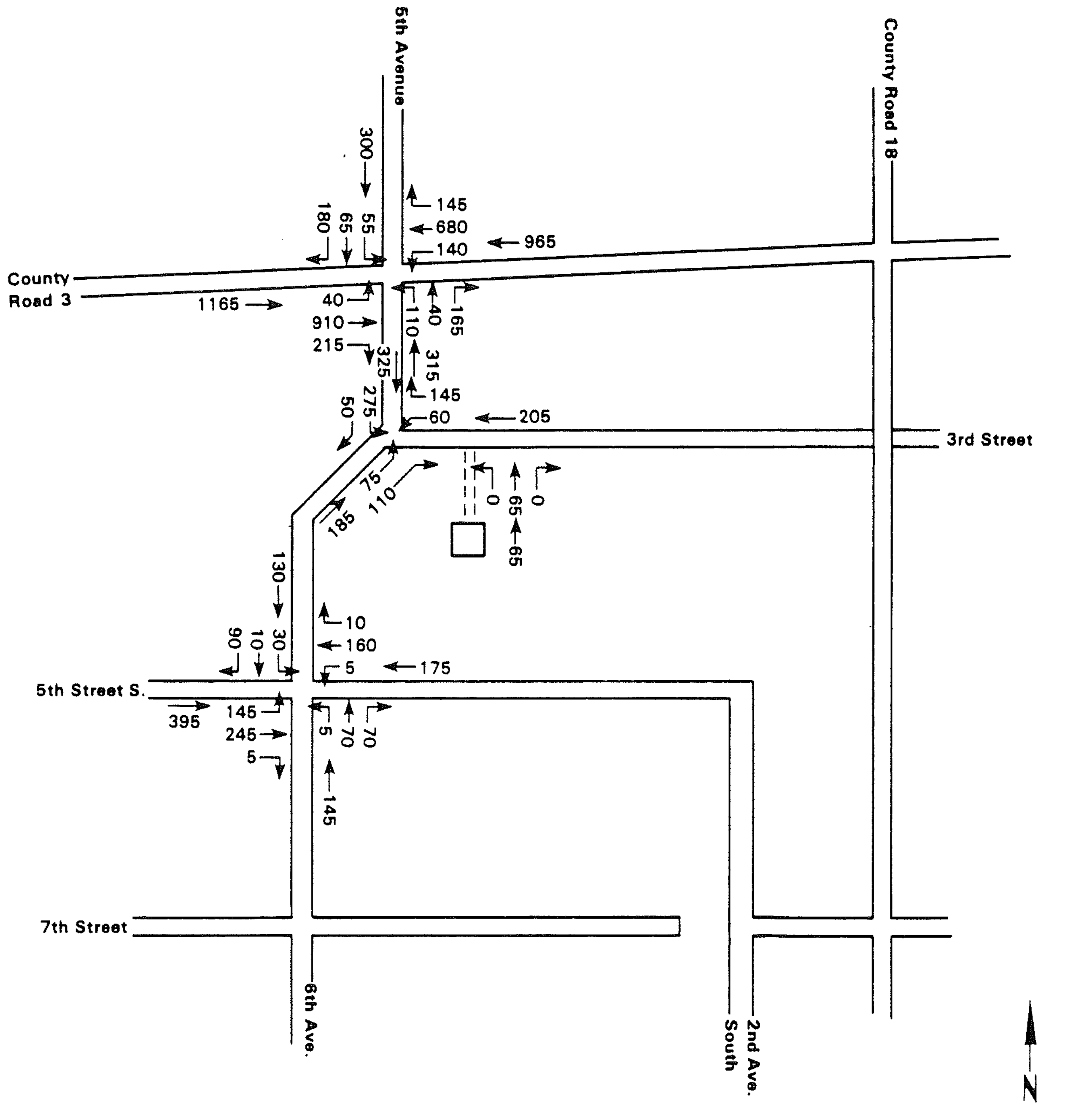

Figure 4.7-35 1989 Cumulative Traffic Volumes, A.M. Peak Hour - Hopkins DOT Site (Design Capacity)

8511050

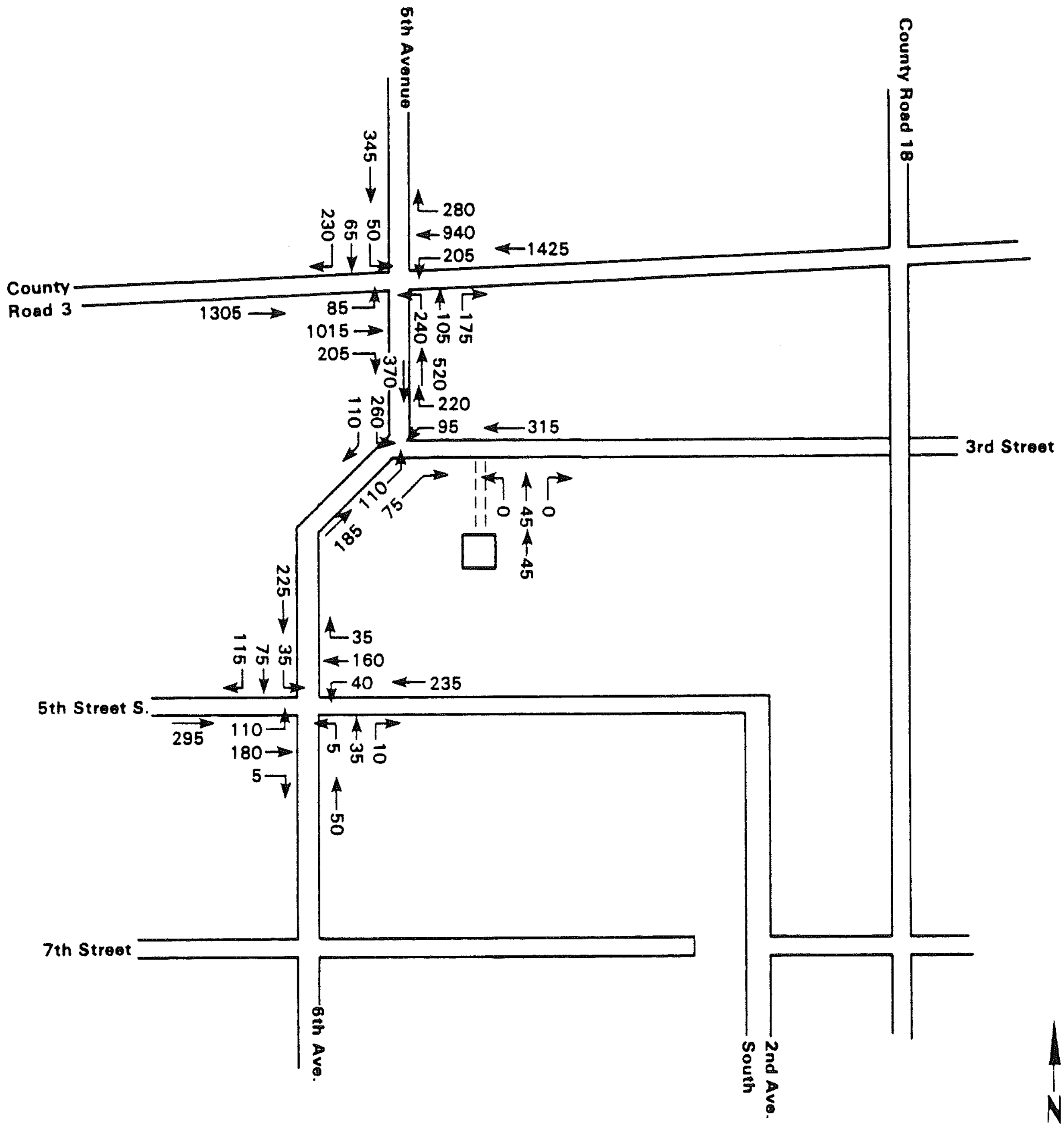

Figure 4.7-36 1989 Cumulative Traffic Volumes, P.M. Peak Hour - Hopkins DOT Site (Design Capacity)

8611051

TABLE 4.7-12
1989 BASELINE LEVELS OF SERVICE
(HOPKINS DOT SITE)

Intersection	Level of Service AM	PM
Fifth Avenue and County Road 3	B	C
Fifth Avenue and Third Street	A	A/B
Sixth Avenue and Fifth Street South	B	B

Source: ERT 1985

not occur at any of the intersections analyzed. The intersection of Fifth Avenue and County Road 3 will operate at a LOS "C" condition during the PM peak hour, and the rest of the intersections will operate at a LOS "B" condition or better during both peak hour periods.

1989 Cumulative Level of Service

Of the three intersections proximate to the proposed transfer station, two will not significantly change in LOS condition from the 1989 baseline scenario. Fifth Avenue at County Road 3 will remain at LOS "B" and "C" for the AM and PM peak hours, respectively. Similarly, Sixth Avenue at Fifth Avenue Street South will remain at a LOS "B" for the AM and PM peak hours. Only at Fifth Avenue and Third Street will a slight decrease in level of service occur. However, the change in LOS condition from "A" to "A/B" in the AM peak hour and "A/B" to "B" in the PM peak hour relates to little delay or congestion in the AM peak hour and very good operations with some short delays in the PM peak hour. Level of service and operating conditions will be acceptable at this intersection being better than LOS "C."

Table 4.7-13 summarizes the results of the capacity analysis for the intersections proximate to the proposed transfer station.

Railroad Operations

The effect of train blockage on Fifth Avenue was reviewed for the Hopkins DOT site because of the proximity of the transfer station to the two mainline railroad tracks. Any blockage on Fifth Avenue could have an adverse impact on adjacent intersections.

The northernmost tracks are operated by the Chicago and Northwestern Railroad, and the southern track by the Chicago, Milwaukee, and St. Paul Railroad. Based upon discussions with railroad officials (Murphy, 1985), the Chicago and Northwestern generally operates one train southbound at 10:00 AM, one train southbound at 11:00 AM, one train northbound at 2:00 PM and one train northbound through the area at 5:00 PM. The trains typically block Fifth Avenue north for about four to five minutes, the time it takes a train to pass. The Chicago, Milwaukee and St. Paul generally operates eight coal trains (total for both directions) through Hopkins per day on unscheduled basis (Teske, 1985). The coal trains average about 100 to 125 cars and would block Fifth Avenue for five to ten minutes while they pass through Hopkins. In addition, scheduled trains pass through Hopkins at 9:30 AM, 10:30 AM, 2:00 PM, 4:00 PM, 8:30 PM and 2:00 AM. These trains would likely block Fifth Avenue for about five minutes. The estimates are based on operating speeds of 20 mph with 60 foot long cars.

A study by Hennepin County DOT observed during a 16-hour period (June 5, 1985) that crossing times varied from 10 seconds to 4 minutes. The County did indicate that they did not observe backups of traffic on County Road 3 waiting to turn left on right onto Fifth Avenue.

Based on the specified train arrival rates, it can be assumed that at least one train could block Fifth Avenue for up to 10 minutes during the PM peak hour. It is possible that the crossing could be blocked up to three times during that period for ten minutes each. Under these circumstances, fifteen vehicles associated with the

TABLE 4.7-13
1989 CUMULATIVE LEVELS OF SERVICE
(HOPKINS DOT SITE)

Intersection	Level of Service AM	PM
Fifth Avenue and County Road 3	B	C
Fifth Avenue and Third Street	A/B	B
Sixth Avenue and Fifth Street South	B	B

Source: ERT, 1985.

resource recovery facility could be blocked during each blockage event. Over the course of one hour, if three blockings occurred, 45 vehicles from the transfer station could be delayed for an average of ten minutes each (worst case assumption).

During any single train blockage, as many as 60 vehicles (including non transfer station vehicles) could be delayed south of the train crossing on Fifth Avenue for as long as an average of five minutes. As many of fifteen transfer station vehicles might be unable to leave the facility during this period. The longest delay for any transfer vehicle would be about ten minutes.

During the train blockage, the intersections of County Road 3 and Fifth Street and Sixth Avenue would operate at LOS E conditions. As previously mentioned delays of as much as ten minutes per vehicle could be experienced by commuters.

Access via Second Avenue South

Although the County proposal calls for prohibition of access to the site on Second Avenue South, a worst case analysis was undertaken assuming such access. Approximately twenty percent of all facility traffic was assumed to access the site from Second Avenue South to Fifth Avenue. Figure 4.7-37 shows the revised trip distribution with 20% of all vehicles accessing from the south via Second Avenue South. Figures 4.7-38 through 4.7-43 show project traffic and cumulative traffic volumes during the AM and PM peak hours.

Table 4.7-14 shows the level of service at affected intersections. The level of service will decline at Sixth Avenue and Fifth Street South with the project. All intersections in the area however would operate at LOS C or better, which is the desired operating standard. Therefore, adjacent intersections would not significantly be impacted.

4.7.5.4 Safety Analysis

Safe operation of an intersection requires that several conditions be satisfied. Adequate sight distance on the major road must be available to provide time for an entering vehicle from a minor road to view approaching vehicles and decide whether or not to proceed with a merging maneuver. In addition, safe operation requires the existence of gaps in vehicle traffic on the major roadway so that a vehicle entering from a minor road can safely access. Also, an intersection should be controlled in the proper fashion, either signalized or unsignalized in order to ensure safe operation.

Sight Distance

The safe operation of a roadway (such as the proposed access road) requires that adequate sight distance on the major roadway exist. With the introduction of an access road at the proposed transfer station, the potential for vehicular conflict will be increased as vehicles enter and exit the proposed facility. The sight distance on Third Street in both directions must be adequate for

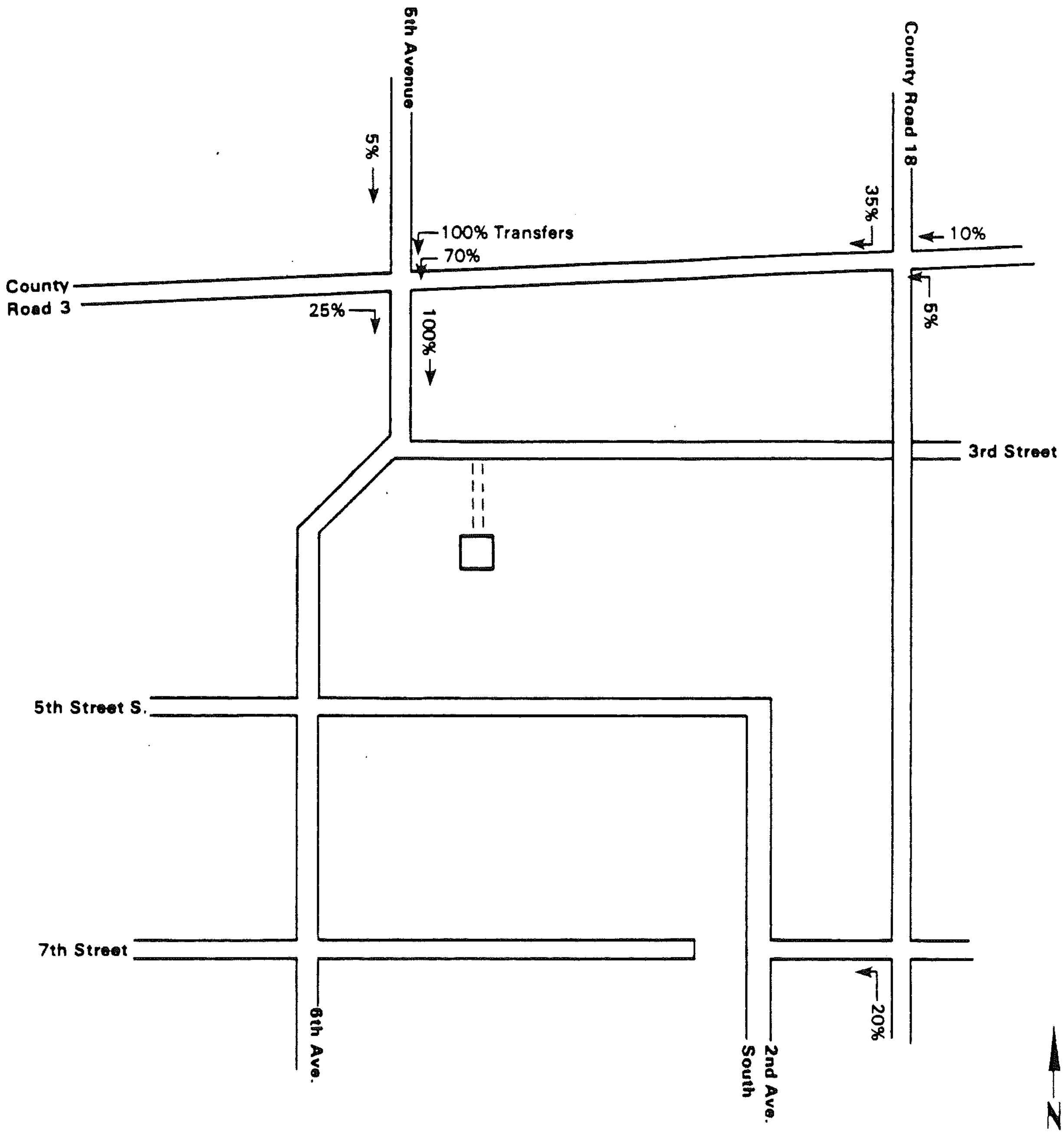

Figure 4.7-37 Trip Distribution, In-Bound Trips - Hopkins DOT Site

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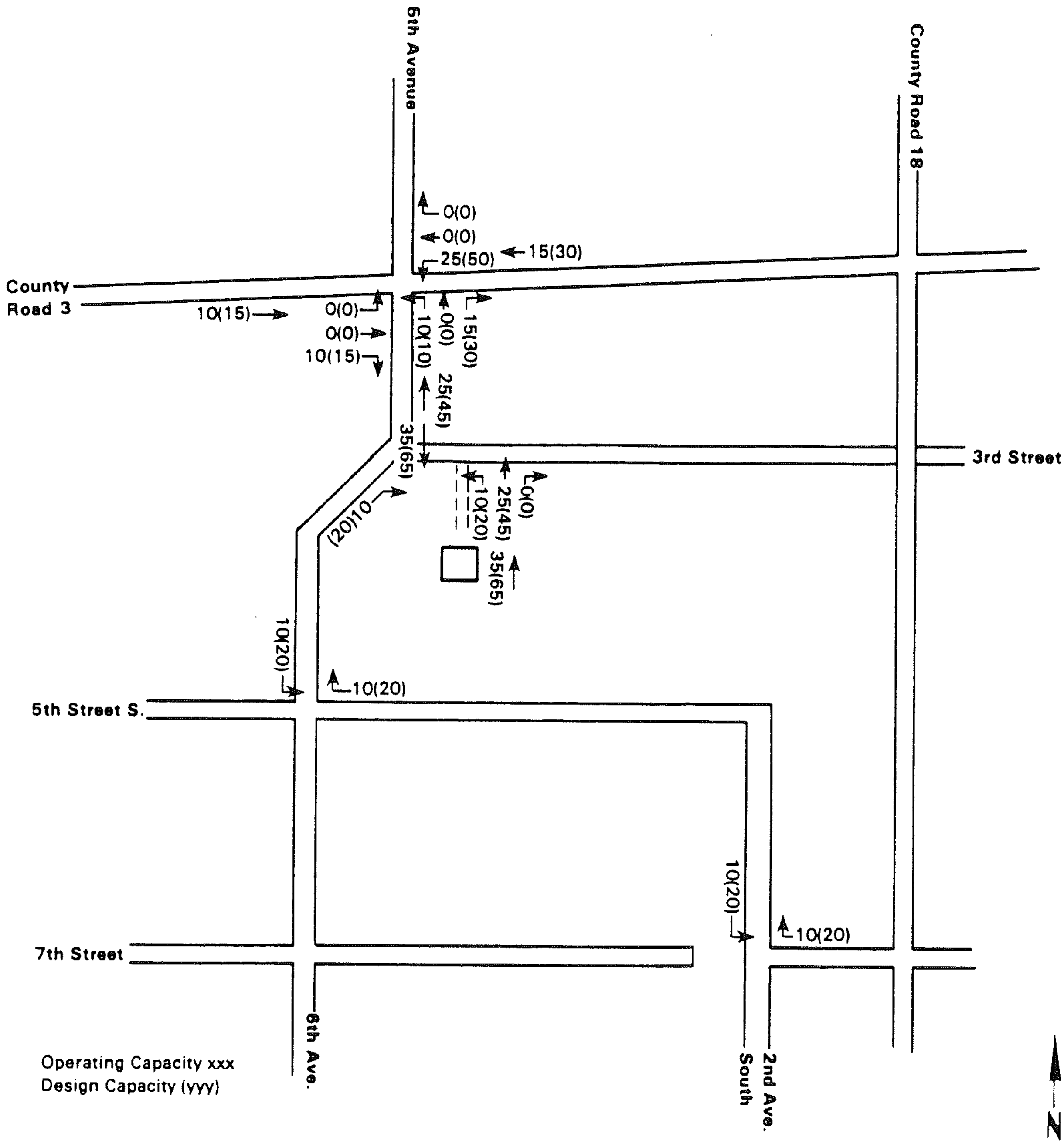


Figure 4.7-38 Project Traffic Only, 1989 A.M. Peak Hour - Hopkins DOT Site

8511046

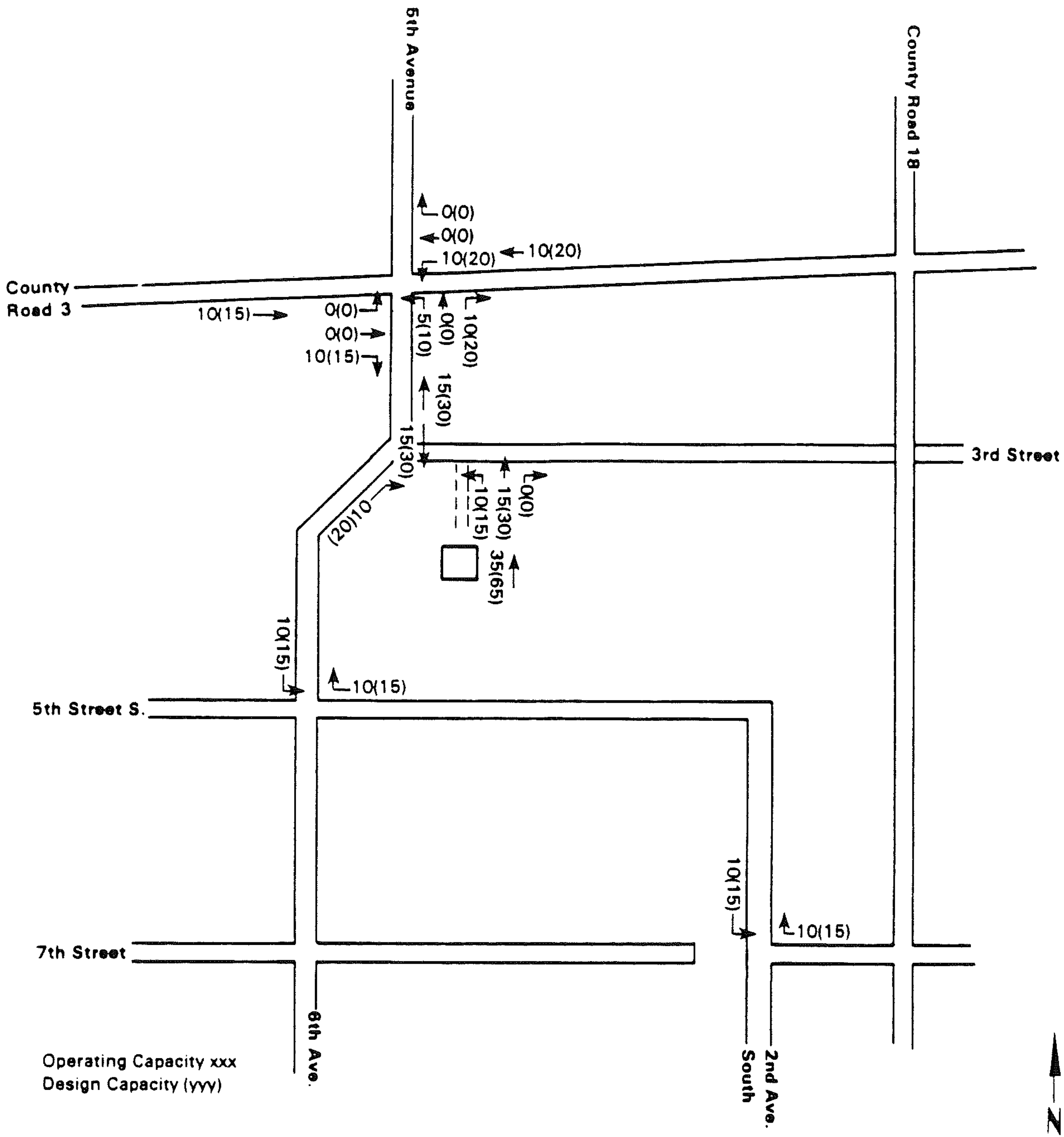


Figure 4.7-39 Project Traffic Only, 1989 P.M. Peak Hour - Hopkins DOT Site

8511046

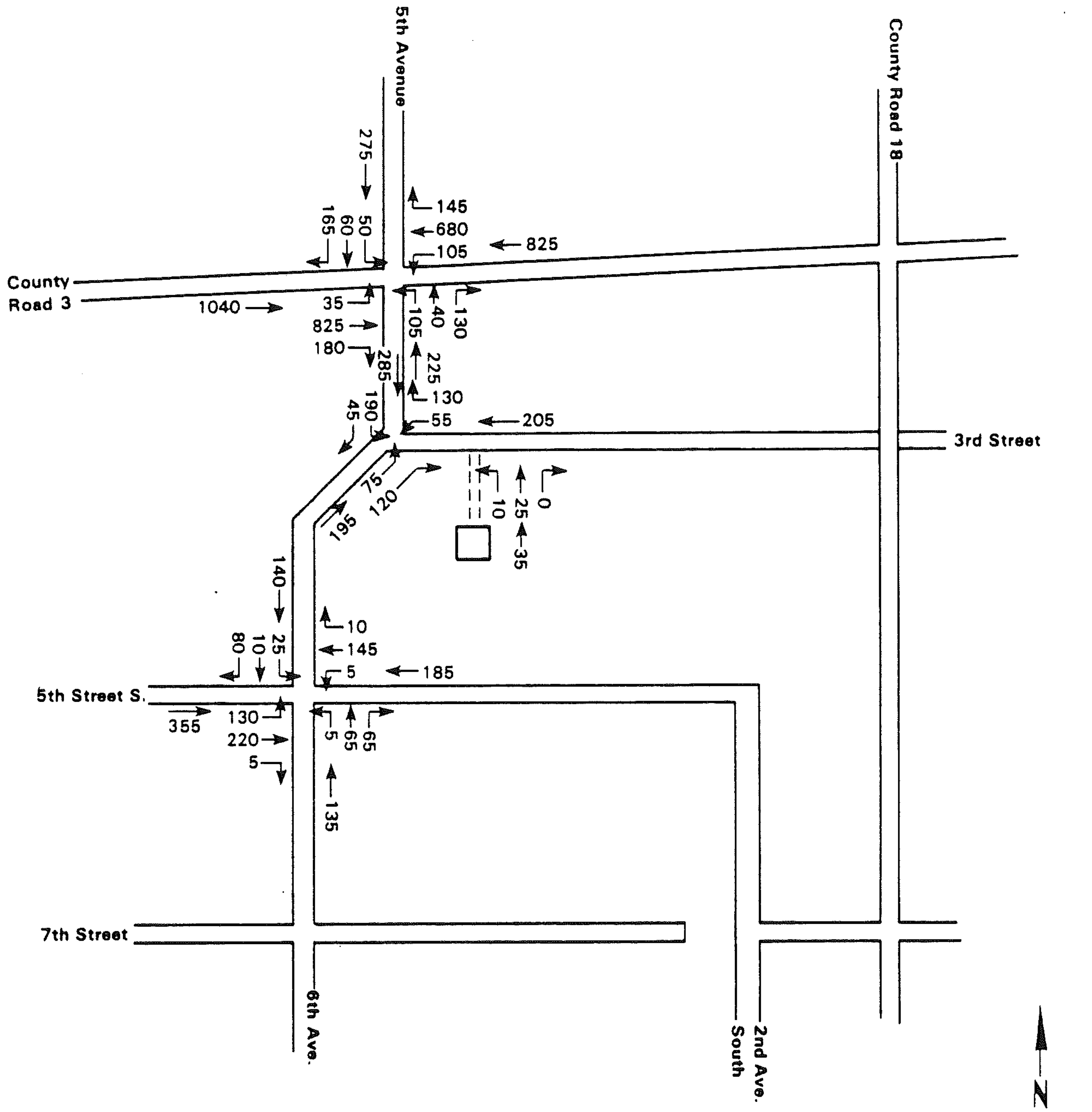


Figure 4.7-40 1989 Cumulative Traffic Volumes, A.M. Peak Hour - Hopkins DOT Site (Operating Capacity)

8510028

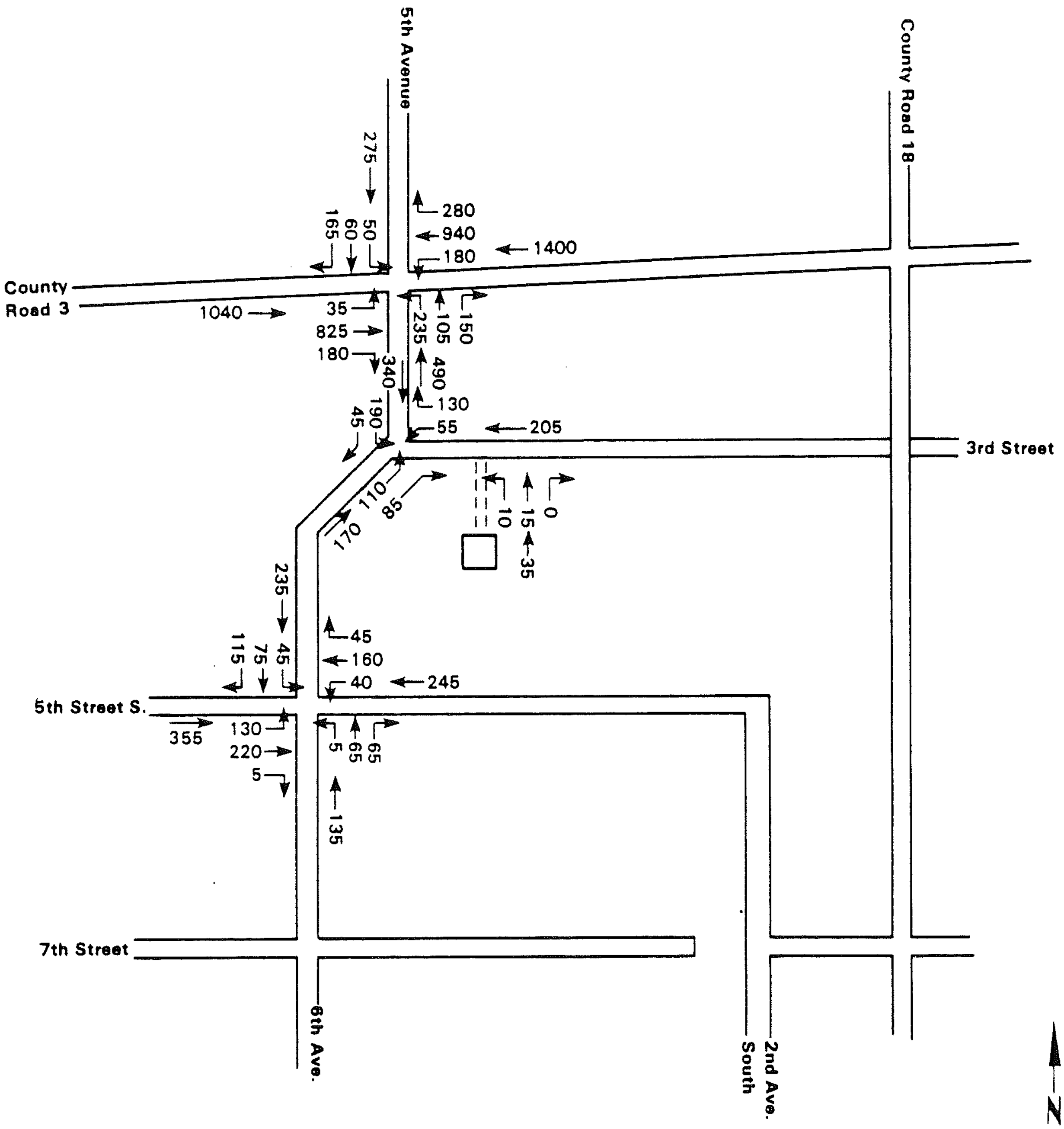


Figure 4.7-41 1989 Cumulative Traffic Volumes, P.M. Peak Hour - Hopkins DOT Site (Operating Capacity)

8510028

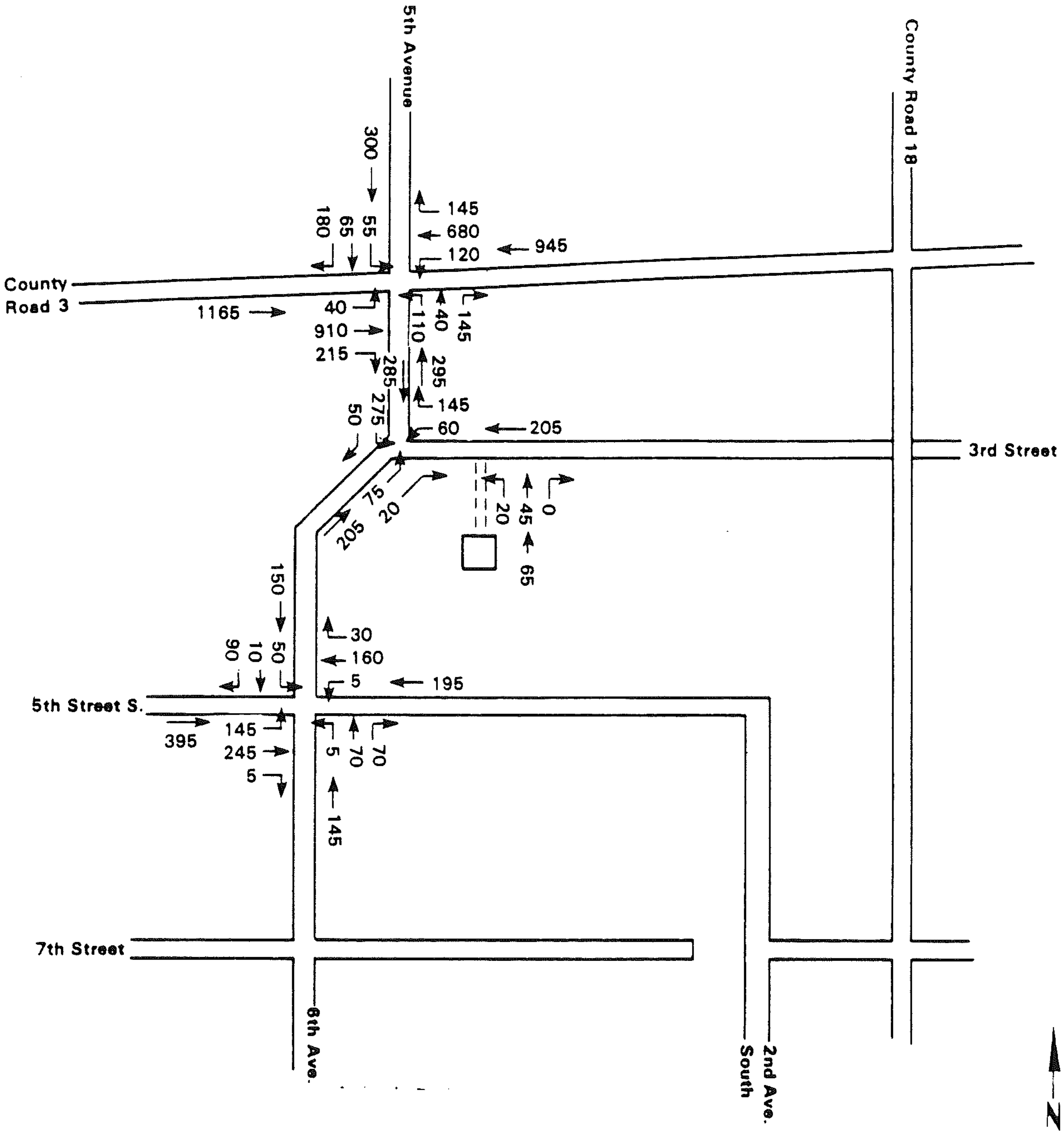


Figure 4.7-42 1989 Cumulative Traffic Volumes, A.M. Peak Hour - Hopkins DOT Site (Design Capacity)

8610028

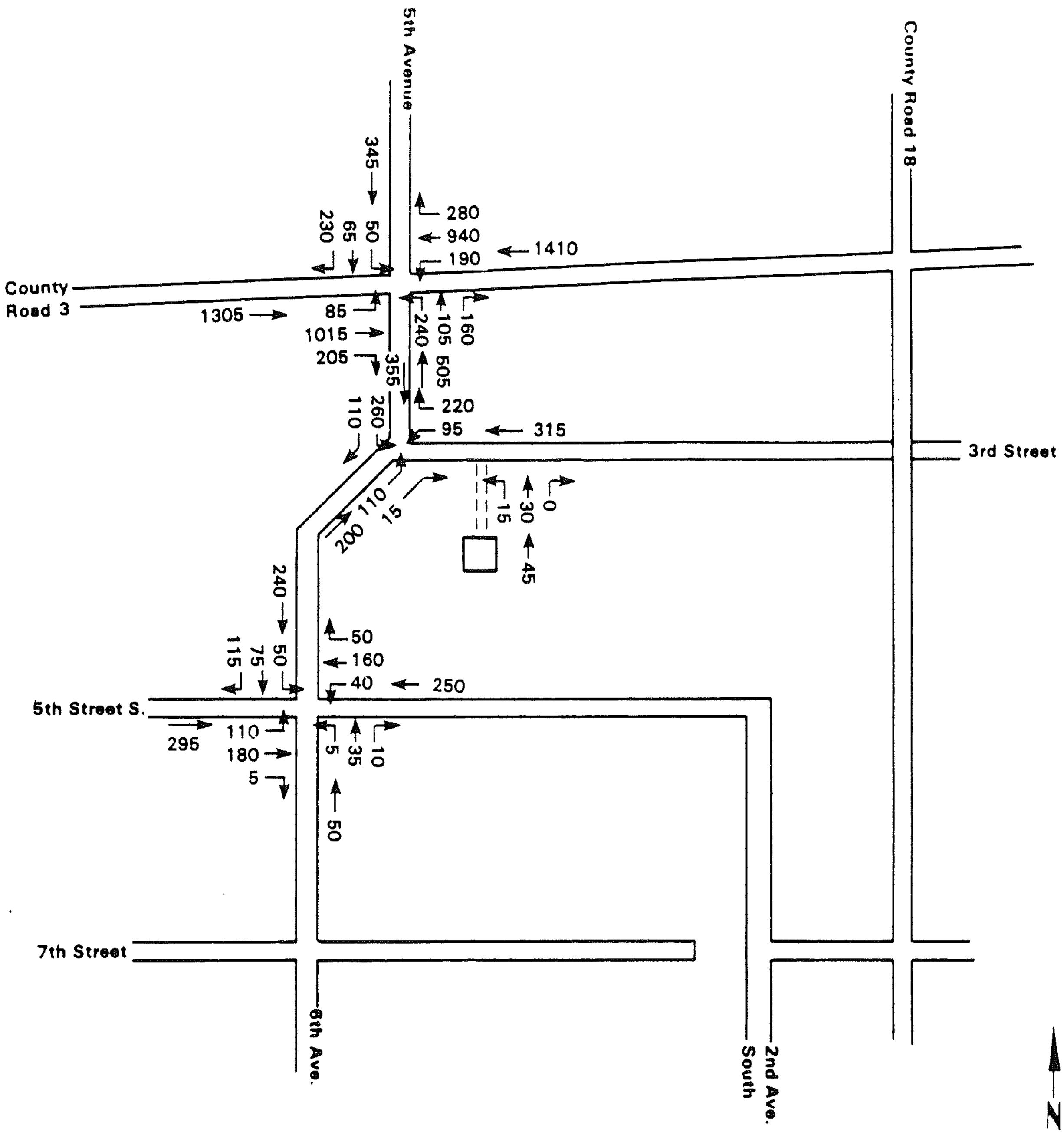


Figure 4.7-43 1989 Cumulative Traffic Volumes, P.M. Peak Hour - Hopkins DOT Site (Design Capacity)

8510028

TABLE 4.7-14

1989 CUMULATIVE LEVELS OF SERVICE

(HOPKINS DOT SITE-ACCESS BY SECOND AVENUE SOUTH)

Intersection	Level of Service AM	PM
Fifth Avenue and County Road 3	B	C
Fifth Avenue and Third Street	B	B
Sixth Avenue and Fifth Street South	B/C	B/C

Source: ERT 1985

drivers on Third Street traveling at or near the posted speed (35 mph) to come to a stop before reaching a conflicting vehicle leaving the access road.

Stopping time is a function of both perception and reaction time. Minimum and desirable sight distances are provided in the Transportation and Traffic Engineering Handbook, Institute of Traffic Engineer, and are a function of roadway speed, perception time, and pavement.

Vehicles traveling on Third Street should have adequate time to view a vehicle exiting the access road for Third Street, and then come to a stop or slow down on Third Street. Similarly, vehicles exiting the access road should be able to see vehicles on Third Street at a distance great enough to ensure that the exiting vehicle can safely merge onto Third Street. The required stopping sight distance per the Institute of Traffic Engineering Standards is approximately 350 feet based upon a speed of 35 miles per hour.

The sight distance on Third Street from the proposed site access road is about 400 feet to the east and west. As a result, vehicles on Third Street would have adequate time to react to vehicles exiting the access road. It can be concluded that adequate sight distance would exist at the proposed access road to allow for safe operations at its intersection with Third Street.

4.7.6 Minneapolis South Transfer Station

4.7.6.1 Trip Generation and Distribution

The vehicular demand generated by the proposed Minneapolis South transfer station can be classified into the following categories:

- Facility employee travel
- Solid waste delivery trucks to transfer station
- Transfer trucks
- Private vehicles delivering solid waste to transfer station

Vehicle generation at the Minneapolis South transfer station was based on a design capacity of 800 tpd. The anticipated operating capacity is 400 tpd. Refuse trucks will carry 5 tons per truck, transfer station trucks will carry 18 tons per truck, and private vehicles will carry 350 pounds per vehicle to the transfer station.

The Minneapolis South transfer station is expected to employ 10 persons on an 11-hour basis. About 160 packer trucks (at design capacity) are expected to use the transfer station on a daily basis. During the AM commuter peak hour (7-8:00 AM), about 15 packer truck trips in and out of the transfer station will be made. During the PM peak hour (4:30-5:30 PM) 10 packer truck trips will be made in and out. About 45 transfer trucks (at design capacity) are expected to use the transfer station on a daily basis. During the AM and PM peak hours 5 transfer truck trips will be made in and out of the transfer station. About 160 private vehicles (at design capacity) are expected to use the transfer station on a daily basis. Private vehicles (including employees) will make about 25 trips in and out of the transfer station during the AM peak hour and 20 trips in and out during the PM peak hour.

Directional distribution has been based on the origin of waste. For an average operating day, about 35 percent of the total traffic (trucks and private vehicles) generated by the transfer station is expected to arrive from and depart to the northeast, 35 percent to the southeast (including all transfer trucks), 15 percent to the northwest, and 15 percent to the southwest (Figure 4.7-44). The employee distribution was assumed to be the same as the delivery vehicles.

Table 4.7-15 lists the traffic volumes associated with the function of the facility at operating capacity, at design capacity, and during construction.

4.7.6.2 Future Traffic Volumes

1989 Baseline Traffic Volumes

The 1985 existing traffic volumes around the proposed Minneapolis South transfer station site were increased by 1.5 percent per year compounded growth, or by a factor of 1.077 to arrive at the 1989 baseline traffic demands. The 1989 baseline AM peak hour traffic demands are illustrated in Figure 4.7-45. The 1989 baseline PM peak hour traffic demands are illustrated in Figure 4.7-46.

1989 Cumulative Traffic Volumes (With Facility)

Operation of the proposed Minneapolis South transfer station is expected to result in an increase in vehicular traffic (at design capacity) in 1989 on East 28th Street and South 20th Avenue of 90 vehicle trips in the AM peak hour (45 vehicles entering and 45 vehicles exiting) and 70 vehicle trips in the PM peak hour (35 entering and 35 exiting). Figures 4.7-47 and 4.7-48 illustrate the project traffic expected in the AM and PM peak hours, respectively, for area roadways in the vicinity of the Minneapolis South transfer station. Figures 4.7-49 and 4.7-50 illustrate the 1989 Cumulative AM and PM peak hour traffic volumes with the facility functioning at operating capacity. Figures 4.7-51 and 4.7-52 illustrate the 1989 Cumulative AM and PM peak hour traffic volumes with the facility operating at design capacity.

4.7.6.3 Capacity Analysis

1989 Baseline Level of Service

Level of Service calculations were performed for the key intersections around the Minneapolis South site for the 1989 baseline AM and PM peak hours. The results are summarized in Table 4.7-16. All of the intersections analyzed operated at or better than a LOS "B/C" condition during both peak hour periods. No intersection capacity deficiencies are expected to result during the 1989 baseline scenario. All intersections operate above the desired standard, LOS "C" operating conditions.

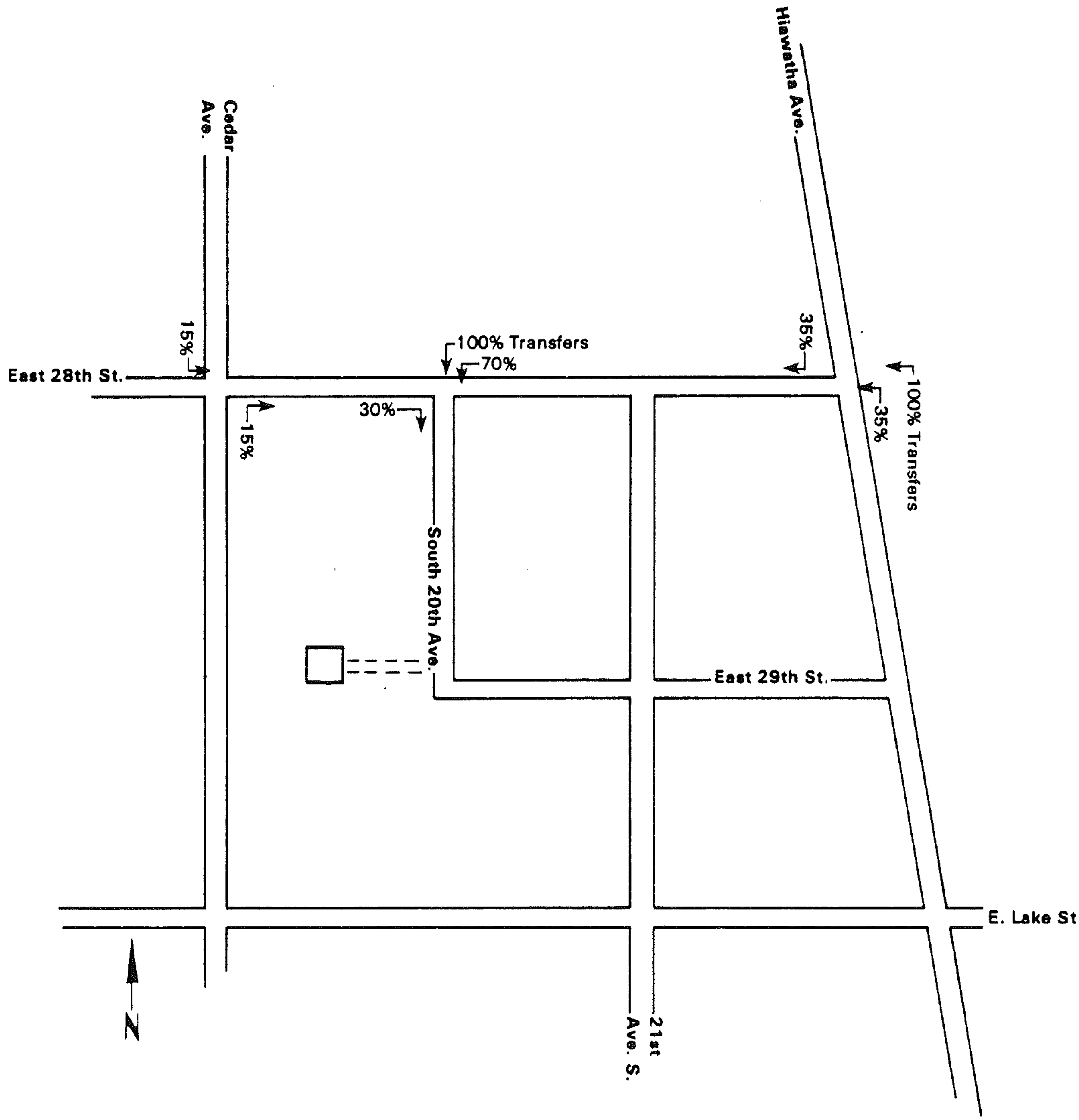


Figure 4.7-44 Trip Distribution, In-Bound Trips - Minneapolis South

8611052

TABLE 4.7-15

TRAFFIC GENERATION CHARACTERISTICS OF PROPOSED MINNEAPOLIS SOUTH TRANSFER STATION

	Operation Capacity	Design Capacity	Construction
Waste Processed in tons per day (tpd)	400	800	---
Number of Refuse Trucks/Day	80	160	---
Number of Transfer Trucks/Day	20	45	---
Number of Private Vehicles/Day	80	160	---
Number of Employees			
Peak	---	---	50
Average	10	10	35

Source: ERT, 1985

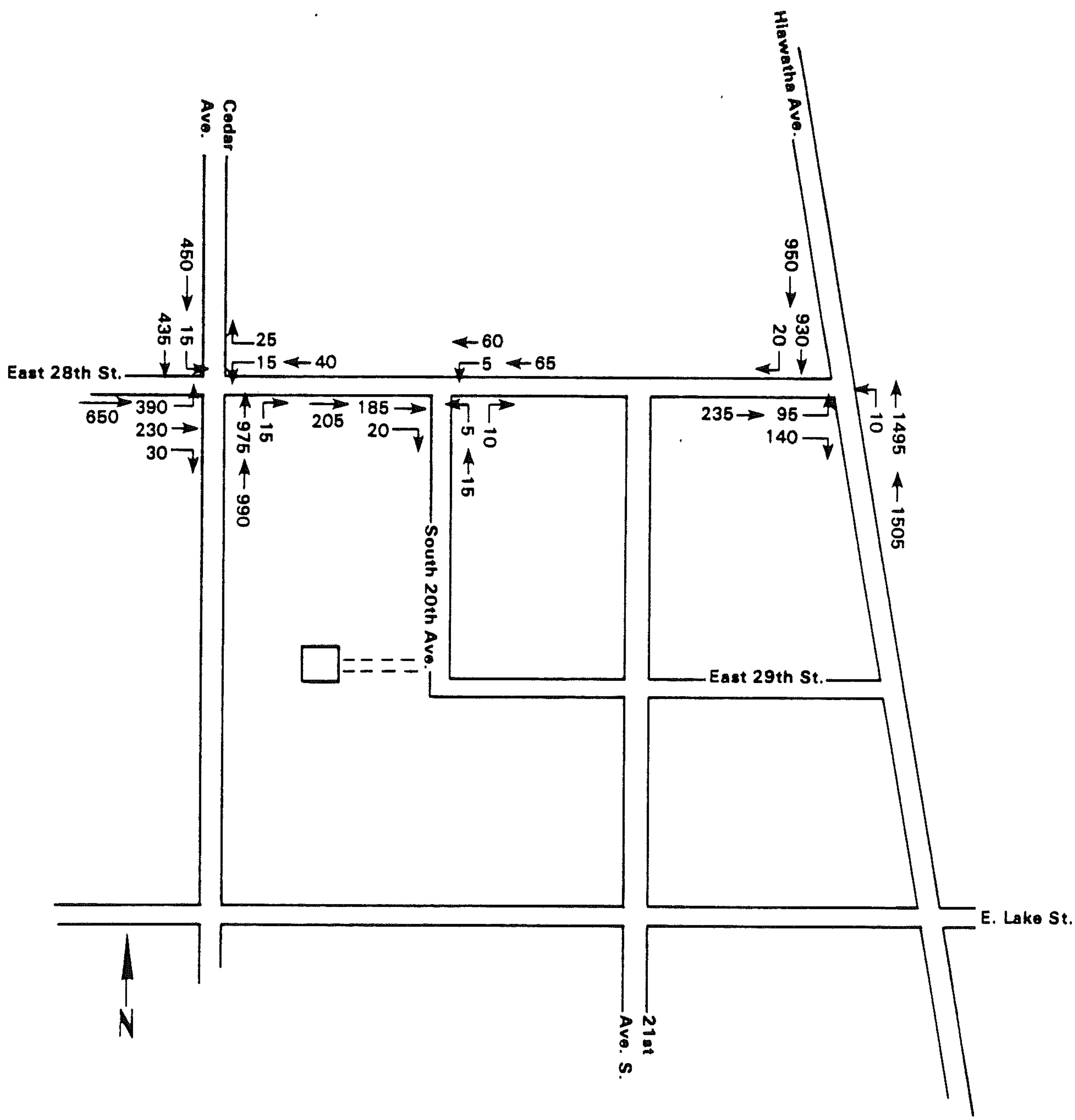


Figure 4.7-45 1989 Baseline A.M. Peak Hour Volumes - Minneapolis South

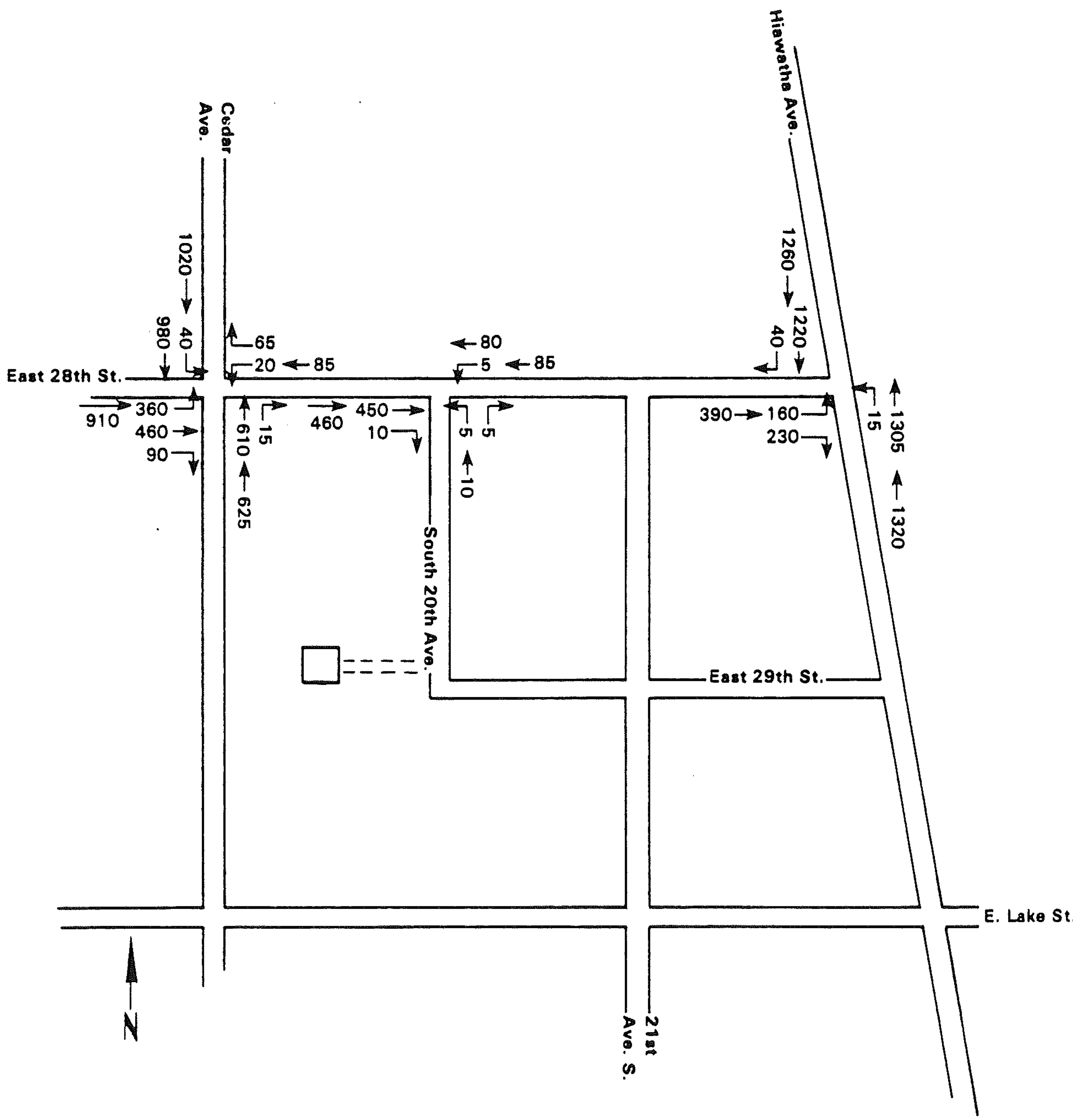


Figure 4.7-46 1989 Baseline P.M. Peak Hour Volumes - Minneapolis South

8610052

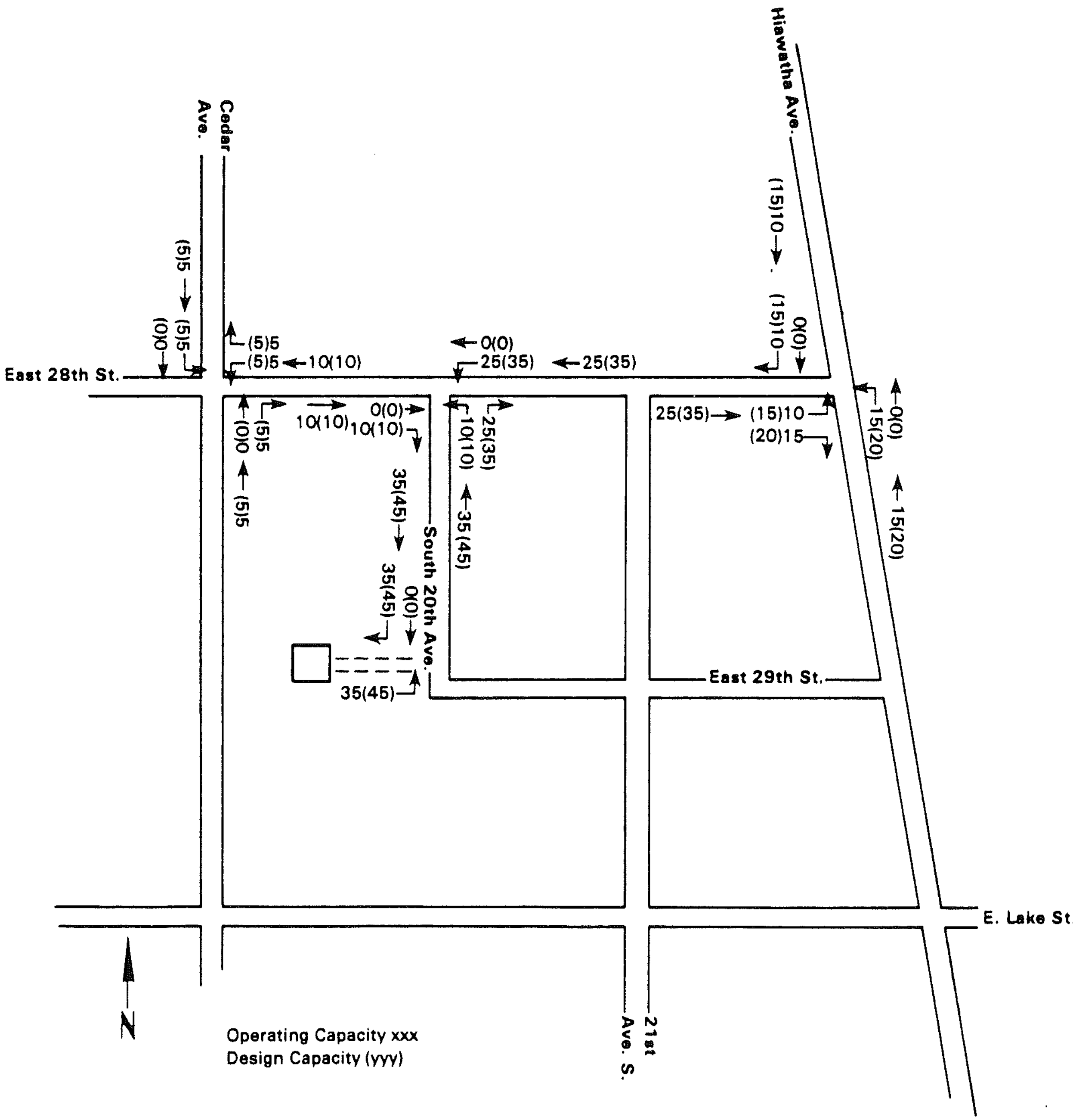


Figure 4.7-47 Project Traffic Only, 1989 A.M. Peak Hour - Minneapolis South

8511053

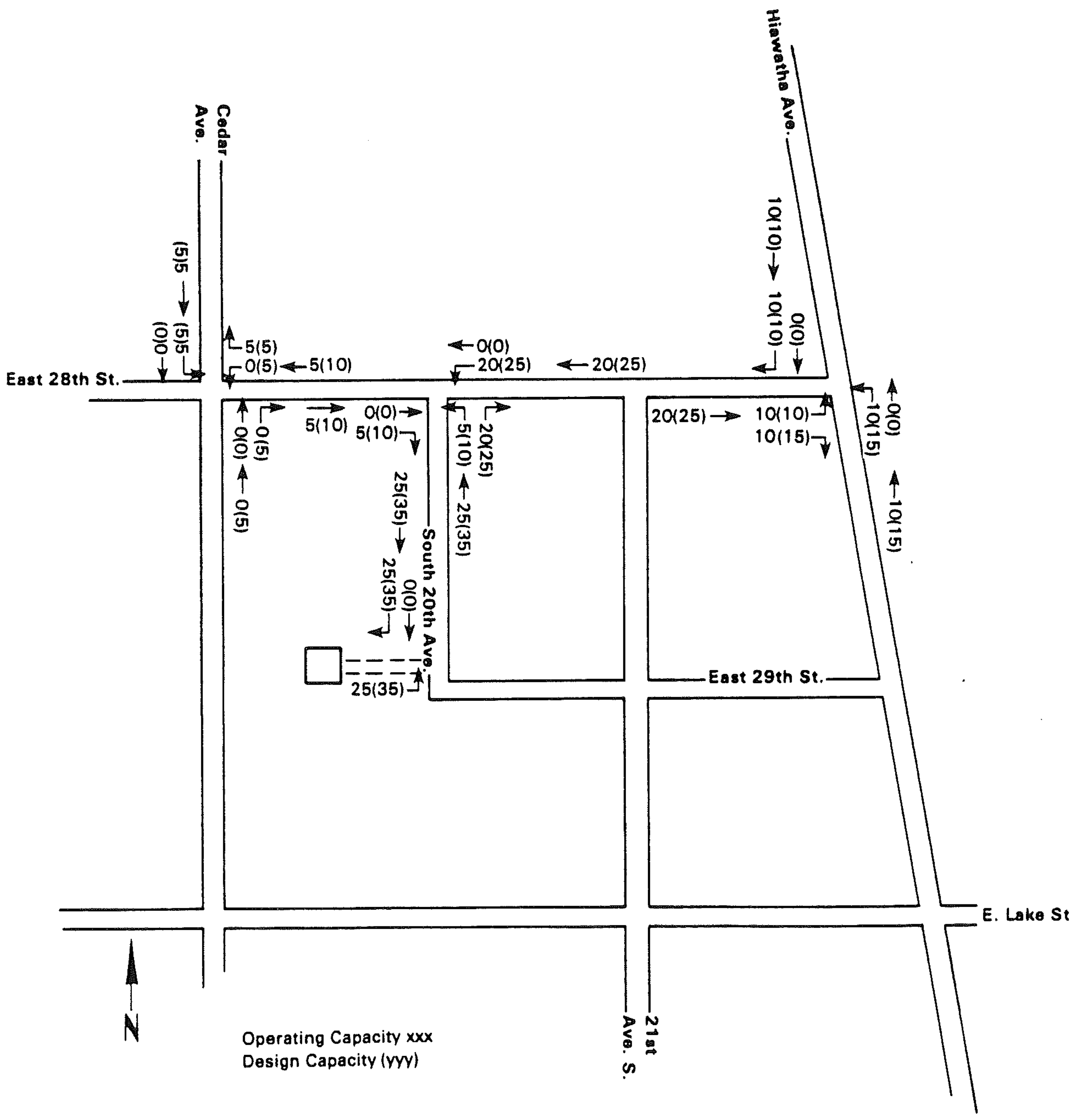


Figure 4.7-48 Project Traffic Only, 1989 P.M. Peak Hour - Minneapolis South

8511054

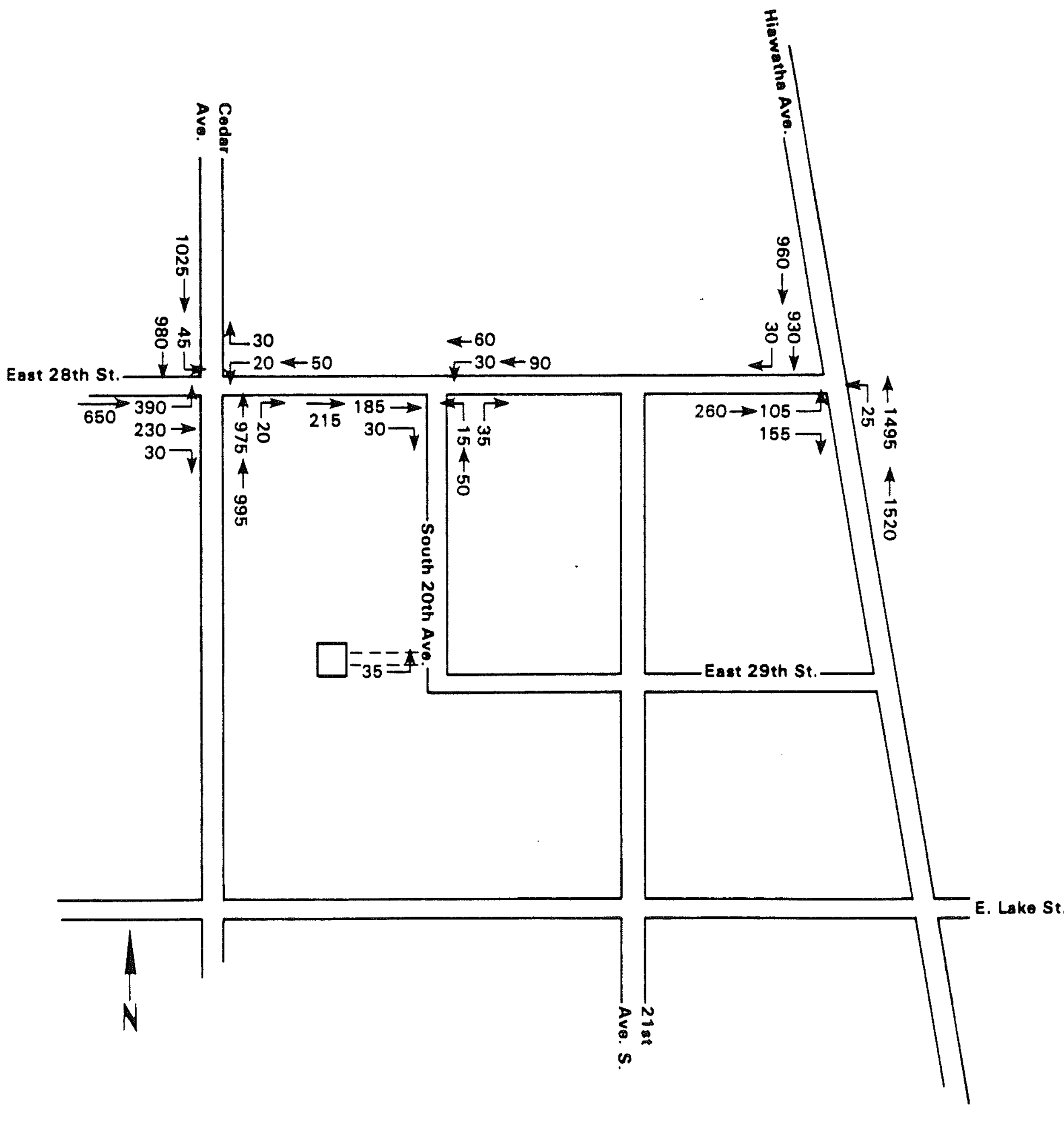


Figure 4.7-49 1989 Cumulative Traffic Volumes, A.M. Peak Hour - Minneapolis South (Operating Capacity)

8511055

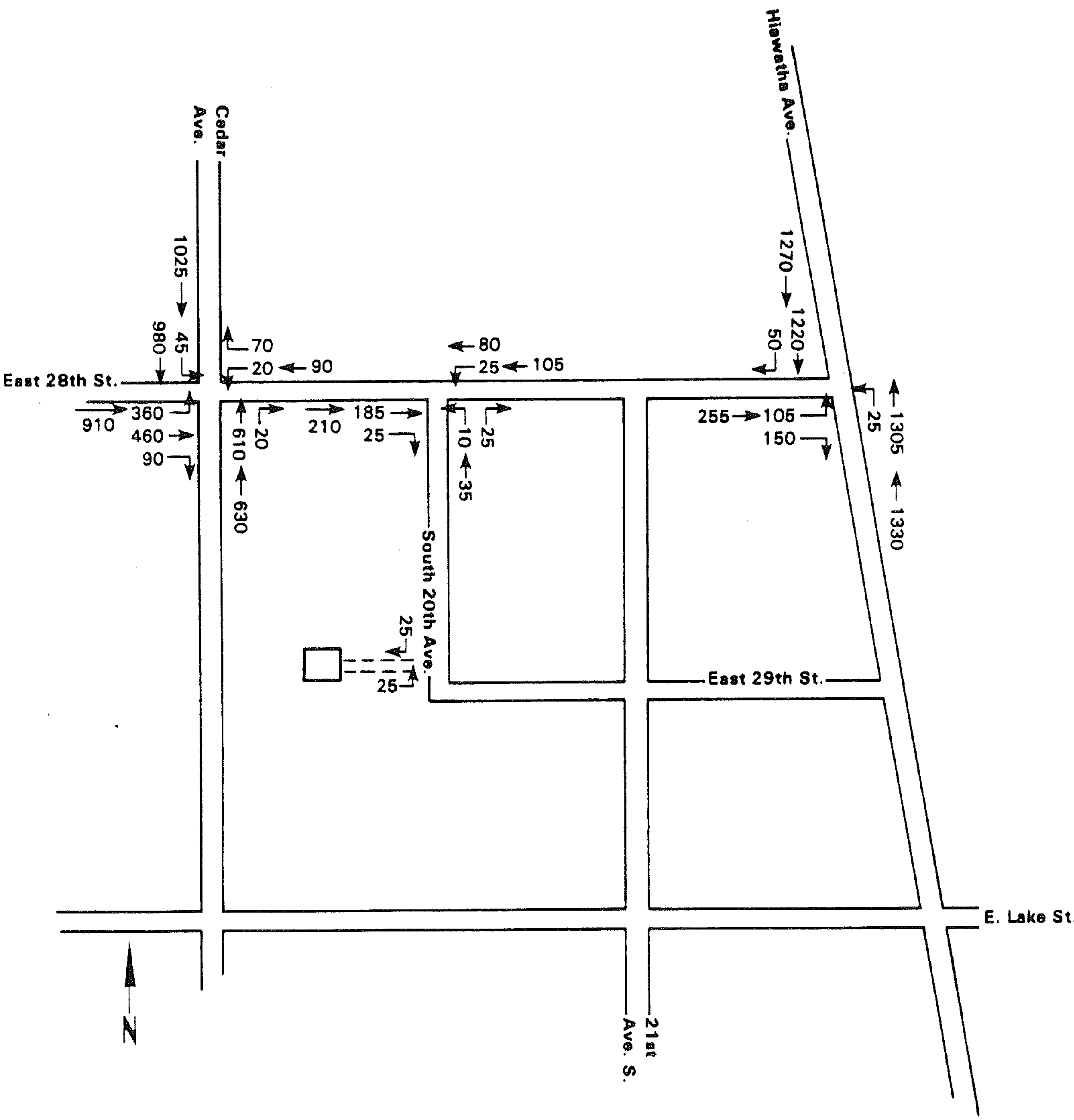


Figure 4.7-50 1989 Cumulative Traffic Volumes, P.M. Peak Hour - Minneapolis South (Operating Capacity)

8611056

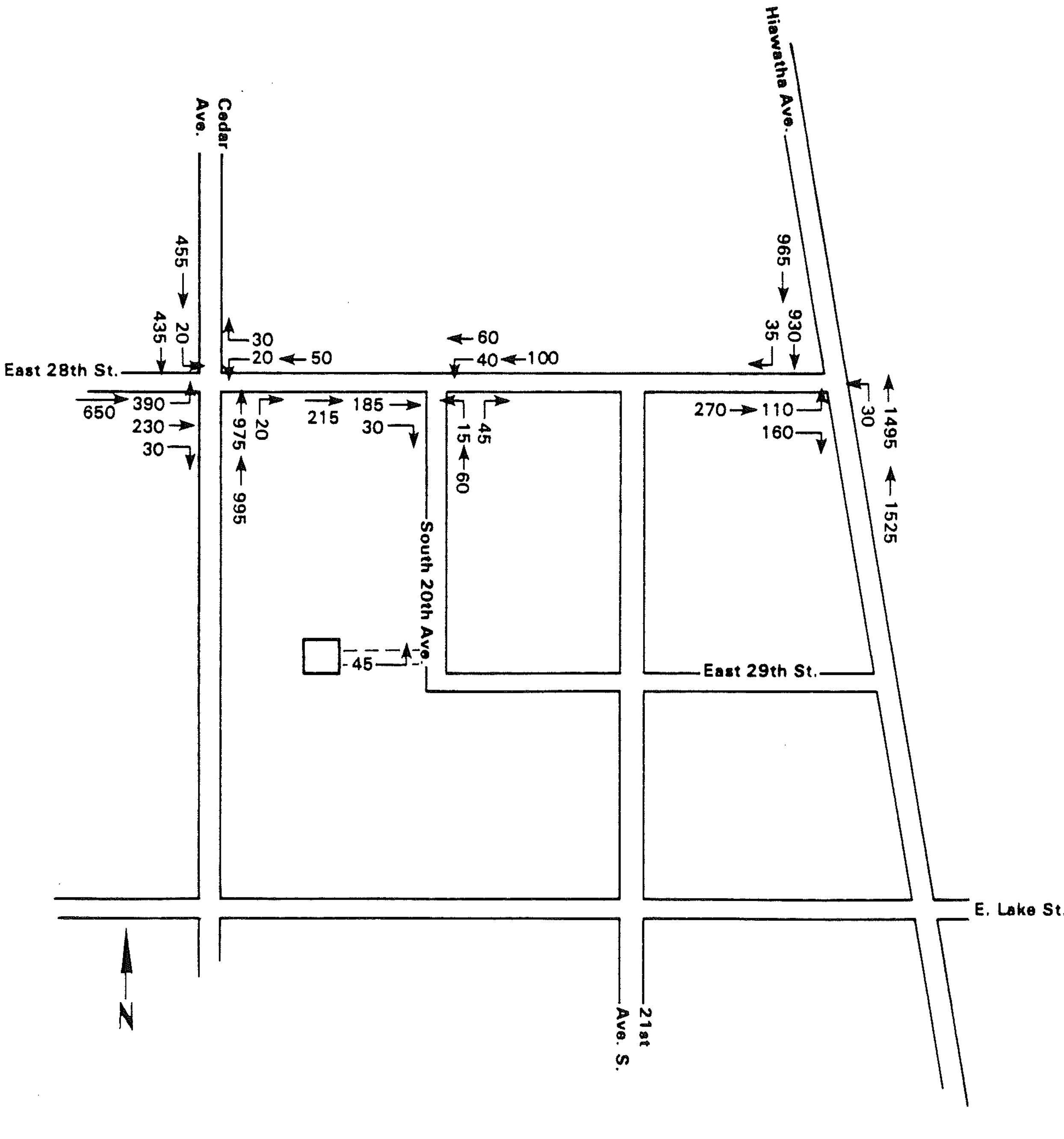


Figure 4.7-51 1989 Cumulative Traffic Volumes, A.M. Peak Hour - Minneapolis South (Design Capacity)

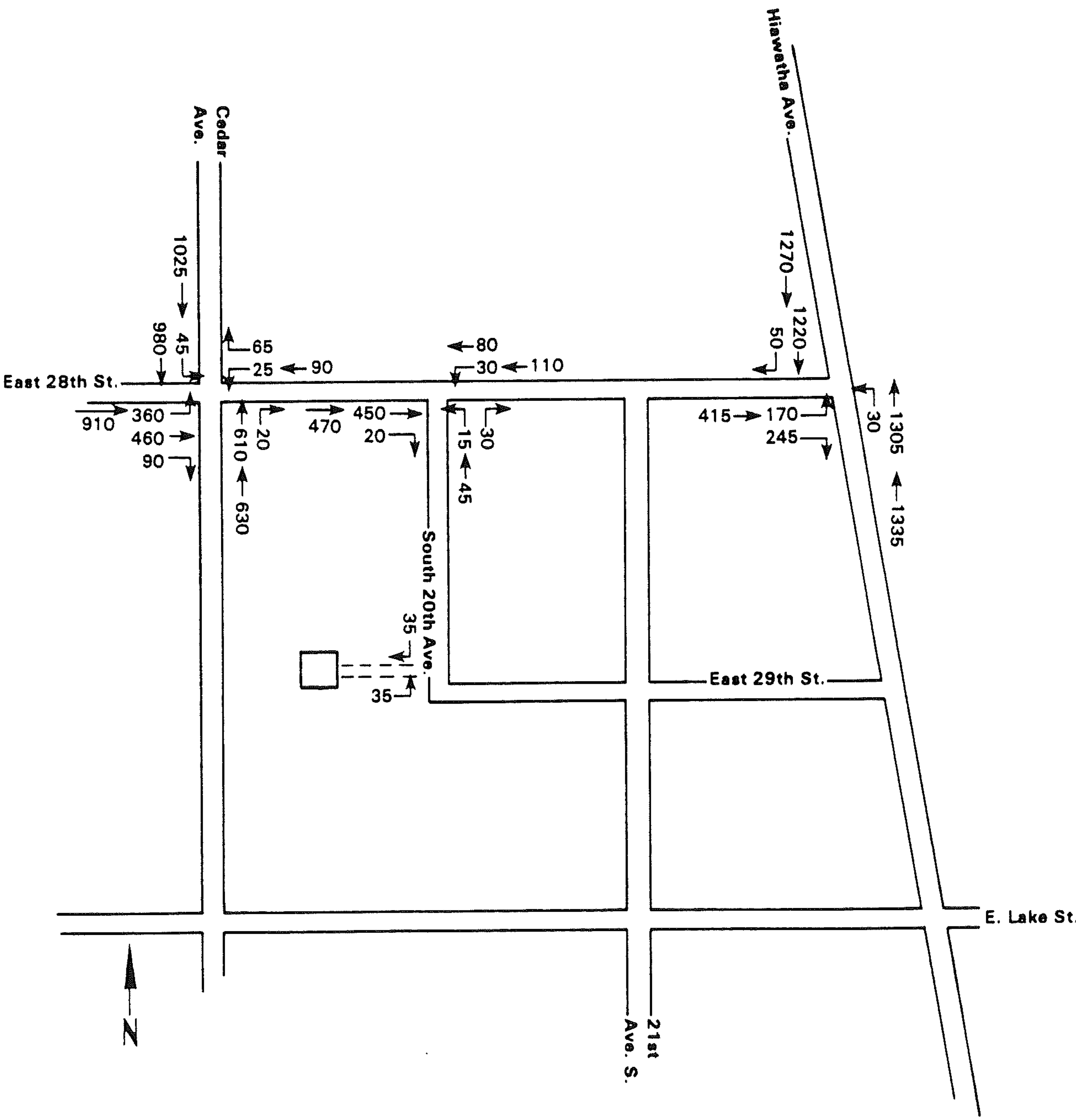


Figure 4.7-52 1989 Cumulative Traffic Volumes, P.M. Peak Hour - Minneapolis South (Design Capacity)

8511058

TABLE 4.7-16
1989 CUMULATIVE LEVELS OF SERVICE
(MINNEAPOLIS SOUTH SITE)

Intersection	Level of Service AM	Level of Service PM
East 28th Street and South 20th Avenue	A	A
East 28th Street and Hiawatha Avenue	B/C	B/C
East 28th Street and Cedar Avenue	B/C	C

Source: ERT 1985

1989 Cumulative Level of Service

Of the three intersections proximate to the proposed transfer station, two will not change in LOS condition from the 1989 baseline condition. East 28th Street at South 20th Avenue will remain at a LOS "A" condition for the AM and PM peak hours. Similarly, East 28th Street at Hiawatha Avenue will remain at a LOS "B/C" condition for the AM and PM peak hours. Only at East 28th Street and Cedar Avenue will a slight decrease in capacity occur. While the LOS condition "B/C" in the AM peak hour will remain unchanged, the PM peak hour will change from a LOS "B/C" condition to LOS "C" condition, which represents acceptable operating conditions with average traffic delays. Table 4.7-17 summarizes the results of the capacity analyses for the intersections proximate to the proposed transfer station. Train operations in the area are not expected to impact level of service.

4.7.6.4 Safety Analysis

Safe operation at an intersection requires the availability of adequate sight distance on the major road to allow sufficient time to decide whether to make a merging maneuver from a minor road. Gaps in vehicle traffic on the major roadway must also exist to ensure safe access for a vehicle entering from a minor road. Lastly, safe operation at an intersection is dependent upon proper control, either signalized or unsignalized.

Sight Distance

The safe operation of a roadway (such as the proposed site access road) requires that adequate sight distance on the major roadway exist. With the introduction of an access road at the proposed transfer station, the potential for vehicular conflict will be increased as vehicles enter and exit the proposed facility. The sight distance on South 20th Avenue in both directions must be adequate for drivers on South 20th Avenue traveling at or near the posted speed (20 mph) to come to a stop before reaching a conflicting vehicle leaving the access road.

Stopping time is a function of perception and reaction time. Minimum and desirable sight distances are provided in the Transportation and Traffic Engineering Handbook, Institute of Traffic Engineers, and are a function of roadway speed, perception time, and pavement.

Vehicles traveling on South 20th Avenue should have adequate time to view a vehicle exiting the access road for South 20th Avenue and then come to a stop or slow down on South 20th Avenue. Similarly, vehicles exiting the access road should be able to see vehicles on South 20th Avenue at a distance great enough to ensure that the exiting vehicle can safely merge onto South 20th Avenue. The required stopping sight distance per the Institute of Traffic Engineering Standards is approximately 200 feet based upon a speed of 20 miles per hour.

The sight distance on South 20th Avenue from the proposed site access road, is about 2,000 feet to the east and 500 feet to the

TABLE 4.7-17

1989 BASELINE LEVELS OF SERVICE

(MINNEAPOLIS SOUTH SITE)

Intersection	Level of Service AM	Level of Service PM
East 28th Street and South 20th Avenue	A	A
East 28th Street and Hiawatha Avenue	B/C	B/C
East 28th Street and Cedar Avenue	B/C	B

Source: ERT 1985

north. As a result, vehicles on South 20th Avenue would have adequate time to react to vehicles exiting the access road. It can be concluded that adequate sight distance would exist at the proposed access road to allow for safe operations at its intersection with South 20th Avenue.

4.7.4 Facility Construction Traffic Demand

4.7.4.1 Resource Recovery Facility

Construction of the proposed resource recovery facility will occur over a 30- to 33-month period. Within this time frame, there will be an estimated peak construction period of three to six months. During this peak period about 210 construction workers will access the site. The average number of construction workers for the remaining construction phase will be about 130.

The majority of the construction worker traffic is expected to occur before the AM commuter peak hour (7-8:00 AM), and before and during the PM commuter peak hour (4:30-5:30 PM). Assumed arrival and departure times for the peak construction period will be as follows:

- o 75% off peak
- o 25% during peak.

Assuming a conservative ratio of 1.0 construction worker per vehicle, an estimate of the vehicular traffic increases at the various key intersections associated with the construction workers during both the AM and PM peak hours has been made.

Utilizing the above described assumptions, total construction worker trips during the peak commuting hours will be as follows:

Peak Construction

$$\frac{\text{(210 workers)(25\% during peak)}}{\text{(1.0 persons/vehicle)}} = \text{50 vehicles in and out during peak hour}$$

Average Construction

$$\frac{\text{(130 workers)(25\% during peak)}}{\text{(1.0 persons/vehicle)}} = \text{30 vehicles in and out during peak hour}$$

The number of construction vehicles cited above will not result in a change in level of service on the roadway system proximate to the proposed resource recovery facility.

4.7.4.2 Transfer Stations

Construction of the proposed transfer stations will occur over a 9- to 12-month period. Within this time frame, there will be an estimated peak construction period of 2 months. During this peak period, about 50 construction workers will access the site. The average number of construction workers for the remaining construction phase will be about 35.

Assumed arrival and departure times for the peak construction period will be as follows:

- o 75% off peak
- o 25% during peak

Assuming a conservative ratio of 1.0 construction worker per vehicle, an estimate of the vehicular traffic increases at the various key intersections associated with the construction workers during both the AM and PM peak hours has been made.

Utilizing the above described assumptions, total construction worker trips during the peak commuting hours will be as follows:

Peak Construction

$$\frac{(50\text{ workers})(25\%\text{ during peak})}{(1.0\text{ persons/vehicle})} = \text{15 vehicles in and out during peak hour}$$

Average Construction

$$\frac{(35\text{ workers})(25\%\text{ during peak})}{(1.0\text{ persons/vehicle})} = \text{10 vehicles in and out during peak hour}$$

The number of construction vehicles cited above will not result in a change in level of service on the roadway system proximate to the proposed transfer stations. Since this traffic is less than that expected with operation of the facilities at design capacity, construction traffic will have even less impact than facility operations.

4.8 Noise

4.8.1 Methodology

The following sections describe the methods used to predict future noise levels and impacts from construction and operation of the proposed resource recovery facility and the four transfer stations. Facility impacts were determined using FHWA 1978 (for traffic) and HUD 1984 assessment methodologies. Project noise levels were added logarithmically to existing noise levels. Increases of 3 dBA are generally considered to be imperceptible (Bolt, Beranek & Newman, 1973).

Operational Noise Level Prediction: Greyhound Facility

Sources of Noise

The steps used to predict future noise levels from normal operation of the planned facility are:

1. Project description information was reviewed along with empirical data on similar projects to identify major potential sources of facility noise.
2. Major noise sources were evaluated and ranked in importance for the specific characteristics of the project.
3. The noise sources from the project were incorporated in a point source propagation model (ERTNOI) to estimate noise levels at selected locations in the community.

A number of sources of exterior noise are associated with a resource recovery facility. The most significant of these, in Table 4.8-1, were used to estimate community noise levels. Other sources of noise, such as transformers, ventilation fans, baghouse fans, material (refuse and ash) conveyors, loud speakers, and steam reliefs are relatively insignificant. These do not normally increase the overall noise level above that produced by the sources listed in Table 4.8-1. Figure 4.8-1 places various noise levels in perspective relative to common everyday noises.

The following paragraphs briefly describe the salient characteristics of the dominant noise sources associated with the proposed facility.

Induced Draft Fans

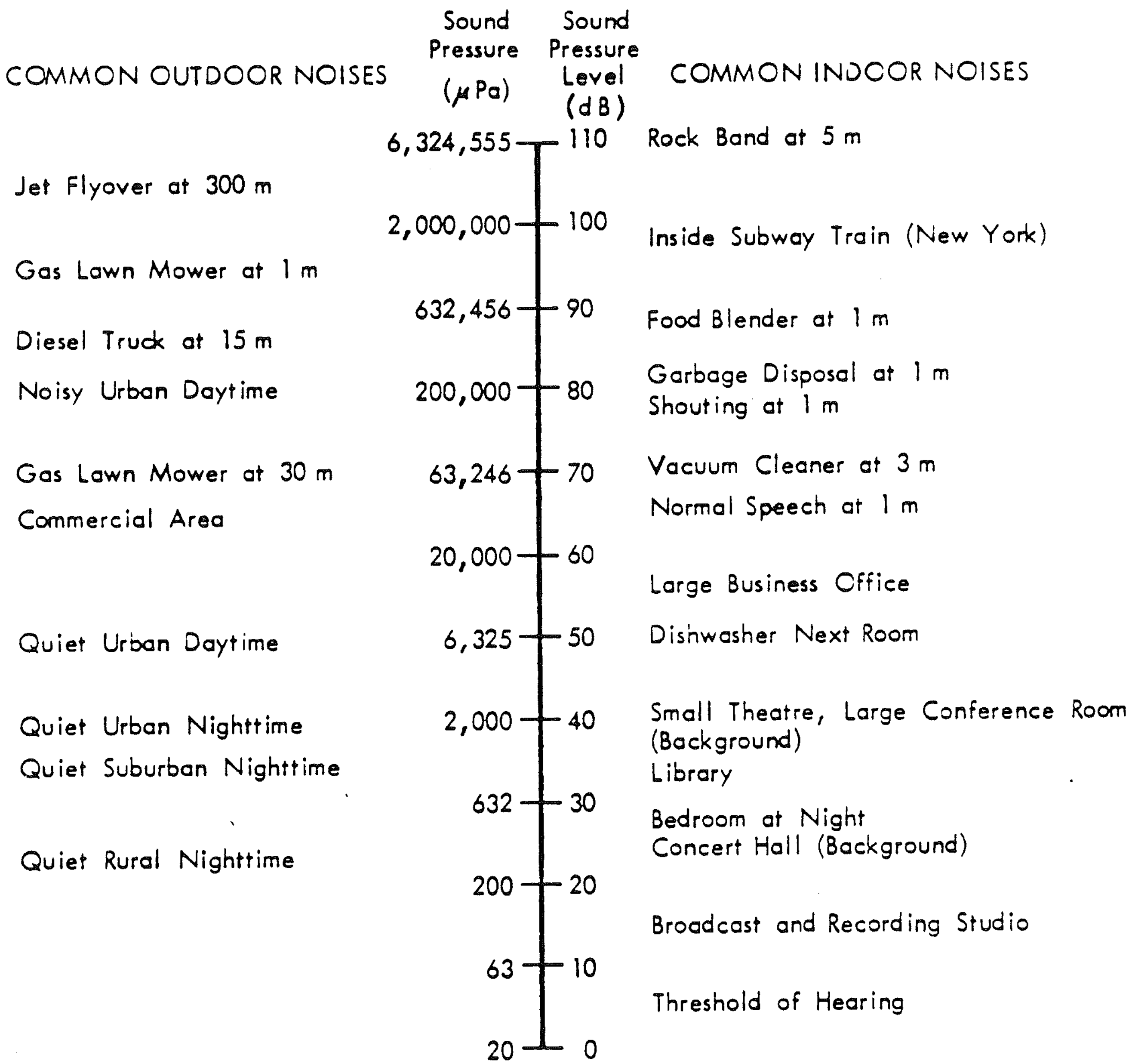
Induced draft (ID) fans can be the most significant source of noise not only because they contribute to the overall A-weighted level, but because they have the potential for generating a strong tonal component of noise. Tonal noise generation is generally associated with ID fans with inlet air flow control vanes for draft control. Use of variable speed drives for draft control has been shown to be effective in preventing such tonal problems. Variable speed drives also result in savings in electrical energy. The noise level analysis was based upon two ID fans discharging directly (without discharge silencers) into a common stack. The analysis also assumed uninsulated fan breachings (casing and duct work).

TABLE 4.8-1
PRIMARY SOURCES OF OPERATIONAL NOISE

Source	Overall Sound Power Level*	Characteristics
ID fans (Stack)	120	2 fans, @ 67,000 ACFM, 22.5 in w.g. (each)
ID fans (Casing)	105	Uninsulated fan casings and ducting assumed.
Tipping hall	120	2 primary air (FD) fans, @ 58,600 ACFM, 15 in. w.g. (each).
		Overhead crane (10 cu. yd)
		Trucks maneuvering and unloading into refuse bunker. (9 trucks @ max. RPM assumed)
Cooling tower	121	2 cells @ 200 hp each

Figure 4.8-1

COMMON INDOOR AND OUTDOOR NOISES



Source: "Highway Noise Fundamentals," Noise Fundamentals Training Document Number 2, U.S. Department of Transportation, Federal Highway Administration, September 1980.

Tipping Hall

The enclosed tipping hall has nine unloading bays and truck access doors facing the southeast. It was assumed that all the doors would be open. It was also assumed that nine packer type trucks, operating at maximum engine speeds, were in the tipping hall. A number of sources of noise are located either directly within the tipping hall (truck maneuvering and unloading area) or in adjacent areas such as the refuse bunker and the boiler house. Project plan calls for the use of inlet silencers on the primary air fans.

Cooling Towers

The noise from propeller type mechanical draft cooling towers represents a blending of fan noise at low frequency bands (31 Hz to 500 Hz) and waterfall noise in the higher (above 1000 Hz) bands. Generally no distinct tonal components stand-out. The noise may be considered low-frequency broadband noise. A free standing array of cooling towers generally exhibits lower noise levels at aspect angles corresponding to the closed ends of the array. Project plans are for a two speed drive cooling tower, to save energy and reduce noise levels during periods of reduced cooling requirements.

Noise Propagation Factors

A number of factors influence the propagation of sound out-of-doors. The basic mechanism determining sound pressure levels at a distance from a source is the spreading of the sound wave or "wave divergence." For a point source, hemispherical spreading of the source emission results in an attenuation rate of 6 dB per distance doubling from the source. Other factors affecting sound power propagation are:

- atmospheric absorption
- barriers,
- source directivity, and
- vegetation.

Atmospheric effects include both molecular absorption and excess attenuation. These are based upon summer conditions (59 degrees F and 70 percent relative humidity), the time when people are more likely to be outdoors. Some of the project buildings would act as noise barriers for those geometric conditions in which they break the line of sight between a noise source and a receptor point.

Some noise sources have significant directivity characteristics. For example, at a given distance from the cooling towers, noise levels along the longitudinal axis will be lower by over 5 decibels than noise levels on a perpendicular to this axis.

Operational Noise: Traffic

Project generated truck traffic would result in increased traffic volumes on streets in the vicinity of the proposed facility and transfer stations. The following procedure was used to predict the effect of increases due to traffic noise.

- o existing and future traffic composition and volumes were obtained for local streets;
- o traffic noise was evaluated at the roadside before and after the introduction of project traffic by using the Federal Highway Administration procedures (FHWA 1978); and
- o traffic volumes and resulting roadside noise levels were tabulated.

Operational Noise: Transfer Stations

The transfer stations have different facility layouts in order to accommodate the peculiarities of each of the four sites. Actual field measurement data is available for the noise emission directly opposite the truck access doors of a 1100 TPD resource recovery and transfer station in Baltimore, MD. This data is presented in Table 4.8-2, along with a simplified representation of transfer station operational noise emission. The measurement data are considered a worst case analysis for the proposed facilities. The RDF facility included the noise from shredders, conveyor belts, and truck arrivals of approximately one vehicle every two minutes. A conservative assumption of a 5 decibel noise level reduction at angles greater than 45 degrees was employed.

Construction Noise

The primary sources of noise during the construction of the proposed facilities would be from operation of diesel engine and pneumatic powered on-site construction equipment. Construction material delivery trucks generally represent a smaller contribution to increased noise levels. This is due to the fact that the trucks are distributed over the course of the work day. Peak volumes of construction trucks and employee vehicles on local streets are expected to be lower than the operational facility truck volumes (at design capacity).

Construction is generally carried out in reasonably discrete stages. Generic noise level data, based upon actual measurements at a number of power plant construction sites, have been developed for each stage (Teplitzky 1978). The empirical model used includes the effects of the appropriate equipment for each stage. It is based upon a conservative (maximum noise) set of assumptions regarding propagation (no wind or temperature gradients, no vegetation losses) and building scale. For the proposed project, construction noise levels were evaluated for the most noise producing stage of construction (excavation). Noise levels, presented in terms of L_{10} and L_{50}, represent relatively long term noise over this stage of construction.

4.8.2 Resource Recovery Facility

The following three sections present predicted noise levels, comparison of predicted noise levels with applicable standards, and an evaluation of the significance of the noise levels. Noise is considered for 1) operation of the facility, 2) traffic noise, and 3) construction noise.

TABLE 4.8-2

TRANSFER STATION OPERATIONAL NOISE

Measured data at 1100 TPD Baltimore, MD facility. At a point 100 feet directly opposite access doors, the following 15 minute noise level sample (dBA) was recorded:

L_{50}	L_{10}	L_{eq}
68	70	71

Simplified Representation of Transfer Station noise:

- o above data considered valid out to ±45° aspect angle
- o all other angles, assume additional attenuation of 5 dBA due to building wall transmission loss
- o 3 dBA attenuation per distance doubling to 1,000 feet; 6 dBA attenuation per distance doubling beyond 1,000 feet.

ERT, 1984

4.8.2.1 Noise Prediction Results

Operations

Predicted noise levels from the operation of the facility are presented in Table 4.8-3, along with existing (measured) noise levels and applicable standards. Noise levels are presented for a series of locations around the periphery of the site and at the noise measurement locations. Noise levels due to the facility alone and combined with existing levels are presented. In all cases, the predicted noise from the facility alone would be below the corresponding existing noise levels.

Truck Traffic

A maximum of approximately 240 packer trucks per day, plus a variety of other vehicles (private vehicles and employees) would access the project site primarily during the period 7:00 AM to 6:00 PM Monday through Friday.

During the AM peak period, the existing truck volumes on Sixth Avenue North are about 45 trucks per hour. The addition of project related traffic would increase local street roadside noise levels by a maximum of 4 dBA on Sixth Avenue North, just west of the site entrance. On the other major access roads the traffic noise increases would be in the range of 1 to 2 dBA, as shown in Table 4.8-4. At greater distances from the facility, increased traffic would be expected to be a smaller proportion of total traffic. It therefore would have an even smaller effect on roadside noise levels.

Construction

Construction of the facility is expected to take approximately two years, and will consist of the basic sequence of site clearing and grading activities, foundation work, steel erection and the installation of facility equipment. Table 4.8-5 presents noise levels for the excavation phase of construction.

A review of structural bearing loads and soil conditions indicates that there will be a requirement for pile driving. It has been assumed that pile driving would generally be performed along with other construction activity during normal working hours from 7:00 AM to 6:00 PM. If impact type pile driving is employed, the maximum exterior noise level occurring at the closest receptors (such as the MTC building on Sixth Avenue North) would be approximately 80 dBA. Interior noise levels would be anywhere from 10 to 25 dBA lower, depending on whether the windows are open or closed (and the tightness of the window seal). If other methods of installing piles are employed, noise levels would be reduced. If soil conditions permit, vibratory pile drivers would result in noise level reductions of at least 10 dBA. Use of special mufflers and enclosure of the hammer of impact type pile drivers has resulted in noise reductions of 20 dBA on some projects (O'Neill 1972).

TABLE 4.8-3

GREYHOUND SITE: COMPARISON OF EXISTING AND FUTURE NOISE LEVELS

Number	Evaluation Location Description	(H)or(L)	Highest (H) & Lowest (L) Existing Levels L_{50}	L_{10}	L_{eq}	Predicted Facility Levels	Project Increase L_{50}	L_{10}	L_{eq}	Total Prediction Levels L_{50}	L_{10}	L_{eq}	MPCA 2 Standard L_{50}	L_{10}	L_{eq}	Minneapolis Standards Duration Greater Than 2 Hours Daytime 4
1	West Side of 7th St. North	(H)	-	-	-	55	NA	NA	NA	61	65	62	75	80	78	60
		(L)	-	-	-	55	NA	NA	NA	56	59	57				
2	West side of 7th St. North	(H)	-	-	-	56	NA	NA	NA	61	66	62	75	80	78	60
		(L)	-	-	-	56	NA	NA	NA	57	59	58				
GHA	North of 6th Ave. North (MTC Building)	(H)	60	65	62	59	3	1	2	63	66	64	65	70	68	60
		(L)	50	56	53	59	10	5	7	60	61	60				
4	East of 5th St. North (Hill Crest Dev. Bldg.)	(H)	-	-	-	55	NA	NA	NA	61	65	62	75	80	78	60
		(L)	-	-	-	55	NA	NA	NA	56	59	57				
GH1	S. Corner of 3rd Ave. North & 5th St. West (Butler Sq. Bldg.)	(H)	64	69	67	54	0	0	0	64	69	67	65	70	68	60
		(L)	57	61	61	54	2	1	1	59	62	62				
GH2	10th Ave. North & 5th St. South & North (Residential Apt. Bldg.)	(H)	62	67	65	<40	0	0	0	62	67	65	60	65	63 (day)	60
		(L)	57	61	60	<40	0	0	0	52	61	60	50	55	53 (night)	50
GH3	6th Ave. N., between 3rd St. North & 56h St. North	(H)	65	75	71	<40	0	0	0	65	75	71	75	80	78	60
		(L)	57	63	61	<40	0	0	0	57	63	61				
GH4	At SW corner of Border Ave. & 3rd St. North	(H)	6.1	66	65	<40	0	0	0	61	66	65	75	80	78	60

Source: ERT, 1985

1. Refer to Figure 3.7-1 for map showing noise measurement and evaluation location. Measurements were not conducted at locations 1, 2, and 4; for purposes of computing toatl noise levels it was assumed.

2. The present MPCA standard is based upon L_{50} and L_{10}; proposed changes involve use of the L_{ez} metric.

3. The limiting value of the daytime (7 AM - 6 PM) noise for non-residential areas is 60 DBA; for night-time (6 PM - 7 AM), the corresponding limit is 50 dBA. For residential districts night-time is defined as 10 PM - 7 AM.

TABLE 4.8-4

ROADSIDE NOISE LEVELS (dBA) DUE TO TRAFFIC

(GREYHOUND SITE)*

Street	Traffic Volumes (Vehicles/Hour): Baseline Traffic (Without Project)			Future Traffic (With Project)			Predicted Noise Levels**		
	Cars	Trucks	Total	Cars	Trucks	Total	Exit.	Future	Increase
Sixth Ave. N. (west of site)	883	47	930	883	162	1045	73	77	4
Sixth Ave. N. (east of site)	1036	69	1375	1306	89	1395	74	75	1
Seventh St. N (north of Sixth Ave. N.)	912	48	960	912	68	980	73	74	1
Seventh St. N (south of Sixth Ave. N.)	1463	77	1540	1463	122	1585	75	77	2
Olson Mem. Hgwy. (west of Seventh St. N)	1453	77	1530	1453	127	1580	75	77	2
Fifth St. N (north of Sixth Ave. N)	366	19	385	366	29	395	69	70	1

Source: ERT, 1985

* Based upon 1989 AM peak hour traffic volumes and project "design" capacity volumes.

** Traffic volumes based upon the conservative assumption that existing traffic composition is five percent heavy duty trucks.

** Based upon L_{eq}; evaluated for steady flow at 40 mph and 25 feet from traffic; excludes existing noise levels from non-traffic sources of noise.

TABLE 4.8-5

AVERAGE CONSTRUCTION NOISE LEVELS FOR THE EXCAVATION PHASE

(GREYHOUND SITE), dBA

Evaluation Location[1]		Highest Existing Noise Level			Predicted Construction Levels			Total Construction & Existing[2]			Increase		
Number	Description	L_{50}	L_{10}	L_{eq}	L_{50}	L_{10}	L_{eq}	L_{50}	L_{10}	L_{eq}	L_{50}	L_{10}	L_{eq}
1	West side of Seventh St. N.	-	-	-	73	78	76	73	78	76	13	13	14
2	West side of Seventh St. N.	-		-	73	78	76	73	78	76	13	13	14
GHA	North of Sixth Ave. N. (MTC Bldg.)	60	65	62	67	72	70	68	73	71	8	8	9
4	East of Fifth St. N. (Hillcrest Dev. Bldg.)	-		-	71	75	73	71	75	73	11	10	11
GH1	Butler Sq. Bldg.	64	69	67	61	66	64	66	71	69	2	2	2
GH2	Tenth Ave. N & Fifth St. N. (Residential Apt. Bldg.)	62	67	65	53	58	56	63	68	66	1	1	1
GH3	Sixth Ave. N., between Third St. N & Fifth St. N.	65	75	71	57	62	60	66	75	71	1	0	0
GH4	At SW corner of Border Ave. & Third Ave. N.	61	66	65	53	58	56	62	67	66	1	1	1

1. Refer to Figure 3.7-1 for map showing noise measurement and evaluation locations.

2. Measurements were not conducted at locations 1, 2 and 4.

Source: ERT, 1985.

4.8.2.2 Comparison to Noise Standards

Operational

Existing, measured noise levels at the closest receptors (which are generally office and manufacturing land uses), do not exceed MPCA standards. At the closest residences (location GH2) existing daytime and nighttime standards are exceeded by up to 7 dBA (L_{50}) nighttime. The facility would not increase noise levels at this receptor. Although standards will continue to be exceeded, the noise from the facility would not contribute to these exceedances. Noise level increases from the facility at receptors GH1, GH3 and GH4 would would be less than 3 dBA which is an imperceptible increase. Predicted noise levels will be below standards. At receptor GHA, the MTC building, noise levels in the evening would increase by as much as 10 dBA and would be perceptible.

Existing noise levels exceed the Minneapolis (greater than two hour period) 60 dBA standard at all locations. Operation of the facility would not significantly alter the extent of exceedances of the Minneapolis standard. Noise level increases from the facility would be less than 3 dBA at receptors GH1 through GH4. Increases of 3 dBA or less are not perceptible. The increases at receptor GHA would be perceptible. Levels at this receptor, however, are not expected to exceed standards.

Traffic

Existing and predicted future traffic noise levels are within appropriate proposed MPCA standards (78 dBA for L_{eq}). Increases in noise levels from truck traffic would be 4 dBA or less. Increases in noise levels at Sixth Avenue North would be 4 dBA, barely perceptible. At all other receptors the increases would be less than 3 dBA and are considered to be imperceptible.

Construction

Construction activity is under the MPCA Noise Area Classification (NAC) 4 SLUCM numerical code 95 ("Under Construction"), for which no standards exist. The City of Minneapolis regulates construction noise by restricting construction to the hours of 7:00 AM to 6:00 PM, Monday through Friday. Exceptions to this rule are possible. Predicted increases in noise levels for construction would be as much as 14 dBA, clearly perceptible (at receptors 1 and 2). Increases at residential receptor GH2 would be one dBA and not perceptible. All increases in noise levels from construction would be short term and temporary in nature. Peak construction activities are expected to occur for only 6 to 9 months.

4.8.2.3 Significance of Predicted Noise Levels

Operational

As noted, the proposed project is not expected to result in the exceedance of applicable standards. Increases at residential receptor GH2 would be less than 3 dBA, and therefore imperceptible. Standards at this receptor are currently being exceeded. Noise levels at all other receptors would be below standards.

The noise spectrum of the project is expected to be broadband and of lower amplitude than the existing noise environment. For these reasons, project noise is not expected to be particularly perceptible. The dominant noise source is the cooling tower. Experience shows that cooling tower noise is not generally considered to be a source of annoyance (Teplitzky, 1978).

Traffic

Traffic noise increases at residential and commercial receptors would generally be 4 dBA or less, which is a normally barely perceptible increase. For a limited portion of Sixth Avenue North, from the site entrance west to Seventh Street North and the Olson Highway, noise levels would increase by 4 dBA. In this one area, pedestrians and others exposed to roadside noise would experience an increase of approximately 4 dBA (L_{eq} and L_{10}). This would be barely noticeable to some people, but would not normally be considered to be a source of significant annoyance.

Construction

Construction is expected to be generally confined to weekday, daytime periods. Because of the hours of activity and the overall brief duration, noise associated with project construction is not expected to cause significant annoyance or other noise impacts to people working in adjacent commercial areas. Peak construction is expected to occur for only a brief period, 6 to 9 months. There are no standards for construction generated noise.

During some relatively brief periods of construction, higher noise levels may be experienced. As noted previously, pile driving noise may be on the order of 80 dBA. This would be audible above existing traffic noise and general construction noise. It is not expected, however, to result in a long term source of annoyance to people using sidewalks.

Another brief, but very high level noise, occurs near the end of the overall construction period as part of plant startup, when the steam system is purged of construction debris. The significance of noise from the boiler blow-down operation can be reduced by effective public notification and schedule planning. The noise from this operation would be short term in nature.

4.8.3 Bloomington East Transfer Station

4.8.3.1 Noise Prediction Results

Operation

As noted earlier in Section 3.7, existing measured noise levels are equivalent to or greater than MPCA daytime NAC-1 standards at three of the sensitive receptor areas (BE1, BE2 and BE4/BEA). Predicted transfer station operational noise levels at the noise evaluation locations are presented in Table 4.8-6. The component of

TABLE 4.8-6

NOISE LEVELS ASSOCIATED WITH TRANSFER STATION OPERATION*

(BLOOMINGTON EAST)

Sensitive Receptors			Existing Noise Levels (Measured)			Predicted Noise Levels				Standard MPCA***			
						Transfer Station Only	Total: Existing Plus Transfer Site						
Key**	Feet	Direction	L_{50}	L_{10}	L_{eq}		L_{50}	L_{10}	L_{eq}	NAC	L_{50}	L_{10}	L_{eq}
BE1	1000	NW	57	67	64	60	62	68	65	1	60	65	63
	Increase						5	1	1				
BE2	800	NE	60	67	67	57	62	67	67	1	60	65	63
	Increase						2	0	0				
BE3	600	SW	56	63	61	58	60	64	63	1	60	65	63
	Increase						4	1	2				
BE4	3100	W	64	70	68	52	64	70	68	1	60	65	63
	Increase						0	0	0				
BEB	600	W	62	64	62	64	66	67	66	2	65	70	68
	Increase						4	3	4				
BEA	3100	W	65	72	68	52	65	72	68	1	60	65	63
	Increase						0	0	0				

* Levels are for day time period only. Normal hours of operation will be limited to 6 AM to 7 PM, Monday through Friday.

** Please refer to Table 3.7-9 and/or Figure 3.7-2 for the location of the receptor areas with respect to the proposed transfer station.

*** The L_{eq} values are in the currently proposed revisions to the MPCA standard and are presented for information only. As noted earlier, the Bloomington area and property line standards are L_{10} = 70 dBA (industrial), 60 dBA (residential).

Source: ERT, 1985.

noise due to the facility alone is generally equal to or lower than measured L_{10} values and no more than 5 dBA greater than existing L_{50} noise levels. At residential receptor BE-3, L_{50} levels would increase by 4 dBA and as a result would equal the MPCA standards for this statistic. In this case, the increase would be perceptible (4 dBA) and would result in an exceedance of standards. At Receptor BEI, noise levels would increase by 5 dBA (a perceptible increase) and would cause an exceedance of standards. At receptor BED, the Donaldson Company, noise levels would increase by 4 dBA resulting in an exceedance of the L_{50} standard noise levels at BE2, BE4 and BEA already exceed standards. The increase at these receptors would be 2 dBA less which is imperceptible.

Traffic

The primary truck access route is West 94th Street (east of James Avenue), south on James Avenue and west on West 96th Street to the Bloomington East transfer station. Table 4.8-7 presents traffic volumes and resulting noise levels along the various access routes to the project site. At several locations, noise levels could increase by as much as 5 dBA adjacent to roadways.

Construction

Construction of the transfer station is expected to be of relatively brief (9 to 12 months) total duration. The period of maximum noise generation (excavation) is expected to be of short, on the order of one month or less.

4.8.3.2 Comparison to Noise Standards

Operational

MPCA and City of Bloomington noise criteria are also presented in Table 4.8-6. Predicted project noise levels alone (excluding existing noise levels) are in compliance with these regulations. At all receptors, future noise levels would equal or exceed MPCA standards. The increases due to the project would be 5 dBA or less. These increases would be barely perceptible, and occur during daylight hours. Increases in noise levels of 3 dBA or less are considered to be imperceptible. At receptors BEI, BE3, and BEB, increased noise levels from the project would result in exceedances of standards.

The primary truck access routes to the transfer station generally avoid residential areas. Truck noise levels at certain receptors would exceed commercial zone noise standards (L_{eq} = 68 dBA). At these receptors the increase due to truck noise would be 5 dBA or less, which is barely perceptible.

Construction

Construction activity falls under the MPCA Noise Area Classification 4 (SLUCM Numerical Code 95, "Under Construction"), for which no standards exist. The City of Bloomington regulates construction noise by limiting construction equipment noise levels to

TABLE 4.8-7

ROADSIDE NOISE LEVELS (dBA) DUE TO TRAFFIC

(BLOOMINGTON EAST SITE)*

Street	Traffic Volumes (Vehicles/Hour)						Predicted Noise Levels*		
	Existing (Without Project)			Future Traffic (With Project)					
	Cars	Trucks	Total	Cars	Trucks	Total	Exit.	Future	Increase
W Ninety Sixth St. (W of site)	81	4	85	81	74	155	63	68	5
W Ninety Sixth St. (W of James)	228	12	240	228	17	245	67	68	1
Girard Ave. S.	57	3	60	57	13	70	61	66	5
Humbolt Ave. S.	33	2	35	33	22	55	60	65	5
Irving Ave. S.	47	3	50	47	3	50	61	61	0
James Ave. S.	261	14	275	261	19	280	68	69	1
James Ave. (N of W Ninety Sixth St.)	347	18	365	347	78	425	69	73	4
W. Ninety Fourth St. (E of James)	774	41	815	774	91	865	72	75	3
W Ninety Fourth St. (W of James)	465	25	490	465	25	490	70	70	0

Source: ERT, 1985

* Based upon 1989 AM peak hour traffic volumes and project "design" capacity volumes.

** Traffic volumes based upon the conservative assumption that existing traffic composition is five percent heavy duty trucks.

** Based upon L_{eq}; evaluated for steady flow at 40 mph and 25 feet from traffic; excludes existing noise levels from non-traffic sources of noise.

an L_{10} value of 85 dBA at 50 feet. Project construction activity would comply with these applicable standards. Construction activity would be short term.

4.8.3.3 Significance of Noise Levels

Transfer station operations will be confined to the hours of 7:00 AM to 6:00 PM, Monday through Friday. Predicted operational noise levels are generally 5 dBA or less above existing noise levels. Increases of 3 dBA or less would be imperceptible to the community. Increases of 5 dBA would be barely perceptible. Because the transfer facilities will not operate in the evening hours, there would be no increases in noise levels during this time.

Noise level increases associated with increased truck traffic would occur along streets which do not have extensive residential development. There would be no increase in noise levels during evening hours when sleep might otherwise be disturbed. Therefore, increases in traffic noise are not expected to significantly adversely affect the general public.

4.8.4 Brooklyn Park East Transfer Station

4.8.4.1 Noise Prediction Results

Operational

Predicted operational noise levels for the Brooklyn Park East transfer station are presented in Table 4.8-8. Noise levels due to the facility alone are generally commensurate with existing noise levels. The increases in noise levels due to the project would be 5 dBA or less at all receptors. Noise levels at receptor BP1 already exceed standards. Increases due to the project would be barely perceptible. At receptor BP2, noise levels currently exceed standards and increases from the project would be imperceptible. Noise levels at receptor BP3 would result in exceedances of standards, project increases would be imperceptible.

Traffic

Truck traffic to the transfer station facility will use Winnetka Avenue and 68th Avenue North. Roadside noise levels due to project traffic are compared with existing noise levels in Table 4.8-9. Roadside noise levels would increase by 4 to 5 dBA due to the addition of project traffic to these roads.

Construction

Construction of the transfer station is expected to take 9 to 12 months. The period of maximum noise generation (excavation) is expected to be on the order of one month or less.

TABLE 4.8-8

NOISE LEVELS ASSOCIATED WITH TRANSFER STATION OPERATION*

(BROOKLYN PARK EAST)

Sensitive Receptors			Existing Noise Levels (Measured)			Predicted Noise Levels: Transfer Station Only	Predicted Noise Levels: Total: Existing Plus Transfer Site			Standard MPCA***			
Key**	Feet	Direction	L_{50}	L_{10}	L_{eq}		L_{50}	L_{10}	L_{eq}	NAC	L_{50}	L_{10}	L_{eq}
BP1	1000	SE	60	63	62	61	64	65	65	1	60	65	63
	Increase						4	2	3				
BP2	1600	SE	63	66	65	57	64	67	66	1	60	65	63
	Increase						1	1	1				
BP3	600	NE	58	61	59	58	61	63	62	1	60	65	63
	Increase						3	2	3				
BP4	1800	N	58	62	61	51	59	62	61	1	60	65	63
	Increase						1	0	0				
BPA	500	NE	56	58	56	59	61	62	61	3	75	80	78
	Increase						5	4	5				

* Noise levels are for daytime period only. Normal hours of operation will be limited to 6 AM to 7 PM, Monday through Friday.

** Refer to Table 3.7-11 and/or Figure 3.7-3 for the location of the receptor areas with respect to the proposed transfer station.

*** The L_{eq} values are in the currently proposed revisions to the MPCA standard and are presented for information only. Brooklyn Park does not have quantitative noise standards.

Source: ERT, 1985.

TABLE 4.8-9

ROADSIDE NOISE LEVELS (dBA) DUE TO TRAFFIC

(BROOKLYN PARK EAST SITE)*

Street	Traffic Volumes (Vehicles/Hour)								
	Existing (Without Project)			Future Traffic (With Project)			Predicted Noise Levels*		
	Cars	Trucks	Total	Cars	Trucks	Total	Exit.	Future	Increase
Winnetka Ave.	19	1	20	19	11	30	57	61	4
Sixty Eighth Ave. N.	38	2	40	38	37	75	60	65	5

* Based upon 1989 AM peak hour traffic volumes and project "design" capacity volumes.

** Traffic volumes based upon the conservative assumption that existing traffic composition is five percent heavy duty trucks.

** Based upon L_{eq}; evaluated for steady flow at 40 mph and 25 feet from traffic; excludes existing noise levels from non-traffic sources of noise.

Source: ERT, 1985.

4.8.4.2 Comparison of Noise Standards

Operations

Existing noise levels at several receptor locations (BP1 and BP2) equal or exceed MPCA residential area (NAC-1) standards. Transfer station operational noise levels would result in additional exceedances of the standard at these receptors by 4 dBA or less as indicated in Table 4.8-8. The Brooklyn Park ordinances deal exclusively with noise as a nuisance and do not set noise level requirements. At receptor BP3, noise from the project would result in an initial exceedance of the L_{50} standard. The increase attributable to the project at this receptor would, however, be 3 dBA or less, which is barely perceptible. Noise standards at receptors BP4 and BPA would be met.

Increased truck traffic on 68th Avenue North may result in exceedance of the MPCA residential daytime standard (for L_{eq}). The increase attributable to truck traffic would be 5 dBA, barely perceptible.

Construction

Construction activity falls under the MPCA Noise Area Classification (NAC) 4 (SLUM numerical code 95, "Under Construction"), for which no standards exist. Construction impacts would be short term in duration.

4.8.4.3 Significance of Noise Levels

Operational noise level increases would be in the range of 0 to 5 dBA maximum. Operation of the facility would result in a barely perceptible noise increase in at the closest receptors. Nighttime noise levels would not be increased as the facility would only operate in the daytime. It is therefore not anticipated that sleep or leisure time activities would be affected by the project. Only at receptor BP3 would noise from the project result in an exceedance of standards. The project increase would be barely noticeable at this receptor.

Increased traffic noise (of 4 dBA to 5 dBA) may be perceptible. The increases will occur during daylight hours but would not affect nighttime activities. Construction impacts would be short term in nature.

4.8.5 Hopkins Transfer Station

4.8.5.1 Noise Prediction Results

Operational

Predicted operational noise levels from the transfer station are presented in Table 4.8-10. All the sensitive receptors identified in Table 4.8-10 equal or exceed MPCA standards. The effect of the transfer station operation is to increase existing noise levels by 3 dBA or less. An increase of 3 dBA or less is imperceptible.

TABLE 4.8-10

NOISE LEVELS ASSOCIATED WITH TRANSFER STATION OPERATION*

(HOPKINS DOT SITE)

Sensitive Receptors			Existing Noise Levels (Measured)			Predicted Noise Levels				Standard MPCA***			
						Transfer Station Only	Total: Existing Plus Transfer Site						
Key**	Feet	Direction	L_{50}	L_{10}	L_{eq}		L_{50}	L_{10}	L_{eq}	NAC	L_{50}	L_{10}	L_{eq}
HD1	1000	N	67	73	70	61	68	73	71	1	60	65	63
	Increase						1	0	1				
HD2	1400	E	64	69	67	53	64	69	67	1	60	65	63
	Increase						0	0	0				
HD3	700	SW	62	66	64	59	64	67	65	1	60	65	63
	Increase						2	1	1				
HD4	700	S	61	71	70	60	64	71	70	1	60	65	65
	Increase						3	0	0				
HDA	700	S	58	61	59	60	60	64	62	1	60	65	63
	Increase						2	3	4				
HDB	1000	N	66	72	70	61	67	72	71	1	60	65	63
	Increase						1	0	1				
HDC	800	S	58	66	63	60	61	67	65	1	60	65	63
	Increase						3	1	2				

* Noise levels are for day time period only. Normal hours of operation will be limited to 6 AM to 7 PM, Monday through Friday.

** Please refer to Table 3.7-13 and/or Figure 3.7-4 for the location of the receptor areas with respect to the proposed transfer station.

*** The L_{eq} values are in the currently proposed revisions to the MPCA standard and are presented for information only. The Hopkins standard is the same as the MPCA's except that daytime is defined as beginning and ending one hour earlier.

Source: ERT, 1985.

Traffic

Traffic volumes and resulting predicted noise levels are presented in Table 4.8-11. County Road 3 will be the approach route to the facility. Increases in roadside traffic noise would be 2 dBA or less, due to the existing high traffic volume on County Road 3. An increase of 2 dBA or less is considered to be insignificant.

Construction

Construction of the transfer station is expected to be of relatively brief. The period of maximum noise generation (excavation) is expected to be on the order of one month or less.

4.8.5.2 Comparison to Noise Standards

Operation

Existing noise levels exceed the MPCA residential, daytime, (NAC-1) standard at every evaluation location in Table 4.8-10. The addition of the transfer station facility does not result in additional noise level exceedances. The increases at all receptors are 3 dBA or less. A 3 dBA or less increase would be imperceptible. Noise levels would not increase during nighttime hours.

At residential receptor HD1, noise levels currently exceed standards. Project induced noise increases would be less than 3 dBA and would be imperceptible. At residential receptor HD2, noise levels currently exceed standards and would not increase. At residential receptor HD3, noise levels currently exceed standards and would increase by an imperceptible amount (less than 3 dBA). At residential HD4 (Sixth Avenue and Fifth Avenue South), noise levels exceed standards and would increase by an imperceptible amount.

Traffic

Existing traffic noise exceeds the MPCA residential, daytime, (NAC-1) standard at residences along County Road 3, such as the Town Terrace Apartments (location HDB), by as much as 12 dBA (L_{10}). The addition of project traffic would increase this exceedance by 2 dBA. The increase of 2 dBA is not considered to be significant.

Construction

Construction activity falls under the MPCA Noise Area Classification (NAC) 4 (SLUM numerical code 95, "Under Construction"), for which no standards exist.

4.8.5.3 Significance of Noise Levels

Project operational and traffic noise increases result in generally small increases above existing levels (on the order of 3 dBA or less). The resulting noise environment is not expected to be perceived as different from the existing noise environment. Noise standards are currently exceeded at all receptors. No perceptible increase in noise levels would occur.

TABLE 4.8-11

ROADSIDE NOISE LEVELS (dBA) DUE TO TRAFFIC

(HOPKINS DOT SITE)*

Street	Traffic Volumes (Vehicles/Hour): Existing (Without Project)			Future Traffic (With Project)			Predicted Noise Levels*		
	Cars	Trucks	Total	Cars	Trucks	Total	Exit.	Future	Increase
Third St. (E of site)	299	16	315	299	16	315	68	68	0
Third St. (W of site)	299	16	315	299	16	315	68	68	0
county Rd. 3 (W of Fifth Ave. S)	1924	101	2025	1924	131	2055	76	77	1
County Rd. 3 (E of Fifth Ave. S)	2365	125	2490	2365	225	2590	77	79	2
Fifth Ave. (N of County Rd. 3)	499	26	525	499	26	525	70	70	0

* Based upon 1989 AM peak hour traffic volumes and project "design" capacity volumes.

** Traffic volumes based upon the conservative assumption that existing traffic composition is five percent heavy duty trucks.

** Based upon L_{eq}; evaluated for steady flow at 40 mph and 25 feet from traffic; excludes existing noise levels from non-traffic sources of noise.

4.8.5.4 Trucks Accessing Facility From Second Avenue South

The City of Hopkins has indicated that it believes that truck traffic might access the facility by Second Avenue South even if that road were posted to prohibit truck traffic (Rapp, 1985). Assuming that trucks would access from Second Avenue South, noise levels would be increased by an additional 3 dBA at receptors HDA, HDC, and HD4. Under these conditions noise levels at these receptors would exceed standards and would increase over baseline levels by as much as 7 dBA, a perceptible increase.

4.8.6 Minneapolis South Transfer Station

4.8.6.1 Noise Prediction Results

Operation

Predicted operational noise levels from the transfer station operation are presented in Table 4.8-12. Noise levels with the facility in operation are expected to be from 0 to 5 dBA greater than existing noise levels.

Traffic

Truck traffic to the Minneapolis South transfer station will use 28th Avenue East and 20th Avenue South to access the site. Roadside noise levels due to project traffic are compared with existing traffic noise levels in Table 4.8-13. Increases would be 7 dBA or less.

Construction

Construction of the transfer station is expected to be of relatively brief (9 to 12 months) total duration. The period of maximum noise generation (excavation) is expected to be short, on the order of one month or less.

4.8.6.2 Comparison to Noise Standards

Operation

Existing noise levels at all sensitive receptors monitored in the vicinity of the Minneapolis South Transfer Station Site equal or exceed MPCA daytime, residential (NAC-1) standards. Addition of the facility would increase noise levels by 5 dBA or less. These increases would be barely perceptible. Noise levels would continue to exceed standards. Nighttime noise levels would not increase as the facility would only operate during daylight hours.

At receptor MSI and MSA, noise levels currently exceed standards. Project increases would be 5 dBA or less and barely perceptible. Similarly, at receptor MS2 (residential) noise levels currently exceed standards and would increase by 5 dBA or less which is barely perceptible. Noise levels would not be increased at residential receptor MS3.

TABLE 4.8-12

NOISE LEVELS ASSOCIATED WITH TRANSFER STATION OPERATION*

(MINNEAPOLIS SOUTH SITE)

Sensitive Receptors			Existing Noise Levels (Measured)			Predicted Noise Levels: Transfer Station Only	Predicted Noise Levels: Total: Existing Plus Transfer Site			Standard MPCA***			
Key**	Feet	Direction	L_{50}	L_{10}	L_{eq}		L_{50}	L_{10}	L_{eq}	NAC	L_{50}	L_{10}	L_{eq}
MS1	250	S	62	68	65	67	67	71	69	1	60	65	63
	Increase						5	3	4				
MS2	600	NE	60	64	64	63	65	67	67	1	60	65	63
	Increase						5	3	3				
MS3	1000	W	66	72	70	56	66	72	70	1	60	65	63
	Increase						0	0	0				
MSA	250	S	65	72	69	67	69	73	71	1	60	65	63
	Increase						4	1	2				

* Levels are for daytime period only. Normal hours of operation will be limited to 6 AM to 7 PM, Monday through Friday.

** Please refer to Table 3.7-15 and/or Figure 3.7-5 for the location of the receptor areas with respect to the proposed transfer station.

*** The L_{eq} values are in the currently proposed revisions to the MPCA standard and are presented for information only.

Source: ERT, 1985.

TABLE 4.8-13

ROADSIDE NOISE LEVELS (dBA) DUE TO PROJECT TRAFFIC

(MINNEAPOLIS SOUTH SITE)*

Street	Future Traffic Volumes (Vehicles/Hour)**						Predicted Noise Levels***		
	Without Project			With Project					
	Cars	Trucks	Total	Cars	Trucks	Total	Exist.	Future	Increase
Twentieth Ave. S	138	7	145	138	97	235	65	70	5
Twenty Ninth St. E	38	2	40	38	2	40	60	60	0
Twenty Eighty St. E (E of Twentieth Ave. S)	247	13	260	247	83	330	67	74	7
Twenty Eighth St. E (W of Twentieth Ave. S)	256	14	270	256	34	290	68	71	3
Cedar Ave. S.	1396	74	1470	1396	84	1480	75	75	0

* Based upon 1989 AM peak hour traffic volumes and project "design" capacity volumes.

** Traffic volumes based upon the conservative assumption that existing traffic composition is five percent heavy duty trucks.

*** Based upon L_{eq}; evaluated for steady flow at 40 mph and 25 feet from traffic; excludes existing noise levels from non-traffic sources of noise.

Source: ERT, 1985.

Traffic

Existing traffic on 28th Street East (west of 20th Avenue South) exceeds the MPCA daytime, residential (NAC-1) standard. The addition of project traffic would increase the exceedance by approximately 7 dBA in certain instances. This would result in a perceptible increase in noise levels. Noise increases would be during daylight hours only.

Construction

Construction activity falls under the MPCA Noise Area Classification (NAC) 4 (SLUM numerical code 95, "Under Construction"), for which no standards exist. The City of Minneapolis regulates construction noise restricting construction activity to the hours of 7:00 AM to 6:00 PM Monday through Friday. Exceptions to this rule are possible.

4.8.6.3 Significance of Noise Levels

Transfer station operation and traffic would result in barely perceptible increases in daytime noise levels at residences exposed to these sources of noise. Standards are exceeded at all receptors analyzed. Expected increases would be barely perceptible. The project would not be expected to be considered a significant source of annoyance to these residences. The only significant increase would be from truck traffic on 28th Street East.

4.9 Utilities

4.9.1 Methodology

Data was gathered regarding existing water, sanitary and storm sewers, gas lines, transmission lines, and telephone lines serving each proposed site. Information was developed from site visits and from information provided by the Minneapolis Water and Sewer Departments; the city engineering departments of Bloomington, Brooklyn Center, Hopkins, Minnegasco, Northern States Power and the Hennepin County Department of Transportation. The utility requirements for the proposed resource recovery facility were based on information provided by Blount. Transfer station utility requirements were estimated based on existing knowledge of actual transfer station operations. Additional detail regarding facility utility requirements is contained in HDR's Environmental Technical Report 12, Utilities.

4.9.2 Greyhound Site

The facility will require water for the following purposes: cooling water, boiler makeup, plant water, domestic use, and fire protection. Circulation water will be needed for turbine condensers. Makeup of circulation water is necessary to offset cooling tower blowdown, cooling tower drift and evaporation losses. Plant water is used for washdown and other auxiliary purposes. Boiler makeup would be required for boiler blowdown.

On the average, approximately 864,000 gallons per day (gpd) of water will be required. Peak water demand will not vary significantly. Table 4.9-1 summarizes the anticipated water requirements for average and peak consumption. Since treated city water is well suited for boiler makeup, plant use, cooling water, and domestic use, the water requirement for these purposes would be provided by the municipal water system. A 1400 linear foot 10 inch main would be installed to loop the facility with the existing city water mains buried along Sixth Avenue North and Fifth Street North. Six-inch and eight-inch mains to connect the residue storage and processing buildings would also be installed. Average daily water demand for boiler makeup, plant use, cooling water, and domestic use represents approximately 1.5 percent of the average daily water use of the municipal system and is well within the capacity of the system.

Fire protection water requirements will be established by insurance carriers of the facility and by the City of Minneapolis. Based on Blount's proposal, fire protection requirements would be 1000 gpm. Fire flow would be supplied from the City system. A ten-inch loop design will provide 1000 gpm flow for a period of three hours, or 180,000 gallons for fire protection.

Wastewater will result from boiler blowdown, plant use, domestic waste and cooling tower blowdown. All of this wastewater will be discharged to the sanitary sewer. Average and peak flow to the sanitary sewer will be 80 gpm and 200 gpm, respectively. Peak flows would occur only a small percentage of the time. The average facility wastewater flows of 117,250 gpd would equal approximately three

TABLE 4.9-1

HENNEPIN COUNTY LARGE SCALE ENERGY RECOVERY PROJECT

ANTICIPATED WATER CONSUMPTION:

GREYHOUND SITE

Item	Average (gpm)	Peak (gpm)
Boiler Make-up	10	20
Cooling Tower Make-up	560	560
Plant Water	25	75
Domestic Use	5	10
Fire Protection	---	1,000
TOTAL	600	1,665
Gallons per Day	864,000	

Source: HDR, 1985

percent of the remaining capacity allocated to the City of Minneapolis by the Metropolitan Waste Control Commission. Average facility wastewater discharge will represent less than one percent of the treatment plant's actual average daily flow in 1984. Wastewater flows would be well within system capacity.

The wastewater flow from the facility will require a 8-inch sewer line connecting to a 90-inch sewer line in Fifth Street North. The sewer connection would be made at one of three manholes, either Fifth Street North and Sixth Avenue North, Sixth Avenue North and Sixth Street; or Seventh Street and Fifth Avenue North.

It is anticipated that increased roof area and paved area would create a 2.4 inch, 25 year, one-hour storm flow of 28 cfs (12,580 gpm). A 36-inch diameter storm sewer that serves the existing site will be rerouted to Sixth Avenue North and Fifth Street North and increased to 42" diameter. The rerouted storm sewer will tie into the existing manhole at Sixth Street North and Sixth Avenue North. Flow from the site would be discharged into a proposed storm drainage tunnel located south of the existing railroad tracks. This tunnel is in the preliminary planning stages.

The waste-to-energy facility will require electric service to supply a reliable source of power to plant auxiliaries. The service will be approximately 3000KVa and will be used for lights, motors, and power requirements of process control equipment, closed circuit television, and a fire alarm system. The resource recovery facility will produce 40 MW of electric power for sale to Northern States Power through a 13.8 KV underground interconnection to the utility's Alrich substation. Electric conductors will be installed underground to prevent any adverse visual impact. The facility will thus result in a net increase in electrical production. NSP has available capacity to provide the needed electrical requirements.

The facility will generate 200,000 pounds per hour of steam at a pressure of 300 psig, which would be available for export. A twelve inch steam line would be required. Although a market for steam has not been negotiated, the preferred alternative is a steam line connection to the MEC steam line on the north side of Seventh Street South between Hennepin Avenue and Nicollet Mall.

4.9.3 Bloomington East Transfer Station

The water, sanitary sewer, storm sewer, gas, fire protection, electric, and telephone service requirements for all the transfer stations will be similar. A facility consisting of a tipping area, load out area, and minimal office space and toilet facilities will require the following utility capacities:

- 2-inch domestic water service (35 GPM Peak Flow-500 GPD Total)
- 4-inch sanitary sewer (25 GPM Discharge - 100 GPD Total)
- 10-inch storm sewer (1.92 CFS - 862 GPM)
- 6-inch fire protection service (850 GPM)
- 1-1/4-inch low pressure gas service or smaller depending on final building heating requirements
- 100 ampere, 120/240 volt, single-phase (assuming a connected load of less than 25 kVA--in excess of 50 kVA 3-phase service will be required).

Domestic and fire protection water to the Bloomington transfer station building will be provided by a 6-inch water service connected to the city water mains. The 8-inch and 6-inch municipal water mains at 96th Street are more than sufficient to supply a domestic water demand of 500 gpd and fire flow of 850 gpm. Daily domestic water demand of the facility would represent an insignificant demand on the existing municipal water system, a wastewater discharge of 100 gpd will comprise an insignificant percentage (.0005%) of the 19 mgd current average daily flow of the Seneca Waste Treatment plant. A 4-inch sanitary sewer line to the facility would be extended from the existing 48-inch sewer on 96th Street, which has adequate reserve capacity to carry facility wastewater flows. The facility also requires a 10-inch storm sewer which would tie into the existing 18-inch storm sewer on 96th Street. Predicted future storm water runoff will be less than existing conditions. Utility systems would have adequate capacity to service the proposed facility.

The invert elevations of the existing storm and sanitary sewer manholes are 810.14 feet and 794.68 feet. The finished grade elevation of approximately 815 feet in the truck loading area would permit the existing sewer inverts to be met with gravity sewer systems.

The facility would require a connected load of 25 KVa which can be provided by 100 ampere, 120/240 volt single phase service. Northern States Power had adequate capacity to provide this 25 Kva load. The existing on-site electrical service will be replaced with more compatible service to meet facility demand. The primary 13.8 Kv line adjacent to the property will be adequate to carry the required load.

Low pressure natural gas service will be required for the facility. Minnegasco has an existing 2-inch 60 psi natural gas service line buried along West 96th Street and would provide gas service to the building. Required telephone service would be provided by Northwestern Bell.

4.9.4 Brooklyn Park East

Water, sanitary sewer, storm sewer, fire protection, electric, gas, and telephone service requirements are presented in Section 4.9.3, since they are similar for all transfer stations. A 6-inch domestic water service and fire protection line to the building from the city main will be required. The existing twelve inch water main located in a 20-foot easement immediately south of the site property has adequate capacity to provide fire protection and domestic water for the facility. Facility water demand would represent an insignificant percentage (less than 1 percent) of the city's average daily water demand. The City has adequate capacity to meet the projected water demand.

The facility's wastewater discharge will be approximately 100 gpd. This will be accommodated by an existing ten inch municipal sanitary sewer in the same 20 foot easement as the twelve inch water main. The invert elevation of the manhole of this sewer line is 856.6, which would allow gravity flow of the 4-inch building sewer into the ten-inch sewer line. The sanitary flows would be discharged to the Metropolitan Wastewater Treatment plant.

The new building and paved area would result in a 25 year, one-hour, 2.4-inch storm flow of 12.5 cfs. A 10-inch diameter storm sewer would be required. Two options exist for storm drainage. The first alternative entails connecting a facility storm sewer to the existing 78-inch storm sewer which has an invert elevation of 866.20. Alternatively, site storm runoff may be collected and then independently discharged into Shingle Creek. The proposed building location's existing grade of 875 would allow gravity flow of the stormwater to the Shingle Creek outfall at an invert elevation of 871 feet. In addition to the storm drainage line, two catch basins would be constructed.

The facility would require a connected load of approximately 25 Kva which can adequately be provided by the existing overhead 13.8 Kv line. An overhead or underground service into the site would have to be installed, and would be provided by Northern States Power. NSP has adequate capacity to provide the service.

Low pressure natural gas service would be required for the facility. Natural gas service will be from either the 12 inch 175 psi or the 2 inch 60 psi gas mains on Winnetka Avenue North to the facility. A one or two line overhead or underground telephone service will be provided to the site. Although there is an underground cable system adjacent to the east side of the project site, there is at present no customer phone service to the site proper.

4.9.5 Hopkins

Water, sanitary sewer, storm sewer, fire protection, electric, gas, and telephone service requirements are presented in Section 4.9.3. A six-inch water service line for domestic water and fire protection to the building will be provided. The building water service line will tie into the 16-inch city water main in Third Street North. This line is adequate for facility water requirements. The transfer station's water demand represents an insignificant percentage (less than 1 percent) of the average daily municipal water demand.

The facility wastewater discharge will be 100 gpd. A 4-inch sanitary sewer line from the building to the existing sanitary sewer in Sixth Avenue South at the southern border of the site will be required. The invert elevation of the Sixth Avenue South manhole is 908 feet. The proposed facility's lower storage area is approximately 921 feet. Thus, a gravity sewer connection is possible.

The proposed site alterations will not significantly increase run-off. The slight increase in runoff (0.36 cfs) could be handled by the existing settling/holding pond for storm drainage. A gravity flow storm water drainage system from the proposed structure into the existing pond is possible given the elevation of the catch basin and the transfer station load-out area.

The building would require a connected load of approximately 25 Kva, which can adequately be provided by the existing 13.8 Kv line. Since this site is an existing commercial/industrial area, the existing NSP electric distribution system has adequate capacity to accommodate building requirements with only minor on-site changes and no required off-site changes.

Low pressure natural gas from Minnegasco would be required for the facility, and would likely be provided from their three inch, 60 psi line on Third Avenue South. The existing 1-inch line on site would not accommodate the proposed facility's load, and will be relocated to permit excavation and construction of new buildings and loads. The facility will require telephone service which would be provided to the building by Northwestern Bell.

4.9.6 Minneapolis South

Facility water use and wastewater discharge will average 500 and 100 gallons per day, respectively. The site presently is used by the city as a solid waste transfer station, and the existing sewer and water lines are adequate to serve the proposed project's domestic and sanitary sewer needs. Further, the present site is nearly 100 percent covered by buildings and pavement, and no increase in site runoff or stormwater handling system requirements are anticipated. A slight decrease in runoff is expected. The present facility does not have an automatic fire protection system, and thus the proposed station would require a new 6-inch water main for fire protection. The 6-inch main in 20th Avenue South is adequate to provide this service.

The present NSP distribution system will accommodate any feasible building facility requirement with minor on-site changes and no required off-site changes. Telephone service exists at the site and may require minor modifications which would be performed by Northwestern Bell.

4.10 Socioeconomics

4.10.1 Introduction

This section discusses the impacts of the proposed project on population, housing, and employment. Also addressed are the impacts on property values, taxes, and community services.

4.10.2 Resource Recovery Facility

Population, Housing, and Employment

The proposed facility would be located in a sparsely populated census tract having 52 year-round households in 1980. The site's census tract is bordered by a more populated one to the west. Land uses surrounding the proposed site are nonresidential (commercial and industrial). Thus, there is no immediate residential population which would be affected by the proposed facility and no persons would be displaced.

New employment opportunities would be created by the construction and operational phases of the facility. A preliminary estimate of the construction labor force for the resource recovery facility is an average of 130 persons with a possible peak of 210 persons. Approximately $26,000,000 of the project's $70,000,000 capital cost would be paid for labor during construction. During plant operations, about 45 persons would be employed at the Greyhound site.

The facility's construction and operational labor demands could be met from within the Minneapolis-St. Paul Metropolitan area, based on 1985 data. In 1985, the Minneapolis-St. Paul area employed construction labor force was 43,200 persons: 5401 persons in construction occupations were listed as unemployed, indicating a surplus of workers for available job openings. The growth of the Minneapolis labor force has been above the national average, resulting in experienced workers in miscellaneous, service, administrative, and professional occupations, over 3,000 of whom were unemployed in 1985. There are available and qualified persons to fill job openings created by the proposed resource recovery facility. These jobs would provide a source of income to the Minneapolis St. Paul economy.

Property Values

Property values reflect the preference of the market for certain locational characteristics, as well as the features and amenities of the property. Over time, property values adjust up or down to reflect what buyers are willing to pay in view of the desirable or undesirable features of a given location (Metropolitan Council of the Twin Cities Area, 1984).

Concern has been expressed that the proposed facility could adversely affect the property values of industrial and commercial properties adjacent to the site, due to perceived potential facility nuisance impacts such as: noise, odors, traffic, and appearance. This issue of property values is dependent upon many factors external to facility operation (such as interest rates) which could affect the market for and value of property in the area. These other factors could modify, or outweigh any negative impacts of the proposed facility. The external factors include proximity to shopping or service opportunities, good highway access, and proximity to the labor force. Factors internal to the facility which would mitigate adverse impacts include design and operation of the facility, landscaping buffers, and an architectural design compatible with adjacent properties.

Opinions expressed by the Minneapolis City Assessor's Office concerning the resource recovery facility (Bernier, Minneapolis Assessor's Office, County of Hennepin, 1985) are that the development would have no impact, or possibly even a positive impact on property values. The Assessors Office felt that any possible adverse affects would be due primarily to a perceived negative image of resource recovery facilities. If the facility is operated as intended and the architectural design is consistent with other newer buildings in the area, it is presumed that image problems could be overcome in a few years. The City Assessors Office expressed the view that the facility may even have a positive influence in the district, because new development generally encourages other new industrial development in an area. A study by the Metropolitan Council (Publication No 12-85-003, October 1983) indicated that some solid waste facilities such as transfer stations, waste processing plants or waste to energy plants; may encourage adjacent industrial or commercial development.

The Assessor's Office (Boris, 1985) also expressed the view that any effect of the proposed facility would be fairly minimal relative to other activities occurring in Minneapolis. Land values in the area of the proposed facility have increased slightly, and have not risen at rates experienced elsewhere in the City. Whereas the average value per square foot of land is approximately five dollars near the proposed facility, values across the railroad tracks to the south are 10-20 dollars per square foot, and values downtown are approximately 100 dollars per square foot. The railroad tracks south of the site form a physical separation between lower and higher valued lands. The railroad tracks would tend to separate any potential negative impacts of the proposed facility from highly valued properties.

Tax Implications

Taxing authorities that include the Greyhound site within their jurisdiction would experience a net tax gain as a result of development of the resource recovery facility. The operator of the facility will lease the site land from the County and will pay property taxes on the leased real property of the site (County of Hennepin, July 27, 1985). The land will be held in a lease agreement between the County and the Operators. Real property includes the building structure and land, but not equipment.

Estimated property taxes to be paid during the construction phase (1986-1990) on the site are summarized in Table 4.10-1 for the various taxing authorities; the tax amounts were calculated by Evensen-Dodge, Inc. (September 1985) based on projected completion schedules, projected annual capital expenditures, and 1985 mill rates. No estimates were made beyond January 1, 1990 due to uncertainty as to what tax rates may be in effect in the future. These estimates are based on the estimated costs of real property. It is anticipated that the project will be complete and operational by the end of 1989 and that the assessment value on January 2, 1990 will represent the first operating year. The actual tax receipts during construction and after completion, will be based on the assessor of jurisdiction's assessment of value. Property taxes are paid the year after they are assessed.

The total annual property tax revenues from the Greyhound site would increase from $134,721 at present (County of Hennepin, July 2, 1985), to approximately $955,000 (payable in 1991). Because the total assessed value of the site would also increase-- from $978,850 (County of Hennepin, July 2, 1985) to approximately $8,775,000 (Evensen-Dodge, Inc. September 1985)--this tax gain would be spread among all the taxing authorities. The entire Twin Cities metropolitan area would benefit from the increased tax revenues collected through the area-wide fiscal disparities rate. The fiscal disparities rate is a special mill rate levied and collected on industrial properties. Development of the proposed resource recovery facility would thus result in a significant positive effect on the tax base for the City of Minneapolis, the County, and other jurisdictions benefiting from tax revenue sharing.

Costs and Revenues

Hennepin County has incurred, and would incur, some costs for implementation of the resource recovery facility. Much of the implementation cost for the resource recovery facility would be reimbursed from project financing. The estimated costs, construction, and annual operating and maintenance costs for the resource recovery facility are as follows: Capital Cost - $70,000,000 Annual O&M Cost - $5,000,000, Labor (Construction - $26,000, O&M - $1,700,000). The financing of the recovery facility is expected to consist of two components: tax-exempt revenue bonds for approximately 75 percent of the plant capital cost, and vendor equity for the remaining amount. The vendor has formed a limited partnership-the Hennepin Energy Resource Company, Limited Partnership--to be the provider of disposal services to the County and obligor of the debt (HDR, June 18, 1985).

Service fees represent operating costs of the facility which will not be offset by energy revenues. The net present value of the service fees, extended from 1990 to 2000, is expected to be $79,644,000 (1990 dollars).

Present annual residential collection and disposal ranges from $78 to $115 per household. Annual residential collection and disposal fees without the proposed system are expected to reach $84 to $121 per household by 1990. Residential solid waste fees could be increased further to $97 to $134 per household as a result of new MPCA regulatory and design requirements on landfills.

The resource recovery facility would result in a loss of potential revenues to area landfills. The annual loss of potential revenues to area landfills is estimated to be over 5 million dollars. However, since state law prohibit the disposal of unprocessed municipal solid waste in landfills after 1990, the projected induced loss of revenues to landfills would occur regardless of facility implementation.

Revenues

The resource recovery facility will generate steam or electricity that will be sold to produce revenues for the County and to offset some of the facility costs. The amount of revenues will depend upon the facility's proportions of steam and electricity sold and the prices agreed to.

An all-electric mass burn facility is estimated to produce approximately $9,300,000 per year in electricity sales (1990 dollars) (Appendix E, Proposal Evaluations, Run 2, Blount). A cogeneration facility is anticipated to produce approximately $12,500,000 per year (1990 dollars). Steam prices are based on equivalent natural gas costs with a 10 percent discount. For the cogeneration scenario, total saleable energy quantities of electricity and steam generation amounts are assumed to be 46,834 MWh/per year for electricity and 1,280,000 MLBS per year of steam. Capacity basis is assumed to be 7,600 kW per month. For the electricity generation only option, electric production will be 177,025 MW hours/year at 28,869 kwa capacity. Capacity payments and capacity basis are based on the energy generating ability of the equipment provided in the facility. Potential markets for the energy produced by the resource recovery facility have been identified as Northern States Power (NSP) for electricity, and the Minneapolis Energy Center (MEC), the Metropolitan Medical Center (MMC), and the Soo Line Railroad for steam (HDR, June 18, 1985). As present, no actual agreements have been finalized with any of these parties.

All recovered ferrous metals and other recovered materials revenues are reserved for the County. The County also maintains the right to recover and sell any other materials not claimed by the operators. The Company or the County may choose to recover any other materials. Any County revenues obtained through the sale of recovered ferrous or other materials will depend on market conditions at the time of the sale, The volatility of the market does not permit a dollar value to be estimated for these sales.

Community Services

No community services and facilities other than fire protection, sewer, and water services have been identified for use by the resource recovery facility. (Blount Energy Resource Corp. 1985). No significant changes in the costs of providing community services are forseen as a result of the facility's implementation.

Impacts on sewer and water services are discussed in Section 4.9, Utilities. The proposed facility would be located in an area of established police and fire services. No increase in services would be required. Operating costs for both police and fire services are paid for out of general funds of the cities in which they are located and are determined by their frequency of use. There is no way to accurately predict the frequency of fires or disorders that may occur at the facility. The facility would however have its own fire protection (Section 4.9.2).

The resource recovery facility would pay a special rate to the City of Minneapolis for water allocated for fire protection. The resource recovery facility would be charged about $180 per year. It should be understood that this charge is only a utilities rate for water intended for fighting fires: it is not a payment for fire department services. No special funds have been designated for police and fire protection services. If the need for any of these services occurs, they would be paid through general city taxes as they are at present.

4.10.3 Bloomington East

Population, Housing, and Employment

The proposed transfer station would be located within a light industrial and commercial area: The closest residential lands are 1500 feet south of the site. As a result, displacement of the area's population and housing would not occur. New employment opportunities would be created by the construction and operation phases of the transfer station. During construction as many as 50 people would be employed. Ten persons would be employed during operations. Since Bloomington is part of the broader metropolitan economic unit, the extent of income and revenue returned to the Bloomington economy as a result of employment opportunities would be minor.

Property Values

As discussed in Section 4.10.1, the effect of the proposed industrial facility on nearby property values can not be completely predicted.

The proposed transfer station would be located in an area where there is a mix of office, industrial, and commercial businesses. There has been little recent development activity in this area, and little turnover of properties on which to base speculation of the sensitivity of market values in the area. High demand for both commercial and heavy industrial properties is focused elsewhere in the city. The Bloomington Assessors Office stated that there were too many variables to completely assess the impact of the facility on property values, and that impacts could range from none to negative. A private appraiser supported this statement of uncertainty as to what property value impacts might be, but did reflect that the proposed facility might negatively affect property. However, he stressed that impacts would be dependent upon the volume of truck traffic, distance separation and buffers between the facility and nearby properties, and the facility design, volume, and hours of operation.

As discussed in Section 4.6.3 Land Use and Zoning, the facility would not generate significant adverse traffic or noise problems, would be buffered from surrounding properties, and would incorporate state-of-the-art facility design and operation, thus potentially softening any property value impacts on nearby industrial or commercial properties.

Tax Implications

The parcel of land within the Bloomington East Transfer station site is privately held and thus contributes to the taxing authorities of jurisdiction. Once purchased by the county for the construction of a transfer station, the parcel would not be subject to property tax.

The current assessed value of the Bloomington East Parcel, currently under industrial use, is $269,898. Taxing authorities would lose $28,450 annually (1985 assessments) in revenues as a result of the county's purchase of the parcel.

Taxing Authority	Estimated Annual Tax Loss ($ 1985 Mill Rate)
Hennepin County	$6,154
City of Bloomington	3,639
Independent School District 271	10,992
Watershed District 1	95
Miscellaneous Levies	1,090
Area Wide Fiscal Disparities Tax	6,480
	$28,450

The revenue loss of $6,480 through the area-wide fiscal disparities tax would be shared by all counties in the seven-county Twin Cities Metropolitan area (Minn Statutes 1984). Revenues collected under this special mill rate, which is levied against only industrial and commercial properties, are shared by individual taxing authorities to provide a more even distribution of revenues from activities.

Costs and Revenues

Hennepin County has incurred, and would incur, some costs for implementation of the four transfer stations, including Bloomington. Transfer stations may be county owned, but fees for the use of the facilities would pay their implementation costs. The estimated capital costs, construction, and annual operating and maintenance costs for the Bloomington, as well as for the other three transfer stations are presented in Table 4.10-2. No financing details for the transfer stations have been determined at present, nor have purchase prices for the costs of property acquisition. However, the cost of properties for the four transfer stations has been estimated at $1,500,000 (HDR). The County would receive revenues from solid waste delivered to County facilities.

Community Services and Miscellaneous Costs

No community services and facilities other than fire protection, sewer and water services have been identified for the four transfer stations. No significant changes due to the implementation of the four transfer stations in the cost of providing these services are foreseen.

Operating costs for both police and fire services are determined by their frequency of use. There is no way to predict the frequency of fire or disorders and their associated costs which may occur at any of the facilities. The facility would however, have its own fire protection.

4.10.4 Brooklyn Park East

Population, Housing and Employment

The proposed facility would be located almost half a mile away from any substantial residential development. The facility would result in the displacement of one home. Impacts, however, to the general population and to housing in the census tract in which the proposed facility would be located are not anticipated . This population is similar in racial composition, age structure, and income to the community of Brooklyn Park as a whole, and housing prices are comparable.

New employment opportunities would be created by the construction (as many as 50 employees) and operation (ten employees) phases of the transfer station. Since Brooklyn Park is part of the broader metropolitan economic unit, the extent of income and revenue returned to the Brooklyn Park economy as a result of the transfer station's employment opportunities would be minor.

Property Values

As discussed in Section 4.10.2, the effect of an industrial facility on nearby property values can not be completely predicted. The proposed facility would be located in an area of industrial and commercial expansion slated for industrial growth. As a result of demand for industrial property, development of industrial tracts and industrial property values within Brooklyn Park has been increasing in recent years (Brooklyn Park Assessors Offices, 1985). Both the City Assessor's Office and a private appraisor were contacted regarding their views of the proposed transfer station on property values. Neither would offer any definitive conclusions. However, the private appraiser did feel that compliance with city zoning requirements (regarding nuisance impacts such as odor, noise, etc) could preclude impacts to neighboring properties, such as Northland Industrial Park. The proposed site, while inconsistent with its zoning designation of light industrial, would, if properly designed and operated comply with nuisance standards and standards regarding landscaping and setback requirements. The private appraisor also indicated that the effect of the proposed facility on the property values of adjacent industrial and commercial lands would be influenced by supply and demand relationships (Orlang, 1985).

Brooklyn Park

Tax Implications

The Brooklyn Park East site contains three parcels (one residential, two vacant industrial zoned lots) with a combined assessed value of $110,700 (County of Hennepin, July 2, 1985; property tax records). The taxing authorities of jurisdiction would lose $11,949 annually (1985 assessments) in revenues as a result of County purchase of the parcels.

Taxing Authority	Estimated Annual Tax Loss ($, 1985 Mill Rate)
Hennepin County	$3,239
City of Brooklyn Park	2,303
Independent School District Nol 279	5,833
Miscellaneous Levies	574
TOTAL	$11,949

The three parcels also have a combined debt of $6,727 for special assessments levied by the City; however, the City would require payment of this amount at the time of the ownership transfer. The parcels are undeveloped and are not subject to the area-wide fiscal disparities tax.

Costs and Revenues

A discussion of costs and revenues associated with implementation of the Brooklyn Park East transfer station is presented in Section 4.10.2, Bloomington East Costs and Revenues. Impacts of this facility are expected to be as described/herein.

Community Services

A discussion of the impact of the Brooklyn Park East Transfer station on community services is presented in Section 4.10.2. Bloomington East Community Services. Impacts for this facility are expected to be as described therein.

4.10.5 Hopkins

Population, Housing, and Employment

The proposed facility would be located in the middle of a narrow industrial corridor. While there are industrial and commercial lands surrounding the site to the west, north, and northeast, there are significant residential lands in close proximity (700 to 1,000 feet) to the south and east. This neighborhood is characterized by a slightly higher income and median home value than the city as a whole. It is not anticipated that the facility would result in displacement of any homes or persons. New employment opportunities would be created by construction and operation of the facility. The extent of income and revenue to the Hopkins economy, however, are expected to be minor.

Property Value

As discussed in Section 4.10.1, the impact of the proposed industrial facility on nearby property values can not be completely predicted. The proposed facility would be located in an area where the value of smaller industrial properties and single and multi-tenant houses has been rising at a rate slightly exceeding the inflation rate. Similarily, the facility would be in close proximity to a fairly dense residential neighborhood where property values are slightly above average residential values found within the City.

Although there is a high demand for industrial property in the vicinity, and a favorable residential market, concern has been expressed that property values would decline as a result of the proposed facility. The Hopkins City Assessors Office (Renne, 1985) has expressed an opinion that property values would decline as a result of implementation of the proposed transfer station, given its proximity to residential neighborhoods and new development. The assessor's office also indicated that property values for specialized industrial properties, i.e. food warehouses would also be affected. A decline in property values of at least five percent for both uses was estimated by the Assessors office.

A private appraiser (Johnson, 1985) stated that heavy atypical traffic usually impacts property values, and can result in eventual blighting of an area. This appraisor indicated that traffic may be the most bothersome aspect of the facility. Similarily, the City of Hopkins Attorney and the Hopkins Main Street Project have voiced similar concerns about decreased values resulting from facility traffic.

The transfer station site is designated for industrial development by the City's Comprehensive Plan. A report prepared by the Metropolitan Countil (Metro Countil Publication #12-82-072) found that if truck routes to and from a facility are major traffic routes before operations begin, property values may not be affected further. However, abutters such as super value have indicated that location of a transfer station in the area might adversely affect future business plans for expansion. If industries in the area would move to other locations because of the presence of a transfer station, property values would decline (Rapp, 1985).

Tax Implications

The Hopkins-DOT site is publicly held and is thus not assessed for property taxes. Development of the transfer station would not alter the tax-exempt status of the parcels, and the taxing authorities with jurisdiction would neither gain nor lose revenues.

Costs and Revenues

A discussion of costs and revenues associated with implementation of the Hopkins transfer station is presented in Section 4.10.2, Bloomington East Costs and Revenues. The impacts of this facility are expected to be as described therein.

Community Services

A discussion of the impact of the Hopkins transfer station on community services is presented in Section 4.10.2, Bloomington East Community Services. The impacts of this facility are expected to be as described therein.

4.10.6 Minneapolis South

Population, Housing, and Employment

The proposed facility would be located in a relatively populated census tract, which is generally lower in income than the city as an average. However, there are a limited number of residential properties adjacent to or in the immediate vicinity of the site. The site area is generally characterized as a mixture of commercial and light and heavy industrial uses. There are institutional lands (Pioneers and Soldiers Memorial Cemetery) immediately adjacent to the south and west. As the proposed use of the site is the same as the existing use, no additional impacts to the area's population or housing are anticipated. Although new employment opportunities would be created by the construction (50 workers) and operation (ten workers) little income is expected to be returned to the immediate neighborhood as a result of these employment opportunities.

Property Values

Properties within the vicinity of the proposed site are already adjacent to the present transfer station and zoning. Construction of an expanded station would not alter property values.

Tax Implications

Parcels within the Minneapolis South Transfer Station site are publicly held and thus are not assessed for property taxes. Development of the transfer station would not alter the tax exempt status of the parcels, and taxing authorities would neither gain nor lose revenues.

Costs and Revenues

A discussion of the costs and revenues associated with implementation of the Minneapolis South transfer station is presented in Section 4.10.3, Bloomington East Costs and Revenues. The impacts of this facility are expected to be as described therein.

Community Services

A discussion of the impact of the Minneapolis South transfer station on community services is presented in Section 4.10.2, Bloomington East Community Services. The impacts of this facility are expected to be as described therein.

4.11 Aesthetics and Cultural Resources

4.11.1 Methodology

This section of the report discusses the impact of the transfer stations and resource recovery facility on visual aesthetics and cultural resources at each of the proposed locations. The proposed facilities would inevitably change the visual conditions on each site. The degree of change and impact would vary for each of the locations due to differences in the visual characteristics of each site.

The actual operations of the facilities will generally take place inside the facilities except for transportation vehicles. Visual impacts that may occur would result from the physical appearance of the facilities themselves or from the truck traffic serving them. The degree of visibility of the facilities, the extent of visual changes resulting from them, and their compatability with the surrounding visual conditions determines any aesthetic impacts.

The appearance of the facilities are illustrated here with photographs of the area and architectural renderings on these photographs. All views are the same as those presented in Section 3.10. The renderings take into account the importance of views other than the ones presented. In general, each transfer station would be a rectangular structure, typically 35 feet high above the truck access ramp with a plain exterior finish. The designs would be similar for each proposed site. The illustration for the resource recovery facility was taken from a rendering supplied by the Blount Energy Resource Corporation.

4.11.2 Resource Recovery Facility

4.11.2.1 Historic Resources

Existing structures on the Greyhound site do not possess historical significance. Given the previously disturbed nature of this industrial site and the lack of properties on site of archaeological value, the proposed resource recovery facility would not impact any archaeological or historic properties on site. Further, if the resource recovery facility building facade were chosen so as to complement red brick historic properties nearby the effect on the North Loop Warehouse Plant Historic District could be an improvement.

4.11.2.2 Aesthetics

The proposed facility would consist of buildings and a stack 213 feet tall. The 213 foot stack would be visible from surrounding land uses. It would be visible from downtown locations with unobstructed views. The remaining buildings would be of modern design and consistent with other modern adjacent structures such as the MTC garage. (See Figure 4.11-1.)

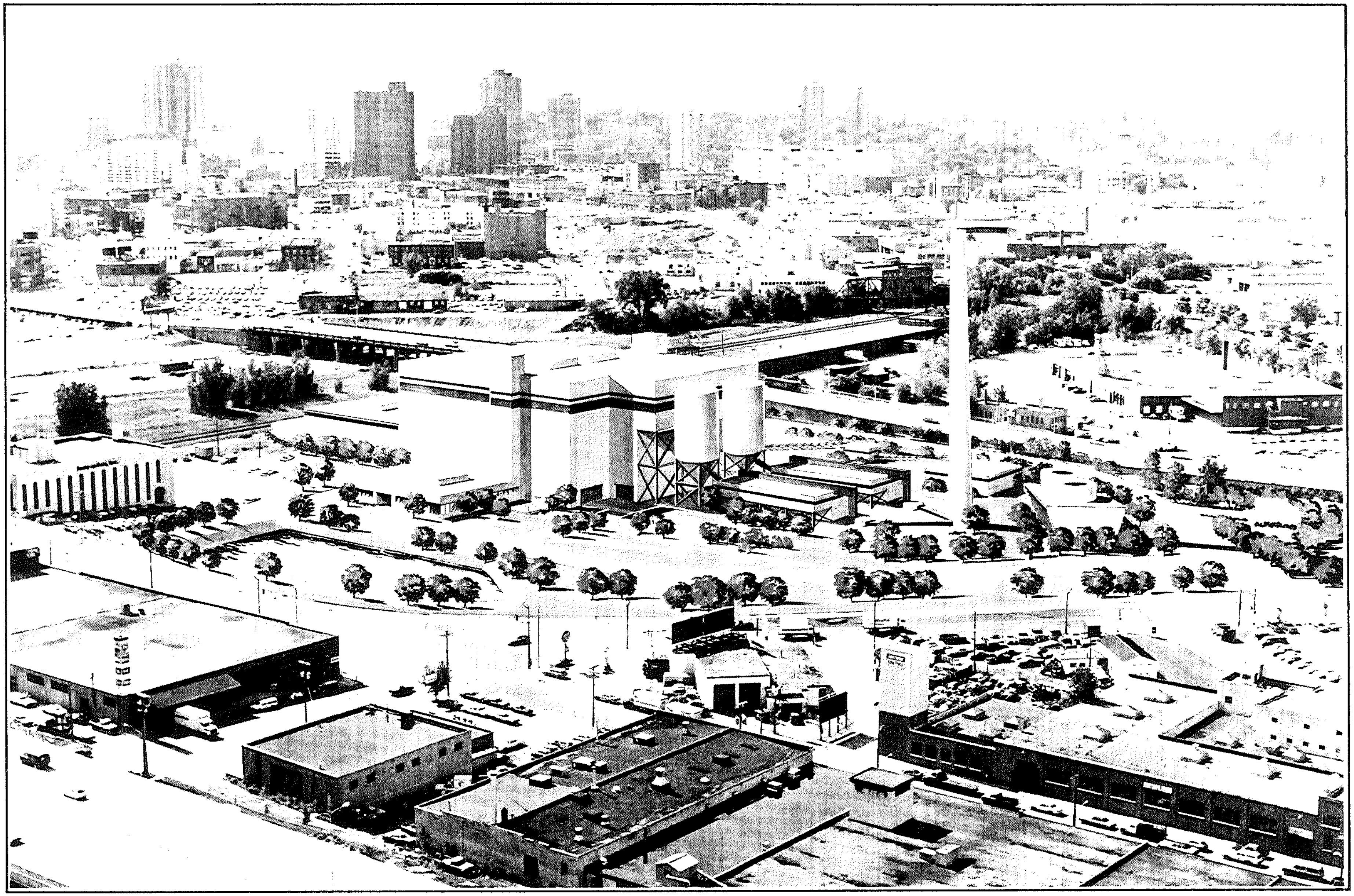


Figure 4.11-1 Greyhound Site Photo with Resource Recovery Facility Rendering.

4.11.2 Bloomington East Transfer Station

4.11.3.1 Historic Resources

Based on the findings of Bloomington: A Community Survey of Historic Sites, and review by the Minnesota Historical Society, there are no properties of historic or archaeological significance. Thus, the proposed transfer station would have no impact on these resources.

4.11.3.2 Aesthetics

Visual conditions would change from the existing situation as a result of transfer station development. The proposed site configuration (photograph with rendering) is shown in Figure 4.11-2. The transfer station would replace the existing structure and be of approximately the same size and configuration. The transfer station would stand about 35 feet above the truck access ramp. The view taken is from the Holiday Inn hotel to the northeast of the site and may be considered the most sensitive view of the site. Other paths of view are mainly from other industrial facilities to the south and east. The view shown would include the facility, the trucks serving the facility, and the present adjacent uses. The quality of the view would be somewhat altered by the proposed project. The most visible and aesthetically adverse features of the landscape are adjacent to the site--such as the existing truckyard to the east and the railroad line to the north and east. Existing industrial uses south of the site would still be visible from this angle. The facility would be visible from other adjacent land uses as would truck traffic. The proposed facility, however, would be visually compatible with the surrounding existing industrial buildings uses.

4.11.4 Brooklyn Park East Site

4.11.4.1 Historic Resources

There are no structures of historic, architectural, or cultural significance on site or in the vicinity that would be impacted by the proposed transfer station. Similarly, based on reconnaissance shovel test excavations exposed soil examinations, and pedestrial surface transects, no archaeological resources which would be impacted by the proposed facility were identified on site. Thus, the Minnesota Historical Society has concurred with a finding of no impact on cultural resources.

4.11.4.2 Aesthetics

The visual character of this site would change from present conditions as a result of transfer station development as shown in Figure 4.11-3. The site is screened by stands of mature trees, interrupting the view from the west. The angle shown is from an office park development to the northwest of the site. Other sensitive receptors in the area would include the residential uses along Winnetka Avenue to the east of the site. Although their view of the facility would be partially screened by vegetation, they would view

Figure 4.I1-2 Bloomingto Site Photo with Transfer Station Rendering.

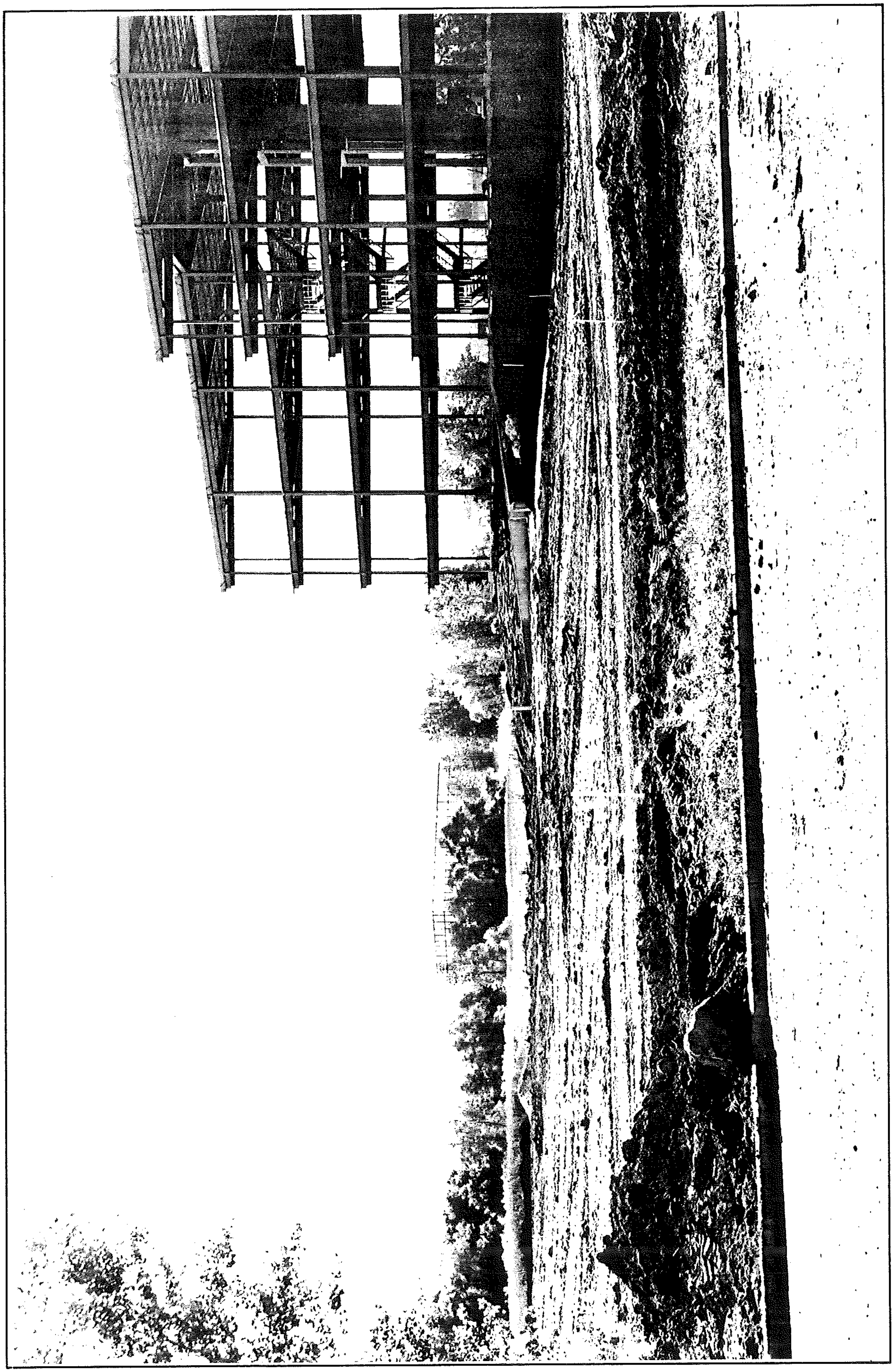


Figure 4.11-3 Brooklyn Park Photo with Transfer Station Rendering.

most of the truck traffic to the facility. The site is essentially vacant at present. Development on the site would be considered by itself a visual impact. This particular location is screened, considerably reducing visual impacts. A transfer station 35 feet above the truck access ramp, built at this site would have a visual impact on the area. The facility does not appear to conflict however, with the surrounding industrial development.

4.11.5 Hopkins-DOT Site

4.11.5.1 Historic Resources

The Minnesota Historical Society as well as the Hopkins historical society have determined that there are no cultural resources on the site of the proposed transfer station. Thus, no impact to cultural resources as a result of facility construction are anticipated.

4.11.5.2 Aesthetics

The building of a transfer station about 35 feet above the truck access ramp would be visible to area residents as shown in Figure 4.11-4. Existing views would not be significantly interrupted by the proposed structure. The present views are of industrial properties and highways. The facility itself would be consistent with other industrial buildings in the area, although somewhat taller. The existing visual characteristics of the site area are primarily industrial and commercial in nature and are not unique or unusual. The present view of the County storage facility would not be significantly altered by the introduction of another industrial structure on the site. Sensitive receptors considered were the apartment buildings along County Road 3 to the north and the residential area to the south. The remaining views of the site are from industrial and commercial properties. Much of the truck traffic at the facility would be visible, especially to residents to the north and south. All access is proposed to be via U.S. 18 to County Route 3. The facility will be industrial like other buildings in the area. The change of visual conditions posed by the transfer station would not significantly alter the industrial character and view of the area. The transfer station on the DOT site would however be visible to residential neighbors to the south and the north because of its height above other nearby industrial structures.

4.11.6 Minneapolis South Site

4.11.6.1 Minneapolis South Transfer Station

The Minnesota Historical Society has reviewed this previously disturbed industrial site, and has determined that no impact to cultural resources would occur as a result of facility construction.

4.11.6.2 Aesthetics

Development of a new transfer station would not significantly alter the visual impact on the neighborhood (see Figure 4.11-5). The present transfer station at the site including the chimney would be

Figure 4.11-4 Hopkins Site Photo with Transfer Station Rendering.

Figure 4.11-5 Minneapolis South Site Photo with Transfer Station Rendering.

removed and replaced by a more modern facility. The proposed facility would be of lower profile (does not involve a stack). It would be consistent with its current use and with the surrounding commercial and industrial development. The view of the facility is taken from East 28th Street to the northeast. It is the most visually accessible angle (adjacent buildings and trees in the Pioneers and Soldiers Cemetery to the south crowd in very closely and block out most other views). The view also represents the area's commercial and industrial character. Truck traffic to the facility would be screened by the adjacent development. The structure just north of the facility would screen out traffic from the view shown, while trees on the cemetery to the south will block views from that angle. The proposed structure could be less visible than the existing one. Construction of a new transfer station on this site however would only result in the replacement of an aging facility with a more modern structure. Therefore, its impact should be positive.

4.12 Ecological Resources

4.12.1 Resource Recovery Facility

Construction of the proposed resource recovery facility would not adversely affect biological resources on the project site or in the region (see Air Quality Section 4.2). The small areas of vegetation on the western portion of the site that will be removed during construction are comprised of early successional species that are common on disturbed sites throughout the metropolitan area. This community provides poor habitat for wildlife so that little wildlife will be displaced by clearing activities. Upon completion of facility construction, undeveloped portions of the site will be landscaped with grass, shrubs, trees and flowers. This will provide new habitat for small mammals and birds tolerant of the urban environment.

Potential impacts to biological resources associated with the operation of resource recovery facilities result from the release of gaseous and particulate pollutants to the atmosphere in stack emissions. Project impacts on vegetation were estimated based on air quality modeling originally undertaken by HDR. Operation of the proposed facility will increase the ambient pollutant loads of SO_2, CO, TSP, NO_2, HF, and HCl in the vicinity of the proposed site. Vegetation will be exposed to pollutants in the atmosphere and to those deposited on the soil. Uptake of gaseous pollutants through foliage is the most rapid route of entry into plants, and plants are most often injured by this type of exposure. Absorption of pollutants from the soil by roots may be buffered or inhibited by soil properties so that tissue concentrations of pollutants absorbed in this manner are less likely to exceed injury thresholds.

Vegetation is usually protected from extensive injury at pollutant concentrations within NAAQS, but SO_2 and several pollutant combinations have adversely affected sensitive species at levels below the standards. Under ambient conditions the interaction of two or more gaseous pollutants, such as SO_2/NO_2, SO_2/O_3, O_3/NO_x, and SO_2/HF, probably is responsible for most of the injury observed on both native vegetation and crops (Karnosky 1985, Loucks 1985). Only a limited understanding of the mechanisms involved in pollutant or pollutant-pathogen interactions and their role in decreasing productivity and increasing morbidity exists. The most reliable data are on the visible effects of single pollutants. Of the pollutants directly generated by resource recovery facilities, SO_2 and HF are the most phytotoxic.

Vegetation is more sensitive to SO_2 than to any of the other major gaseous pollutants, although species vary widely in their tolerances to SO_2. Short-term injury thresholds identified from controlled-environment and field studies range from 3-hr exposures to concentrations between 800 and 1600 $\mu g/m^3$ for sensitive varieties, to greater than 6,000 $\mu g/m^3$ for SO_2-tolerant varieties (Heggestad & Heck 1971, EPA 1973, Jones et al. 1974). Jones and associates (1979) used air monitoring data from two coal-fired power generating stations in the Tennessee Valley in conjunction with observations of foliar injury, to develop an assessment of in-field SO_2 threshold dosages for a variety of native and crop species. The climate and meteorology of the study region provided environmental conditions that increased both the frequency of ground-level exposure and the sensitivity of the vegetation so that there was a high potential for localized impacts on vegetation. Field data indicated that the threshold dosages for visible injury were approximately 850 $\mu g/m^3$ (11-hr average) and 450 $\mu g/m^3$ (3-hr average) for two relatively susceptible plants, soybean and pine. However, injury was never observed unless the instantaneous peak SO_2 concentration was at least twofold greater than the 3-hr threshold concentration. A few shrubs (blackberry and winged sumac) and herbaceous species responded to a 3-hr exposure to 340 $\mu g/m^3$, but only under ambient conditions that maximized sensitivity (Jones et al. 1979).

After the proposed resource recovery facility begins operation, vegetation within 2,580 m of the project site (Table 4.2-7) would be exposed to elevated levels of ambient SO_2. Short-term exposures have been found to be the most common cause of injury to vegetation (Jones et al. 1974, 1979), but often effects from this type of exposure are reversible if an SO_2 event is not repeated within the growing season (Loucks 1985). The predicted maximum 3-hr impact from the facility (29.6 $\mu g/m^3$) would be below known injury thresholds. When this concentration is added to the existing ambient SO_2 load, the total impact (466.3 $\mu g/m^3$) would be slightly in excess of the minimum concentration reported to cause visible injury on the most sensitive vegetation. Local vegetation could be affected by SO_2 at this level if maximum concentrations coincided with periods of high plant sensitivity and were accompanied by greater peak concentrations. Since the predicted worst-case air impacts are based on conservative assumptions, the likelihood of such an event occurring is considered to be rare, and extensive injury to local vegetation is not expected. In addition, if visible injury did develop, the effects could be reversible if exposure to high levels of the gas did not continue.

The risk of vegetative injury from maximum, short-term SO_2 concentrations can be increased by the presence of NO_2. Combinations of NO_2 and SO_2 in subthreshold concentrations of 90 to 470 $\mu g/m^3$ and 130 to 660 $\mu g/m^3$, respectively, have injured crop species (NAS 1977). Vegetation is relatively tolerant of NO_2 alone, and NO_2stress has been reported only on vegetation growing downwind from excessive industrial sources (Smith 1981, Thomas 1951), or along high-use transportation corridors (Loucks 1985). One-hour injury thresholds range from 7,500 to 15,000 $\mu g/m^3$ for sensitive vegetation, such as oats, to greater than 24,400 $\mu g/m^3$ for tolerant species, such as corn and sorghum (Heck & Tingey 1970). NO_2 concentrations of 470 $\mu g/m^3$ throughout the growing season have reduced size and productivity and increased senescence in tomatoes and navel oranges (Taylor et al. 1975, Spierings 1971). Most plants, however, are tolerant of long-term exposures to NO_2 concentrations below 120 $\mu g/m^3$ in the absence of other pollutants (Thompson et al. 1974). Worst-case 3-hr (13.4 $\mu g/m^3$*) and annual (36.1 $\mu g/m^3$) NO impacts predicted to result after the resource recovery facility begins operations should be below reported injury

*Value is a result of facility emissions only and does not include a monitored background concentration.

thresholds. Although monitored, 3-hr NO_2 background data are not available for the facility impact zone, the small, incremental increase in ambient NO_2 loads that would result from facility operations is not expected to increase ambient levels to within the range reported (NAS 1977) to react synergistically with SO_2 to produce foliar injury.

The proposed resource recovery facility would also increase ambient concentrations of CO and TSP. Vegetation is tolerant of both these pollutants. Concentrations greater than 11,500,000 $\mu g/m^3$ have produced plant abnormalities, including early senescence and decreased growth (Heuter et al. 1972). Exposures to 115,000 $\mu g/m^3$ CO for up to three weeks have not produced visible injury on most plants (Zimmerman et al. 1933). No visible injury has been documented from exposures to less than 27,000 $\mu g/m^3$ (Chakrabarti 1976). Under worst-case conditions operation of the proposed facility would increase 1-hr and 8-hr CO concentrations within 2,580 m of the site by 25.5 $\mu g/m^3$ and 14.2 $\mu g/m^3$, respectively. These small incremental increases are well within the reported tolerances of native vegetation and crops and will not adversely affect local plant communities.

Atmospheric particulates pose a problem for vegetation when high concentrations occur in combination with sufficient moisture to encrust foliage and block gas and light exchange mechanisms. Although injury thresholds have not been identified for industrial particulate emissions (Lodge et al. 1981), TSP impacts associated with the proposed facility are not expected to injure vegetation adjacent to the project site. Operations would increase ambient TSP levels a maximum of 1.1 $\mu g/m^3$ over 24 hours and 0.1 $\mu g/m^3$ annually. These increases would be negligible when added to the ambient TSP load to which local vegetation is currently exposed.

The proposed facility would also generate gaseous and particulate emissions of minor pollutants of which HCl and HF have the greatest potential to affect vegetation. Greenhouse experiments have been used to demonstrate HCl sensitivities for a number of tree and garden species. A short-term threshold between 8,939 and 11,918 $\mu g/m^3$ has been determined for forest species (Means & Lacasse 1969). A lower dosage of 4,760 to 5,600 $\mu g/m^3$ for 1.5 to 2 hours has been estimated to be the threshold for the more sensitive species, tomato and chrysanthemum (Shriner 1969). Federal HCl standards have not been promulgated to protect vegetation. Benedict and associates in a report presented at the Annual Meeting of the Air Pollution Control Association (1974), suggested that maximum dosages ranging from 5,959 $\mu g/m^3$ for 1.5 hours, to 372 $\mu g/m^3$ for 120 hours, would protect vegetation from injury. Guderian (1977) suggested that intermittent exposure over long periods to concentrations averaging 50 $\mu g/m^3$ would pose only a slight risk to sensitive species. Worst-case 3-hr (16.8 $\mu g/m^3$*) and annual (1.6 $\mu g/m^3$*) HCl impacts expected to result from operation of the resource recovery facility are below levels documented to induce stress and those proposed as adequate to protect sensitive vegetation.

HF is the most phytotoxic of the minor air pollutants because vegetation can accumulate F continuously within foliage. Exposure to 1.5 ppb (7.9 ug/m^3) for eight hours per day for five days has injured forage crops. Short-term exposures such as this have little impact on long-term forest or crop growth because plant recovery mechanisms become operative when fumigations end (Amundson & Weinstein 1980). Long-term exposures to low levels of gaseous F have a greater potential throughout the growing season. Sidhu (1977, 1978) studied the effects of continuous F emissions from a phosphorous facility in Newfoundland. Defoliation occurred when ambient F concentrations during the growing season averaged 0.2 $\mu g/m^3$ for conifers and 0.4 $\mu g/m^3$ for deciduous, broadleaf species. Sidhu (1978) proposed that 0.2 $\mu g/m^3$ be adopted as the Canadian Air Quality Standard for continuous exposure periods of 70 days or more. The predicted annual average and 24-hr worst-case concentrations resulting from operation of the proposed facility would not exceed 0.025 $\mu g/m^3$* or 0.26 $\mu g/m^3$*, respectively. These are within the range of concentrations considered to be safe for vegetation (Sidhu 1978, Brennan 1985). Injury from F on native and ornamental plants within the facility impact zone is not expected.

4.12.2 Bloomington East Transfer Station

Construction impacts at the proposed Bloomington East Transfer Station site will be limited to the elimination of a small area of weedy, herbaceous vegetation in the northeastern portion of the site. Local and regional wildlife populations would not be affected by removal of this habitat or by the conversion of the gravel-covered areas of the site to impervious surface. Wildlife use of the site may be enhanced once construction activities have ended by the establishment of vegetated buffer strips around the periphery of the site.

The increase in human activity, noise and traffic on the proposed site during construction and operation may disturb wildlife inhabiting the park located to the west of the transfer station. Since the plant communities in the park support only small populations of small mammals and birds that are common in urban areas (HDR 1985), the overall impact on this area is not expected to affect regional wildlife populations. In addition displaced species may return to the park once the vegetated buffer strip between the park and the site is established. Construction impacts would be only short-term in nature.

4.12.3 Brooklyn Park East Transfer Station

Construction of the Brooklyn Park East Transfer Station would result in the loss of both the upland and lowland plant communities on the proposed site including their associated wildlife populations. As part of the proposed site development, grassland and woody vegetation will be cleared, and areas within the designated flood fringe will be filled to an elevation equal to or exceeding the regulatory flood protection elevation (HDR 1985). Buildings, roadways and other impervious surface will replace vegetation throughout much of the site except in the extreme southwestern corner. Site boundaries, the edges

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*Value is a result of facility emissions only and does not include a monitored background concentration.

of access roads and other unused upland portions of the site (50 to 60 percent of the site) will be landscaped and planted with grass, shrubs, flowers and small trees.

Land clearing activities would result in a permanent loss of the upland and lowland plant communities from the site. Although neither of these communities is unique locally or within the project region (HDR 1985), the communities cannot be recreated on the unused portions of the site because of the change in edaphic conditions and moisture regimes as a result of filling and grading. Wildlife associated with the grassland and oldfield habitats will be permanently displaced from the site. This would not affect regional population numbers, but it would have a local impact. Since it is generally assumed that most habitats operate at carrying capacity, displaced fauna cannot be readily assimilated into adjacent habitats. In addition, the habitat value of the grassland area to the north of the site may be decreased by the traffic and noise associated with construction of the transfer station. Many of the bird and small mammal species inhabiting the grasslands presently are not tolerant of high levels of human disturbance. Species that are adapted to this type of activity would most likely reinvade the proposed site once the landscaped plantings are established.

The wetland area at the southwestern corner of the site and the small arm of Shingle Creek that enters the site in the extreme northwest would not be directly altered by the proposed action. Filling or construction activities will not occur in these areas. Therefore, there will not be a loss of wetland habitat. Construction of the access road along the western edge of the site, however, may result in temporary surface erosion to the wetlands both on-site and adjacent to the western boundary. This impact would be temporary and should be eliminated once the vegetative cover along the roadway becomes established. The wetland areas within Shingle Creek Park would not be affected. Permanent impacts to the wetlands may result from an alteration of the surface drainage patterns on the site (see Section 4.5.3 Water Quality) and from elimination of the grassland buffer and the subsequent increase in industrial activity in close proximity to the wetland. Heavy truck traffic and noise associated with construction and transfer operations may cause some sensitive marsh species to abandon the area. This is not expected, however, to have an overall impact on population levels within the Shingle Creek wetland ecosystem.

4.12.4 Hopkins Transfer Station

Development of the proposed site for the Hopkins Transfer Station would not have an adverse impact on local or regional plant communities or wildlife populations. The site is currently covered with artificial fill and does not provide any permanent habitat for wildlife. Landscaping of the site with shrubs, trees and herbaceous vegetation upon completion of construction may slightly increase utilization of the site by species tolerant of the noise and human activity associated with the operation of the transfer station. A landscaped buffer strip with a mixture of structural components and plant species could provide cover and foraging habitat for wildlife within an urban environment.

4.12.5 Minneapolis South Transfer Station

The site proposed as the location for the Minneapolis South Transfer Station is currently used as a solid waste transfer station. Little vegetation exists on the site; it is currently covered with pavement or structures. The construction of the proposed facility will not have an adverse effect on local or regional biological resources. Wildlife use of the adjacent cemetery should not be disrupted by construction or operation because species that presently inhabit this area are adapted to the high levels of noise and traffic. The establishment of a vegetated buffer screen may reduce the impact of transfer operations on the wildlife habitat in the cemetery.

5. MITIGATION MEASURES

This section of the environmental impact statement describes measures that could reasonably eliminate or minimize adverse environmental, economic, employment or sociological effects identified of the proposed resource recovery project. These measures could be employed by the governmental units that have regulating and licensing authority over the resource recovery facility and transfer stations (see discussion, 2 Governmental Approvals). The governmental units, however, have the ultimate decision as to whether or not these measures will be implemented.

5.1 County Solid Waste System

5.1.1 Identification and Separation of Nonacceptable Wastes

The success of managing nonacceptable wastes arriving at the resource recovery facility or transfer stations depends on rigorous enforcement and aggressive management practices. The following discussion suggests ways to control nonacceptable wastes, some of which Hennepin County and Hennepin Energy Resource Co., the project operator, have already proposed to implement. The primary deterrent to delivery of unacceptable wastes (which includes hazardous materials) is the federal, state, county and city prohibitions on delivery of such materials to the facility and the substantial penalties that can be incurred for delivery of such materials.

Visual inspection and refusing admittance of vehicles would occur at the facilities for unacceptable waste. Refuse vehicles with suspicious loads could be further inspected in the tipping areas. Employees should have proper training in identifying nonacceptable materials. Signs clearly delineating what will not be accepted and the penalties for noncompliance could be posted. Good security measures should be used during nonoperating periods. Public and hauler awareness programs could also be established to educate those using the facilities about the proper disposal of nonacceptable wastes (Metropolitan Council, 1985b).

Some nonacceptable wastes that inadvertently arrive at the recovery facility and transfer stations can create employee safety problems. The separation and storage of hazardous wastes may be especially dangerous activities in some circumstances. Evaluation of equipment that can be used to accurately and safely inspect, identify and handle suspicious waste could be undertaken on a periodic basis. Employees should be trained in the proper methods of fire and explosion prevention and suppression. The training should include thorough instruction in the design and operation of safety equipment. Careful testing of the fire control systems could be conducted before the recovery facility and transfer stations become operational and periodically thereafter (Metropolitan Council, 1985b).

If nonacceptable wastes are segregated at the recovery facility and transfer stations, the following general management guidelines should be followed:

1. Storage of materials should be in an enclosed area.

2. There should be no long-term outdoor storage of materials.

3. If necessary, certain materials should be immediately removed and disposed of at proper facilities.

4. Materials should be transported off site in enclosed vehicles.

Procedures for handling hazardous wastes that are inadvertently received at the transfer stations and recovery facility could cover: notification requirements when hazardous wastes are received; employee safety procedures to be activated; quantities and types that can be stored; length of the storage period; the type of storage place, including separation and venting requirements; and requirements for removal and disposal of the hazardous wastes. The following general guidelines were developed in the Metropolitan Council's EIS prepared for the Ramsey-Washington Counties Waste-to-Energy Project (May 1985):

- Hazardous wastes with flammable, reactive or explosive properties must be separated prior to processing;

- Collected hazardous wastes must be stored in accordance with MPCA rules (such as the hazardous waste generator standards);

- If more than 1,000 kg of hazardous waste is stored or if any quantity is stored for 90 days, a MPCA facility permit will be required; and

- Collected hazardous wastes must be disposed of or treated at licensed hazardous waste management facilities.

The county could also aggressively support the implementation of state hazardous waste management programs and activities. Pilot collection projects and waste surveys could be started in cooperation with the MPCA and the Minnesota Waste Management Board. The county could support the development of hazardous waste processing facilities and any renewed state efforts to find a suitable location for a hazardous waste land disposal facility. A county plan for managing household quantities of hazardous wastes could be adopted.

5.1.2 Disposing of Ash Residuals

A suitable long-term disposal facility for combustion residuals will have to be identified. Ash disposal may be restricted to segregated areas of existing or new sanitary landfills. If an ash-only landfill is proposed, it will likely be subject to MPCA design standards similar to those required for mixed municipal solid waste.

A number of existing landfills are within haul distance of the resource recovery facility and could be used for the disposal of ash residuals. The landfills include the Anoka Municipal, Burnsville, Freeway, Pine Bend, Woodlake and Louisville Landfills. The capacity of these landfills, unless expanded, will be exhausted by the mid-1990s (see discussion, 4.1.3 Net Abatement Potential and Effect on Needed Landfill Capacity). The county is currently preparing an environmental impact statement on four candidate landfill sites within the county (see discussion, 3.1.4 Landfill Availability). The disposal of ash residuals could be considered as a part of the EIS evaluation.

The resource recovery facility will abate 9,040 acre-feet of landfill space over a 20-year period. The total quantity of ash residuals and other nonprocessible waste produced over the 20-year period would require the equivalent of 1,860 acre-feet of landfill space. To reduce this space requirement, the county could explore ash residuals abatement efforts. A number of studies have been done on the utilization of coal ash and sludge ash residuals. Such materials have been found to be useful as an additive to road asphalt and concrete. Very little research, however, appears to be available on the utilization of refuse ash. The county could undertake such a study. The Minnesota Pollution Control Agency may require stabilization of the metals in refuse combustion residuals prior to disposal. Stabilization may increase its potential for reuse. It should be noted that a lime reagent will be injected into the flue gas stream in the recovery facility scrubber system.

5.1.3 Storing Recyclables at the Transfer Stations

Hennepin County proposes to have drop-off containers for recyclables at the transfer stations. Common materials accepted at drop-offs can include newspapers, aluminum, glass, ferrous cans and cardboard boxes. Plans have not yet been proposed by the county to manage the drop-off facilities. The containers should be convenient enough to facilitate public use, but should not disrupt the solid waste transfer activities or present nuisance or aesthetic problems to the surrounding area.

Key aspects of any management plans could include: 1) on-site storage of the recyclables in an enclosed area; 2) enclosed transport of the recyclables when they leave the site; and 3) no long-term outside storage of the materials (Metropolitan Council, 1985b). Instructions for preparing and leaving the recyclables should be available to the public. The drop-off area should be frequently inspected to see if the containers are full and to ensure litter problems are not occurring. Containers should be labeled to indicate the type of materials that can be left, and they should be removed immediately when full.

Location of the drop-off area in relation to the transfer activities is an important consideration. The drop-off area could be at the side of the transfer building or located on site away from the building. Vehicles entering the site carrying recyclables should be diverted immediately to the drop-off area. Such vehicles should not interfere with the operation of refuse vehicles.

Implementation of these general provisions could prevent or minimize the potential for litter and nuisance impacts. Aesthetic impacts should also be considered. For example, if large quantities of white goods are stored outside, aesthetic impacts could increase. Design and management of the drop-off area should involve the close cooperation of the local community. Local controls may have to be employed specifying restrictions on the drop-off facilities.

5.1.4 Diverting Excess Waste to Alternate Facilities

During emergency shutdowns or if waste supply volumes exceed the resource recovery facility's capacity or the capacity of a particular transfer station, wastes may have to be diverted to alternate facilities. To avoid sending wastes to landfills and, thus, reduce the environmental effects of these occurrences, some options could be considered by Hennepin County.

Excess waste could be sent to other resource recovery facilities. Some excess capacity is expected to be available at facilities being developed by Anoka County, and Dakota, Ramsey and Washington Counties' joint effort. The total additional capacity is unknown at this time until further project planning efforts have been completed. In addition, the three exclusion projects may operate with some available excess capacity (see discussion, 3.1.6.2 Exclusion Projects). The Reuter project, in particular, plans to operate with a 200 ton-per-day third processing line available on a standby basis if one of the two operating processing lines shuts down. Contractual agreements would have to be worked out if the county pursued use of other recovery facilities.

Excess wastes could be stored for short periods of time in transfer vehicles and/or at tipping areas if short-term shutdowns occur at the recovery facility. Storing the wastes, however, is a temporary, short-term extreme measure and should generally not exceed a 24-hour period. Another option would be for the county to develop another resource recovery facility or co-composting facility that would operate with additional standby capacity. The additional capacity could be used during peak waste generation times and shutdowns at the main plant. There are, however, questions regarding how much waste the county generates to justify another facility (see discussion, 5.1.5 Contingency Planning by Hennepin County). Moreover, there could be substantial costs to the county to develop additional processing capacity merely to use on a standby basis.

The resource recovery facility has a design capacity of 1,212 tons per day. It should be noted that the plant's design capacity is sized at 1,212 tons per day in order to accommodate an annual average throughput of 1,000 tons per day. The design capacity takes into account the facility's on-line availability including maintenance periods. The amount of excess waste that could be handled above the 1,000 tons may, in fact, be quite small. If excess wastes arrive, the facility could operate above its proposed annual average throughput of 1,000 tons per day. State law places an annual average throughput of a 1,000 ton-per-day limitation on recovery plants in Minneapolis. In light of the 1990 ban on the land disposal of unprocessed waste, it may be desirable to seek clarification of this limitation by the state legislature.

The county could have a contingency plan for each transfer station and the recovery facility to handle excess refuse volumes. Alternate facilities could be identified and notification procedures could be activated. Waste haulers using particular facilities could be made aware of the contingency procedures.

5.1.5 Contingency Planning by Hennepin County

As previously discussed, most of Hennepin County's solid waste supplies are committed to resource recovery and waste recycling projects currently being planned. Taking into account peak waste generation periods and waste volume forecasts, waste may be available for additional projects in the future (see discussion, 4.1.2.1 Waste Availability). Moreover, if one or more of the committed projects fails to develop or perform as planned, available waste supplies could also increase. If more waste supplies, therefore, become subject to the county's designation, utilization of the transfer stations would be affected.

During seasonal low generation periods for 1990, the available waste supplies committed to resource recovery and recycling projects appear to be as high as 95 percent. Because of this factor, whether or not the county could enter into other long-term guarantees with large-scale project vendors is questionable. As previously pointed out, however, present waste generation forecasts may be too conservative, and more waste may be available than originally thought (see discussion, 4.1.5 System Impacts on the Transfer Stations). Additional study could be done by the county to pin down figures for the uncommitted waste volumes.

One option the county has is to pursue agreements with other counties for additional resource recovery capacity. This becomes especially important if one or more of the proposed exclusion projects fails to develop (see discussion, 4.1.4

Impact of the Exclusion Projects). Moreover, the Metropolitan Council's solid waste guide places a strong emphasis on developing large-scale recovery projects through intercounty planning efforts. Intercounty agreements become especially important and mutually beneficial in light of the region's 1990 land disposal ban on unprocessed waste. If more wastes are committed to recovery projects, the transfer stations could be more fully utilized and serve an intercounty system as originally intended.

5.2 Air Quality

During construction fugitive dust would be generated. In order to minimize the creation of dust the construction site should be watered occasionally. Dirt areas should be left exposed only as long as necessary. Prompt revegetation is recommended. Watering of construction sites has been found to reduce the generation of fugitive dust by as much as 50 percent.

The air quality modelling indicates a potential for the build-up of .0029 inches of ice during a 14 hour period (assuming worst case meteorological conditions) from the cooling tower deposition. This build-up would occur along sixth Avenue North immediately in front of the proposed facility. Such build-up is equivalent to a very light dusting of snow during winter months. The generation of traffic on the road is likely to prevent the build-up of any ice on sixth Avenue North due to tire road friction. Ice build-up will be infrequent in occurence (see Section 4.2.2).

The applicant could apply material such as sand to the road if ice build-up appears to be occurring. This will provide additional traction and lower the freezing point of moisture droplets thereby minimizing ice build-up.

An effective but more costly alternative would be the installation of a wet/dry cooling tower which minimizes drift deposition. With this technology, ice build would not be expected to occur. This technology is more expensive than other mitigation measures such as sand application.

The handling of refuse has the potential to result in the production of odors. The impact analysis did not indicate potential odor problems from the resource recovery facility. The facility will destroy most odors in the boiler. The potential does exist for the generation of odors at the transfer stations. Several strategies can be employed to minimize odors there.

A reodorant should be applied to the waste as it is handled at the transfer stations. Reodorants do not mask odor, but rather minimize odor from the waste. Reodorants have been employed in various facilities throughout the county. The reodorants also serve to keep the waste moist, thereby reducing dust generation.

The implementation of fans and filter material in the transfer stations could be employed to collect dust particles and odors in a filter. The ventilation system would be used to draw air in the transfer stations through a filtering system before discharge to the outdoors. Such air quality control equipment has been employed at transfer stations in the country to control dust and odor generation from transfer stations (i.e., an 1100 TPD facility in Baltimore, Maryland).

5.3 Geology and Soils

Development of the resource recovery facility and transfer stations is not expected to result in significant long-term impacts to geologic or hydrologic resources. Potential impacts identified are the removal of contaminated soils at the Greyhound site and a potential need for site dewatering during construction. Eventual removal of contaminated soils at the Greyhound site would represent an improvement over existing conditions.

Construction practices could be employed to minimize temporary changes in rates of erosion and runoff caused by disruption of naturally compacted soils and vegetation. These practices include:

- o periodic wetting and mulching of unvegetated and uncompacted areas to reduce blowing dust, soil erosion and runoff.
- o Prompt revegetation of disturbed areas, and
- o construction of temporary detention ponds to interrupt runoff.

Underground tanks should not be used for fuel storage. Above ground tanks are recommended. Such tanks minimize the potential for groundwater contamination.

5.4 Water Quality

Construction of the facilities would result in a potential for increased runoff. Associated with the runoff could be a decrease in water quality.

During construction immediate revegetation of the sites would minimize erosion potential and impacts on water quality. At the Brooklyn Park site in particular, runoff patterns to the west should be maintained. A detention pond during construction would minimize project impacts. In addition, all construction could be restricted to areas outside of the 100 year flood plain. It may be very costly or infeasible to construct outside of the flood fringe area since it occupies much of the center of the site. The only technologically feasible mitigation measure might be construction at an alternate site.

The utilization of in line baffled concrete drop box structures to contain contaminated liquids would reduce the likelihood of petroleum contamination during operations. Another possible mitigation measure at Brooklyn Park East would be to confine construction of the facility to areas outside the flood fringe.

Construction of the facilities on other sites or the decision not to construct at all could eliminate potential impacts. If the proposed facilities were not constructed, environmental impacts would be avoided at the proposed sites, although all county wastes would then have to be landfilled. The goal of reducing the landfilling of solid waste might not be accomplished, however, by implementation of such a strategy.

5.5 Land Use and Zoning

Each city's zoning ordinance generally fails to specifically address resource recovery or transfer station facilities. In some respects this is a direct result of the fact the resource recovery technology is relatively new in this region.

A resource recovery facility at the Greyhound site is not expressly permitted in the Minneapolis zoning ordinance. State statute provides for such a use under its special use provisions. The city cannot issue a conditional use permit per provisions of the state statute.

Resource recovery transfer station facilities are not expressly listed as conditional uses in the Bloomington, Brooklyn Park, or

Hopkins zoning ordinances. Uses similar in nature are however allowed as conditional uses. The zoning ordinances could be modified to expressly allow such facilities as conditional uses or permitted uses in industrial zones.

Another mitigating measure would be to not construct the facilities within the communities designated as potential sites. Alternative locations might, however, have zoning ordinances which do not address resource recovery facilities as permitted uses. Location at alternative sites could result in a trade-off of environmental impacts from one site to another.

Construction of the facilities in Minneapolis, Bloomington, Brooklyn Park, and Hopkins would be generally consistent with land use and Comprehensive plans. Each municipal plan shows a future industrial use recommended for the various sites. Mitigation measures such as amendments to the plans would not be necessary or appropriate.

5.6 Transportation

The transportation analysis indicated no significant degradation in traffic operations at the Greyhound site. There could be a potential for conflict between site traffic and buses when both have green lights to enter Sixth Avenue North. This conflict could be mitigated by using separate signal phasing to allow traffic to leave the MTC garage.

The intersections in the immediate vicinity of the Bloomington East site are of concern. Without development of the transfer station delays will occur at the inhtersections of West 98th Street and Jones Avenue and West 98th Street and Girard Avenue and West 98th Street and Old Shakopee Road. Consideration should be given to upgrading, signalization, and changes in signal cycle phasing to accommodate future traffic volumes.

Two intersections at the Brooklyn Park East transfer station are projected to operate below desirable standards in 1989 without development of the project facilities. These intersections are the stop sign controlled intersection of U.S. 169 and 73rd Avenue and the signal controlled intersection of West Broadway and U.S. 169. Consideration should be given to signalizing U.S. 169 at 73rd and reviewing the signal phasing at West Broadway and U.S. 169 to mitigate future potential capacity problems. In addition, the construction of a future interchange at Boone Avenue and the extension of 73rd Avenue (slated to design construction within the year) will serve to reduce traffic. It is expected that traffic will be reduced at the intersection of West Broadway and U.S. 169, thereby improving operating conditions. Removal of vegetation at this intersection and proper signing on the northbound leg of West Broadway would provide additional safety measures at this intersection.

Traffic operations at all intersections analyzed would be acceptable in 1989. Concern has been expressed regarding railroad operations near the Hopkins site entrance. A potential mitigation measure would be the scheduling of project truck traffic to avoid scheduled train operations in the area. No significant operating deficiencies were observed at any of the intersections considered. Weaving of vehicles in County Road 3 were evaluated in the analysis and found not to be a significant problem. In addition, a designated traffic route from County Road 18 to Fifth Avenue would minimize noise and traffic impacts. Storage for refuse vehicles on site could be provided for trucks delayed by trains blocking Fifth Avenue. It is recognized that a number of trains through Hopkins (as many as 8 coal trains per day) are unscheduled. This would make scheduling of project traffic difficult. The Hennepin County designation ordinance prohibits access to the facility via Second Avenue South. Measures to prevent access could be:

1) Posting of the route by City of Hopkins to prohibit truck traffic,
2) Prohibition and fining of haulers using the route by the County,
3) Design of entrance to prohibit access from the south, and
4) Spot checking by County to insure the route is not utilized.

5.7 Noise

The primary impact during construction of the proposed resource recovery facility would occur from additional traffic caused by commuting workers, trucks, and the operation of construction equipment. Pile driving and steam-blow during initial project start-up (will occur only once) would elevate noise levels. The impacts of construction operations could be minimized by restricting construction activities at all sites to the hours of 7 AM to 7 PM (daylight hours only). Construction equipment could also be required to employ mufflers and sound reducing devices. Vibratory pile drivers if employed would reduce noise levels.

During operations noise impacts will be perceptible at the MTC garage opposite the Greyhound site. Mitigation measures designed to reduce noise impacts could be employed. They are:

- Application of acoustic materials to stationary equipment.
- Use of variable speed ID fans
- Silencers on all steam and air vents
- Use of Air intake filters/mufflers for compressors
- Application of mufflers in vehicles and other motorized equipment.

At the transfer stations, noise levels will be increased by project operations. At the Bloomington East Site, noise levels will exceed MPCA standards at three receptors during operations (see Section 4.8). At Brooklyn Park East, one receptor will exceed MPCA standards as a result of the project. It is important to note that all receptors analyzed at the Hopkins DOT site will exceed MPCA standards with or without the project. Project increases will be 3 dBA or less. Similarly, noise levels currently exceed MPCA standards at all receptors analyzed. Although project impacts will be slight, MPCA standards will be exceeded even further by project operations.

Several mitigation measures could be employed to reduce noise generated by the transfer station. All vehicles accessing the facilities could be required to have adequate mufflers to reduce noise levels. Plant equipment should incorporate mufflers and insulating material to reduce noise levels to a minimum. In addition designated truck routes should be specified to avoid residential neighborhoods. For example truck traffic could be restricted from the use of Second Avenue South in Hopkins (see discussion in Section 5.7).

5.8 Utilities

No significant impacts requiring mitigation were identified.

5.9 Socioeconomics

construction and operation of the proposed facilities would generate jobs in the area. Operation of the transfer stations by the County will reduce real-estate tax payments at the Bloomington East and Brooklyn Park East sites.

Concern has been expressed regarding the impact of the facilities on adjacent property values. No conclusive evidence exists to categorically show that resource recovery facilities reduce the value of adjacent properties. However, if the facilities were not constructed the potential for changes in property values from transfer station facilities would be eliminated.

The county could allow a private party to develop the sites (own and operate) thereby being subject to pay property taxes. Developers could also utilize the publically owned sites, such as the Hopkins site, for profit making purposes (if the County would sell the land). Development of all the sites represents lost opportunity costs to utilize the sites for other purposes. The City of Hopkins has provided an estimate of the opportunity cost developing the site at $925,000 (estimated market value of property). Estimates for other sites have not been provided.

5.10 Aesthetics and Cultural Resources

Impacts on visual aesthetics could be eliminated by not constructing any of the facilities (see Part 2, Section 1.0). In addition, impacts can be minimized at all of the facilities by several strategies. These include:

- o Extensive landscaping and ornamental tree/shrub plantings
- o Use of aesthetically pleasing architectural treatments. This could involve establishment of community based committees to have impact into the design of the facilities.
- o Exterior finishings should be compatible with adjacent structures.
- o Landscaping should be utilized to block open views of the facilities.
- o Buildings could be sited as far as possible from adjacent structures to preserve a buffer zone, and
- o Efforts should be made to preserve existing natural vegetation to the extent possible.

5.11 Site Layout and Design Modifications

5.11.1 Greyhound Site

The proposed resource recovery facility could be designed to provide on-site maneuvering room for refuse vehicles outside of the buildings. This would provide for storage of refuse vehicles on site, as well as for the rejection of certain loads more easily. Redesign of the facility would be costly and would not easily be accomplished given the size of the facility and the available land.

The facility could be constructed to provide additional acoustical material to reduce noise emissions. Stack breechings and induced draft fans could be wrapped with sound reducing materials.

Reorientation of the buildings would likely result in a less efficient operation without significantly reducing potential environmental concerns.

5.11.2 Bloomington East

The Bloomington East Transfer Station could be designed to employ additional air pollution control equipment, to control airborne dust, odor, and other air borne materials. Modification of the layout of the facility is not considered to represent a significant alteration of environmental concerns.

5.11.3 Brooklyn Park East

The site layout could be altered to avoid the 100 year flood plain to the maximum extent possible. This could be very costly and difficult since the flood plain covers much of the middle of the site. This would include the movement of the facility to the east and reorientation of the site access roads to avoid the flood plain.

Pollution control measures such as carbon filtering, baghouses, wash down and spraying of reoderants could be incorporated into the design to remove odors and air borne contaminants. Such measures tend to be costly.

5.11.4 Hopkins DOT

Pollution control measures, such as carbon filtering, washdown, baghouses, and reodorant sprays, could be incorporated into the design to remove odors and air borne contaminants. Acoustical materials incorporated into the design layout could be considered.

The facility could be significantly reduced in size and designed to handle considerably less waste, for example 600 TPD design capacity. The facility would then be redesigned to accommodate the smaller throughput. The waste flor designation currently proposed pertains to the entire County. If the facility were reduced in size the designation ordinance would result in the delivery of more waste to the facility than it could feasibly handle. It would be necessary to ammend the designation ordinance to reduce the waste flow (i.e., designating specific communities).